Broadband Deployment in California

California Public Utilities Commission
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Chapter 1. Introduction

Telecommunications is in the midst of a revolution.

Technology advances in recent years have changed the way we live, learn, communicate, and do business. Telecommunications has become central to the needs of families, the health of our economy and the vitality of our communities. Today, much of the information in the world is no more than a click away for those in even the most remote areas. Doctors can review medical test results in real time and diagnose patients from 100 miles away, bringing critically needed healthcare to rural communities. Students can take classes and earn degrees from universities on the other side of the continent. Whether you need the latest news or a business license, whether you are hiring a plumber or buying a car, sending family photos, text-messaging a friend or closing a business deal with a company on the other side of the world – advances in telecommunications technologies have brought limitless opportunities and benefits to our lives.

There is one catch. You need bandwidth to take advantage of these opportunities.

California leads the nation in broadband use, both in terms of total number of broadband lines and U.S. market share, and our growth rate continues to exceed the national average.

California's success to date is based on a wealth of early adopters and tech-savvy businesses. As the broadband market moves beyond its infancy, however, California is falling behind other states in developing policies to continue broadband growth and facilitate deployment of next generation technologies.

In a state-by-state analysis, Silicon Valley's respected coalition of technology company executives, known as TechNet, ranked California 14th in the nation in developing policies that encourage broadband deployment.[1] For the state of California, home of Silicon Valley, to rank only 14th in broadband policies is a serious concern.

If California is to maintain its lead in broadband usage, reach into lower-use communities and lead the way in next-generation technologies, we must adopt next-generation policies that match our quest for progress. Progress will come from relentless innovation not only in technology, but also in policymaking.

This report is the product of a continuing mandate by the California Legislature to identify and eliminate barriers to the ubiquitous availability of advanced telecommunications services in California.

[1] "The State Broadband Index," TechNet, July 17, 2003.

1.1 Legislative Context: Senate Bill 1563

Today's "broadband" will be considered narrowband when tomorrow's technologies are deployed and consumers increasingly demand greater bandwidth.

In Senate Bill (SB) 1563, the California Legislature directed the California Public Utilities Commission (CPUC) to develop a plan "for encouraging the widespread use of advanced communications infrastructure." SB 1563 states:

> ...the mission of the plan is to identify factors preventing the ubiquitous availability and use of advanced communications services, assess the consequences of, and develop strategies for, addressing these factors while encouraging the deployment of adequate investment for advanced communications infrastructure that serves the public good.[2]

SB 1563 advances California's long-standing view that the state will benefit from increased deployment, access and usage of broadband services. California Public Utilities Code Section 709 was subsequently modified to express the SB 1563 policy objectives:

- To continue our universal service commitment by assuring the continued affordability and widespread availability of high-quality telecommunications services to all Californians.
- To promote economic growth, job creation, and the substantial social benefits that will result from the rapid implementation of advanced information and communications technologies by adequate long-term investment in the necessary infrastructure.[3]

1.2 Public Comment Process: OIR 03-04-003

The CPUC opened an Order Initiating Rulemaking (OIR) identifying issues for study and examination consistent with the requirements of SB 1563. In pursuit of this inquiry, the CPUC has solicited written comments from parties and members of the public, conducted public participation workshops, prepared and analyzed results from two surveys on broadband use and related issues, conducted independent research, reviewed current literature and information, and met with affected individuals, community based organizations, businesses and policymakers.

1.3 Definition of Broadband

The first issue identified by the CPUC in its investigation is that there is no clear definition of the term "broadband." Many people associate the term "broadband" with a particular speed of transmission or a certain set of services, such as Digital Subscriber Line (DSL) or wireless local area networks (wLANs). However, the term broadband does not refer to a specific speed or service.

Broadband combines connection capacity (bandwidth) and speed. Twenty years ago, anything faster than primary rate Integrated Services Digital Network (ISDN) service, which offered speeds of up to 144 kilobits per second (Kbps), might have been considered broadband. Over the last six years, as broadband networks based on either DSL or cable modem technologies have been deployed, speeds of 200 Kbps and upward generally have been regarded as broadband.

[2] SB 1563, codified in Public Utilities Code Section 709.
[3] Public Utilities Code Section 709.

However, since broadband technologies are advancing rapidly and Internet access speeds are continuing to increase, the definition of broadband also continues to evolve. In the rapidly changing technology environment of the Internet, the definition of broadband is a moving target that is likely to mean something different next year, as well as the year after that. For purposes of this Report, therefore, we identify the "current" state of broadband. Today, the term broadband typically describes connections that range from a minimum of 384 Kbps to 10 megabits per second (Mbps) and higher.

1.3.1 Broadband As Initially Defined by the FCC

In response to congressional mandate,[4] the Federal Communications Commission (FCC) initiated its first inquiry on the state of advanced telecommunications services in 1999 and filed the first Section 706 Report with Congress.[5] In that first Section 706 Report, the FCC defined "broadband" as:

> the capability of supporting, in both the provider-to-consumer (downstream) and the consumer-to-provider (upstream) directions, a speed (in technical terms, "bandwidth") in excess of 200 Kbps in the last mile. This rate is approximately four times faster than the Internet access received through a standard phone line at 56 Kbps.[6]

The FCC chose 200 Kbps because "it is enough to provide the most popular forms of broadband -- to change web pages as fast as one can flip through the pages of a book and to transmit full-motion video."[7] However, a 200 Kbps threshold will not support full-frame video and many other imaging and multi-media applications, regardless of the platform.

1.3.2 Other Definitions of Broadband

There are perhaps as many definitions of broadband as there are organizations and countries that have attempted to define it. The Committee on Broadband Last Mile Technology, an expert group assembled by the National Academy of Sciences, called 200 Kbps "at best, a lowest common denominator" and added that setting any minimum speed threshold is "unwise over the long run."[8] The International Telecommunications Union, a global standards-setting body, defined broadband as a "transmission capacity that is faster than primary rate Integrated Services Digital Network (ISDN) at 1.5 or 2.0 Mbps.[9] The Organisation for Economic Cooperation and Development, on the other hand, considers downstream access of 256 Kbps (with 128 Kbps upstream) as broadband.[10]

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[4] Federal Communications Commission, "Inquiry Concerning the Deployment of Advanced Telecommunications Capability to All Americans in a Reasonable and Timely Fashion, and Possible Steps to Accelerate Such Deployment Pursuant to Section 706 of the Telecommunications Act of 1996," FCC Docket No. 98-146, Second Report, FCC 0-290 (August 21, 2000). Available online at http://www.fcc.gov/Bureaus/Common_Carrier/Orders/2000/fcc00290.pdf.

[5] Section 706 reports are the FCC's primary national reporting mechanism on the state of advanced telecommunications services.

[6] Ibid.

[7] Ibid.

[8] http://books.nap.edu/html/broadband/ch5.html.

[9] http://www.itu.int.

[10] http://www.oecd.org.

The Canadian National Broadband Task Force (CNBTF) in formulating its definition of the term "broadband," noted that among the 14 countries that were surveyed, national definitions of the term ranged from as low as 2 Mbps to high as 30 Mbps. Taking a more functional approach to definition, the CNBTF decided not to define broadband in terms of information transmission rates, but instead defined it as "a high capacity, two-way link between end users and access network suppliers capable of supporting full-motion interactive video applications to all Canadians on terms comparable to those available in urban markets."[11] Based on the technology existing at the time, it concluded that a minimum two-way or symmetrical transmission speed of 1.5 Mbps per individual user was required to meet this standard. In the future, the CNBTF predicted, speeds of up to 4 to 6 Mbps would be required to handle emerging applications such as peer-to-peer video file sharing and video conferencing.[12]

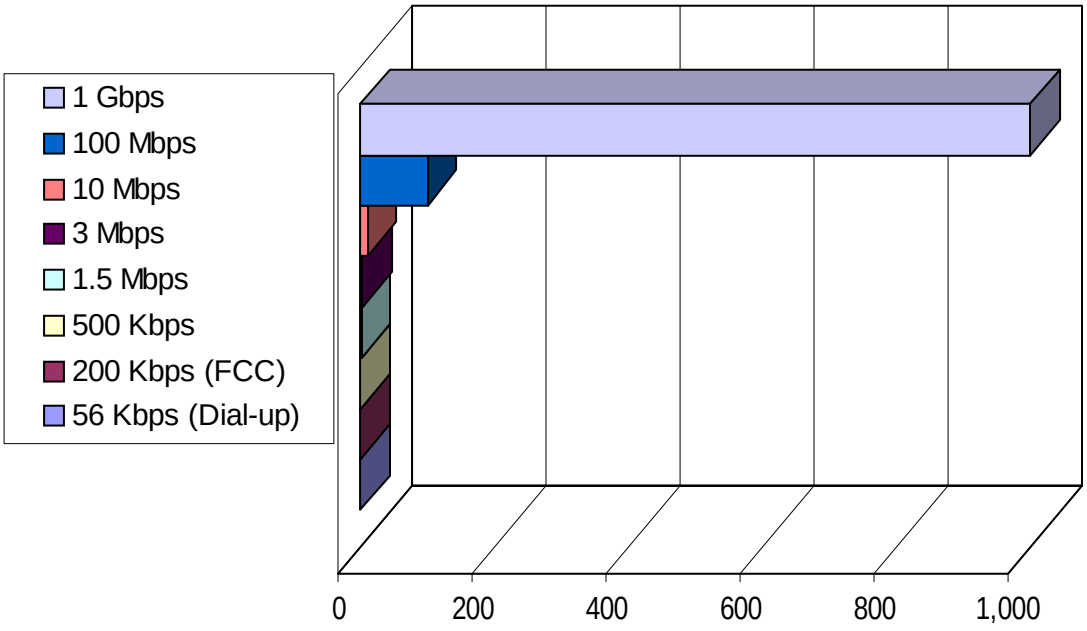
1.3.3 Why the Definition of Broadband Matters

The proliferation of bandwidth-intensive applications is the key driver of broadband adoption. Access to a "pipe" is merely a means of obtaining products and applications such as the Internet, video on demand, news services, interactive gaming, chatting, telephony and countless other services. Policies designed to promote broadband deployment and access to advanced services, therefore, must encourage a definition of broadband facilities that is robust enough to support emerging technologies and applications not yet developed. Policies that promote a limited definition of broadband ultimately discourage broadband adoption by supporting technologies that may limit the applications consumers can access.

The following graph provides a comparison of various Internet access speeds, from dial-up modem to high-speed broadband achieved by fiber optic cable.

[11] Report of the National Broadband Task Force available at http://www.broadband.gc.ca/Broadbanddocument/report_e.asp.
[12] Ibid.

Figure 1.1
Comparison of Internet Access Speeds in Million Bits Per Second



The following table illustrates the capabilities of Internet Access speeds, as well as various other communications delivery systems, to transmit a DVD[13] from New York to California.

Figure 1.2
Speed and Bandwidth[14]

Delivery	Minutes	Hours	Days
UTOPIA Fiber (1 Gbps)	1 min		
UTOPIA Fiber (100 Mbps)	10.4 min		
PON (OC-12/32) (19.4 Mbps)	53.6 min		
VDSL (8.5 Mbps)		2 h 12m	
PON (OC-3/32) (4.84 Mbps)		3 h 36m	
Cable Modem (3 Mbps)		5 h 18m	
FedEx		10 h[15]	
T-1 (1.54 Mbps)		11 h 12m	
DSL (1 Mbps)		16 h 48m	
ISDN (128 Kbps)			5 1/2 days
Pony Express			11 days[16]
Dial-up Modem (56 Kbps)			13 days

[13] Electronic transmission figures assume a typical 2 hour-long movie.
[14] http://www.utopianet.org/technology/speed.htm.
[15] FedEx package delivery from New York, NY 10005 to Beverly Hills, CA 90210.
[16] Extrapolated from record Pony Express delivery time: Lincoln's Inaugural Address, March 4, 1861 carried approximately 2,000 miles from St. Joseph, Missouri to Sacramento, CA in 7 days 17 hours.

Chapter 2. The California Broadband Market

2.1 Broadband is Widely Deployed in California

The analysis that follows is based largely on data reported by carriers to the FCC's Form 477 survey for June 2004. We acknowledge the limitations on this Report's ability to more accurately assess the availability of broadband in California that are imposed by our reliance on the FCC Form 477 data. The FCC Local Competition and Broadband Form 477 data (collected semiannually in December and June) used to prepare the maps and tables presented here is based on the outmoded FCC definition of broadband, and is derived from responses from only those providers having 250 or more customers. In addition, all data is collected by zip code, and does not include the number of customers in each zip code. Accordingly, an entire zip code may be characterized as having broadband availability, even if only a part of that zip code has such availability.[17]

The FCC data was augmented by independent CPUC research,[18] and has been compiled into a set of maps (see separate files for Maps 1 through 4).

Map 1 illustrates that broadband is available in every California zip code. All four broadband technologies surveyed in the FCC 477 report (Wireless, DSL, Cable and Satellite) are available in 26% of California zip codes, and 39% of California zip codes have DSL, Cable and Satellite broadband technologies available.

Figure 2.1
Broadband Availability in California Zip Codes[19]

Services	Percentage of Zip Codes
DSL, Cable Modem, Wireless, and Satellite	26
DSL, Cable Modem, and Satellite	39
DSL and Satellite	19
Cable Modem and Satellite	3
Satellite only	13
Total	100

[17] In addition, the data is provided to state commissions after the FCC publishes its analysis of the data in its Section 706 Report on the Availability of Advanced Telecommunications Capability, generally with a six-month lag. The June 2004 data was the most current available at the time this report was prepared. December 2004 data will be available in June 2005. On November 12, 2004 in FCC Docket 04-266, the FCC adopted a new Form 477 that, among other things, will require reporting of five speed broadband services categories, ten broadband technology types and will eliminate any minimum customer reporting threshold. This more detailed information should help identify supply and subscribership patterns with greater accuracy and specificity.

[18] Staff researched the availability of cable broadband in California zip codes through a variety of sources, including interviews with providers, public participation meetings, and research. Staff found that cable broadband is available in 313 more California zip codes than FCC data indicates. Staff's coverage calculations also assume that all areas in California with exposure to the Southern sky have access to satellite broadband. See Section 4.3 of the report.

[19] FCC Form 477 data, June 2004.

Data on cable modem availability indicates that broadband service is much more widely available than is shown by the FCC data, however. According to the National Cable & Telecommunications Association, 12,440,053 California homes are passed by cable, a figure that represents approximately 97% of all homes with television service in the state. 11,960,046 of these homes, or approximately 96%, have broadband cable modem service available; 264,574 or approximately 2% do not have cable modem service; and data was not available for the remaining 215,433 homes, or 2%.[20] . Of all homes passed by cable, it is estimated that at least 90% have broadband service available to them via cable modem.[21]

Map 2 illustrates the wide choice of broadband service providers in California. Areas of the map that are shaded red, which are primarily located in major metropolitan areas, have access to at least 11 or more broadband service providers. As shown in Figure 2.2 below, two or more broadband providers serve almost every California zip code (93%). A majority of California zip codes are served by four or more broadband providers.

Figure 2.2
Broadband Service Providers in California Zip Codes

Number of Providers	Percentage of Zip Codes
1	7
2-3	35
4-5	10
6-10	17
11 +	31
Total	100

Map 3 illustrates population density in California, with the red areas being those with the most population (100,001 to 3,912,200 people) and green representing those with less than 5,000 people. Viewing this map in conjunction with the two other maps illustrates that multiple broadband providers service the major population areas in California, and that consumers within those zip code areas have multiple broadband providers available to them.

The last map, Map 4, depicts the most current information on WiFi hotspots in California. "WiFi" is the abbreviated term for wireless fidelity, and "WiFi hotspots" are physical locations such as cafes, hotels, and airports where wireless connections to the Internet are offered. Most public WiFi hotspots require paid subscriptions -- hourly, daily or monthly -- for access, although there are a growing number of free hotspots.

[20] Warren's Factbook 2004; email correspondence between CPUC staff and representative of Comcast, April 8, 2005.
[21] Based on national data, see Lynn Stanton, "'Shaping Industry' Like 'Herding Cats'," Telecommunications Reports, April 5, 2005 (quoting FCC Chairman Martin as stating "As a result of cable broadband investment, 90% of homes have [broadband] access…"); "Cable Industry Facts-at-a-Glance January 2005," www.ncta.com.

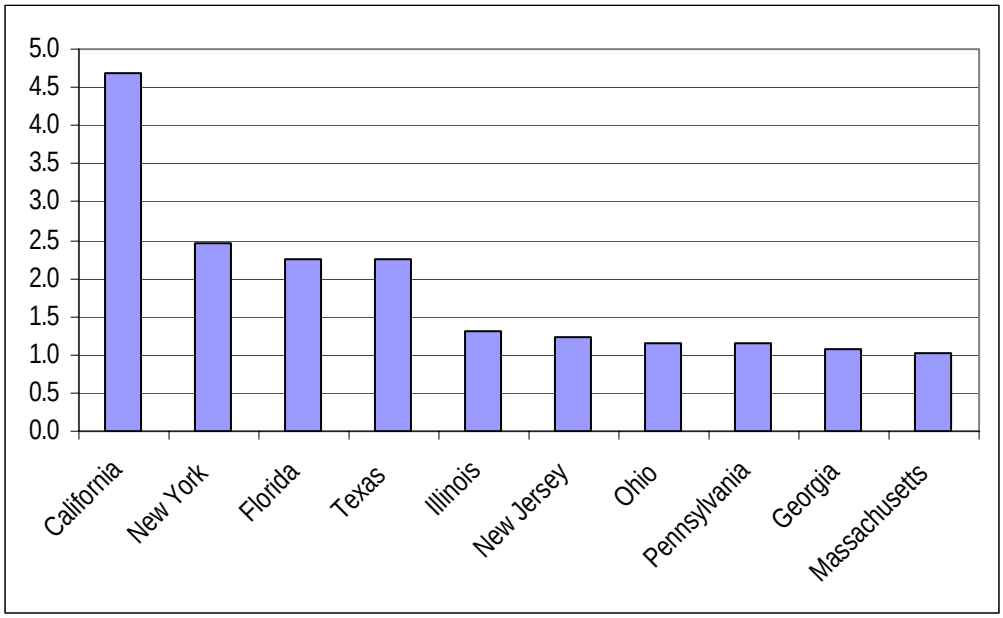
There are now more than 50,000 WiFi hotspots around the globe. The number of hotspots around the globe is believed to have increased more than 40% since July 2004 alone - from 35,000 locations just seven months ago[22] - and new hotspots are being developed at a furious pace. The United States leads the world in hotspot availability, having more than 21,000 cities where WiFi hotspots can be found. California leads the country with 3,848 -- more than double New York's 1,546 hotspots. San Francisco ranked ninth among the top ten cities, with 382 hotspots. Other California areas with significant WiFi hotspots are Oakland, Los Angeles, San Jose, Orange County, and San Diego.

The number of hotspots in California and elsewhere will continue to increase at a rapid pace, as the number of consumers able to access them with their laptops grows. More than 30 million laptop computers with wireless broadband capability were sold in 2003, and experts predict that in less than two years, 100% of all laptop computers sold will be WiFi capable.[23]

2.2 Broadband Access in California Leads the Nation

California leads the nation in the total number of broadband lines[24] as well as overall national broadband market share. Figure 2.3 below shows the number of broadband lines for the ten most populous states in the nation. As of June 2004, California had 4.69 million broadband lines, almost as many as New York and Florida combined.[25]

Figure 2.3
California Leads the Nation in Broadband Lines (in millions)

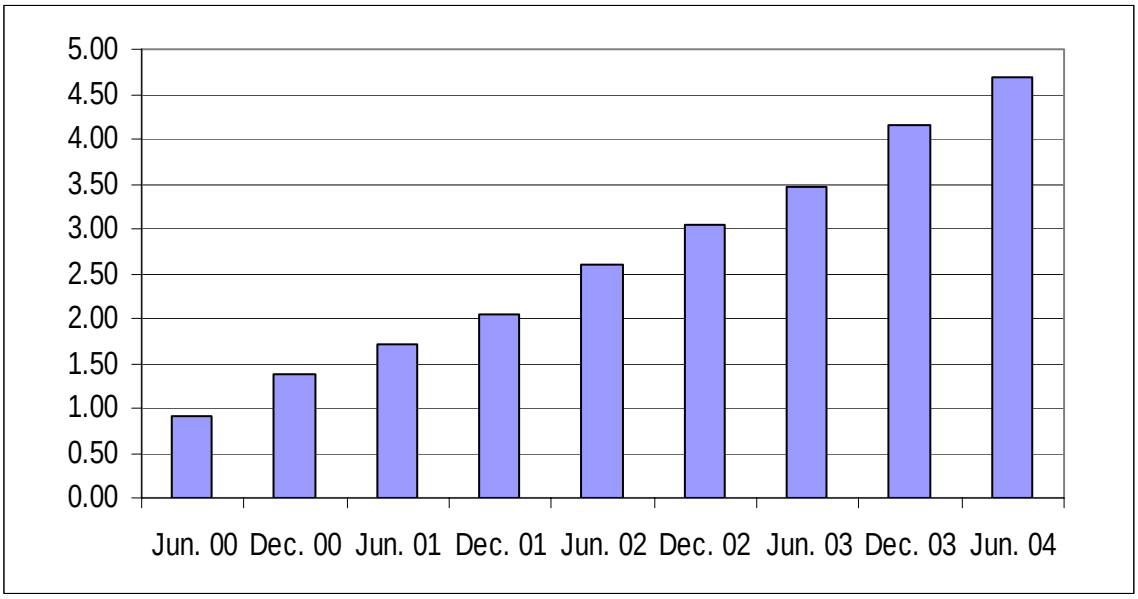


[22] www.jiwire.com; Sam Diaz, "World is going WiFi – Fast," San Jose Mercury News, January 17, 2005, p. 3E. See Section 4.4 of this report for a detailed discussion of wireless broadband technologies.
[23] See www.dcontinuum.com/content/news.php?id=169.
[24] Consistent with FCC practice for Broadband reporting inForm 477 and elsewhere, for purposes of this Chapter, "lines" refers to all broadband connections, including those using wireline technologies, such as fiber, copper, co-axial cable and electric power lines, and those using wireless connections, such as satellite and WiFi.
[25] FCC Form 477, December 2004.

2.3 Rapid Growth In California Broadband Market

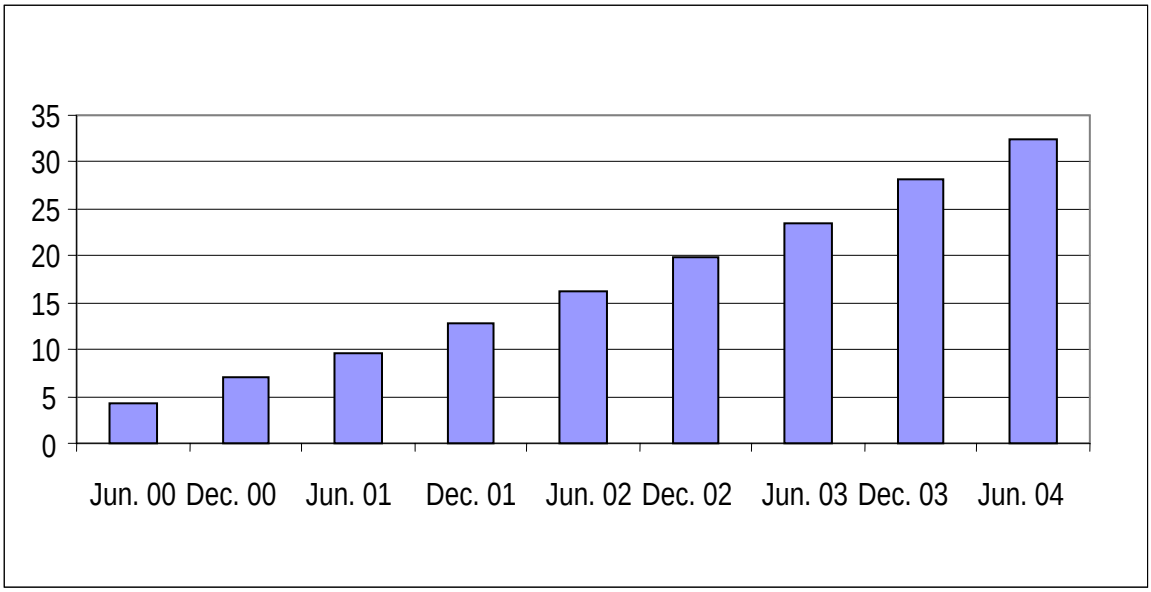
From June of 2000 to June of 2004, California's broadband market expanded by 516%, growing from 900,000 to just over 4.69 million broadband lines (See Figure 2.4 below).

Figure 2.4
Growth in Broadband Lines in California (in millions)



During the same 48-month period, the national broadband market grew by 751%, increasing from 4.3 million broadband lines in June 2000 to 32.4 million broadband lines in June 2004.

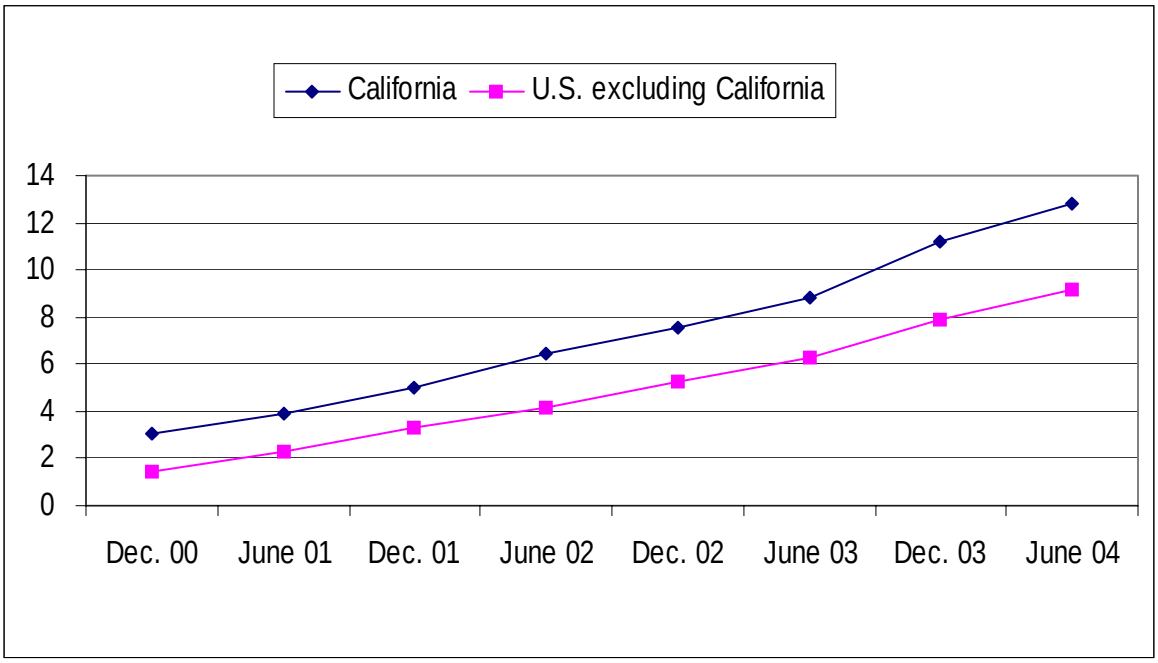
Figure 2.5
Growth in Broadband Lines Nationwide (in millions)



2.4 California Broadband Penetration Lead Continues to Grow

While the rate of growth of the U.S. broadband market exceeded that of the California market (751% vs. 516%), it is important to remember that California was well ahead of the rest of nation in its broadband penetration rate (3.1 vs. 1.46 broadband lines per 100 persons) in June 2000. California's early market maturation has resulted in a slightly lower rate of growth compared to other states. However, California's lead in broadband penetration compared to other states has continued to grow. In December 2000, California had 1.64 more broadband lines per 100 persons than the average of other states. By June 2004, California's lead had grown to 3.57 more broadband lines per 100 persons than the average of other states.

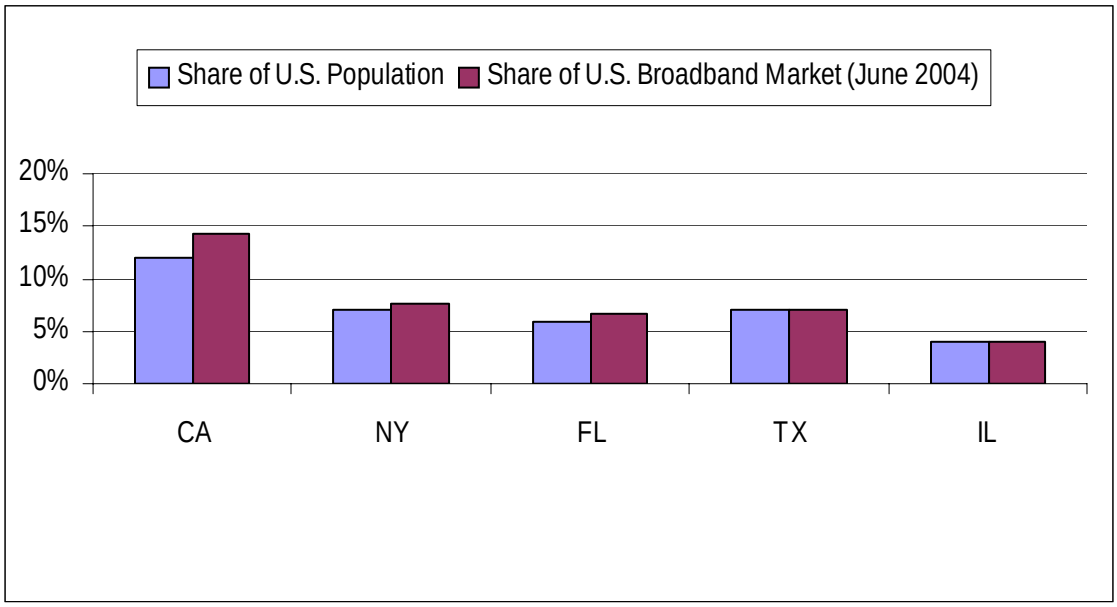
Figure 2.6
Broadband Lines Per 100 Persons



2.5 California's Share of National Broadband Market

California leads all other states in its share of the national broadband market as a percentage of population. The following figure illustrates that California's broadband market is 19% larger than its population would otherwise indicate, with 14% of the national broadband market and 12% of the nation's population. New York's broadband market share is 13% higher than its population share, while Florida's is 19% higher. On the other hand, the Texas and Illinois broadband markets are 5% and 10% smaller, respectively, than their shares of the U.S. population.

Figure 2.7
Share of Population vs. Share of Broadband Market



2.6 Is Broadband Reaching Everyone?

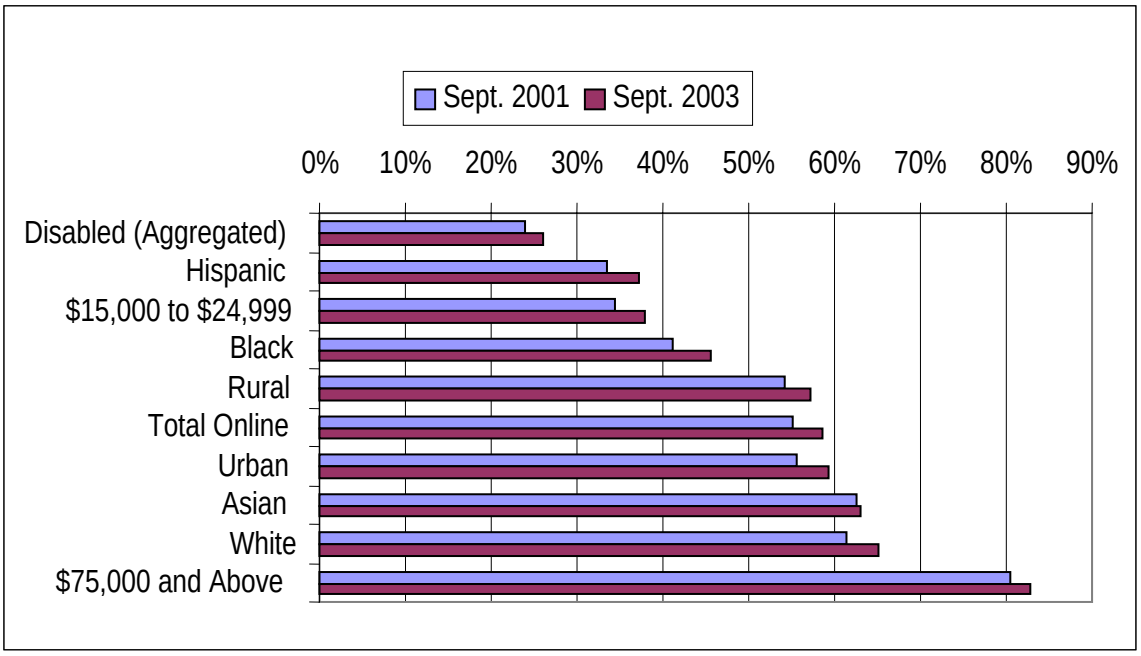
Despite California's success and national leadership on broadband penetration, not all of the state's residents have access to, or are using, broadband. Certain communities are lagging behind: low-income consumers, residents of rural areas, and persons with disabilities.

Disparity in the access to, and use of, broadband among certain communities is now commonly referred to as the "digital divide," much as that term was used in the past to describe the gap between those who owned computers and those who did not, and later to describe the gap between those who used the Internet and those who did not. Much of the information available on the digital divide still examines that issue in terms of access to the Internet or access to a personal computer. Although these studies and statistics do not directly address broadband deployment and use, we include examples of them here because we believe them to be of probative value in addressing the problem of unequal access to, and use of, broadband.

Much of the data found addresses the "digital divide" in the United States, not in California specifically, regardless of one's definition of that term.

As recently as September 2004, the United States Department of Commerce released data on the disparate rates of Internet usage among certain communities, shown in Figure 2.8 below.

Figure 2.8
Internet Usage: Percent of U.S. Population Online



U.S. Department of Commerce, "*A Nation Online*: Entering the Broadband Age," September 2004.

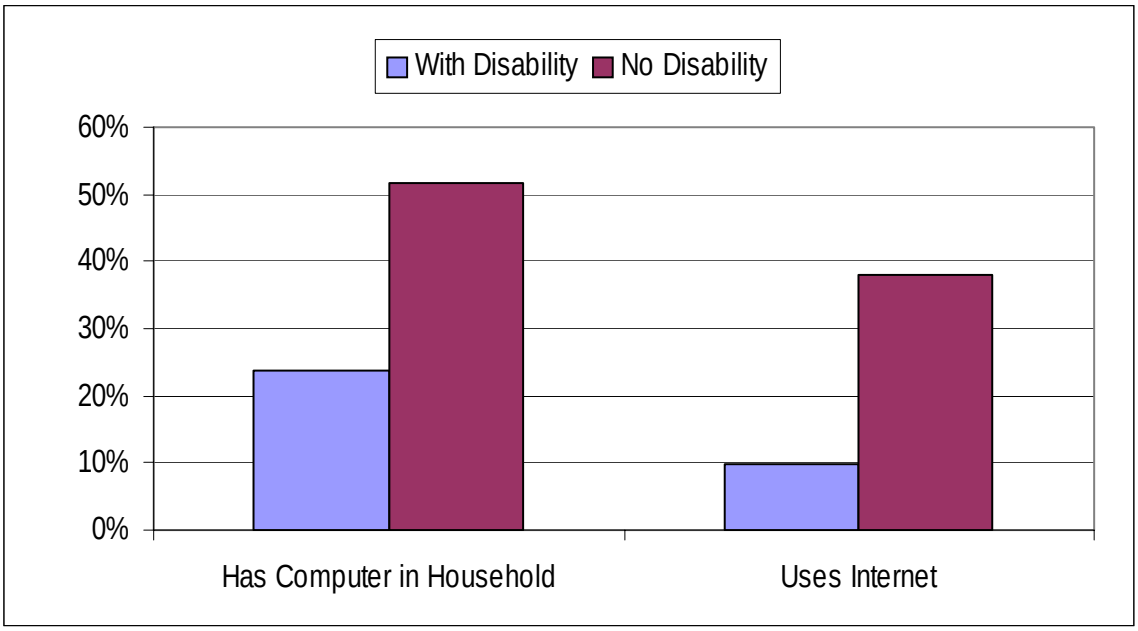
The data shows disabled populations being the least connected to the Internet (24% in 2001 and 26% in 2003), with the most connected being households with a family income of $75,000 and over (80% in 2001 and 83% in 2003). Other lower use groups include Hispanics of any race (33% in 2001 and 37% in 2003), low income persons (34% in 2001 and 38% in 2003), and Blacks (41% in 2001 and 46% in 2003).[26] The statistics revealed almost no difference among the total United States population online and the rural and urban populations online – all three were approximately 57% in 2003.[27]

2.6.1. Disabled Community

Access to broadband, and the wealth of information and resources it provides, presents a critical opportunity for people living with disabilities to live fuller, more "connected" lives. Yet, a study entitled "Disability Watch: The Status of People with Disabilities in the United States," found in 2001 that 24% of disabled individuals had access to a personal computer (compared with 52% for non-disabled), and only 10% of disabled individuals had access to the Internet, either through a dial-up or broadband connection (compared with 38% for non-disabled).[28] This data appears to conflict with the U.S. Department of Commerce data showing disabled community Internet usage at over twice that level.

[26] U.S. Department of Commerce, "A Nation Online: Entering the Broadband Age," September 2004, Appendix Table 1.
[27] Ibid.
[28] Disability Watch: The Status of People with Disabilities in the United States, Volume 2, 2001, p. 87.

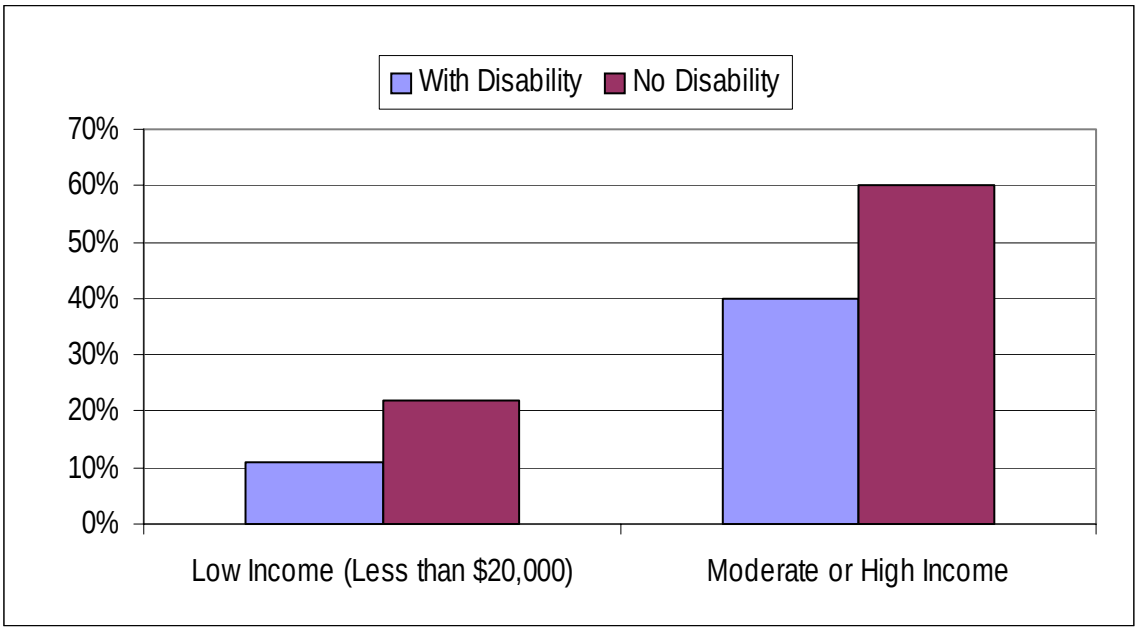
Figure 2.9
Computer Access and Internet Use



As the following chart illustrates, cost appears to be the primary barrier to bridging the technology gap between the disabled and non-disabled communities. With lower average incomes, 11% of low-income people with disabilities use computers, compared to 22% of other low-income persons.[29] Computer use increases at higher income levels for persons with and without disabilities.[30]

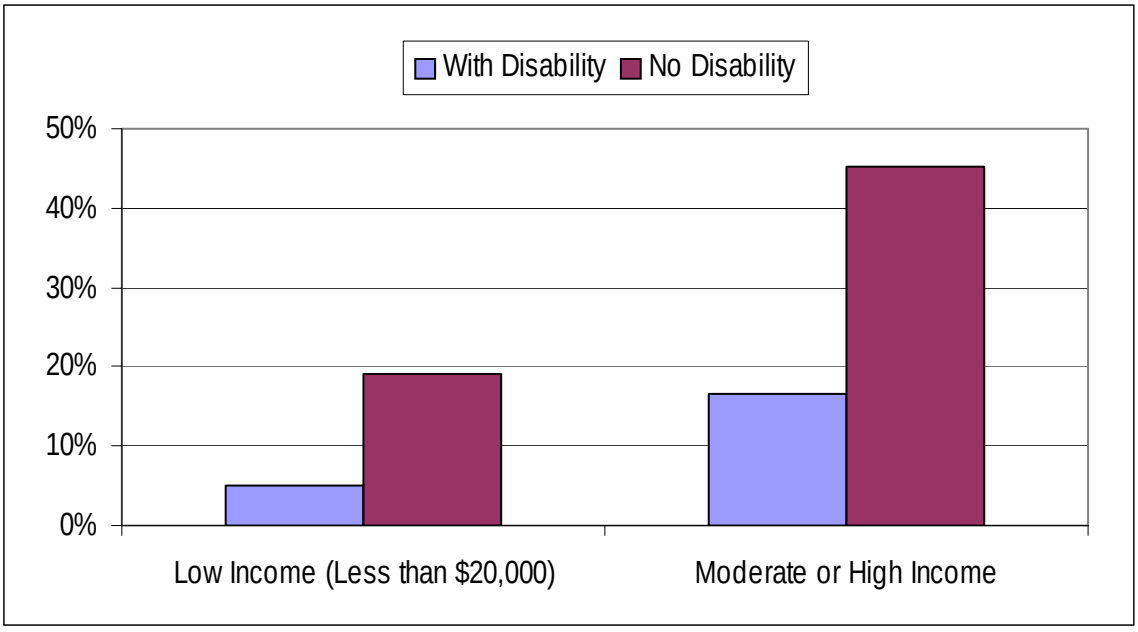
[29] In California, the median household income for people without disabilities is $29,339 while the median income for people with disabilities is $16,534. Andrew J. Houtenville, Adam F. Adler, Cornell University, "Economics of Disability Research Report No. 4," Table No. 8, April 2001.
[30] Ibid.

Figure 2.10
Computer Use by Household Income



The rate of Internet use among low-income people with disabilities is only 5%, while the rate for those with higher incomes is more than three times higher, at 17%. Persons with no disability use the Internet at 19% and 45%, respectively, for low income and moderate or high income households.[31]

Figure 2.11
Internet Use by Household Income



[31] Disability Watch, p. 90.

2.6.2 Rural Areas

Although the U.S. Commerce Department data cited in Figure 2.8 above fails to illustrate a significant difference in Internet use between rural and urban residents, other studies such as the Pew Internet & American Life Project's "Rural Areas and the Internet"[32] do cite a significant difference, as shown in Figure 2.12 below.

Figure 2.12
Internet Penetration by Community Type[33]

	2000	2003
Rural	41%	52%
Urban	51%	67%

While Internet access has grown in rural areas between 2000 and 2003, urban access has grown as well, with the disparity between the two increasing from 10% to 15% in those three years.

2.6.3 Lower Income Individuals

Despite the trend toward lower prices, computers and Internet access remain more expensive than many low-income individuals can afford. The following table shows Internet access by urban households with incomes of less than $30,000 to range between 38% and 54%, while urban households with incomes above $30,000 range from 70% to 93% Internet access. Internet access is lower for rural populations than urban populations at almost all income levels, with the difference being generally greater at lower income levels and fairly low at higher income levels.[34]

Figure 2.13
Percentage Urban/Rural Internet Penetration by Household Income[35]

	Under $10K	$10K – $20K	$20K – $30K	$30K – $40K	$40K – $50K	$50K – $75K	$75K – $100K	$100K and Greater
Urban	38%	52%	54%	70%	79%	83%	93%	90%
Rural	19%	35%	39%	66%	73%	76%	85%	89%
Difference: Urban vs. Rural	19%	17%	16%	4%	6%	7%	8%	1%

[32] Pew Internet & American Life Project, "Rural Areas and the Internet," February 2004.
[33] Ibid., p. 8.
[34] Ibid., p. 34.
[35] Ibid.

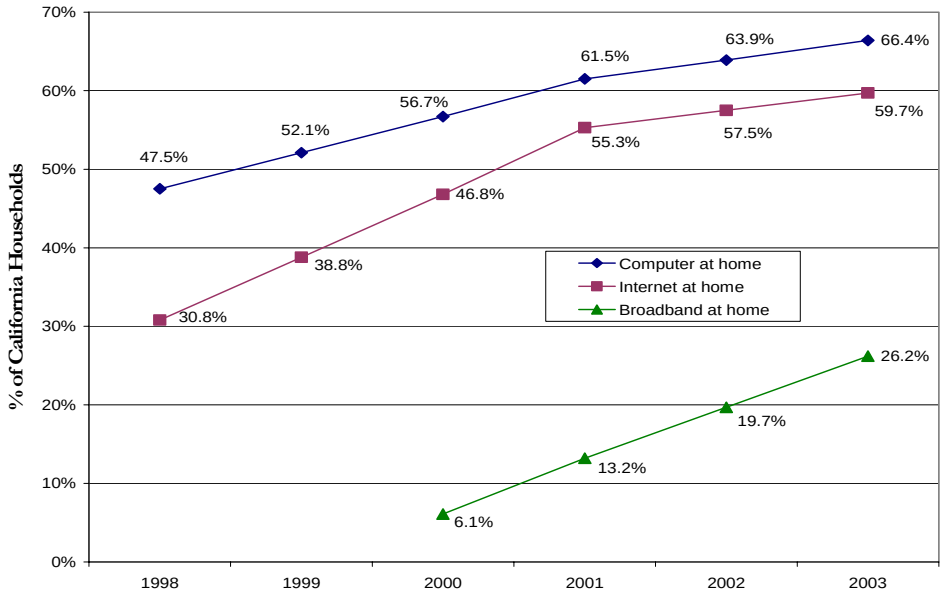
2.6.4 A California-specific Study

The Center for Justice, Tolerance and Community at the University of California Santa Cruz has worked to quantify and analyze the "digital divide" in California, and recently published its work in a report entitled "A Nation Offline? Research on the Digital Divide."[36]

The report found that an increasing number of California households have computers, are accessing the internet, and are using broadband to access the internet. By 2003, over 66% of California households had computers, almost all households with computers had access to the internet, and close to half of all households with computers had access to broadband.[37]

Figure 2.14

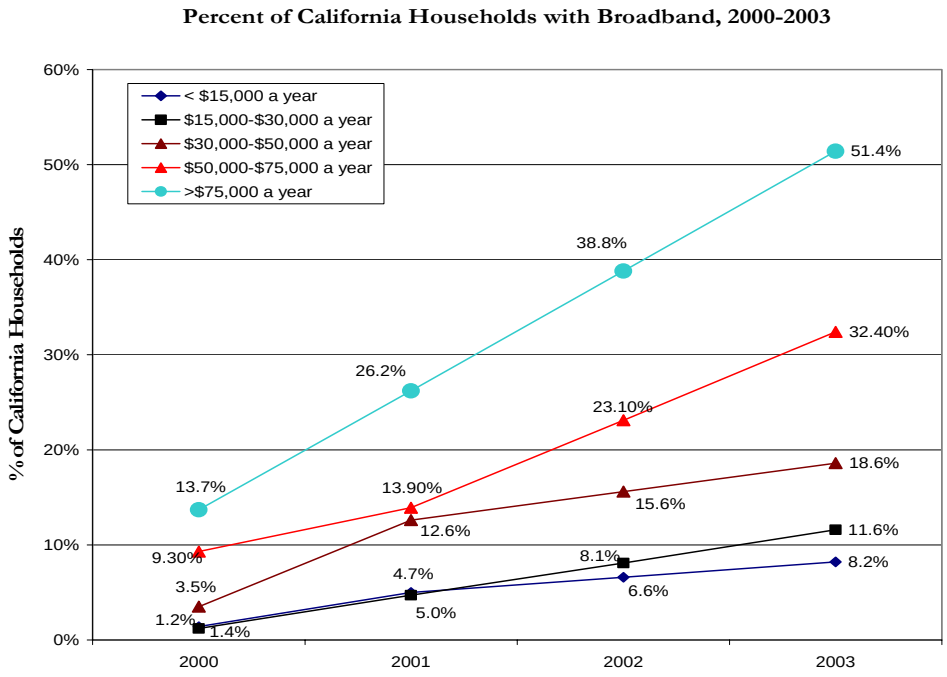
Percent of California Households with Computers and Internet Connections, 1998-2003



[36] Rob Fairlie, Rebecca London, Manuel Pastor, Rachel Rosner, "A Nation Offline? Research on the Digital Divide," Center for Justice, Tolerance & Community, University of California Santa Cruz, 2003; www.cjtc.ucsc.edu;digitaldivide.html. Data source is the Bureau of Labor Statistics' and Census Bureau's Current Population Survey and Internet and Computer Use Supplement, which are not available every year.
[37] Ibid.

The report found a strong correlation between household income and broadband. In 2003, California households with annual income of over $75,000 were more than six times as likely to have broadband connectivity than households with annual income of less than $15,000.[38]

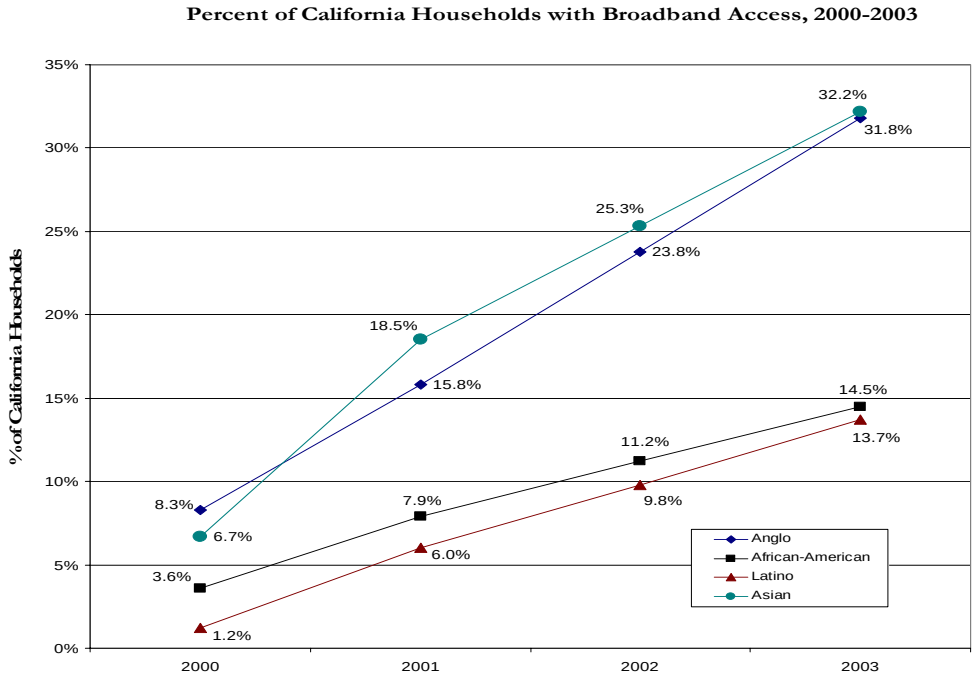
Figure 2.15



The report also examined broadband penetration rates based on ethnicity, and found that Anglo and Asian households in California were more than twice as likely to have broadband than African-American and Latino households (as shown in Figure 2.16 below).[39]

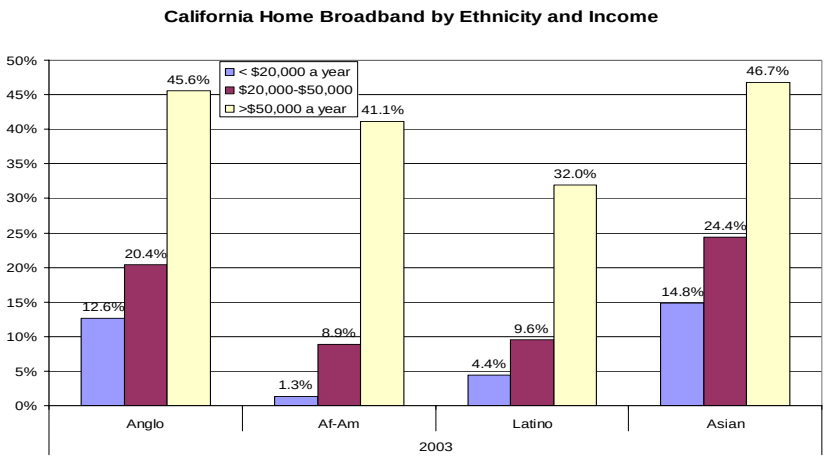
[38] Ibid.
[39] Ibid.

Figure 2.16



The report then examined the existence of broadband in California households in 2003 by both annual income and ethnicity. It found that households with annual incomes of over $50,000 were the most likely to have broadband connectivity, and households with annual incomes of less than $20,000 were the least likely to have broadband, regardless of ethnicity. The report did find, however, that disparities existed within the three household income groups based on ethnicity.[40]

Figure 2.17



[40] Ibid.

Chapter 3. Broadband Market Competitors

Broadband providers in California consist of traditional telecommunications companies - incumbent local exchange carriers (ILECs), competitive local exchange carriers (CLECs), wireless companies and cable operators - as well as relative newcomers to the market, such as satellite companies, developers of new wireline broadband technologies, and fiber deployment companies. As noted in Chapter 2, many parts of California benefit from a broadband market marked by competition among multiple providers and technology platforms. Additionally, some communities have built their own broadband networks.

3.1 Incumbent Local Exchange Carriers (ILECs)

ILECs are wireline telecommunications carriers that own the legacy telephone network within a geographic area. They offer local telephone service, local toll, long distance, international, Internet access and are now offering video services through co-marketing agreements with satellite television companies such as DISH Networks. Currently, two large ILECs (SBC and Verizon), two mid-sized ILECs (Citizens and SureWest), and eighteen small ILECs operate in California. A majority of the ILECs serving California offer broadband services through affiliates established for that purpose.[41]

3.2 Competitive Local Exchange Carriers (CLECs)

CLECs are wireline carriers that are authorized under CPUC and FCC rules to compete with ILECs to provide local telephone services. They often package their local service offerings with local toll, long distance, international, Internet access, cable and/or video services. Under policies adopted by the CPUC, the FCC and the Telecommunications Act of 1996 (1996 Act), CLECs are not required to duplicate ILEC local service offerings. They can choose which customers to serve (business, residential or both) and what services to offer.[42] CLECs provide telephone services in one of three ways, or a combination thereof:

(a) Building network facilities needed to connect themselves to their customers' premises;
(b) Purchasing telecommunications services from another carrier (typically an ILEC) at wholesale rates and reselling those services to their own customers at retail rates; and
(c) Leasing parts of the ILEC network, referred to as "unbundled network elements" (UNEs).

There are 332 CLECs operating in California. Some of the larger CLECs in the state are AT&T, WorldCom, Inc., Pac-West Telecommunications Inc., and Cox California Telecom, LLC. A limited number have reported offering broadband services through affiliates.[43]

Some ILECs also operate as CLECs outside their original service territories. In California, for example, SBC and Verizon each have authority to operate as CLECs in the other's service areas.

Data Local Exchange Carriers (DLECs) are an ILEC and CLEC subset. DLECs deliver broadband services generally by purchasing unbundled local loops and providing their own electronics at each end to provide DSL service to customers. DLECs traditionally have not provided voice services, although some are now offering Voice over Internet Protocol (VoIP) telephony.[44] DLECs operating in California include Covad Communications Company and SBC-Advanced Solutions Inc.

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[41] In a 2003 CPUC Competition Report, 12 ILECs reported offering broadband through affiliates.
[42] 47 U.S.C. Sections 151 et seq.
[43] 2003 Competition Report, supra.
[44] See Section 5.3 of the report for a discussion of VoIP.

3.3 Satellite Broadband Providers

Satellite providers can deploy broadband service to customers in almost any part of the United States. Customers must install a satellite dish with a clear line-of-sight view of the southern sky. It is a popular choice for customers in rural and other areas that lack an existing broadband infrastructure, where deployment costs are often too high for other broadband providers to enter the market. Deployment costs are substantial, as they involve placing a new satellite into orbit. Satellite providers often set limits on data downloads, with overage charges applied if a customer goes over his or her quota. Three prominent satellite broadband service providers serving residential customers in the U.S. are DirecWay, Echostar and StarBand. DirecWay and StarBand currently offer service in California.

Other providers are entering the market. Wild Blue's plans to provide satellite broadband service literally got off the ground in mid-2004 with the successful launch of the Anik F2 satellite. Wild Blue plans to begin offering service in the second quarter of 2005, focusing on rural areas yet unreached by DSL and cable providers. Wild Blue plans on offering 1.5 Mbps download and 256 Kbps upstream speeds for under $50 per month.

3.4 Wireless Broadband Providers

Wireless carriers provide broadband service using fixed or mobile wireless technology. Fixed wireless technology can offer services to large geographic areas with a modest investment. It is a particularly attractive form of broadband in rural areas, smaller towns, and suburbs. Sprint Broadband Direct and WorldCom are examples of fixed wireless providers serving customers in certain areas in California. Companies offering mobile broadband services, such as Verizon Wireless and its EvDO (Evolution Data Optimized) service, Cingular Wireless and its UMTS (Universal Mobile Telecommunications System), and Nextel and its planned OFDM (Orthogonal Frequency Divisional Multiplexing) service, are expected to play an increasingly prominent role as technologies like 3G, 4G, and WiMAX continue to develop.[45] Verizon Wireless currently offers EvDO service in San Diego, Los Angeles and Orange Counties, and is deploying the service to Ventura County in the near future. It is estimated that by the end of the year, EvDO service will be available to half of California's residents.[46] Cingular Wireless has launched its UMTS service in six markets, including San Francisco and San Diego, and intends to continue the roll-out of this service in 2005.[47] Nextel is in an earlier stage of developing its service offering, but is expected to begin competing with Verizon Wireless and Cingular in the near future.

Other providers in California include companies like SkyPilot and NextWeb, Inc..[48] NextWeb is California's largest and fastest growing wireless Internet service provider,[49] and is discussed as a Case Study in Section 8.1.4 of this report.

[45] Stephen Lawson, "EVDO Lights Up Mobile Data," NetworkWorldFusion, August 12, 2004; www.nwfusion.com; See Chapter 4 of the report for a discussion of Wireless broadband providers.
[46] www.verizonwirelesspr.com; April 4, 2005 email between CPUC Staff and Verizon Wireless representative.
[47] Email correspondence between CPUC staff and representative of Cingular Wireless, April 5, 2005.
[48] James Granelli, "Network with No Strings Attached," Los Angeles Times, August 30, 2004; www.skypilot.com; www.nextweb.net.
[49] www.nextweb.net.

3.5 Cable Providers

Cable companies provide broadband services over their coaxial cable networks. Cable providers are generally granted exclusive franchises by the jurisdictions in which they operate. Cable broadband providers serve primarily residential customers, since many homes across the nation already subscribe to cable video. There are five major cable providers in California – Comcast, Cox, Time Warner, Adelphia, and Charter, which operate in exclusive franchise territories. In addition, there are a number of smaller cable providers operating in the state, including Brighthouse Networks, Mediacom California and NPG Cable.

3.6 Broadband Overbuilders

Broadband Overbuilders are a new type of telecommunications provider. Unlike local telephone and cable television companies, which have adapted their existing networks to provide broadband, these providers focus on a core business strategy of building new fiber-optic networks which they use to provide local telephone, cable television, and high-speed Internet services. Companies must first obtain a local franchise authorizing them to begin construction and must obtain the Rights of Way to build the network.

For example, Grande Communications has announced plans to deploy an FTTP network to over a million homes and businesses in Texas over the next seven to ten years.[50] Although Broadband Overbuilders have a limited presence in California, there are several currently offering service, including SureWest, RCN, Seren Innovations (doing business as Astound!), and Champion Broadband.

According to the General Accounting Office, once the Broadband Overbuilder begins building its network, construction usually takes between two to four years if the company has steady access to capital and has no difficulties in obtaining the necessary local government permits.[51] This same study compared six markets with a Broadband Overbuilder and six without, and found that those markets with a Broadband Overbuilder had lower local telephone, cable and high-speed Internet rates.[52]

3.7 Publicly Owned Broadband Networks

Some communities without commercial broadband providers have opted to build their own networks using public funds, or by establishing public-private partnerships. Examples of this form of broadband deployment include the Truckee-Donner project in Northern California and the City of Cerritos's project in Southern California, both of which are discussed in section 8.3.2 of this report.

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[50] "Grande To Deploy Fiber to the Home Targets One Million Texas Homes, Businesses," Grande Communications Press Release, January 14, 2005; http://www.grandecom.com/About/pressroom_release.jsp?PR_ID=_PR284.

[51] General Accounting Office, "Wire-Based Competition Benefited Consumers in Selected Markets," GAO-04-241, February 2004; www.gao.gov/cgi-bin/getrpt?GAO-04-241.

[52] Ibid.

Chapter 4. Broadband Technologies

Similar to the diversity found in the number and type of broadband providers, California is home to a number of different technology platforms that are used to deliver broadband to consumers.

4.1 Digital Subscriber Line (DSL)

Figure 4.1
DSL Characteristics

What is it?	Benefits	Limitations	Price[53]
Broadband service that uses the same phone line used for voice service	Widely available and relatively affordable; the leading platform used for broadband service in California	Limited bandwidth potential and transmission range (<18,000 ft.)	$14.95 | $79.95 per month

DSL runs on the traditional wireline network, utilizing the higher frequency spectrum available in a pair of copper telephone wires which is unused by analog telephone services. Upgrading copper loops for DSL services essentially involves installing a piece of new equipment[54] in the telephone company central office, and removing interference generating devices from the local loop.

Depending on a consumer's distance from the central office, DSL can achieve download speeds of up to 8 Mbps, although DSL service providers usually cap the maximum download speed at about 1.5 Mbps and only guarantee a minimum download speed of 384 Kbps.[55] DSL speeds are sufficient to bring streaming video into customer homes and for customers to send out basic information such as video selections.[56] DSL works well as a basic Internet connection, since most residential Internet consumers place greater emphasis on the download speeds needed for surfing the web, downloading files, and sending email messages. Since being introduced in the 1990s, DSL has become the leading broadband technology in California and the second leading broadband technology in the national market.

DSL has certain technical limitations. The most significant limitation is the transmission range. As a digital signal is transmitted through the copper loop, the signal suffers from greater distortion the farther it must travel from a provider's central office to the customer. Debilitating signal degradation generally occurs when the local loop length between customer premises and the central office is between 16,000 and 18,000 feet.

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[53] Prices are for consumer, not wholesale, customers. Broadband pricing can vary greatly depending on a variety of factors: length of contract, speed, equipment (rent or buy), promotional period pricing, existence of market competitors, and bundling with other services (See the discussion of convergence in section 8.2.1 of the report). Generally, costs and prices of all broadband technologies decline as efficiencies due to economies of scale and equipment standardization are realized.

[54] This equipment is called a Digital Subscriber Line Access Multiplexer. The DSLAM allows for the simultaneous transmission of high-speed data and voice services over traditional copper phone lines.

[55] Broadbandreports.com; http://www.dslreports.com/faq/356.

[56] There are other variations of DSL including ADSL, SDSL and VDSL. ADSL, or Asymmetric DSL offers different bandwidth speeds depending upon the direction of the information flow. Data coming from the Internet to the customer's modem will be sent at a higher speed while data coming from the subscriber and going to the Internet is sent at a relatively lower speed or bandwidth. SDSL stands for Symmetric DSL, which offers the same upload and download speed, but would require a pair of dedicated copper loop. VDSL stands for very high data-rate DSL that offer a much higher speed than DSL (52 Mbps) but has a very limited range of less than 4,000 feet.

DSL had traditionally suffered from other technical limitations, that are now being addressed through technological advances. For example, DSL had previously been limited in its deployment due to the requirement that it operate only in a pure copper environment. However, telecommunications companies have overcome this technical limitation by installing DSLAMs inside remote terminals.[57]

Also, DSL's bandwidth capacity has traditionally limited the ability of DSL providers to offer the same type of "triple play" package, including video, data and voice services, that can be delivered over cable or fiber facilities. However, new compression technologies are being developed that will allow high definition TV to be delivered over existing copper phone lines.[58] In addition, in order to compete effectively with companies offering bundled services, ILECs such as Verizon, SBC and BellSouth have partnered with satellite companies to add video to their bundled services.[59] For a more detailed discussion of the role of Convergence and Service Bundling, please see section 8.2.1 of the report.

4.2 Cable Modem

Figure 4.2
Cable Modem Characteristics

What is it?	Benefits	Limitations	Price
Broadband service that uses the same coaxial cable used for cable television service	Widely available and relatively affordable; the leading platform used for broadband service in the U.S.	Limited future bandwidth potential; not widely deployed to business customers	$19.95 | $49.95 per month

Internet service via coaxial cable became available with the cable television industry's migration from analog to digital TV.[60] In the early 1990s, most of the cable television infrastructure in the United States was incapable of carrying digital TV signals. Upgrades were needed to make coaxial networks capable of delivering digital TV, including a high capacity fiber-optic backbone to carry the increase in data, as well as the capability for two-way data transmission. The cable industry spent more than $65 billion dollars between 1996 and 2002 to upgrade its infrastructure.[61] This new cable TV network architecture, called a hybrid fiber-coaxial (HFC) network, allows high-capacity, digitized, two-way data transmission that is used for broadband Internet services today.

Because of the industry's head start in upgrading its network,[62] cable modem has been the dominant national broadband technology since 2000.[63] At the end of 2002, there were more than 65 million cable television customers in the United States, with more than 10 million of those

[57] CPUC Staff interview with SBC representatives, February 1, 2005.
[58] See, e.g., Carol Wilson, "Qbit unveils new compression approach," Telephony Online, January 7, 2005.
[59] "SBC, EchoStar Announce Strategic Marketing Alliance," April 17, 2002. www.sbc.com
[60] Digital TV programming is digitized and compressed before being transmitted over the coaxial cable, enabling much more programming to be carried over a single coaxial cable.
[61] National Cable & Telecommunications Association (NCTA), http://www.ncta.com/Docs/pagecontent.cfm?pageID=96.
[62] MediaOne, since acquired by AT&T and then Comcast, began to offer cable modem service in 1994 in West Los Angeles.
[63] This is not the case for California. DSL service is currently the dominant technology in California.

customers subscribing to cable modem service. By September 2004, the number of cable modem subscribers had grown to more than 19.4 million.[64]

The HFC network architecture consists of a fiber backbone linking the cable company headend to a local distribution node.[65] The local distribution node is where cable TV and cable modem data are converted from optical signals to radio frequency (RF) signals to be retransmitted through coaxial cable to a nearby customer's premise. While the fiber backbone has a capacity of 5 Gbps, only 6 Mhz bandwidth is allocated for cable modem service from the node to the customer. A theoretical 40 Mbps bandwidth is possible over the 6 Mhz bandwidth for each individual cable modem user.[66] This 40 Mbps is shared by all of the cable modem customers serviced by the distribution node, with the possible maximum of 30 Mbps of the 40 Mbps available to each cable modem user under the new cable modem standard.[67] A single node may serve hundreds of customers, so service degradation can occur if many users are connected to the internet simultaneously.[68] Today, most cable modem services promise customers a download speeds of between 1.5 Mbps and 3 Mbps.

4.3 Satellite

Figure 4.3
Satellite Broadband Characteristics

What is it?	Benefits	Limitations	Price
Broadband service delivered through geostationary satellites	Covers all areas with a direct view of the southern sky	Limited bandwidth; providers often limit amount of data downloaded per month; difficult and expensive to add capacity	$49.59 | $99.99 per month

Satellite broadband services utilize geo-synchronized satellites that stay in a fixed point in the southern sky to receive and transmit data to and from satellite broadband customers who must install a satellite dish. The primary advantage of satellite broadband technology is that it is available to customers located anywhere in the U.S. with a direct view of the southern sky. The availability of satellite broadband services makes it technically possible, albeit generally at higher cost ($60 - $80 per month) and lower speed (400 Kbps),[69] for virtually anyone living in the United States to obtain broadband service.

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[64] National Cable & Telecommunications Association (NCTA); http://www.ncta.com/Docs/pagecontent.cfm?pageID=96

[65] A "headend" is a master facility for receiving TV signals for processing and distribution over a cable TV system; http://en.wikipedia.org/wiki/Cable_TV_headend. Headend is also where cable modem data is received and retransmitted to the Internet or the customer's computer. A headend serves a region that can be one city, several cities or part(s) of a city depending on the number of households subscribing to the cable data service.

[66] Working through an industry association CableLab, the cable industry agreed on a common cable modem technical standard DOCSIS 2.0 (Data Over Cable Service Interface Specification), which allocated a cable channel of spectrum for cable modem with 40 Mbps of bandwidth.

[67] Under the previous cable modem standard DOCSIS 1.1, each cable modem customer can achieve maximum download speed of 10 Mbps, DOCSIS 2.0. increases the maximum download speed to 30 Mbps.

[68] Institute of Electrical and Electronics Engineers (IEEE); http://www.spectrum.ieee.org/WEBONLY/publicfeature/jun01/cmode.html. DSL Reports; http://www.dslreports.com/faq/7135.

[69] As compared to typical DSL and cable modem price ($29.95 to $49.95) and bandwidth (1.5 Mbps to 3 Mbps).

There are one-way and two-way satellite broadband services. One-way satellite broadband service requires a telephone line to send data upstream, while data is downloaded directly from the satellite. Initially, for satellite broadband service, only one-way service was available because satellites at that time were not designed to receive data from customers. Those satellites were designed to transmit TV signals back to earth rather than provide two-way communications required for broadband service. Two-way satellite broadband became possible when a new generation of satellites, designed with broadband service in mind, was placed into orbit in the mid-1990s.

The limitation of satellite broadband services is that its capacity, both in terms of total bandwidth and number of customers, cannot be readily or easily upgraded since it involves launching new satellites into orbit. The architecture of satellite broadband is similar to the architecture of the cable modem HFC network, except satellite uses radio waves instead of fiber and coaxial cable to connect to the node. As a result, satellite broadband service providers limit the amount of data their customers can download and upload each month, and charge additional fees to customers exceeding the monthly cap. Another limitation for satellite broadband service is that it is more susceptible to service interruptions from severe weather conditions.[70]

4.4 Wireless

Figure 4.4
Wireless Broadband Characteristics

	What is it?	Benefits	Limitations	Price
WirelessLAN (Wi-Fi /UWB) Wireless MAN (WiMax) 3G/4G Cellular	Broadband technology using licensed and/or unlicensed radio frequency spectrum for transmission	Low deployment costs and widespread access	Availability of spectrum; technical standards for higher bandwidth and longer range technologies still being developed; licensed spectrum for dedicated services is expensive	Free | $99.99 per month

Wireless communications are revolutionizing peoples' lives, enabling consumers to access a high-speed connection to the Internet using virtually any device, at any time, from any location. Wireless technologies being deployed today are as diverse as the ideas for how to use them, from Bluetooth, to hot spots, to wireless Internet backbones stretching hundreds of miles over mountain ranges.

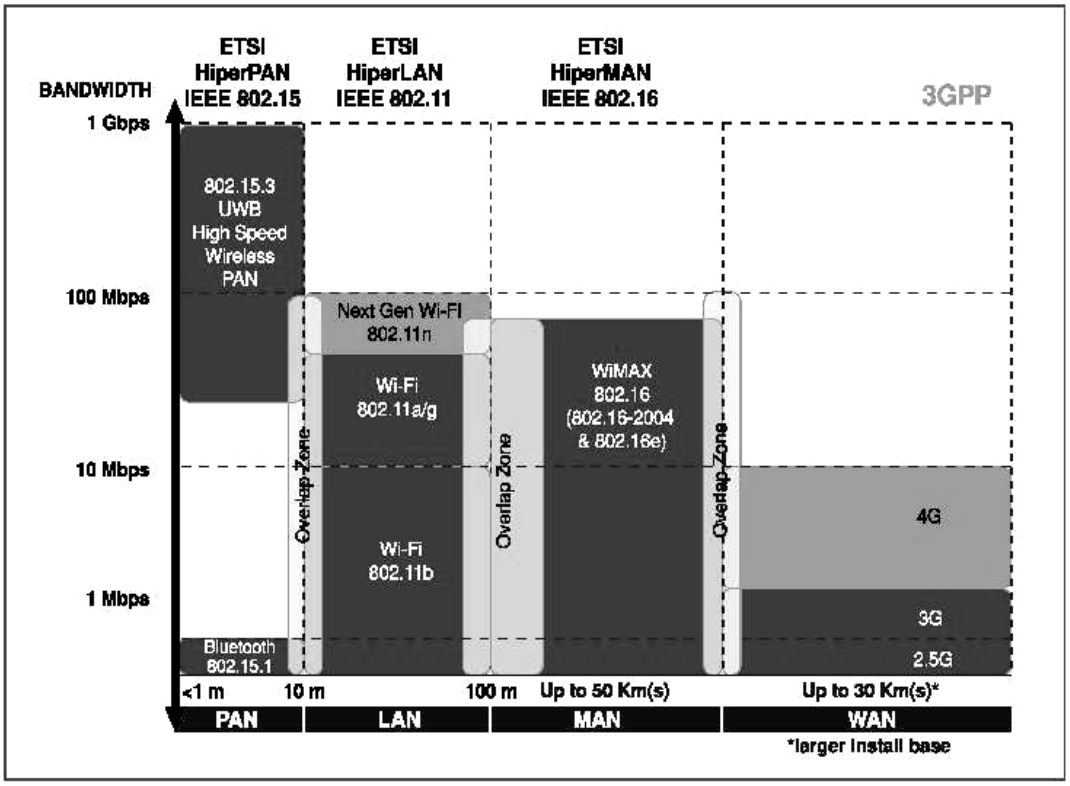
There are four major categories of wireless technologies today that enable high speed connections to the Internet:

- Personal Area Networks (PANs) including Ultra-Wide Band (UWB);
- Local Area Networks (LANs) including Wireless Fidelity (WiFi);
- Metropolitan Area Networks (WANs) including the Worldwide Interoperability for Microwave Access standard known as "WiMAX;" and
- Next-generation cellular technologies also known as "3G" and "4G" such as Verizon Wireless's EvDO and Cingular Wireless's OFDM services.

[70] Lonestar Broadband, http://www.lonestarbroadband.org/technology/satellite.htm.

Each provides a solution to access broadband Internet that varies based on distance, bandwidth and quality of service that can be tailored to meet the specific needs of consumers based on the price, quality and type of usage they need. Each technology is discussed below.

Figure 4.5
Types of Wireless Broadband Technologies



Source: Intel, Understanding Wi-Fi and Wi-MAX as Metro-Access Solutions

4.4.1 Wireless Personal Area Networks (WPAN) and Ultra-Wide Band

Wireless Personal Area Networks (WPANs) use two types of standards: 802.15.1 (also known as Bluetooth) and 802.15.3 (Ultra-Wide Band). Both are designed for very small networks within a confined space, such as a home office, desk, or car. Bluetooth is used primarily for communications and computing peripherals, such as computer to printer or handset to headset. Ultra-wide band provides higher bandwidth (over 400 Mbps) for small networks, which allow multimedia services such as DVD-quality video to be shared wirelessly throughout a home.

4.4.2 Wireless Local Area Networks (WLAN) and WiFi / Mesh-Networks

Wireless Local Area Networks (WLANs) have a broader range than WPANs (up to 100 meters) and are typically found in "hot spots," such as cafes, hotels, airports, offices and home networks. The wireless standard associated with WLANs is IEEE[71] 802.11. Three versions of the 802.11 standard are commonly used and built into most laptops and mobile devices today:

- 802.11a supports bandwidth speeds up to 54 Mbps
- 802.11b supports bandwidth speeds up to 11 Mbps
- 802.11g supports bandwidth speeds up to 54 Mbps[72]

Wireless Internet Service Providers (WISPs) using directional antennas or implementing "mesh" network technologies have been able to increase WLAN performance beyond 54 Mbps and to cover wider areas (over 10 km) using the 802.11 standard. To extend wireless access nodes, providers still mostly rely on wires or fiber for long distance backhaul to the provider, and from the provider to the core network.

Directional Antennas

WiFi LANs (such as those at Starbuck's "hotspots") use omni-directional antennas that transmit radio frequency (RF) signals in all directions equally. Alternatively, high gain directional antennas can concentrate RF signals primarily in one direction like the beam of a spotlight. By extending the signal across longer distances, these directional antennas can serve as point-to-point links between buildings and access points. These line-of-sight links using directional antennas can be used to bridge last mile gaps, but are sensitive to interference from buildings, mountains and other obstacles.

Mesh Networking

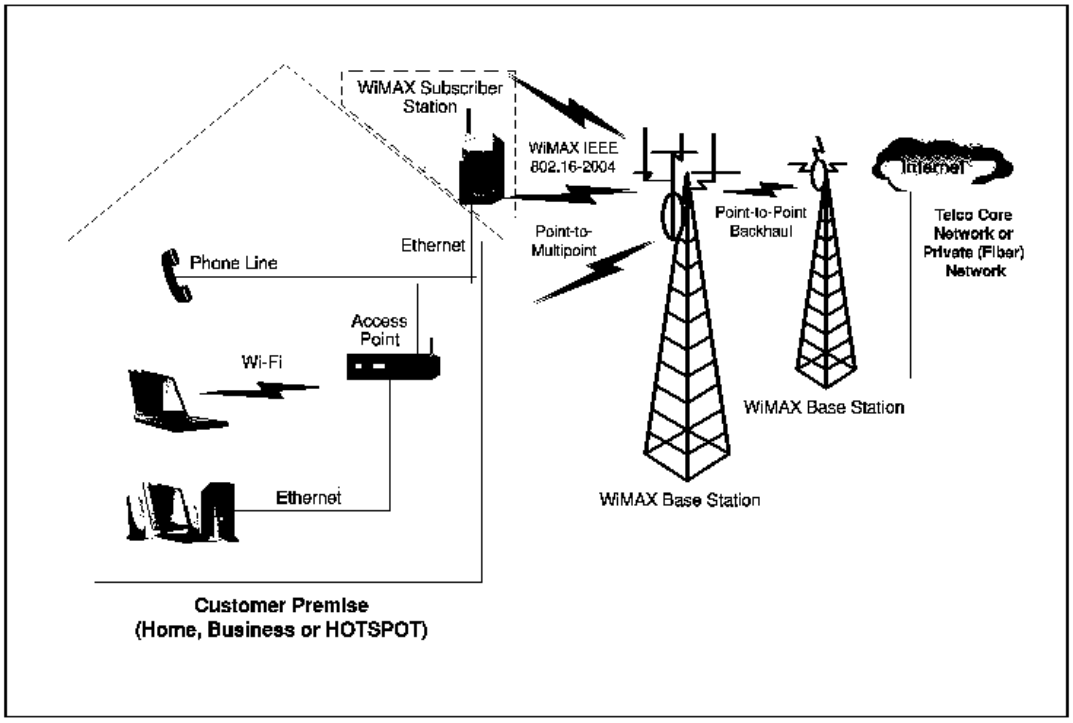
Mesh-network technology extends the range of traditional WLANs by allowing a collection of 802.11 standard "nodes" (an individual laptop or fixed access point such as a hot spot) to interconnect and move data between nodes acting as one "shared" network. In a mesh network (sometimes referred to as "multi-hop" network) small nodes are installed throughout a large area, such as a neighborhood or school, and each acts as a router, transmitting data from one node to the next. One advantage of mesh networks is the use of dynamic path configuration that allows RF signals to navigate around large obstacles, such as mountains or buildings. If one path to the base station is blocked, a transmission using a mesh network will automatically find another path through another node. Another advantage is reliability. In a "single-hop" network, if one node goes down, the entire WiFi LAN network goes down. In a mesh-network architecture, if one node goes down, the network continues to operate by routing data through other nodes.

[71] Institute of Electrical and Electronics Engineers, www.ieee.org.
[72] Both 802.11a and 802.11g standards offer up to 54 Mbps in bandwidth but use different radio spectrums and technologies.

4.4.3 WMANs, WiMAX and WWANs

Wireless Metropolitan Area Networks (WMANs), also known as WiMAX, use the 802.16 standard and cover a much greater distance than WLANs - up to 50 km. This standard is also referred to as "fixed wireless" because it uses a mounted antenna at the subscriber's site to transmit the RF signal from point to point (or point to multi-point) over long distances. WiMAX uses more sophisticated transmission protocols than the 802.11 standards, which result in improved connectivity, network reliability and quality of service. WiMAX therefore serves as a carrier-class solution for the last mile problem - a wireless alternative to cable, DSL or fiber optics. For example, the 802.16 standard enables wireless Internet service providers to guarantee high bandwidth to business customers, and low latency for voice and video applications.

Figure 4.6
WiMAX Network Topology



Source: Intel, Understanding Wi-Fi and Wi-MAX as Metro-Access Solutions

WiMAX can also be used to aggregate WiFi networks (such as mesh-networks and hot spots) and provide long distance backhaul to a core network.

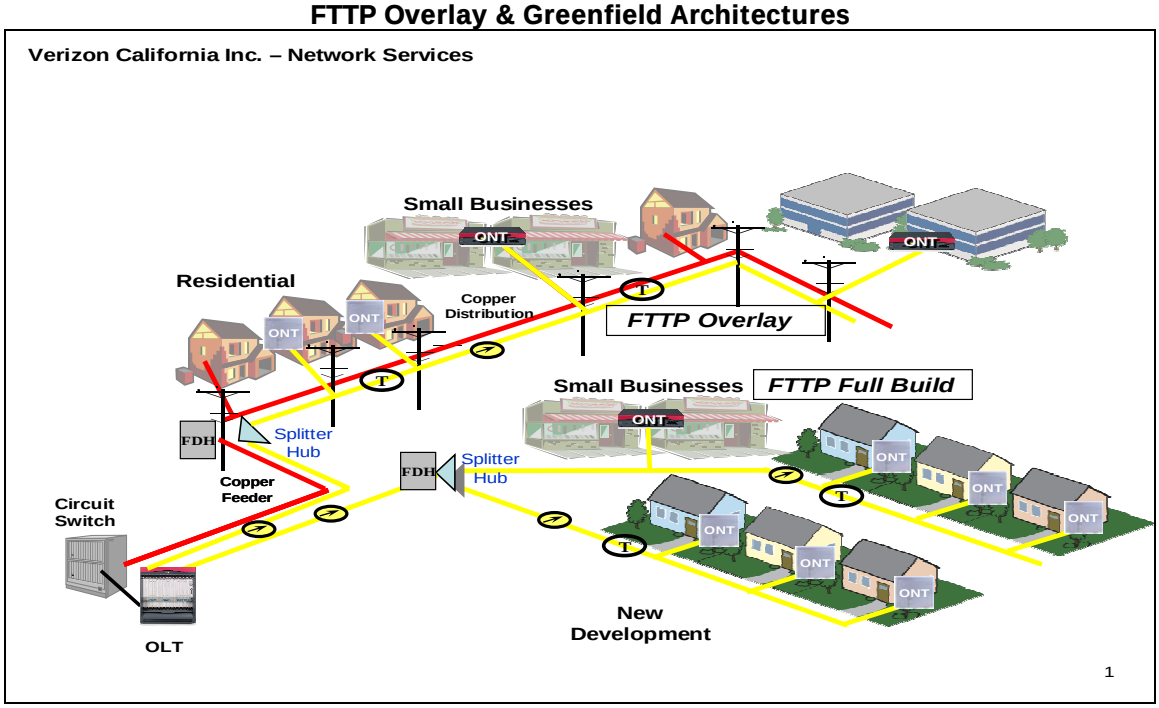
Wireless Wide-Area Networks (WWANs) aggregate WMANs over a large geographic area (over 50 km) using fiber optic or other wired links to connect to the core network, either using WiMAX point-to-point transmission for long distance backhaul or connecting directly to a fiber node.

4.5 Fiber-to-the-Premises

Figure 4.7 FTTP Characteristics			
What is it?	**Benefits**	**Limitations**	**Price**
Broadband service delivered through fiber optic cable	Great bandwidth potential	Expensive to deploy, especially for laying underground lines	$34.95 | $49.95

Fiber-to-the-Premises (FTTP) is a telecommunications network architecture currently being developed by the ILECs and others (including Broadband Overbuilders), to be the next generation of broadband technology. FTTP takes advantage of the extensive fiber backbone network that ILECs have built out over the years and further extends it into customers' homes and businesses. Under the current FTTP architecture, B-PON (Broadband Passive Optical Network), up to 32 customers can be served by a single optical node with a minimum bandwidth of 19.4 Mbps per customer. However, depending on the number of others online at the time, each subscriber could access the entire fiber node's bandwidth of 622 Mbps.[73]

Figure 4.8
FTTP Overlay & Greenfield Architectures



[73] Renee Estes, SBC Laboratories Inc., "Fiber-to-the-Premise – Broadband Optical Passive Network," presented at CENIC conference on March 17, 2004.

The present FTTP standard can be upgraded to 1.2 Gbps, and a new standard offering speeds 2.4 Gbps, called GPON (Gigabyte-Capable Passive Optical Network) is near adoption by the industry. One of the great advantages of fiber is that bandwidth upgrades are achieved simply by installing new equipment at the ends of the fiber facilities.

The primary barrier to deploying FTTP is cost. The per-unit cost of deploying FTTP has dropped from $7,500 per home in the mid-1990s to $1,600 in 2002, and to $1,350 in 2004. This is the main reason that SBC, Verizon, and BellSouth chose a set of common FTTP technical standards, hoping equipment standardization and the combined economy of scales would drive the deployment cost down even further. Verizon estimates that deploying FTTP to its customers in all of its 29-state territory will cost between $20 and $40 billion.[74] There is a significant cost difference between overhead and underground fiber deployment because of the additional costs associated with trenching and digging up streets to bury fiber underground.

Despite the costs, fiber deployments are being made throughout the country. A recent survey indicated a significant increase in FTTP deployments in the United States, almost doubling in number in a six month period - from 78,000 homes in March 2004 to 146,500 homes in September 2004.[75] In California, Verizon has already begun FTTP deployment in the cities of Huntington Beach and Murrieta.[76] SBC developed one of the nation's first FTTP deployments in 2001 for the San Francisco Mission Bay community.[77] SureWest, recognized as one of the nation's leading independent providers of fiber, is deploying FTTP service in Sacramento in direct competition with SBC and the local cable company, and is estimated to be terminating fiber at approximately 30,000 homes.[78]

4.6 Broadband Over Powerlines

Figure 4.9
BPL Characteristics

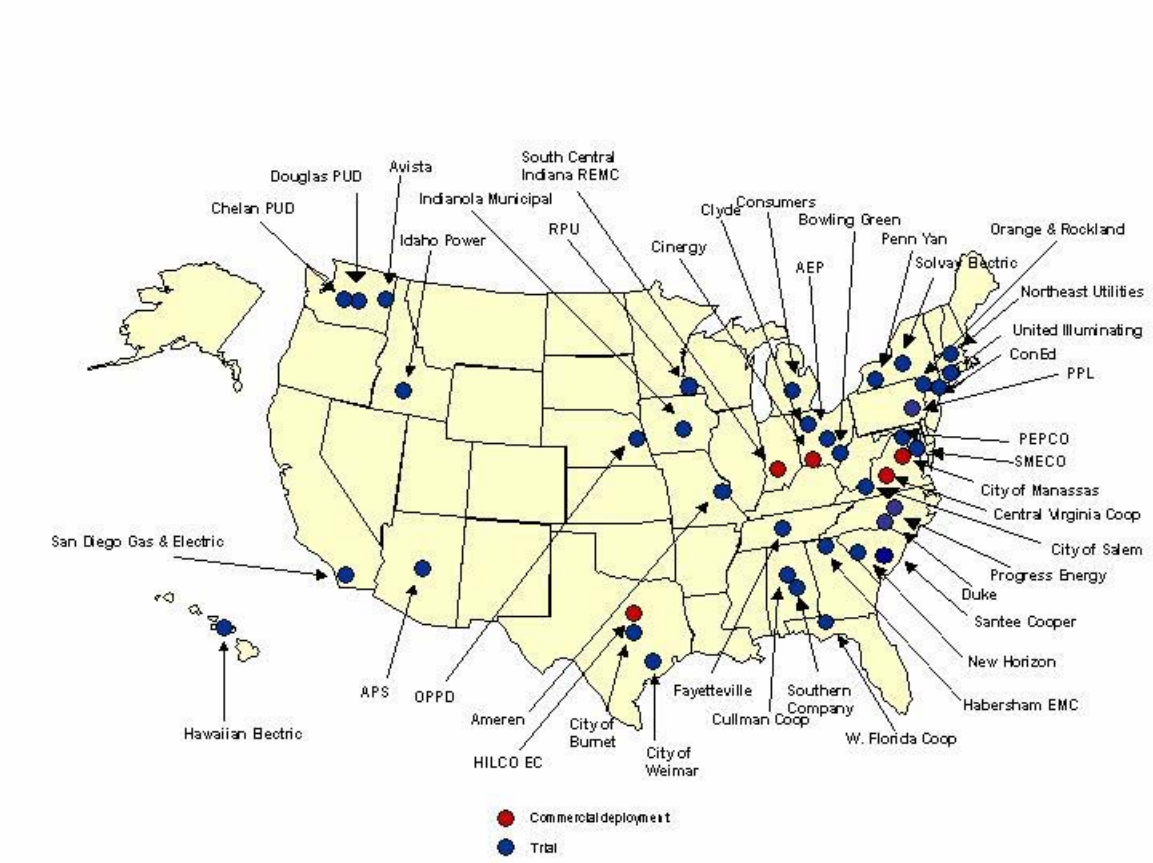
What is it?	Benefits	Limitations	Price
Broadband service delivered through the electric distribution system.	Should have relatively low deployment cost and time since BPL utilizes the existing electric grid	Still in development/trial stage. Interferences to and generated from BPL is a potential hurdle	$27.00 | $49.95

Broadband over Powerlines (BPL) is the provision of broadband service over existing electricity distribution wires using the higher frequency bandwidth of those wires. The BPL signal is separated from the electric transmission before it reaches the transformer located on the pole outside the customer premise. It is then sent directly through the customer's wall sockets to equipment located at the premise, allowing a customer to access the Internet by plugging a computer into any electrical socket. Alternatively, BPL can be used to transmit broadband through the power distribution poles, with a wireless connection between a transmitter on the

[74] Steve Rosenbush, "Verizon's Gutsy Bet," BusinessWeek, August 4, 2003.
[75] Vince Vittore, "IOCs," Telephony, February 28, 2005.
[76] Verizon News Release, July 19, 2004.
http://newscenter.verizon.com/proactive/newsroom/release.vtml?id=86053
[77] SBC News Release, June 22, 2004; http://www.sbc.com/gen/press-room?pid=4800&cdvn=news&newsarticleid=21207.
[78] Vince Vittore, supra.

pole and the customer's computer used to achieve the final connection. This is feasible since electric poles are usually no more than 100 feet from people's homes, which is suitable for present Wi-Fi technologies. BPL offers similar bandwidth as DSL and at comparable prices, based on information from the few communities where BPL is in operation. The full bandwidth potential of BPL is not known, however, since it is still early in its development and deployment when compared to other broadband platforms. It is reported that new technologies will permit BPL to provide broadband at bandwidths of up to 200 Mbps by the summer of 2005.[79]

Figure 4.10[80]
BPL Projects and Trials in the United States



[79] Ed Gubbins, "New Reports Suggest 2005 As Critical to Growth of BPL," Telephony, February 28, 2005, p. 9.
[80] United Telecom Council, www.utc.org.

The country's first city-wide commercial BPL deployment will be finished in April 2005 in the city of Manassas, Virginia. ComTek, the company offering the service received a license from the city and is providing BPL over power lines owned by the city Utilities Department.[81] ComTek has stated that more than 10% of the homes passed by its network have decided to take the 500 kpbs symmetrical service, which ComTek is offering for $29 per month. ComTek expects to achieve 20% to 30% pentration among the city's 12,500 homes and 2,500 businesses in the very near future.[82] Cincinnati, Ohio is another city with an active BPL deployment. That project is a joint venture between Cinergy, the local electric utility, and Current Communications, a BPL service provider.[83] Current Communications is also actively looking to commence a BPL project in California in the near future, although no specific plans have been announced.

About 100 residents of Menlo Park, California were to get 3Mbps BPL broadband and VoIP service as part of a trial co-sponsored by Pacific Gas and Electric Company (PG&E) and AT&T. AT&T dissolved the project in October 2004, four months after it was announced in July 2004.[84] PG&E has advised CPUC staff that it is still interested in exploring deployment of BPL technology but currently has no partner or active BPL project. At the Commission's Full Panel Hearing on this Report on February 8, 2005, San Diego Gas & Electric Company (SDG&E) publicly stated that it was moving forward with a BPL pilot project in its service territory in the near future.[85] The exact scope and nature of this pilot project is still being considered by SDG&E, but the service could potentially reach all 1.3 million customers in its service territory.[86]

[81] http://www.powerline-plc.com/newsreleases/City_Of_Manassas_Utility_Connection_11_03.pdf
[82] Gubbins, supra.
[83] http://www.cinergy.com/News/default_corporate_news.asp?news_id=420.
[84] http://www.dslreports.com/shownews/48889; http://www.arrl.org/news/stories/2004/10/21/100/?nc=1.
[85] Transcript of California Public Utilities Commission Full Panel Hearing on Broadband Deployment, February 8, 2005.
[86] Craig Rose, "SDG&E Explores Offering Web Access," San Diego Union-Tribune, February 10, 2005.

Chapter 5. Benefits

5.1 Economic Development

Advanced telecommunications is the key infrastructure for today's digital economy. The economies of California, the nation and the world are increasingly powered by the creation, use and transmission of information and entertainment content in digital format. Just as the telegraph transformed management of the far-ranging railroad networks of the 19th century, and the telephone enabled coordination of businesses with widespread operations in the 20th century, the digital communications infrastructure is transforming business activities on a global scale and in real-time in this century. The widespread deployment and use of broadband will spur the creation of entire new industries, transform existing ones and, like the automobile industry's impact on horse-drawn carriage manufacturers, displace others.

The deployment of broadband infrastructure impacts the economy both directly and indirectly. The cable industry alone has invested over $65 billion since 1996 upgrading its systems to provide digital content. Verizon is poised to spend up to $40 billion in the coming years to deploy a FTTP network.

Yet, the effects of broadband technology on the economy are much more far-reaching than the direct benefit created by capital investment in deployment and the manufacturing of the components such a network requires. The most significant economic benefits do not come from the deployment of broadband technology, but in its use. As broadband penetration increases, there will be resulting demand for computer and home network equipment, software applications, wireless devices and other equipment that utilize broadband. Like all infrastructure investment, the economic impacts of broadband will also include the increased productivity and innovation that it fosters. The full economic impact of widespread broadband deployment and adoption cannot be captured in even the most sophisticated econometric modeling.

5.2 Quantifying the Economic Benefits of Broadband Deployment

Several studies have attempted to quantify the economic impacts, particularly increases in employment and economic activity, that can either be directly or indirectly liked to increased deployment of broadband technologies. For example, one study sponsored by Cisco Systems, written by Hal Varian of the University of California and Robert Litan of the Brookings Institute, found that full implementation of currently underway or planned Internet business solutions could result in over $528 billion in cost savings to U.S. businesses though 2010.[87] Additionally, this study finds that these solutions could result in a cumulative increase of over $1.5 trillion in revenue to businesses resulting from implementation of Internet business solutions. While this study looked broadly at Internet based business solutions, and not just those enabled by broadband, this information is nevertheless illustrative of the significant benefits advanced telecommunications can have on business and on economic growth.

[87] Varian Litan, Elder, and Shutter, "The Net Impact Study: The Projected Economic Benefits of the Internet in the United States, United Kingdom and Germany," January 2002.

Figure 5.1
Broadband Investment Projections

Required Investment	Description
About $1300 per line, $270 billion total	Figures for DSL.; Reflects costs necessary to retrofit all US copper plant
About $1200 per line, $65 billion total	Figures for Cable-modem; Reflects past investment through 2002
More than $1250 per line, total investment would vary based on platforms used	Figures for "Ultraband" fiber connections; $1250 reflects customer expenses, not upstream capital and communication costs
About $700 per line, $63 billion total[88]	Figures for wiring additional 75% of US households with current technologies (cable or DSL)
About $900 per home passed and $2200 per home served by the technology, $93 billion total[89]	Weighted average calculated from 2003 to 2021, for investment in FTTP technology

The wide-ranging deployment of broadband infrastructure will have the direct effect of employing thousands of people: to manufacture, sell, purchase, install, manage, and maintain the equipment and facilities, as well as the resulting services.

Only a few studies have examined the issue of job development resulting from greater broadband investments, although many other publications and documents reference them.

Figure 5.2
Job Growth Due to Broadband Deployment

SOURCE	U.S. JOBS	CA JOBS
TeleNomic Research, 2002[90]	1.2 million	100,000
Critereon Economics, 2003[91]	1.2 million	N/A
CENIC/Gartner Consulting, 2003[92]	N/A	2 million

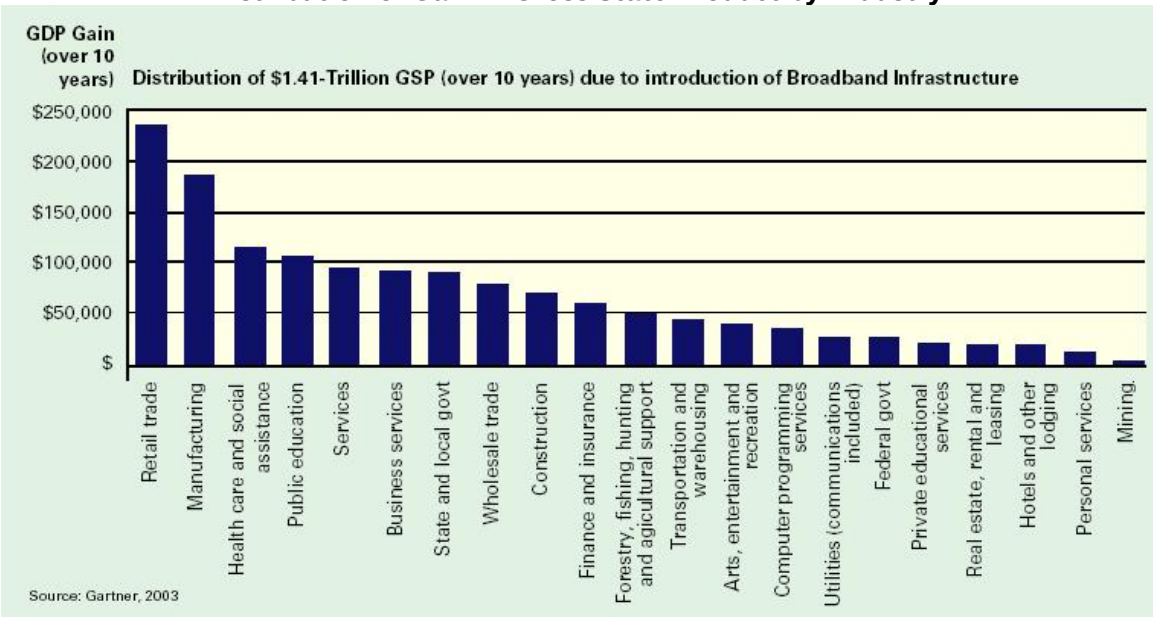
[88] Per line figure calculated using data from http://quickfacts.census.gov/qfd/states/00000.html.
[89] Staff found some variation in these projections.
[90] S. Pociask, "Building a Nationwide Broadband Network: Speeding Job Growth," TeleNomic Research, LLC, February 2002; http://www.newmillenniumresearch.org/event-02-25-2002/jobspaper.pdf.
[91] R. Crandall, C. Jackson, H. Singer, "The Effects of Ubiquitous Broadband Adoption On Investment, Jobs and the US Economy," Criterion Economics, LLC, September 2003; http://www.newmillenniumresearch.org/archive/bbstudyreport_091703.pdf.
[92] Gartner Consulting, "One Gigabit or Bust Initiative: A Broadband Vision for California," May 2003; http://www.cenic.org.

5.2.1 The CENIC/Gartner Study

The Gartner Group, a technology and market research and consulting firm, was engaged by the Corporation for Education and Network Initiatives in California (CENIC) to evaluate the economic potential of accelerating next generation broadband deployment in California.

Gartner studied the impact that a 50% penetration by 2010, i.e. one broadband line for every two people in California, would have on economic activity and employment. [93] Gartner's modeling shows an increase of $376 Billion in incremental Gross State Product (GSP) over a ten-year period. This increase would result in a $5,500 increase in annual per capital GSP. Gartner then sought to quantify theses economic impacts by sector of the economy. The following chart illustrates the study's results.

Figure 5.3
Distribution of Gain in Gross State Product by Industry



Source:
CENIC's One Gigabit or Bust Initiative: A Broadband Vision for California Summary Report
http://www.cenic.org/gb/pubs/gartner/Gartner_Short.pdf

Retail trade, manufacturing, health and social assistance, and public education see the largest positive economic impacts of accelerated broadband deployment.

Gartner also studied the impacts such accelerated deployment would have on employment and found the potential to create two million additional jobs in California over the ten-year study period.

[93] The equivalent penetration of basic telephony in California is approximately 73% on a per capita basis.

5.2.2 The TeleNomic Research Study[94]

A study conducted by TeleNomic Research found substantial employment gains from increased broadband deployment. The major finding of this study is that building and using a robust, nationwide network will expand U.S. employment by an estimated 1.2 million new and permanent jobs. Specifically, TeleNomics found:

- 166,000 jobs would be created directly in the telecommunications sector;
- 72,000 manufacturing jobs would be generated by the direct purchase of network plant and equipment and customer premise equipment; and
- 974,000 indirect jobs would be created if a next generation network were built.[95]

TeleNomic Research estimated that about 237,000 jobs nationwide would be created directly from broadband deployment. To this, the study adds jobs created indirectly from the deployment and use of broadband, such as content providers and software developers, who create new products that utilize the broadband networks. This indirect effect also includes jobs created by the increased spending of those whose jobs were directly linked to broadband deployment. The study finds that the effects of greater broadband deployment will ripple though the economy, increasing employment even more. TeleNomic estimates that over 4 indirect jobs will be created for every 1 new job directly resulting from the deployment of broadband.[96]

5.2.3 The Criterion Economics Study[97]

Robert Crandall and his associates at Criterion Economics completed a study in 2003 looking at the effects of ubiquitous broadband adoption on the U.S. economy. The study considers 95% penetration to be ubiquitous broadband adoption and assumes that this level of penetration is reached in 2021.[98] This study estimated that for every $1 million in capital investment in telecommunications networks, there are 18 jobs created. This leads the study to project that an average of 140,000 direct jobs would be created by the increase in capital investment engendered by widespread deployment of broadband. The indirect jobs created are estimated to be approximately 664,000, leading to a total of 804,000 new jobs.

The study also concluded that widespread deployment of broadband technologies could result in increased economic activity of $414 billion in additional economic output for the nation.

This study also examined the impacts of an even more rapid deployment of broadband and finds that under a scenario where 95% penetration is reached in 2013 (rather than 2021) as many as 546,000 additional new jobs would be added.[99] This results in a total addition of 1.2 million jobs to the U.S. economy.

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[94] S. Pociask "Building a Nationwide Broadband Network: Speeding Job Growth," TeleNomic Research, LLC, February 25, 2002. http://www.newmillenniumresearch.org/event-02-25-2002/jobspaper.pdf.
[95] Ibid., p. 2.
[96] Ibid., p. 7.
[97] R. Crandall, C. Jackson, H. Singer, "The Effects of Ubiquitous Broadband Adoption On Investment, Jobs and the US Economy," Criterion Economics, LLC, September 2003; http://www.newmillenniumresearch.org/archive/bbstudyreport_091703.pdf.
[98] To achieve this level of penetration broadband subscribership must increase by about 9.4% per year from 2004 through 2021.
[99] The study shows that employment peaks in 2010 at 546,000 and averages approximately 271,000 though 2021.

The Criterion Study also attempted to measure the additional benefits to consumers of broadband deployment by measuring consumer surplus. Consumer surplus is defined as the measure of the net benefit that new or improved goods and services bring to consumers. Given the tremendous value that broadband can provide to consumers, the study found significant gains in consumer benefit and found that the more ubiquitous the deployment the greater the consumer gains.

At 50% broadband penetration, the Criterion Economics study finds that additional value to consumers would rise to between $64.4 billion and $96.6 billion per year depending on price elasticity. If broadband service were to become truly ubiquitous, similar to ordinary telephone service at 95% penetration, this study concludes that the additional value to consumers - over and above their expenditures on the service - would be between $234 billion and $351 billion per year.

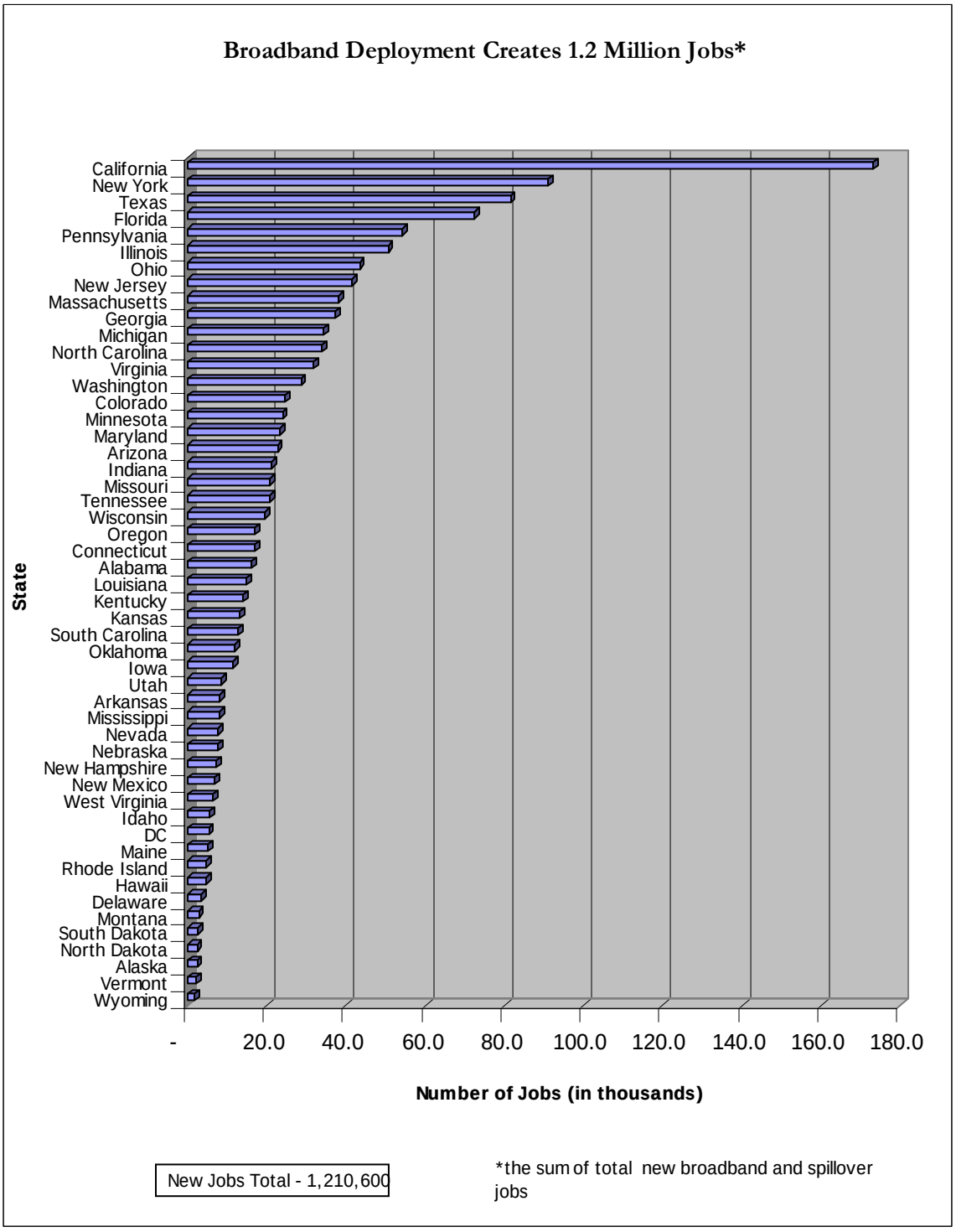
5.2.4 The Citizens for a Sound Economy Study

Citizens for a Sound Economy (CSE) published a study by Wayne T. Brough, Ph.D., which took the results of the Criterion study and sought to estimate the employment impact by state.[100] This study estimated that California would see an increase in employment of over 170,000 new jobs. The CSE study found that California would gain over 96,000 direct jobs. This would be expected given California's large information technology sector. For comparison, CSE estimates that Florida and New York would see gains of over 40,000 jobs as a direct result of broadband deployment. California would also see over 76,000 new jobs through the indirect impacts of broadband deployment, according to the study.

The findings of the study are illustrated in Figure 5.4 which follows.

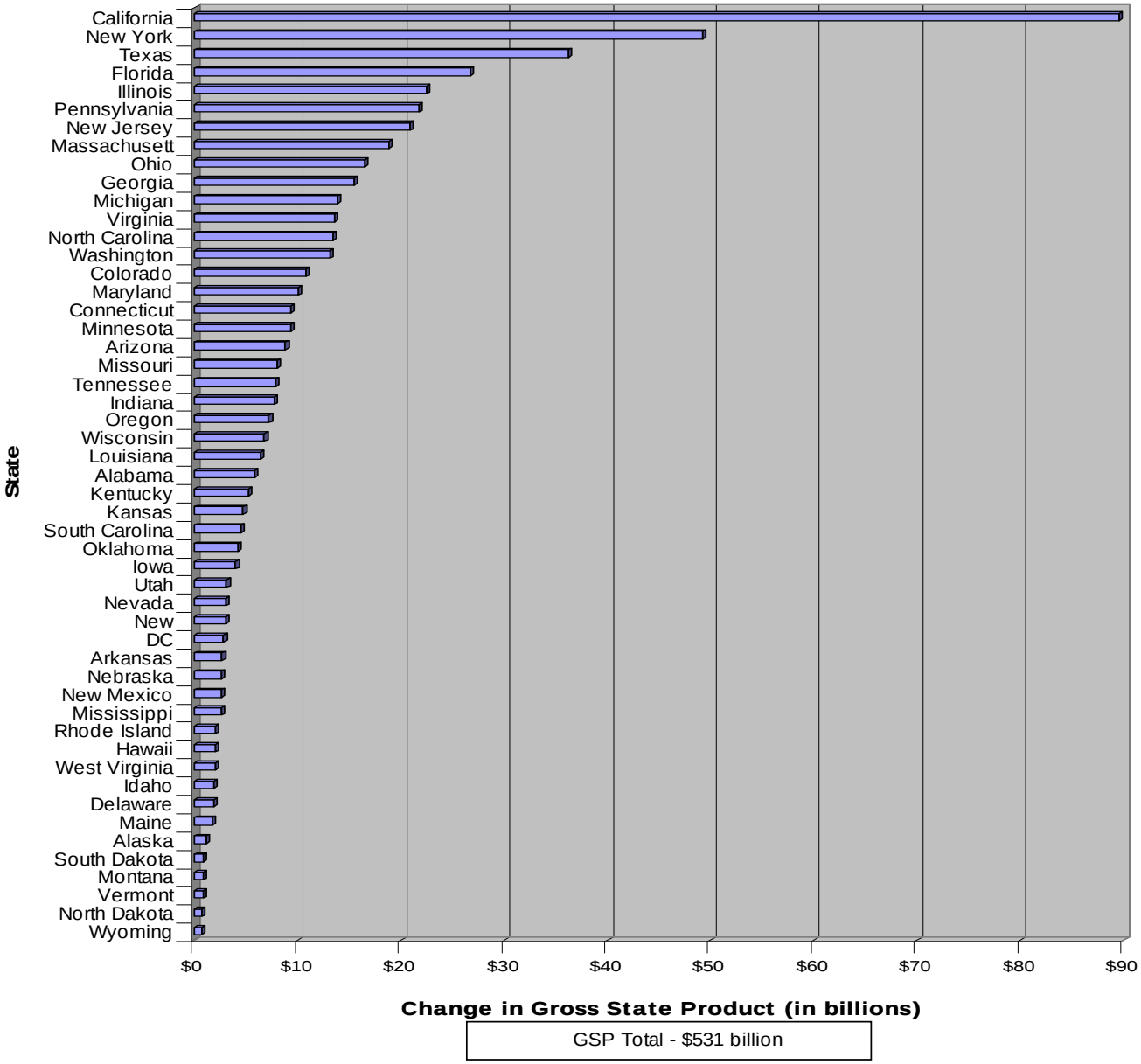
[100] Wayne T. Brough, "State Economies Can Benefit from Broadband Deployment," Center for a Sound Economy, December 1, 2003.

Figure 5.4



The CSE study also calculates that widespread broadband deployment could add over $500 billion to the U.S. economy and calculates that California would add over $90 billion to its economic output due to increased broadband deployment. Given California's large information technology and entertainment industries, California gains from increased broadband deployment in other states, as well as the benefits it derives from deployment within California.

Figure 5.5
Economic Output Increases by State



5.3 New Products and Services

Broadband will provide consumers with significant bandwidth, that will in turn encourage the development of new services, applications and hardware for consumers. The range of new products and services will only be limited by the imagination of innovators and the interests and demands of consumers.

5.3.1 Telemedicine

Telemedicine and eHealth are broadly defined as the application of electronic communication technologies to the provision of healthcare, health education and health services. The two terms are frequently used interchangeably. Many, if not all, Telemedicine applications require access to broadband services. A major goal of the delivery of Telemedicine and eHealth services is to eliminate barriers of time and distance to allow health service and education to reach individuals in their own communities, instead of the movement of people to centers of healthcare expertise.

Telemedicine applications will benefit from the proliferation of expanded broadband networks. Telemedicine applications can use broadband to transmit detailed medical images, as well as for videoconferencing to connect healthcare clinics in remote rural locations with experts and specialists located primarily in urban centers. In this way, rural clinics and hospitals can have access to the same medical expertise that is available in the most sophisticated urban hospitals. Telemedicine applications can allow health care professionals to monitor a patient's health remotely and, using videoconferencing technologies, can have access to critically needed specialists.

Over the past five years, California has become known as a telemedicine and eHealth leader. California was one of the first states to allow Medicaid reimbursement for telemedicine and eHealth services. The California Telemedicine and eHealth Center (CTEC)[101] funded by The California Endowment, is an example of one organization in the state committed to reducing health disparities through strategic application of telecommunications and eHealth technologies.

CTEC has made significant contributions toward increasing the technological expertise of California health care organizations through capacity building, training, education, and regranting. In particular, CTEC has emerged as the primary source for hospitals and clinics in promoting the use of telemedicine and eHealth within underserved communities. CTEC provides funding and resources to expand and develop regional eHealth networks throughout California using health technologies to improve the provision of health services to rural and underserved communities.

> **Case Study: eMental Health – Enhancing Mental Health Services for the Underserved.** CTEC funded the UC Davis eMental Health Project. This project has been highly successful in demonstrating new and innovative ways to provide mental health care services to rural populations. This project was developed to provide critically needed psychiatric services for ten rural community clinics that have a documented need for increased mental health care services and resources, where these services were not available. The UC Davis multidisciplinary consultation-liaison team provides professional expertise (advice and consultations) via Telemedicine and other communication technologies on the management of patients who are seen at the selected rural sites, especially for complex and /or urgent mental health issues. This project offers a choice of urgent and non-urgent consultations by phone, fax, email/internet, or videoconferencing. The services administered to the rural sites include: triage consultation, clinical psychologist, psychiatric consultations, medication management, and counseling services. In just over six months, the project staff has seen over 150 clients, in which 50% of those clients have been children.

[101] See www.cteconline.org.

Rural sites are provided with the most up-to-date information on best practices as well as easily accessible resources and professional expertise from the staff at the UC Davis Medical Center (UCDMC). Along with providing clinical services to the rural sites, the UCDMC faculty also provides a regular program of fully accredited continuing medical education lectures and seminars. Over 100 rural providers have received education on the treatment of depression, anxiety, dementia and psychiatric illnesses in the medically ill. The additional services made available through this unique project have aided in the acceptance, support, and overall success of the consultation-liaison model at the ten participating rural sites.

5.3.2 VoIP

The most prominent example of how broadband has resulted in innovative new services is the development of VoIP (Voice over Internet Protocol). VoIP allows high quality two-way voice transmission over broadband connections, and is already revolutionizing the telecommunications industry.[102] While the commercial deployment of VoIP is relatively new and there are still important public policy issues raised by its emergence such as e911 and support for Universal Service programs, analysts predict that between 2004 and 2008, the number of VoIP connections will increase from about 800,000 to 17 million.[103]

Calls made using IP technology or over the public Internet provide significant cost savings to consumers by eliminating most per minute long distance and local toll charges. Many VoIP providers are offering unlimited local and long distance calling plans for as low as $19.95 per month.[104] In addition to significant cost savings, VoIP facilitates advanced applications and capabilities including mobility, location independence including choice of area code, integrated messaging applications, voice access to e-mail and a common mailbox for voice, e-mail and Instant Messaging.

5.3.3 Video on Demand

Cable companies and Broadband Overbuilders already offer television and video over their broadband networks. Telephone companies are seeking to offer similar services, delivering their own "triple play" to consumers. SBC and set-top box vendor 2Wire this year will offer TV, video on demand, digital video recording and Internet content over DSL and satellite service.[105] The increased capacity of these broadband networks combined with advances in data storage technology will spur increased Video on Demand applications.

5.3.4 Smart Homes

Homeowners can utilize broadband technologies to control the electronic devices in the home remotely. Lighting, heating and air conditioning, appliances, and home security and other systems can now be remotely monitored and controlled. In addition, advanced energy metering technology in the home will allow consumers to control their energy demand and respond to market signals.

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[102] http://www.businessweek.com/technology/content/sep2004/tc20040921_7486_tc024.htm.
[103] Suzanne Vranica, "No Nerds Needed: VOIP Is No Longer Just for Techies," Wall Street Journal, November 3, 2004; http://online.wsj.com/article/0,,SB109943061445662597,00.html.
[104] See "Freedom Unlimited," www.packet8.net.
[105] "SBC, 2Wire Inc. to Launch Home Entertainment Services," Sacramento Business Journal, January 4, 2005.

5.3.5 Gaming

Online interactive video and computer gaming is increasingly a leading driver of broadband deployment and use. It is forecast that the worldwide market for online games will reach $9.8 billion in 2009, a 410% increase over 2003 revenue of $1.9 billion.[106] Broadband applications can provide gamers with the ability to connect directly with interactive, multi person, high-resolution, fast action, and complex online games. Broadband gaming technologies that create virtual-reality environments could be a precursor to sophisticated training and simulation applications with a myriad of uses in industrial, entertainment, military, and commercial settings.

5.4 Teleworking and Telecommuting

In 2004, a report sponsored by the International Telework Association and Council found that the number of Americans who worked at least part time from home increased 7.5% from 2003, to a total of 44.4 million workers. The report also found that during that same one year period, the number of teleworkers using broadband soared 84%, from 4.4 million to 8.1 million employees.[107] Companies can use broadband to enable employees scattered around the globe to communicate and share information in real-time. Employees working from home or in branch offices are able to work with colleagues in other offices as easily as if they sitting in adjacent cubicles. Broadband allows telecommuting to serve as a practical alternative to office-based employment. In addition to the efficiencies realized by employers from lower overhead costs, telecommuting results in significant benefits to the environment,[108] results in greater worker productivity and job satisfaction, as well as the expansion of employment opportunities to those with disabilities.[109]

California was a pioneer in exploration and adoption of telecommuting by state employees. In 2003, the state published a guide to assist agencies plan and implement teleworking/telecommuting programs.[110]

5.5 Benefits to Public Agencies and E-Government

Government can increase the number and level of public services available to citizens by putting new and existing services online.[111] Union City, California has announced that it is replacing the telephone crime reporting system now in use with a system that will allow residents to file certain crime reports from their homes through the Internet. The new system will be less stressful for victims, eliminating games of "phone tag," while it eases the workload on community service aides and police officers. The $20,000 cost is projected to save the city $85,000 in salary and benefits annually.[112]

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[106] DFC Intelligence Forecasts Significant Growth for Online Games, August 3, 2004; http://www.dfcint.com/news/praug32004.html.

[107] "Work at Home Grows in Past Year by 7.5% in U.S.; Use of Broadband for Work at Home Grows by 84%," Press Release of International Telework Association and Council, September 2, 2004; http://www.telecommute.org/news/pr090204.htm.

[108] See AT&T's Telecommuting Calculator at www.att.com/telework/calculator.html, which permits workers to calculate carbon dioxide emissions saving by telecommuting.

[109] Burt Helm, "Paving the Road for Telecommuters," BusinessWeek, September 29, 2004; Ben Macklin, "The Benefits of Broadband: Telecommuting," Entrepreneur, May 6, 2002.

[110] http://www.dpa.ca.gov/telework.

[111] Herndon, Virginia Helps Locate Missing Children with PhoneTop AMBER Alerts and Cisco IPC System, February 9, 2004; http://newsroom.cisco.com/dlls/2004/hd_020904b.html

[112] www.ci.union-city.ca.us/default.htm.

As broadband becomes more widespread, public safety authorities will be able to develop systems for providing public safety alerts via the Internet. For example, the town of Herndon, Virginia is using its VOIP-based network to broadcast Amber Alerts to the IP based phones in local government offices.

Broadband allows local government jurisdictions to host Internet community forums and provide multimedia communication services on websites. Additional benefits of such e-government include eliminating the time and transportation costs involved with visiting local government offices.

Similar to the benefits realized by private companies, broadband is also helping to reduce paperwork and cut costs for government. California State Controller Steve Westly has advanced a wide-ranging set of e-government proposals designed to save as much as $37.5 million annually by making the state more efficient at handling everything from tax returns to travel vouchers. Electronic filing of tax returns and refunds alone are expected to save up to $7.5 million each year. On-line processing of travel claims, payroll and benefits for state workers will bring additional savings of up to $29 million each year.[113]

Increased deployment of advanced telecommunications services including broadband will also have a positive impact on revenues to state and local government. Increased employment will generate higher income tax revenues, and increased economic activity will create additional sales tax revenues. Furthermore, the capital expenditures to deploy broadband networks will increase the property tax base.

5.6 Benefits for the Disabled Community

Broadband services are particularly beneficial to the disabled community. For example, video phones with closed caption technology can greatly increase the ability to communicate for those within the deaf community. High-resolution computer screens and voice-activated programs can aid the visually impaired, and with software such as eBooks, everything from novels to textbooks can be downloaded. For the physically disabled and the elderly, the Internet, especially with a broadband connection, provides a means for them to connect and communicate with the world.

Wireless broadband offers another opportunity for the disabled. Rather than using a desktop computer, a wheelchair bound consumer with a mounted notebook computer can access the Internet from anywhere in his/her home. With voice-activated dialing, a physically disabled or visually impaired consumer can communicate more effectively and easily using VoIP over a wireless broadband connection.

[113] "Westly Outlines E-Government Agenda," May 12, 2004; http://www.controller.ca.gov/eo/pressbox/index.shtml.

5.7 Benefits for Rural Areas

Broadband infrastructure can be a critical element in assisting a rural community to compete economically within the overall global business climate.[114] Broadband infrastructure assists rural communities in attracting businesses, providing health care to residents and accessing government services. Broadband can serve as a critical link to information and news for communities that have limited newspaper, radio and television station choices. Access to broadband infrastructure can also improve the quality of education available to small population communities. For, example the California Mother Lode region - including Amador, Mariposa, Tuolumne, Calaveras, Inyo and Mono counties - has no state college or university and only one community college within the area's 18,546 square miles. High-speed Internet connections allow Mother Lode residents to access technology training and educational opportunities provided through the Golden Gate University's Cyber Campus. Students can remain in their communities, receive Bachelors and Master degrees online and with their advanced education, contribute to the economic vitality of the region.[115]

5.8 Benefits for Low Income Consumers

Increasingly, access to computers and the Internet are necessary for academic success and better-paying jobs . Broadband offers access to training, services and educational advancement that allows low-income consumers to improve their skills, access critical services such as health care, and actively participate in the new digital economy

There are surprisingly few studies measuring the benefits of broadband to lower income consumers.[116]

> **Case Studies: Reaching out to Low Income Consumers**
> The Eastmont Computing Center in Oakland provides broadband Internet access, computer courses and job placement services to approximately 500 people per week.[117] The Latino Issues Forum conducts computer technology and Internet literacy projects in low-income urban and rural schools.[118] The Signature Learning Project and the Rural Technology and Information Project are model public, private and nonprofit partnerships created to develop comprehensive technology learning environments for low income and minority communities.[119]

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[114] "Public Policy Roadmap for Improving Broadband Access," New Valley Connexions, December 2003, p. 16.
[115] Amador-Tuolumne Community Action Agency, Opening Comment in R. 03-04-003.
[116] One study found that children of school age increased their use of a personal computer for education-related purposes by 19%, while decreasing their use for gaming and entertainment by 21%, when those computers were equipped with broadband connections. 2004 British Telecom Study; www.unreasonableman.net/2004/09/broadband_has_p.html.
[117] Latino Issues Forum and Greenlining Institute, Opening Comments in R. 03-04-003.
[118] Ibid.
[119] Latino Issues Forum and Greenlining Institute, Opening Comments in R. 03-04-003, Appendix A: Model for closing Technological and Educational Disparities in Underserved Communities.

Chapter 6. Barriers

Many of the barriers to greater broadband deployment relate to the "last mile" problem. The "last mile" refers to the connection between the broadband infrastructure and the consumer at the neighborhood level. For many communities, connecting the last mile represents the single greatest challenge to delivering broadband to consumers. Last mile hurdles include such issues as difficult topography, problems with government permitting and licensing, as well as the economic and technical challenges caused by low population density and distance from major population centers.

6.1 Access to Non-Telecommunications Utility Property and Facilities

Municipal and utility resistance to placement of wireless antennas and other telecommunications equipment on existing utility poles and structures or in utility Rights of Way is a barrier to broadband deployment. Notwithstanding that both state law[120] and federal law[121] mandate non-discriminatory access to utility Rights of Way, local governments have been slow to grant the necessary permits. For example, the cities of San Francisco, Walnut Creek, Santa Monica, Napa and Calabasas have either refused to grant access to wireless providers or have imposed extraordinary requirements on the applicants that have had the effect of indefinitely delaying deployment. These cities and utilities have offered various reasons for denying wireless broadband providers access to existing right-of-way including the desire to develop city-owned broadband facilities, aesthetics, worker safety and deference to the wishes of utility pole owners.[122]

6.1.1 Section 851

Public Utilities Code Section 851 requires a utility to obtain prior CPUC approval before selling or leasing property that is necessary or useful in the utility's performance of its duties to the public. This arises as a barrier to broadband deployment because it can prevent a utility from leasing access to existing utility property, such as electricity distribution poles, to a company seeking to use those poles to carry broadband infrastructure such as wires or antennae. Even when the CPUC approves a Section 851 application, the delay in receiving CPUC approval is often so long as to effectively deter broadband projects. In recent years, the average time for the CPUC to act on a Section 851 application has decreased from more than a year to approximately six months. However, the CPUC has been sharply divided on interpretation of the standards necessary for Section 851 approval (whether the proposed transaction must provide a public "benefit" or must simply have no negative impact). Many routine applications can remain pending at the CPUC for nine months or longer with no indication that approval is assured. The result is significant regulatory uncertainty, which can disrupt financing and planning of broadband projects.

[120] California Public Utilities Code Section 7901.
[121] 47 U.S.C. Section 253.
[122] Conversation between CPUC Staff and Counsel for NextG Networks of California, Inc. on March 17, 2005.

6.1.2 California Environmental Quality Act (CEQA)

In the case of broadband deployment over existing utility Rights of Way, the application of Section 851 also triggers CPUC review under the California Environmental Quality Act (CEQA) for any such proposed build-out.[123] For example, if Southern California Edison were to lease power lines for broadband deployment, CPUC approval including a favorable CEQA review would be required even though the physical changes to existing power lines would be minimal and would result in no discernable environmental effects. The CPUC has the power to grant categorical exemptions from Section 851 requirements to certain types of projects, however inconsistent interpretation of the relevant exemption standard has limited the use of that mechanism.[124]

Case Study: San Mateo Bridge

In March 2000, PG&E sought CPUC approval under Section 851 for authority to lease space on its electric transmission towers crossing San Francisco Bay to a company seeking to install fiber optic cable. PG&E obtained authority to install the wires from the Bay Conservation and Development Commission (BCDC), which, consistent with CEQA, found that the installation of wires on existing utility poles is categorically exempt from CEQA. PG&E began installation, while continuing its efforts to obtain CPUC authority for the lease transaction.

On October 8, 2002, the CPUC issued a draft decision that denied PG&E approval of the lease, effectively shutting down work on the project. On May 22, 2003, the CPUC granted the Section 851 application, but found that the installation of fiber optic cable on the towers was not categorically exempt from CEQA. On June 20, 2003, PG&E filed a petition to modify the decision, noting that the BCDC had found that the installation of utility transmission facilities on utility towers categorically exempt from CEQA. On April 1, 2004, over four years after PG&E's first request for approval, the CPUC reversed its position and found the installation to be exempt from CEQA. By that point, however, the fiber optic company had filed for bankruptcy protection.[125]

6.2 Rights of Way

The process for obtaining Right of Way (ROW) permits for construction of broadband infrastructure in California is lengthy, expensive, inconsistent and is cited as one of the most significant barriers to broadband deployment. ROW permits are issued by various agencies - federal, state and local, as well as tribal governments - to build broadband infrastructure on property controlled by those agencies. There is no consistency in the application form or process, or in the permitting criteria or fees.

California Public Utilities Code Section 7901 authorizes telecommunications providers Rights of Way (ROW) access within the state of California. The Code further defines the rights of municipalities with respect to ROW as the "right to exercise reasonable control as to the time, place, and manner in which roads, highways, and waterways are accessed."[126] The California Government Code reserves the right of local governments to charge permit fees to companies that access ROW.[127] The federal government does not assert jurisdiction over public Rights of Way, but does define the role of state and local governments in their administration.[128]

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123 California Public Resources Code Sections 21000 – 21177.
124 California Public Resources Code Section 853(b).
125 CPUC Decision 04-04-068 (2004).
126 California Public Utilities Code Section 7901.1(a).
127 California Government Code Section 50030.
128 Section 253(c) of the 1996 Telecommunications Act.

6.2.1 ROW Fees are Inconsistent and Often Above Cost

The 1996 Act stipulates that local municipalities may "require fair and reasonable compensation from telecommunications providers, on a competitively neutral and nondiscriminatory basis."[129] In addition, California Government Code Section 50030 states that "any permit fee imposed by a city, including a chartered city, a county, or a city and county... shall not exceed the reasonable costs of providing the service for which the fee is charged and shall not be levied for general revenue purposes." As a result, local governments have the right to collect fees from telecommunications providers for access to ROW to cover the costs associated with administration of the ROW.

The Legislature and the courts have upheld the requirement that fees be limited to the local government's cost of providing access. In response to concerns that local governments were charging developers unfair or unrelated fees that were hindering development, California adopted the Mitigation Fee Act (MFA) in 1987.[130] The act requires public agencies to meet specific requirements when imposing a fee as a condition of new development. Most importantly, the MFA states that there must be a relationship between fees and the local government's cost of administering the development.

The law was first applied to a communications case in *Williams Communications vs. City of Riverside*.[131] On December 19, 2003, the *Williams* court found that ROW fees must be limited to the local government's cost to administer permits and ordered that the city refund $750,000 that it had required as a condition for granting a license to Williams for installing and maintaining fiber optic facilities in the city streets. The court also ruled that there could be no separate fee or distinction for providers of advanced data services.[132]

Despite statute and case law, ROW fees remain an area of contention between municipalities and telecommunications providers. Local governments have argued that "reasonable," a term used in both the state and federal law, does not necessarily infer that fees are to only cover costs. Providers have argued that to be reasonable, fees must be directly related to the city's costs. Providers believe that local governments often use the ROW process as an opportunity to increase local revenue which in turn, "raise[s] the cost of deploying broadband."[133]

There is no consistency in how cities and counties calculate ROW costs and often apply different fee requirements for similar infrastructure projects. Verizon reports, for example, that the fee schedule for its FTTP Project from the City of Banning is based on the amount Verizon has traditionally been charged as an ILEC. The County of Riverside and City of Beaumont, by contrast, have charged additional fees based on footage of aerial facilities. Turlock, Sunnyvale, and Palo Alto, for example, charge fees based on the provider's cost of construction, not the cities' respective costs.

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[129] Ibid.
[130] Government Code Section 66000 et seq.
[131] 114 Cal. App 4th 642 (2003).
[132] Ibid.
[133] Verizon California Inc.'s Opening Comments in R. 03-04-003.

6.2.2 ROW Application Processing is Inconsistent, Costly and Time-Consuming

The time to process a ROW application varies depending on the local government, and providers are unable to predict how long it will take to obtain permission to build out facilities. Obtaining permits can take anywhere from weeks to months in each jurisdiction. When setback requirements and in-depth reviews by municipal planning departments are imposed, turnaround times approach the upper limits of this range. Reviews for compliance with zoning regulations also add to processing delay. The City and County of Los Angeles on average has a turnaround time of six weeks to obtain permits, although each project varies greatly. For example, placing utility cabinets above ground may lengthen the permit process due to local design-review codes. In some jurisdictions providers complain that cities sometimes do not reply to permit requests at all. Other cities, like Sunnyvale, Santa Clara, and Corona, require providers to enter into right of way agreements that can take many months to negotiate before the city will issue permits. SBC reports that it took two years to obtain permits for recent projects in Orange, Riverside and San Bernardino counties, although they indicate that the majority of permits are issued within the lower range of the time frame.[134]

Uncertainty caused by the ROW application process is a barrier to deployment. Financing of projects is often based on estimated completion dates that are impossible to predict under the current process. The National Association of Regulatory Utility Commissioners (NARUC) adopted a resolution that states that ROW reform is necessary and that deployment of advanced services would benefit from requiring local government to "act on applications for access to public Rights of Way in a reasonable and fixed period of time."[135]

6.2.3 ROW Application Forms and Assessment Criteria Are Inconsistent

Each city and county in California has its own ROW application. Providers who intend to offer services within multiple cities and counties are faced with a different form for each jurisdiction. Providers also face different criteria upon which cities and counties assess their ROW applications. These criteria can even differ within the same jurisdiction, depending on the type of technology deployed or the type of project sponsor. For example, some permitting agencies, cities, counties request higher fees for fiber installations than they have traditionally charged for other materials for no discernible reason, and they impose additional engineering requirements, such as engineering stamps.[136] In contrast, ILEC engineers are exempted from this requirement pursuant to Business and Professional Code Section 6747. This results in different rules being applied to projects depending upon the status of the project sponsor.

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[134] Email transmittals between CPUC Staff and representatives of Verizon and SBC on January 14, 2005; January 26, 2005; January 27, 2005.

[135] "Broadband Facilities and ROW," July 13, 2002, NARUC; http://www.naruc.org/associations/1773/files/broadband_access.pdf.

[136] The stamp certifies the plans were developed by a registered professional engineer. Communications companies contract with outside engineering firms to have their plans reviewed and then stamped. However most engineering firms only stamp plans they develop, requiring communications companies to contract the outside firm to draw the plans as opposed to being able to use their own employees, which is usually cost prohibitive.

6.2.4 California Lacks Efficient ROW Dispute Resolution Method

A dispute over ROW can delay the deployment of facilities for months or even years. In some cases, a provider may be forced to completely withdraw its plan.

In 1998, the CPUC adopted a ROW dispute resolution process for carriers and municipalities in Decision 98-10-058. However, local governments can ignore a CPUC order granting access to a ROW because they are not subject to CPUC jurisdiction. With no other recourse available to them, providers often proceed directly to expensive court battles to resolve disputes.

6.2.5 No Standards for State Agencies in ROW Permitting

State law currently provides little certainty as to the process and criteria used by state agencies in imposing and collecting ROW fees. California Government Code Section 50030 does not apply to state agencies, which led to a recent dispute between the California Department of Transportation (CalTrans) and SBC in Humboldt County. In that case, CalTrans imposed millions of dollars in ROW fees for deployment of fiber optic lines along a freeway, as a means of raising General Fund revenue to close a budget gap in 2001 . In the past, CalTrans had used an "incremental cost recovery" model in pricing ROW. To generate additional revenues, however, CalTrans charged SBC $6.40 per linear foot per one-inch conduit for right of way access, adding up to $2 million to the project cost. The CPUC ruled the dispute out of its jurisdiction, and SBC sued in federal court maintaining that the fees were illegal. Deployment of high-speed Internet access to the region was halted while the fees were disputed in court. A two-year impasse ended in June 2003 when SBC agreed to place $1.4 million in disputed fees in an escrow account. Although the long-awaited construction project was able to proceed, the core issue as to the extent to which a state agency can charge above-cost ROW fees remains unresolved and continues to be litigated.[137]

6.3 Carrier Certification Process Inconsistent and Unclear

The CPUC has traditionally required that telephone companies constructing facilities outside their traditional service territories seek authority to do so under Public Utilities Code Section 1001. With the advent of competition in the telecommunication market in California, new market entrants began to offer services in the state. Since these carriers did not have "service territories," the CPUC began requiring new entrants to obtain a Certificate of Public Convenience and Necessity (CPCN) to construct facilities and begin offering service.

Thus, the CPUC has required new entrants to obtain CPUC approval prior to entering the market and prior to construction of any facilities. For those firms that utilize existing facilities owned by other carriers, the granting of a CPCN focuses simply on the fitness of the provider to offer service in California, such as the company's record of compliance with consumer protection laws, as well as the records of the company's owners and management team. However, for those carriers seeking to construct new facilities to provide service, obtaining a CPCN requires the filing of a formal application and final approval by the CPUC, which can take many months longer to process and approve.

[137] North Coast Times, June 5,2003; see also http://www.cenic.org/gb/pubs/gartner/report/broadbandObstacles.htm.

In 1996 the CPUC developed a process to streamline the application and environmental review process for new carriers. However, in 1999 the CPUC changed the process to require that new entrants file a formal application for a CPCN. This was intended to be a temporary measure to remain in place while the CPUC addressed concerns with the process established in 1996, such as inequitable treatment of carriers based on a carrier's status. In February of 2000, the CPUC opened R.00-02-003 to address these underlying issues. However, this proceeding has been dormant since the summer of 2000. No new rules have been established, and the stop-gap measures remain in place, leaving the industry without a workable process for entry and build-out of networks.

The CPUC's current implementation of its CPCN approval process is problematic because it does not treat carriers seeking to construct new facilities in a uniform manner. The primary area where this disparate treatment occurs is in the review of the environmental impacts of the new entrants' proposed networks. The CPUC administers its review differently depending on the regulatory classification of the provider, and depending on when the provider received its certificate to operate in California - instead of the environmental impacts of the specific project.

The lack of uniformity in the CPUC approval process is illustrated by the following example: an ILEC is not required to seek review for either a CPCN or under CEQA for a project to build out infrastructure, as long as it is within its existing service territory. A CLEC that received authority to operate in California in 1996 might need approval depending on whether or not the project will be built in an existing ROW.[138] A CLEC that just recently applied to enter the California market would be required to file a CPCN application with the CPUC before it could do anything. Energy utilities are permitted under CPUC rules to construct certain facilities without CPUC approval or environmental review. However, such exemptions have not been made available to many telecommunications providers. Additionally, many of the CPUC staff conducting the reviews have experience reviewing large electric and natural gas projects, but relatively little experience reviewing telecommunications projects. Providers are hesitant to invest time and resources in a project if they cannot predict if, when, or under what conditions the project will be approved.

6.4 Cable Franchising

California Government Code Section 53066 allows cities and counties to authorize exclusive franchises for the construction of a cable TV system.[139] Under this arrangement, there is minimal competition among cable companies for customers. Other cable providers are not permitted to compete in the area unless the local government grants an additional franchise, which is referred to as a competitive franchise.[140] The local government evaluates requests for competitive franchises based on "significant positive or negative impacts on the community being served."[141] If an additional franchise is approved, state code mandates that the competitive franchise be required "to wire and serve the same geographic area within a reasonable time," as the incumbent provider.[142] This obligation to wire and serve the same area as the incumbent is cost prohibitive to most potential entrants, as it requires a massive infrastructure investment that is in most cases not economically viable.

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[138] CPUC Decision 96-12-120.

[139] California Government Code Section 53066. (a) Any city or county or city and county in the State of California may, pursuant to such provisions as may...authorize by franchise or license the construction of a community antenna TV system.

[140] California Government Code Section 53066.3 (a) allows "...a city, county, or city and county elects to grant an additional cable TV franchise in an area where a franchise has already been granted to a cable TV operator..."

[141] California Government Code Section 53066.3.(1).

[142] California Government Code Section 53066.3 (d).

To facilitate deployment and encourage competition in the cable video market, the 1996 Act created a new designation for competitive cable providers called Open Video System (OVS) as an alternative to traditional cable TV regulation.[143] The OVS designation was created to encourage competition by lessening the regulatory burdens on OVS providers. Most importantly, the OVS designation does not include the build out requirements. This allows a competitive provider to enter the market without the requirement to extend its network throughout the entire franchise territory.

California code does not currently recognize the OVS designation, however, and state requirements for a competitive franchise are in direct contradiction to the federal scheme. The California Attorney General recognized this problem and opened Opinion No. 02-1013 in 2002, requesting comments. An opinion was never issued.

6.5 Convergence and Service Bundling

The ability of ILECs to respond to the competitive telecommunications marketplace with bundled offers that bring down prices for consumers, and which consumers increasingly demand, is frustrated by the current pricing and imputation requirements, tariff filing process, and affiliate transaction rules and requirements imposed on them by the CPUC. Wireless competitors are not subject to any of the requirements imposed upon ILECs, and cable telephony and other wireline competitors are only subject to the tariff filing process, not any of the pricing or imputation rules. As a result, ILECs are not always able to respond to more attractive offers for bundled services that are offered to consumers by CLECs and cable companies.

For example, in order for an ILEC in California to introduce a new service offering, such as call blocking, extensive cost analyses must be done in preparation for filing a tariff for CPUC approval. These cost analyses often require two months of work. 60 days prior to the target offering date, the ILEC must provide notice of the offer to CLECs, as required by the Interconnection Agreements. 30 days prior to the target offering date, the ILEC then files for CPUC approval, and includes the cost analyses demonstrating that the new offer meets the Commission's price floor and imputation rules.[144] For the first 20 days after the filing, competitors can protest the filing, which they almost always do. If the Advice Letter process is suspended in response to a Protest, a delay of up to 120 days may occur before the new service can be offered.[145] In total, the CPUC's regulatory requirements often delay new ILEC bundled service offerings by a minimum of four months.

In addition, it is more difficult for an ILEC in California to take the lead in making a competitive offering because it must give 60 days notice about any new offering. Competitors, free from the regulatory burdens imposed on ILECs, are often able to put together a competing offer and bring it to the marketplace at the same time, or even prior to, the ILEC offering.

[143] 1996 Telecommunications Act, Section 653. FCC Rules, Section 76.1500-76.1505.
[144] CPUC General Order 96-A.
[145] CPUC Decision D.05-01-032.

6.6 Broadband Access Challenges to the Disabled Community

Broadband access for those with disabilities lags behind the non-disabled. One reason for this is the fact that many technical adaptations for consumer premises equipment and assistive services for the disabled are not widely available and are often expensive. Public access points, such as community centers and libraries, often can not accommodate disabled individuals, despite requirements under California law and the Americans with Disabilities Act.[146] A variety of computer-based assistive technology devices and software tools are available to help people with disabilities. However, access to a computer and appropriate software is often prohibitively expensive.[147] Disability Rights Advocates quotes prices for JAWS® screen-reading software for blind and visually-impaired consumers at up to $1,095.00, and voice recognition software at $179.99.

Assistive technologies available to the disabled community through the Deaf & Disabled Telecommunications Program (DDTP) are focused on traditional voice communications services over the Public Switched Telephone Network, not high-speed Internet access, services, consumer premises equipment or software such as those mentioned above.

6.7 Challenges to Access in Rural Communities

In rural California, low population density makes investment in certain types of broadband infrastructure, such as DSL and cable, less economically feasible than in urban and suburban areas. In Tuolumne County, for example, local officials indicate that more than 90% of the population does not have access to high-speed Internet service other than satellite.[148] Dial-up Internet service over analog phone lines remains the predominant form of Internet connection in many rural areas for reasons of economics, demographics and lack of infrastructure.

The demographics of rural areas play a large role in broadband subscription rates, making cost-effective investments in infrastructure even more difficult. Research data from 2002 indicate that nearly two-thirds of rural residents believe that they will not go online at all in the future. Rural areas also have large elderly populations, who are the least likely of all consumers to go online, as well as the smaller numbers of high school and college students relative to the rest of the population. High school and college students are the most likely to use the Internet. A significantly higher percentage of rural residents earn less than $30,000 per year (47% compared with 39% of urban and 29% of suburban residents). The $30,000 per year earning level is a significant break point in terms of usage rates.[149]

Figure 6.1
Internet Use by Population by Community Type[150]
May 2002

	Will go online	Will not go online
Urban	47%	50%
Rural	33%	62%

[146] Comments of Disability Rights Advocates and the Center for Independent Living, San Francisco meeting on February 10, 2004.
[147] Disability Watch, p. 93.
[148] Amador-Tuolumne Community Action Agency, Opening Comments in R. 03-04-003.
[149] Pew Internet & American Life Project, "The Ever-Shifting Internet Population," April 2003.
[150] Ibid., p. 16.

Population demographics are significant criteria in infrastructure investment decisions. Less densely populated areas are at a disadvantage in attracting private capital for broadband infrastructure because there are fewer willing consumers to provide a return on any investment over a reasonable period.

Local officials and community based organizations have provided subsidies and grants to build broadband infrastructure in rural areas. Construction loans for broadband deployment are available from the Rural Utilities Service (RUS). The definition of "rural" that certain federal agencies use, however, unduly restricts the flow of subsidies to many areas.[151] The U.S. Department of Agriculture (USDA), which oversees the RUS, defines rural as "any incorporated or unincorporated place that (A) has not more than 20,000 inhabitants based on the most recent available population statistics of the Bureau of the Census; and (B) is not located in an area designated as a standard metropolitan statistical area." This definition disadvantages many rural California communities because some large, rural counties also include a large urban population, resulting in the entire county not obtaining RUS grants because it does not meet requirement (B).

For example, California's San Joaquin Valley is approximately 80% rural with low population densities.[152] But by federal definitions, it is not eligible for federal funding.

[151] New Valley Connexions' Public Policy Roadmap for Improving Broadband Access, December 2003, pp. 18-20.
[152] New Valley Connexions, p. 3.

Chapter 7. Existing Programs to Promote Broadband

7.1 Subsidy Programs

Subsidy programs are designed to benefit consumers of broadband service by reducing the monthly price, making the service more affordable. Incentive programs are designed to both encourage further deployment of broadband infrastructure and provide education and training about broadband technology to promote the use of advanced telecommunications technology.

Two subsidy programs, the California Teleconnect Fund (CTF) and the Federal E-Rate program, provide benefits directly to consumer end users and are available to Californians.
Under both the CTF and E-Rate programs, qualified participants receive discounted service from telecommunications carriers, which are then compensated with program funds for the discount provided. The subsidies are provided to organizations that share their technology with the larger community. The FCC's E-Rate program offers eligible K-12 schools and libraries a discount of 20% to 90%.[153] The CTF program provides a 50% discount for eligible schools, libraries, hospitals, health clinics and community based organizations. The table below compares the CTF and E-Rate Programs.

Eligible schools and libraries can participate in both the E-Rate program and the CTF program. CTF participants are not required to participate in the E-Rate program and some CTF recipients, who are also eligible for E-Rate funding, choose not to apply for E-Rate benefits because of the complexities and delays in the application process. The CPUC is currently researching how to adjust the CTF discounts to encourage E-Rate participation.

[153] On August 3, 2004, the FCC suspended any new grants from the E-rate program. On November 29, 2004, funding for the program resumed.

Figure 7.1
Comparisons of CTF and E-Rate

	CTF	E-Rate
Eligible Entities	Schools, libraries, hospitals, health clinics and community based organizations	Schools and libraries
Amount of Discount	50%	20% to 90%
Services Covered	Regular phone service and high speed data lines	Data lines, Internet service providers and internal building equipment
Funds Committed 1999 – 2003	$290 million	$1,641 million This is the amount of funding received by California schools and libraries.
Funding Source	(A)[154]	Universal Service fee charged to companies providing interstate and/or international telecommunications services

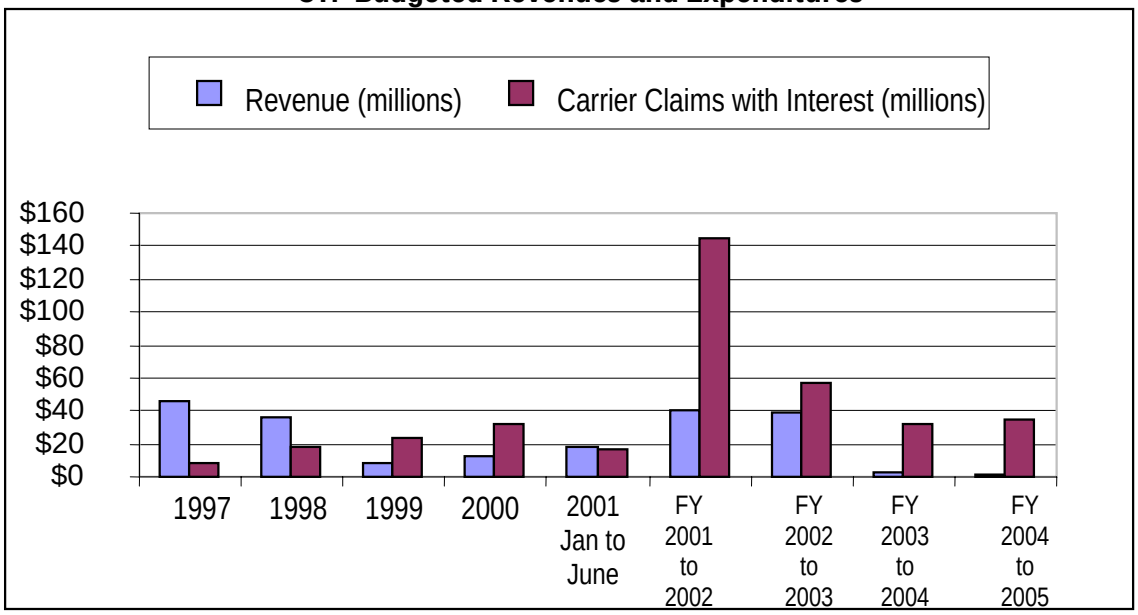
7.1.1 California Teleconnect Fund

The California Teleconnect Fund program, administered by the CPUC, provides a discount of 50% on selected telecommunication services to qualified schools and libraries, municipal-, county-, or hospital district-owned and operated hospitals or health clinics, and community based organizations offering health care, job training, job placement, and/or educational instruction. The covered services range from basic telephone service to high-speed transmission lines for data services.

The table below shows the CTF program's budgeted revenues and expenditures from 1997 through the current fiscal year. The table below shows the CTF program's budget revenues and expenditures from 1997 through the current fiscal year. A review of the table indicates that there has historically been a disconnect between the program's budgeted revenues and budgeted claims. In some years, program revenues far exceeded claims, and in other years, claims far exceeded revenues. Such discrepancies, along with operational problems discussed below, have been a cause of concern. An appropriation of $17,974,000 for Fiscal Year 2004/2005 was adopted by the Legislature.

[154] The all-end-user surcharges are assessed on consumers' bills for intrastate telecommunications services except for the following: Universal Lifeline Telephone Service (ULTS) billings, charges to other certificated carriers for services that are to be resold, coin sent paid telephone calls (coin in box) and debit card calls, customer-specific contracts effective before September 15, 1994, usage charges for coin-operated pay telephones, directory advertising, and one-way radio paging.

Figure 7.2
CTF Budgeted Revenues and Expenditures



The CTF program receives funds from an end-user surcharge applied to the intrastate portion of all customers' monthly telephone bills. The current surcharge is 0.16%. From the program's implementation in 1997 through 2002, the surcharge rate has ranged from 0.05% to 0.41%. From January 2003 through July 2004, the surcharge was set at 0%, when the surcharge was suspended because more than sufficient funds had been collected for the subsequent fiscal year.

7.1.2 Services Covered

The CTF discount applies to both regular telephone service as well as advanced services. At present, claims paid to providers show that the percentage of funds dedicated to advanced services versus regular telephone service is about evenly split. However, although DSL is an eligible service under CTF program rules, few telephone companies are providing DSL under the program. More funds could be dedicated to advanced services if providers elected to offer DSL under the CTF program.[155]

[155] SBC's affiliate, SBC Advanced Solutions, Inc. (SBC ASI) has filed intrastate tariffes with the CPUC for advanced telecommunications services and provides CTF discounts on these services when purchased by qualifying organizations. SBC ASI is the only broadband provider to do so.

7.1.3 CTF Program Issues

Recipients of CTF subsidies report that while the program has helped lower-use communities, the subsidies are not sufficient because they do not cover broadband access to the home. While many organizations rely on the CTF to pay for broadband service, there are even more that are unaware of the program's existence.[156] The survey revealed that there are a number of organizations that do not receive any type of support for broadband service and are not familiar with the CTF Program.[157]

Providers who participate in the CTF program have stated that there are delays in claim processing and uncertainty about the availability of funds given the state's ability to borrow money for the General Fund.[158] Claim processing delays occur when there is a significant influx of claims filed at the same time. Claim processing procedures have been significantly streamlined with CPUC adoption of Resolution T-16763 in May 2004, reducing the potential for future backlogs.

Because of the uncertainty created by the budgetary battles over CTF funding, providers may be hesitant to further promote the CTF program because providers apply the discount to end user's bills, with no guarantee that the state will reimburse them for the discount.

The CPUC staff currently conducts outreach to community-based organizations in order to expand awareness of the CTF fund, in an effort to increase subsidies to these groups.

7.1.4 E-rate Program

The E-rate program provides eligible K-12 schools and libraries a discount of 20% to 90% off telephone service, internet access and other services. The level of discounts depends on the poverty level and the urban/rural status of the population served. The table below shows how the discount is determined.

[156] 47% of respondents received support from the CTF while 35% received support from E-rate and another 18% from Rural Utilities Service (RUS). RUS is discussed later in this chapter. Of the 82 respondents to the second survey, only eight reported receiving the CTF subsidy. 39 respondents reported that they were not aware of the CTF at all.

[157] Of the respondents not identifying the CTF program as a support mechanism used, 58% stated that they did not know about the program.

[158] Funding for the CTF Program was not included in the 2004-2005 State budget. However, Senate Bill 1276, signed by Governor Schwarzenegger on September 28, 2004, authorizes funding for the CTF Program.

Figure 7.3
Determination of Discount Percentage

INCOME	URBAN DISCOUNT	RURAL DISCOUNT
If the % of students in THE school that qualify for the National School Lunch Program is...	...and you are in an URBAN area, your discount will be...	...and you are in a RURAL area, your discount will be...
Less than 1%	20%	25%
1% to 19%	40%	50%
20% to 34%	50%	60%
35% to 49%	60%	70%
50% to 74%	80%	80%
75% to 100%	90%	90%

The average percentage discount received from the E-Rate Program by California schools and libraries for the past five years is shown below.

Figure 7.4
Average E-Rate Discount[159]

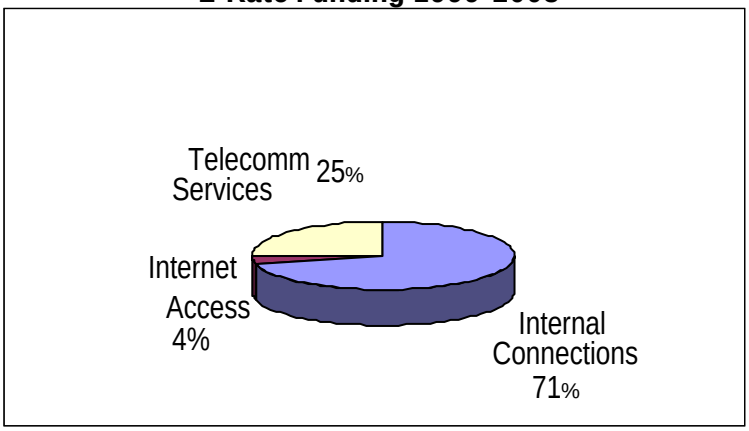
1999	75.57%
2000	82.75%
2001	82.65%
2002	78.14%
2003	79.84%

The E-Rate program provides discounts for telephone services, Internet access as well as the costs associated with connecting users to common equipment. The program also covers usage, cell phones and long distance, which the CTF does not. Internet access includes "basic conduit access" to the Internet. The E-Rate program defines "basic conduit access" as all standard features typically provided by Internet Service Providers. Internal connections are infrastructure items serving multiple users, such as cabling and file servers.

California schools and libraries have received $1.6 billion from the E-Rate program during the last five years. $63.5 million (4%) of the $1.6 billion has been appropriated for Internet access. The following figure illustrates the funds distributed to California over the last five years and the types of services that were subsidized:

[159] Percentages calculated from data downloaded from www.sl.universalservice.org.

Figure 7.5
E-Rate Funding 1999-2003



7.2 Federal Incentive Programs

In addition to the E-Rate program, which offers direct subsidies to the users, there are a number of existing federal programs that provide funding for broadband deployment, education and telemedicine services. The USDA is the lead federal agency on these initiatives, as well as the agency with the greatest amount of funding available. The United States Department of Commerce and the Department of Health and Human Services also provide funding for broadband related projects. Additionally, there are Congressional initiatives that provide funding to rural and lower-use communities.

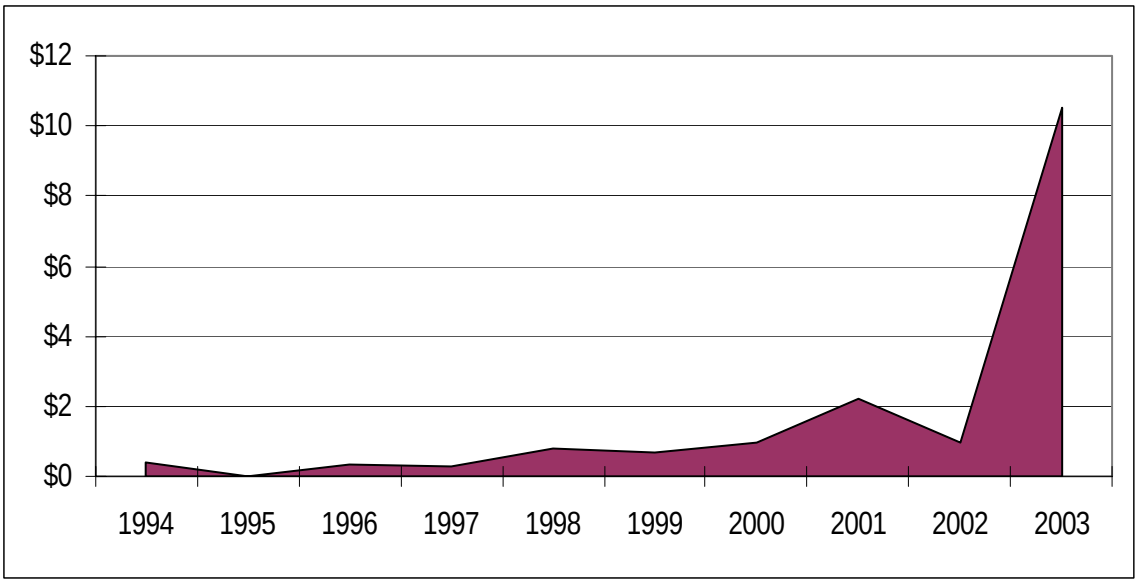
7.2.1 The Rural Utilities Service

The Rural Utilities Service (RUS) program provides grants, incentives, and low-interest financing to electric, communications, water, sewer, telecommunications, and environmental projects. The RUS has been in existence for over 50 years, always with the purpose of providing essential services to rural communities. In October 2003, the RUS program issued $44 million in grants for programs to improve access to broadband for educational institutions, medical agencies for telemedicine services, as well as to generally increase penetration of broadband usage in rural communities. Of the $44 million, $23.5 million was provided for distance-education projects, $11.3 million for rural community projects, and $8.9 million for telemedicine projects.[160] According to the RUS's 2003 annual report, the program has an excess funding level of $1.8 billion specifically earmarked for telecommunications.[161] Over $2.2 billion was made available for loans to promote broadband access in 2004/2005.[162]

The following graph illustrates the $17.2 million cumulative funding provided to California beneficiaries of the RUS program for the years 1994 to 2003. Three awards are in the 2003 amount, including one award for $9.7 million to Doctors Telehealth Network in Newport Beach, California.

[160] Federal Computer Week, October 1, 2003.
[161] http://www.usda.gov/rus/index2/RUSannualreport.pdf.
[162] Federal Register, Vol. 69, No. 60, March 29, 2004.

Figure 7.6
RUS Grants to California Recipients
(Dollars in millions)



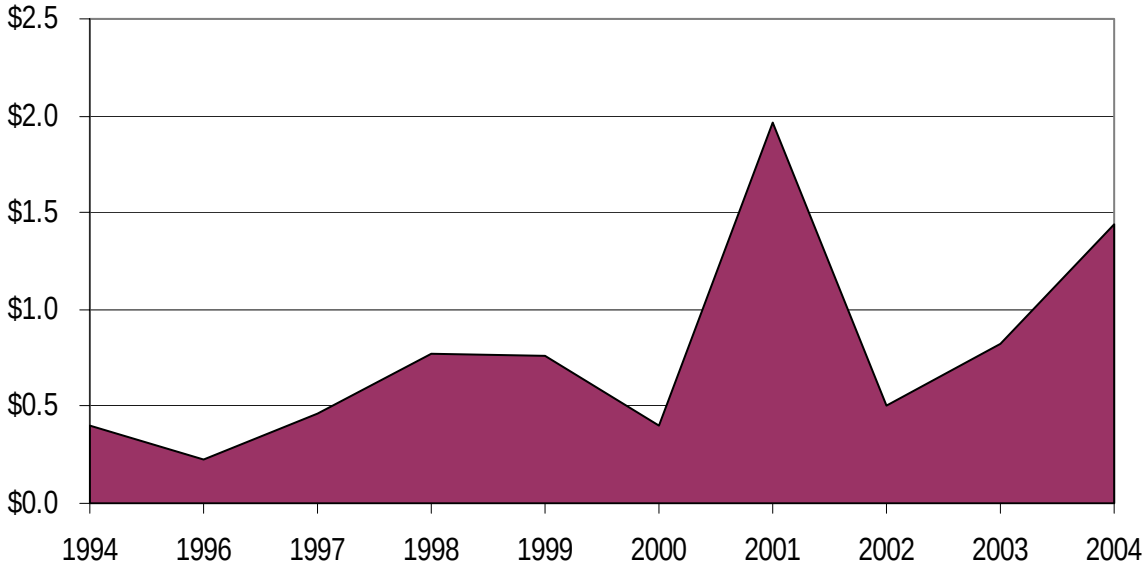
On May 4, 2004, the USDA announced that it would provide $190 million in broadband loans to 19 states.[163] States qualified for the loans by agreeing to arrange for matching funds and using the loans to improve broadband access in low-income communities with less than 2,500 people. As of November 2004, the RUS had announced that two California providers had received Broadband Loan Awards: $7.7 million to Calaveras Telephone Company in Copperopolis and $38.3 million to Sierra Telephone Company in Oakhurst.[164]

7.2.2 Distance Learning and Telemedicine Grant Program

The Distance Learning and Telemedicine Grant Program (DLT), also administered by the RUS, helps fund capital costs for broadband infrastructure and equipment for eligible institutions such as schools and hospitals, and requires a 15% matching of costs. The DLT program has spent $173 million funding broadband projects since 1993.[165] California has received over $8 million from this program, up to and including 2003. In 2004, the DLT program issued $24,604,673 in grants, with California receiving a $447,752 award for West Hills Community College.[166]

[163] http://www.usda.gov/Newsroom/0180.04.html. The 19 states are AL, AR, MS, GA, KS, TX, LA, MI, ND, OH, OK, PA, SC, SD, TN, CO, IL, VA, and WI. To fund the loans, $150 million came from the 2002 Farm Bill, and $40 million from the traditional RUS program.
[164] http://www.ruralbroadbandcoalition.net/RUSLoans.pdf.
[165] Application information can be found at http://www.usda.gov/rus/dlt/dlml.htm, and DLT regulation at http://www.usda.gov/rus/dlt/dltregs.htm.
[166] http://rurdev.usda.gov/rd/newsroom/2004/2004DLTGrants.html.

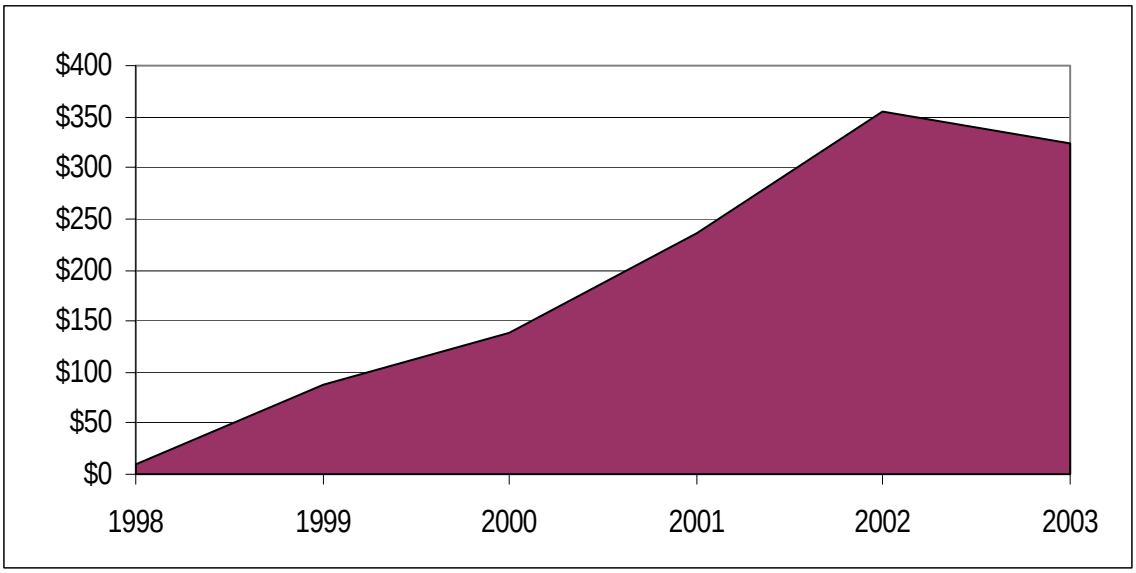
Figure 7.7
Distance Learning Grants to California Recipients
(Dollars in millions)



A number of programs specifically promote telemedicine in rural areas. For communities that lack a medical infrastructure, these programs can provide real-time care in such areas as consultations, drug abuse therapy, and counseling. In 2003 the Department of Health and Human Services awarded $3.74 million in grants to improve rural telemedicine outreach.[167] The Health Resources and Services Administration Office for the Advancement of Telehealth announced a $3.86 million grant program on October 21, 2003. The following graph illustrates that California recipients have received a cumulative $1,151,254 in Telemedicine grants for the years 1998 - 2003.

[167] http://tie.telemed.org/funding/news.asp.

Figure 7.8
Telemedicine Grants to California Recipients
(Dollars in thousands)



7.2.3 Technology Opportunities Program

The United States Department of Commerce funds the Technology Opportunities Program (TOP). TOP provides matching grants for projects to increase training in advanced telecommunication technology. TOP's purpose is to support lifetime learning, assist public safety officials, encourage telemedicine applications and promote economic development. In 2004, 27 TOP grants were awarded for a total of $14.4 million, including grants to San Diego State University Foundation and San Joaquin General Hospital.[168]

7.3 What Other States Are Doing

Many states have taken steps to facilitate broadband deployment. States have generally avoided direct intervention in the broadband market, however. The extent to which state governments are engaged in deployment of broadband infrastructures varies according to policymakers, strategies, budgetary situations, and other factors.

A matrix identifying a variety of government initiatives for deployment of broadband infrastructure is attached to this report as Appendix B. The types of policies examined in the matrix largely address state government actions taken outside of the regulatory context that are aimed at directly or indirectly assisting the build-out of broadband network infrastructure.

The following are eight examples of approaches taken by other states to encourage broadband deployment.

[168] http://www.ntia.doc.gov/top.

7.3.1 Alaska

The Regulatory Commission of Alaska (RCA), the equivalent of the CPUC, developed a program called the "Rural Alaska Broadband Internet Access Program" in 2002 to provide grants funding 75% of costs to bring high-speed Internet to isolated communities. The funds for the program were obtained from the federal government's Rural Utilities Services (RUS). The recipients of the grants are required to charge a rate comparable with the price in urban areas, such as Fairbanks or Anchorage (currently around $50 per month) through the maintenance phase of the project. As of May 5, 2004, $15 million has been allocated to the program, with $4 million already committed to various projects.[169] The FCC's 477 report states that between December 2002 and December 2003, there were almost 16,000 broadband lines installed in the state of Alaska, representing approximately a 28% increase in broadband penetration.[170]

7.3.2 Idaho

Idaho provides a Broadband Tax Credit of 3% for Idaho taxpayers. The credit allows corporations and individuals to install qualifying broadband equipment that has a capacity of transmitting signals at a rate of at least 200 Kbps to a subscriber and at least 125 Kbps from a subscriber.[171] According to the Idaho Public Utilities Commission (IPUC), in the first three years, the program has funded almost $3 million in broadband projects, with another $500,000 to $750,000 currently pending. Qwest, Verizon and CableOne submit the majority of the applications. The tax credit not only has a carry-forward option, but also is transferable, in that a company can sell its tax credit. In the most recent legislative session, the governor signed a bill to extend the program. According to the FCC's Form 477, from 2000, until the most current information available, an additional 72,000 broadband lines have been added in the state, an increase of over 897%.

7.3.3 Maine

Maine offers a number of research and development and technology tax credit incentive programs, including the "High Technology Investment Tax Credit."[172] Eligibility criteria are designed for businesses primarily engaged in high tech activities, such as design and production of computer software, equipment, and supporting communications components. The credit amount is equal to the adjusted basis of eligible equipment placed in service in Maine, less any lease payments received during the taxable year. The credit cannot reduce the tax liability to less than the preceding tax year's liability after the allowance of any credits, and it cannot reduce the tax liability in the current year below zero. Any unused portions of the credit may be carried forward five years but the credit cannot exceed $100,000 in any one year and income must be increased by any credit base amount claimed as a business expense. The High Technology Investment Tax Credit is part of an ongoing effort to increase investment in the state. Since inception, this tax credit has funded an estimated $2 million in broadband projects. Maine also has a Business Equipment Tax Reimbursement that reimburses businesses for locally-imposed business equipment taxes, but it cannot be used in tandem with the High Tech tax credit. The program has assisted operations such as MBNA, LL Bean and BankNorth and has led to a significant growth of call centers. Maine now has more call centers per capita than any other state. According to the FCC's Form 477, from 2000, until the most current information available, an additional 73,000 broadband lines have been added, an increase of over 278%.

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169 http://www.state.ak.us/rca/Headlines/040506_1.pdf.

170 http://www.fcc.gov/Bureaus/Common_Carrier/Reports/FCC-State_Link/IAD/hspd0604.pdf.

171 Before the Idaho Public Utilities Commission, Case No PRJ-T-03-1, Order No. 29318.

172 http://www.maineco.org/advantages/I_tax_credits.html.

7.3.4 Michigan

The Michigan Broadband Development Authority (MBDA) was established in August 2002 to spearhead a state initiative to encourage broadband deployment. Michigan has also raised capital through bond issues to increase financing opportunities for providers, and to provide community grants and low interest loans for the planning of infrastructure projects. Interested companies must submit a business plan that includes financing needs and expected results. According to the September 2002 report by the MDBA, 32 project proposals had been submitted for requests totaling over $250 million. These projects (ranging from $500,000 to $50 million) include DSL, cable, medical applications, E-commerce, data centers, and others. Michigan's programs to increase broadband subscription are ongoing, with the most recent balance sheet of the Michigan Broadband Development Authority showing Total Assets of $45 million. Forecasted 2004 financial statements show a loan portfolio of $11 million, that is estimated to be $150 million by 2009. According to the FCC's Form 477, since the date of the MDBA's inception in 2002, an additional 208,000 broadband lines have been added in the state, an increase of about 32%.

7.3.5 Mississippi

In 2003, the Mississippi Broadband Technology Development Act was enacted in the state legislature. The Technology Act seeks to bring broadband and similar services to "Tier 2" and "Tier 3" areas, not just "Tier 1" by means of infrastructure investment.[173] The Act became effective on June 30, 2003 and remains in effect until July 1, 2013. Recipients are awarded tax credits based on the areas in which they plan to invest. Equipment costs for providing broadband service are reimbursed at a rate of 5%, 10%, and 15% (urban to rural), with a credit cap of 50% of the provider's tax liability. But unlike Oregon or Montana, the provider can carry forward the benefit for a maximum of 10 consecutive years. To qualify as broadband technology, a minimum of 384 Kbps transmission speed is required in at least one direction. The state Science & Technology Institute quotes BellSouth as praising Mississippi's initiative in providing tax credits for broadband investment, and states that prior to the legislation, costs to expand broadband technology into rural areas was too cost-prohibitive.[174] In the same report issued by TechNet, BellSouth estimated that it has spent over $10 million dollars in Mississippi by the end of 2003, and now believes that it has 100% DSL coverage in the state. According to the FCC's Form 477, in 2003 an additional 35,000 broadband lines have been added, an increase of almost 44% from 2002.

7.3.6 Montana

Montana offers a 20% tax credit to telecommunication providers who invest in advanced telecommunications infrastructure improvements in the state. The tax credit (called the Advanced Telecommunications Infrastructure Tax Credit) may not exceed a total of $2 million for all qualified telecommunication services in any consecutive 12-month period. There are further tax implications, forbidding the use of carry-back or carry-forward of any losses resulting from the credit, and no refund is allowed on a tax return if the company has a zero or negative tax liability as a result of the credit. A provider is required to submit an application proving that the investment would improve access to a majority of customers in an unserved or lower-use

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[173] The tiers each represent one third of the counties in Mississippi ranked by average per capita income and unemployment rates. The 27 counties with the highest income and lowest unemployment are designated Tier 1. The next lowest income and highest unemployment is Tier 2, then Tier 3.

[174] http://www.matr.net/print-7475.html.

community. In 2000, the program accounted for $204,221 in tax credits, which was included in an estimated $1,777,237 in total infrastructure expenditures that year. The following year, $1,006,476 in tax credits was awarded, for a total infrastructure investment of almost $11,000,000.[175] By the end of 2001, it is estimated that over 120 formerly lower-use rural areas of Montana now have complete access to broadband, DSL, or comparable services. Funding for these projects was eliminated after 2002 due to budget concerns. The director of the program noted that while a number of useful projects were started, there were fewer than expected applications from providers. According to the FCC's Form 477, since 2000 (the first year data is available for Montana) until the most current information available, an additional 32,000 broadband lines have been added, an increase of over 432%.

7.3.7 Ohio

The Public Utilities Commission of Ohio created the Community Technology Fund. This fund was created to help ensure that rural communities would have access to advanced telecommunications technology. As of June 2001, the Fund had awarded $754,000 to various not-for-profit organizations in their efforts to bridge the digital divide. According to the FCC's Form 477, since 2001 until the most current information available, an additional 541,000 broadband lines have been added, an increase of over 124%.

7.3.8 Oregon

Oregon has two broadband investment programs with different incentives. The Advanced Telecommunications Facility Credit (ATFC) provides a tax credit to broadband providers investing in broadband infrastructure and equipment in lesser-use communities. The ATFC offers a tax credit based on total expenditures. The tax credit is capped at $10 million, or 10% of the total expenditure. Other stipulations include a limit on customer price to 125% of average cost in a comparable urban area, and access must be made available to at least 51% of persons in the lesser-use community to be served. "Advanced telecommunications" is defined as equipment receiving and sending at a minimum transmission speed of 200 Kbps.

The Oregon Telecommunications Infrastructure Act (TIA), the other broadband program, offers grants based on an identified need in lesser-use communities, usually rural areas. Funded by U.S. West funds as a condition of the deregulation of its intrastate operations, over $70 million dollars has been invested in TIA infrastructure projects. Grant amounts are not limited and recipients are not subject any requirements. However, tax credits received under the ATFC program are deducted from TIA grant awards. According to the FCC's Form 477, since the inception of ATFC and TIA in 2001, 287,000 broadband lines have been added in Oregon, an increase of 308%.

[175] http://www.techpolicybank.org/mtprogram.html.

7.3.9 Rights of Way

A number of states have paid particular attention to reforming their Rights of Way process. For example, Florida and Michigan have undertaken efforts to standardize and streamline the ROW process in an effort to encourage broadband deployment. Below are highlights of their recent ROW legislation:

Florida: Simplified Communications Services Tax

- Creates a common base for the assessment of all local taxes and fees on all communications services.
- All communications providers are required to pay the same fees.
- Local governments can wave their rights to franchise fees in exchange for an increase in local taxes.
- Local governments will set general ordinances for the use of ROW, therefore communications provider will not have to enter into individual use agreements with each local jurisdiction.

Michigan: Metropolitan Extension Telecommunications Rights of Way Oversight Act

- Creates a telecommunications ROW oversight authority.
- Coordinates with local governments to collect ROW fees.
- Standardizes ROW permitting and fees.
- Creates a common ROW maintenance fee for all local governments.
- Offers a waiver of the ROW fee to providers in "lower-use communities."
- Requires local government to make a decision on ROW application within 45 days

In addition, the National Telecommunications and Information Administration (NTIA), a branch of the U.S. Department of Commerce, has been working with a variety of agencies and associations to streamline and simplify Rights of Way processes and procedures at the state and local level. As part of its work, NTIA has assembled a matrix of state ROW laws, which is attached as Appendix A to this report. [176]

[176] In addition to compensation statutes, the NTIA matrix also includes citations to relevant state statutes and provides a brief description of key statutory provisions relating to jurisdiction, timelines, nondiscrimination, mediation, remediation and maintenance concerning access to public Rights of Way. The information was compiled through original research by NTIA, with reliance on existing research by NARUC and NATOA; www.ntia.doc.gov/ntiahome/staterow/rowtableexcel.htm.

Chapter 8. Emerging Solutions

There have been many significant developments that hold promise for addressing the current barriers to greater broadband deployment in California. This chapter identifies a number of these emerging solutions and categorizes them into three key areas: (a) technology improvements, (b) market developments, and (c) policy issues.

8.1 Technology and Infrastructure

Improved technology holds the promise of overcoming many of the barriers currently preventing more widespread deployment and use of broadband. The history of broadband technology has been one of ever-greater innovation, increasing capabilities, and decreasing costs.

8.1.1 DSL

Telecommunications companies have overcome the technical limitation of DSL requiring all-copper facilities by installing DSLAMs inside remote terminals. Because the price and capability of DSL equipment have been greatly improved in recent years, ILECs have been able to deploy more DSLAMs in remote terminals, making it feasible to provide broadband in more areas with low population density. As the ILECs continue to extend the reach of DSL farther out into more rural areas, broadband services will continue to become more widely available.

The maximum bandwidth that can be delivered via DSL remains distance-dependant, but technical advancements are also increasing the bandwidth available through DSL. By locating DSLAMs farther into neighborhoods and closer to customers, and combining 2-wire pairs in a process called "copper pair bonding," telephone companies are also able to offer higher speed DSL services with existing facilities.[177]

New technologies that compress digital signals also allow images to be transferred at a much higher rate over DSL.[178] Using compression technology, a high definition television signal which requires about 20 Mbps could be reduced to approximately 2 Mbps, allowing a standard 6 Mbps ASDL line to transmit HDTV into homes. This could facilitate an ILEC's ability to deliver any data, including real-time video, over any medium including a twisted copper pair.

8.1.2 Fiber to the Premises (FTTP)

Fiber to the Premises systems involve the installation of optical fiber directly into homes. The technology promises speeds of up to 100 Mbps and can reach greater distances, 6.2 to 49.6 miles, than DSL. In an effort to remain competitive with cable companies, ILECs have begun to deploy fiber in select areas, providing a single connection that can carry telephone service, high-speed Internet and video on demand. Verizon has announced plans to deploy FTTP over the next 10 to 15 years throughout its nationwide operating system. SBC has also recently announced plans to invest $4 billion dollars over the next three years to build a fiber network using both Fiber to the Node (FTTN),[179] and FTTP technologies. SBC expects to reach 17 million homes with FTTN and 1 million homes with FTTP by 2007, including a residential neighborhood in Irvine, California[180] and a new development in San Francisco's Mission Bay.[181]

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[177] Loring Wirbel, "SBC Shifts Focus from DSL to Passive Optical Nets," EE Times, November 27, 2001.
[178] "Carriers Get Technical Help in Bringing HDTV to Market," Telephony Online, January 17, 2005.
[179] Fiber-to-the-Node, which is similar to cable modem's HFC network architecture, but SBC will use copper loop instead of coaxial cable to connect to individual customers.
[180] Financial Times, June 22, 2004.

Case Study: SureWest's Broadband All-Fiber Network
SureWest Broadband, a subsidiary of ILEC Roseville Telephone serving the Sacramento area, was among the first providers in the nation to offer the "triple-play" package of integrated data, voice and video on demand over a fiber-to-the-home network in California. With over 9,000 subscribers constituting a 20 percent market penetration rate, SureWest's all-fiber broadband Internet offers speeds up to 10Mps symmetrical. SureWest has committed to pass 150,000 homes with fiber by 2006.[182]

Case Study: Verizon's FTTP Deployment
Verizon is now offering FTTP services in Riverside, Orange, and San Bernardino counties[183] with plans to offer the service to about 100,000 homes and businesses in California.[184] Prices range from $39.95 per month - $199.95 per month, based on the level of service. Maximum connection speeds range from 5Mbps download and 2Mbps upload for the entry-level service to 30Mbps download and 5Mbps upload for the fastest service.[185] Verizon announced plans to pass 1 million homes and businesses in nine states by the end of 2004.

Case Study: SBC's Project Lightspeed
SBC's Project Lightspeed will use both FTTP and FTTN technologies. In existing neighborhoods, SBC plans to use an FTTN architecture, which takes fiber to within 3,000 feet of homes being served and makes use of advanced compression technologies along with IP switching to deliver high-quality TV, Internet access and voice services. FTTN is capable of delivering 20 to 25 Mbps downstream, sufficient to simultaneously deliver four streams of TV programming, including HDTV and Internet access with robust speeds, and IP voice —all on a common IP network platform.[186]

8.1.3 Cable

Currently, the 40 Mbps bandwidth available to a cable node comes from the dedication of a single cable channel for cable modem service. To satisfy demands for greater bandwidth, there are efforts underway in the cable industry to increase available bandwidth by 10 Mbps to 20 Mbps through adoption of a new cable modem technical standard called DOCSIS 2.0. On December 16, 2003, Comcast doubled its downstream speeds from 1.5 Mbps to 3 Mbps for customers in the San Francisco Bay Area.[187] The new cable standard increases bandwidth by dedicating more TV channels to cable modem service.

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[181] June 22, 2004, http://www.sbc.com/gen/press-room?pid=5097&cdvn=news&newsarticleid=21207.

[182] SureWest, http://www.surewest.com, July 9, 2003; "Cisco Helps SureWest Deploy Integrated Data, Voice and Video," http://www.cisco.com, 2004.

[183] Verizon, "Verizon Deploying Fiber Optics to Homes and Businesses in 6 More States in Northeast and Mid-Atlantic," www.verizon.com, October 21, 2004;
http:///newscenter.verizon.com.

[184]Jim Duffy, "Verizon details FTTP plans," Network World, July 26, 2004;
http://www.nwfusion.com.

[185] Verizon, http://www.verizon.com.

[186] SBC, www.sbc.com, November 11, 2004.

[187] Comcast, www.comcast.com.

In August 2004, RCN launched cable broadband service with a download speed of 7 Mbps, making it the fastest residential Internet service available in the country.[188] The 7 Mbps also comes with an upstream speed of 800 Kbps and is offered in the San Francisco Bay Area and Southern California markets. RCN is an OVS provider and with its 7 Mbps service, is currently offering broadband services at double the speed of the incumbent cable providers with which they compete.

8.1.4 Wireless Technologies

With a range of up to 30 miles and bandwidth of 70 Mbps, WirelessMAN technologies have the potential to become a viable last mile broadband connection, allowing prospective broadband customers to bypass the physical broadband pipes owned by the phone companies, cable companies and electric utilities. Of the two wireless broadband technologies, WiFi and WiMax, WiMax is farthest along in development. Further enhancing WiMax's prospect to become a true last mile alternative, industry heavyweight Intel plans to introduce WiMax chipsets for service providers and for integration onto desktop and laptop computers. Intel played a critical role in helping to popularize Wi-Fi by integrating Wi-Fi chipset into its Centrino chipset for laptop computers. Commercial distribution of WiMax & WiFi chips from companies like Intel is crucial, as it dramatically lowers the cost of integrating the technology onto a computer since it is included as a function of a computer chipset, rather than a separate component.[189]

There are increasing calls for the FCC to reallocate and/or dedicate additional unlicensed spectrum for wireless broadband technologies. One promising source of new spectrum is that currently occupied by local television station analog signals. This spectrum will become available once television stations complete their migration from spectrum to broadcast high-definition television programming. The FCC has opened a proceeding to look into this issue.[190] The FCC also currently is undertaking efforts to better manage and allocate spectrum to meet the demands for wireless broadband, including allocating additional unlicensed spectrum for WiFi.[191] Another federal agency, the Office of Spectrum Management is charged with coordinating the development of a comprehensive national spectrum management policy.[192]

> **Case Study: WiFi Hot Zones in Los Gatos**
> Several businesses and a local wireless networking company, called Firetide, have teamed up to develop a two-block WiFi network in Los Gatos, California, complete with free broadband. Previously, organizations such as the Los Gatos Opera House and the Tollhouse Hotel were unable to offer broadband to clients due to the difficulty with wiring fragile century-old building walls. The Los Gatos project provides a glimpse at the potential for widespread use of hot zones. WiFi zones can meet the needs of multi-block neighborhoods and school campuses, and could someday replace the wired broadband networks that require miles of expensive and cumbersome underground cables to reach homes and businesses.

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[188] Sam Kennedy, "RCN Offers Fastest Access to Internet," The Morning Call, August 31, 2004. http://www.mcall.com.

[189] Wi-Fi Planet, http://www.wi-fiplanet.com/news/article.php/3302591; Intel, http://www.intel.com/netcomms/technologies/wimax/.

[190] FCC Notice of Proposed Rulemaking (FCC 04-113), May 13, 2004.

[191] For a more detailed discussion, visit the FCC website, "Spectrum Policy Task Force Proceedings and Initiatives," at http://wireless.fcc.gov/spectrum/proceeding.htm?pagenum=1.

[192] An office of the NTIA, U.S. Department of Commerce.

Case Study: NextWeb
NextWeb is a wireless Internet service provider based in Fremont, California. NextWeb offers fixed-wireless broadband services of up to 10 Mbps to small and medium business customers utilizing unlicensed radio spectrum and proprietary technologies. It has more than 2,000 customers in more than 175 cities in California. The NextWeb wireless link is connected over carrier-class fixed broadband wireless facilities that never touch the incumbent phone company's access network, and then route through NextWeb's redundant transit providers. By combining a NextWeb wireless link with the customer's existing wireline connection - DSL, T1, Cable or a NextWeb-supplied wireline service, the customer has multiple distinct, path-diverse connections to the Internet, increasing reliability of the network.[193]

Case Study: MetroFi
A company based in Mountain View, California, MetroFi, intends to offer a residential WiFi Internet service to Santa Clara in early 2005, and to Cupertino homes later in the year. At $19.95 a month, the MetroFi price will be considerably less expensive than current cable modem or DSL service.[194]

8.1.5 Satellite

Satellite broadband providers are continuing to improve their services by adding bandwidth and capacities. Satellite service providers can now offer services to nearly every Californian at speeds that exceed DSL. For example, Ground Control located in San Luis Obispo, California offers fixed location services with upload speeds now reaching between 450 and 500 Kbps and download speeds near 1.5 Mbps. Ground Control states that since July 2003, it has had over 99.9% uptime for satellite broadband service and that its services are available to over 99% of those requesting service in California. Ground Control also offers the option of a mobile broadband service. Although the mobile service does not equal the speeds of its fixed services, it is capable of reaching speeds of 1.5 Mbps download and 128 Kbps upload.[195] Ground Control expects to offer mobile services that match its fixed service speeds in the near future.[196]

Case Study: NASA Uses Satellite Technology to Recover *Columbia*
As an example of how advanced commercial provider technology has become, NASA used satellite broadband to recover debris in the aftermath of the *Columbia* shuttle tragedy in February 2003. Since the debris was spread over remote areas stretching from California to Texas, Hughes Corp. made available its two-way satellite broadband service (DirecWay) to NASA. By dedicating more than 180 Mbps in bandwidth to the recovery efforts, searchers were able to take high-resolution digital photographs as large as 30 MBs and send them to NASA for review and confirmation that photographed artifacts were part of the *Columbia*.[197]

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193 http://www.nextweb.net/network-technology.htm.

194 MetroFi, www.metrofi.com.

195 Ground Control, www.groundcontrol.com.

196 CPUC Staff interview with Ground Control, December 8, 2004.

197 CPUC Staff interview with DirecWay representative during April 2003 Broadband Summit in Washington, D.C.

8.1.6 Broadband Over Powerlines (BPL)

Because of the ubiquity of electric power systems, BPL may be the broadband technology that proves most effective in bringing affordable broadband to lower-use communities. As such, BPL technology has the potential to become a significant player in the broadband market.

In November 2004, the NARUC BPL Task Force reported BPL trials or commercial deployments taking place in fifteen states.[198] Since that time, a number of other BPL projects have been announced, including one in the service territory of SDG&E.

On October 14, 2004, the FCC adopted rules to encourage BPL development.[199] The Order establishes technical and administrative requirements for BPL equipment and operators to ensure that interference with licensed radio operators does not occur. The Order also sets forth procedures to measure the radio frequency (RF) energy emitted by BPL equipment.[200]

8.2 Market Solutions : Convergence

To date, competition in the broadband industry - and consumers themselves - have been the greatest drivers of broadband deployment.

A torrent of innovation including Voice over Internet Protocol (VoIP) and advanced wireless technologies is causing great upheaval in the telecommunications industry, shattering traditional business models based on separate offerings of voice, video and data services over separate networks owned by distinct types of companies. Cable companies now offer phone service; telephone companies offer video programming; Internet providers offer anytime, anywhere calling plans; and wireless carriers offer email, Internet access and even video news delivered to consumers through their cell phones. Electric utilities are working to provide all these services through BPL. The traditional models are gone. This market development, referred to as "technology convergence," is the future of the telecommunications industry. The choices, lower prices and benefits available to consumers from convergence is driving the demand for broadband.

Price is the key to broadband use.

Convergence is the key to lower prices.

Many experts agree that deployment of advanced services networks, while not yet ubiquitous, is less of an obstacle to broadband penetration rates today than the price of service and the perceived value of those services to consumers. In fact, in most areas including rural California, supply still outstrips demand for broadband services.[201] Many industry surveys show that at a price point of $30 per month, broadband subscribership would significantly increase. One consumer survey in 2004, for example, showed that at $29.99 per month, 46% of dial-up users would be likely to upgrade to broadband.[202]

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[198] The 15 states are: Arizona, Florida, Hawaii, Indiana, Maryland, Massachusetts, Michigan, Missouri, New York, North Carolina, Ohio, Pennsylvania, Tennessee, Texas and Washington.

[199] The CPUC filed comments in this docket, expressing support for the FCC's efforts. http://gullfoss2.fcc.gov/prod/ecfs/retrieve.cgi?native_or_pdf=pdf&id_document=6516209118

[200] News Release, FCC 04-245 *Report and Order ,* ET Docket No. 04-37.

[201] Pew Internet and American Life Project, Rural Areas and the Internet, February 17, 2004.

[202] Jupiter Research, The DSL Market Opportunity (January 2004)

Technology convergence is driving competition among broadband service providers, and competition is the single, most effective way to lower prices and bring greater value to consumers. For example, when ComTek started offering BPL in Manassas, Virginia, the leading cable competitor dropped its broadband prices by 55%.[203]

The average household in California spends $160 per month for telecommunications services today.[204] As technology convergence continues, providers are competing with each other to offer multiple services bundled together as a package, which is driving down the price of all services in the bundled package. As illustrated below, virtually every major telecommunications provider today offers a 10%-30% discount to customers who buy multiple services from them:

- Verizon's "Freedom" plan currently offers unlimited local and long distance calling plus DSL for $89.95 per month or DirectTV for $97.95 per month. For packages that include all three (unlimited calling, DSL and DirectTV) customers would pay approximately $127 per month.[205]

- East Coast cable giant Cablevision, in a battle for customers with Verizon, offered a promotion in 2004 called the "Triple Play" that included telephone, high-speed Internet and TV services for $29.95 each with a one-year contract.[206]

- Cox Communications in San Diego offers combination packages including standard cable, digital telephone, high-speed Internet and digital cable programming for $99.99 (unlimited local calling) and $124.99 (unlimited nationwide calling).[207]

- Time Warner Cable offers digital cable, high-speed Internet and nationwide digital phone service for approximately $127 per month plus equipment installation charges.[208]

- SBC Communications Chairman and Chief Executive Officer Ed Whitacre recently said in an interview with the *Wall Street Journal* that he expects SBC to offer a full slate of video services, Internet access, wireless calling and all-distance phone service with the cost of the combined package (including wireless) to decline to approximately $100 per month.[209]

- By the end of 2006, more than half of the households in the U.S. (an estimated 110 million) will have the option of getting phone service from their cable company.[210] The nation's largest cable providers, including Comcast, Time Warner and Cox Communications, are also discussing the formation of a joint venture to add cell phone service to their bundled packages.[211]

The price of broadband service as part of these bundled packages drops as low as $19.95 to $26 per month plus the cost of customer premises equipment [212]

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[203] Gubbins, supra, p. 9.

[204] TNS Telecom Report, October 2004. www.TNStelecoms.com.

[205] www.verizon.com.

[206] "Here Comes Cable...," Wall Street Journal, September 13, 2004.

[207] http://www.cox.com/sandiego/coxcombo.

[208] www.timewarnercable.com.

[209] "Meet the New TV Guy," Wall Street Journal, November 24, 2004.

[210] "Here Comes Cable...," Wall Street Journal, September 13, 2004.

[211] "Cable Titans Discuss Offering Cellular Services...," Wall Street Journal, November 8, 2004.

[212] See Verizon online, Comcast, SBC Yahoo.

8.3 Policy Issues

8.3.1 Universal Service

The Universal Service Fund (USF) was designed to promote ubiquitous deployment of basic phone services by subsidizing deployment costs in rural and low-population density areas. California expanded Universal Service to provide subsidies to low-income individuals for the cost of basic telephone service. Nationally, the USF collects and distributes approximately $6 billion in funding. Some states, including California, have added a separate surcharge to customers' bills to fund a higher level of subsidies. California collects and distributes approximately $1 billion per year in additional subsidies through two High Cost Funds (HCF-A and HCF-B for different types of carriers). The federal USF surcharge is imposed on interstate and long-distance calls.

With technology convergence, all-distance calling plans and IP-telephony, interstate and long distance revenues are falling rapidly - reducing the funding source for Universal Service programs. The FCC is engaged in several proceedings dedicated to reforming intercarrier compensation (a significant source of revenue for USF), Universal Service Funding and IP-enabled services. As an integral part of these proceedings, the FCC and states will address future funding for USF and whether Universal Service should be expanded to include subsidization of broadband, wireless technologies and other types of telecommunications services. As Congress begins amending the 1996 Telecommunications Act, these policy issues will be central to the debate.

8.3.2 Public Ownership of Advanced Service Facilities

Government has a long history of providing basic services such as water, electricity, trash removal; sewage, and natural gas to constituents, in part due to the classification of these services as essential. A number of local governments have deemed high-speed Internet access to be essential and have opted to use government resources to build, as well as own and/or operate public broadband networks.[213] Others have opted to provide wholesale access only with the end-user services being provided by a private sector companies.[214] Some states prohibit local governments and municipal utilities from providing broadband services based on the view that government entities engaging in commercial broadband ventures displace private investment, stifle competition, and operate with an unfair competitive advantage due to superior access to capital and a captive ratepayer base. The alternative view is that high capacity telecommunications infrastructure is as essential to a community's economic well being in today's world as its airport, freeways, and reliable water supply, and with deployment costs rapidly declining, chosen to provide low-cost or free broadband access as a public benefit.[215] This debate was most recently and publicly played out in Philadelphia, Pennsylvania.[216]

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[213] See, e.g., Ed Fletcher, "West Sac Mayor Rolls Out Plan for Free Wi-Fi," The Sacramento Bee, April 6, 2005; Miguel Helft, "Whining Telcos Battle Cities' Broadband Plans, San Jose Mercury News, March 30, 2005. For additional information on this subject: Nancy Bedard, "Progress on Point -Periodic Commentaries on the Policy Debate: A Survey of Government-Provided Telecommunications"; Kent Lassman and Randolph J. May, "Disturbing Growth Trend Continues Unabated," October 2003; "Community Broadband, Separating Fact from Fiction," Yankee Group, January 2004; "Wholesale Communications Strategies Reports, Municipalities Make their Own Broadband Opportunities," January 2004.

[214] Ibid.

[215] "The UTOPIA Story: Wholesale Telecommunication Services and Regional Development", Roger Black, Deputy Director and Chief Operating Officer, Utah Telecommunications Open Infrastructure Agency, August 2004.

[216] See, e.g., Stephen Lawson, "Law May Snag Philadelphia Wi-Fi Rollout," and "Philadelphia Wi-Fi Plans Move Forward," IDG News Service, December 2, 2004.

Case Study: Loma Linda
Loma Linda enacted an ordinance requiring new homes to be FTTP-equipped. Contractors must install the networks according to specifications provided by the city, similar to installing sewer and water lines, and then deed the networks back to the city, which owns and operates the network. The fiber requirement adds approximately $3,000 to the cost of a home, but contractors have cooperated with the ordinance.[217]

Case Study: City of Cerritos
The City of Cerritos is a southern Los Angeles county community of 51,000 residents with a median household income of $73,000. Seeking to provide broadband to more residents in the area, Cerritos entered into an agreement with Aiirnet Wireless, LCC, allowing Aiirnet's antennas to be attached to city owned buildings and other properties. In exchange, Aiirnet is able to provide wireless broadband service for the entire city. WiFi is available without cost near the civic center area during certain hours of the day. Elsewhere, a variety of payment and service plans are available.[218]

Case Study: Truckee Public/Private Partnership
In Truckee, consumers complained about the service quality of the available cable modem and satellite broadband dish services. The Truckee Donner Public Utility District researched the feasibility of creating a fiber optic network, and spent four years obtaining the permits, funding and partners needed to launch an integrated service combining digital cable television, VoIP telephony, and high-speed Internet access. The utility then formed a partnership with Eagle Broadband, a private company, to deliver the services. The proposed fiber-optic network will cost $24 million and will provide Internet access at 1.5 Mbps. Construction had been scheduled to begin in October 2004, but the local cable franchise holder, Cebridge Connections, objected, stating that the business plan is financially unviable and arguing that the arrangement is unfair competition. The permit authority agreed to reconsider the city's permit.[219]

Case Study: San Diego's Tribal Digital Village (TDV)
The Tribal Digital Village is a Wireless Internet Service Provider owned and operated by Native American tribes and located in a remote part of San Diego County. The Southern California Tribal Chairmen's Association began the project in March 2001 after obtaining a "Digital Village" grant from the Hewlett-Packard Development Company. The TDV's goals are focused in five key areas: (1) linking the tribes to a community network infrastructure and the Internet; (2) preserving tribal traditions and culture for future generations; (3) improving educational opportunities through distance learning; (4) enabling community interaction using online tools; and (5) launching a community-led economic development project. With a $5 million grant from Hewlett Packard, including $4 million in computers and peripherals and $1 million over a period of 3 years, TDV uses a series of solar-powered radio towers to wirelessly connect a central data center with various locations, creating 250 miles of point-to-point and point-to-multi-point links throughout the underserved reservations of rural San Diego County. Using point-to-point broadband transmission towers, 65 different tribal buildings - including libraries, community resource centers, tribal offices, sheriff substations, and fire stations - are connected to a 45 Mbps backbone. Each end point recieves between 1.5Mbps to 4Mbps+ of broadband connectivity.[220]

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[217] Carol Wilson, "FTTP 'Revolution': Bell Companies," Telephony, February 28, 2005.

[218] CPUC Staff interview with Cerritos representative, January 31, 2005.

[219] John Gartner, "Public Fiber Tough to Swallow," Wired, September 13, 2004. http://www.wired.com/news/technology/0,1282,64902,00.html.

[220] Visit of Assigned Commissioner to TDV, September 2004; see also www.sctca.net

8.3.3 Legislation

The importance of promoting broadband deployment has been recognized by both the United States Congress and the California Legislature. In recent months, a significant number of federal and state legislative proposals that have been introduced.

Federal Legislation

In December 2004, President Bush signed the Internet Tax Nondiscrimination Act (SB 150), which put a new four-year ban on state and federal taxation of certain kinds of Internet transactions. SB 150 expands the definition of Internet access to include dial-up as well as DSL, cable modem and wireless Internet connections. It is expected to promote broadband deployment by prohibiting the taxation of Internet access, double taxation of a product or service bought over the Internet, and discriminatory taxes that treat Internet purchases differently from other types of sales. The new law does not apply to sales taxes on Web transactions nor Internet telecommunication services.[221]

In January 2005, H.R. 3 was introduced. Titled the "Transportation Equity Act: A Legacy for Users," this bill would require the Secretary of Transportation in cooperation with the Secretary of Commerce, state departments of transportation, and other appropriate state, regional, and local officials, to conduct a feasibility study on whether installing fiber optic cable and wireless infrastructure along multistate Interstate System route corridors would improve communications services to rural communities along those corridors. The report would specifically identify rural broadband access points for such infrastructure.

H.R. 144 was also introduced in January 2005. This bill, titled the "Rural America Digital Accessibility Act," would authorize the Secretary of Commerce to make grants and guarantee loans to facilitate private sector deployment of broadband capabilities to underserved rural areas. In aggregate, the grants/loans would not exceed $100 million annually for years 2005 through 2009. The bill states that particular attention shall be given to providing Internet service to underserved rural areas, new models or technologies for broadband service, and the use of broadband service to stimulate economic development. In addition, tax credits may be granted to holders of qualified technology bonds, and $25 million will be appropriated for the National Science Foundation to research the facilitation or enhancement of access to broadband services, particularly for rural areas.

H.R. 146 would amend the Public Works and Development Act of 1965 and would provide grants for broadband-based economic development. Eligible applicants include state or local governments, institutions of higher learning, and nonprofit economic development organizations, while the affected regions shall contain populations of less than 1,000,000 individuals. $50 million will be appropriated for these grants, which individually shall not exceed $1 million; the federal share of the cost of each project will be set at 50%.

S. 14, titled the "Fair Wage, Competition and Investment Act of 2005", would establish a broadband access tax credit, permitting electing taxpayers to treat any qualified broadband purchase, lease, installation or connection expenditure as a deductible expense to any taxable year.

[221] http://internetnews.com/xSP/article.php/3443631.

S. 497, titled the "Broadband Rural Revitalization Act of 2005," would establish a Rural Broadband Office within the Department of Commerce to coordinate all Federal resources relating to the expansion of broadband technology into rural areas. The Rural Broadband Office would be required to annually submit a report to Congress that assesses the availability of broadband technology, estimates the number of individuals using broadband technology and establishes a plan to meet unmet demand for broadband technology in rural areas. This bill would also permit electing taxpayers to expense qualified broadband Internet access expenditures in any taxable year.

State Legislation

A number of bills have been introduced by California legislators in the current legislative session, including:

SB 631, enacting the "Real Investment in California's Economy Program," would provide qualified taxpayers, beginning on or after January 1, 2006, with an exemption from those taxes on personal property capable of providing broadband services at speeds greater than 128 Kbps.

SB 850 would declare the Legislature's intent that California's universal service policy includes the concept of universal availability of broadband to all areas of the state. This bill would require the Secretary of the Business, Transportation and Housing Agency to develop a strategy for making broadband telecommunications service accessible to all areas in California. This bill would also require the Public Utilities Commission to determine which areas in California lack broadband service and which areas are lacking competition in the provision of broadband service, and report the findings to the Legislature by July 2006.

AB 1388, titled the "Digital Opportunity Act of 2005," would express the intent of the Legislature to promote the accelerated deployment of next-generation broadband networks in California. This bill would require the Department of General Services (DGS) to submit an annual status report to the fiscal and policy committees of the Legislature, the Department of Finance (DOF), and the CPUC on implementation of this bill. This bill would also require DGS, in consultation with the Director of Transportation and the CPUC, to report to the fiscal and policy committees of the Legislature, the DOF and the CPUC on the extent to which the residents in each census tract in the state will have or are likely to have access to advanced communications services networks by 2011.

AB 1458 would amend current law relative to leases of state-owned property to wireless telecommunication providers. Currently, 15% of revenues from fees collected pursuant to a lease agreement must be available, upon appropriation by the Legislature, for the purpose of addressing the state's digital divide. Current law excludes revenues from fees collected from lease agreements signed before January 1, 2004 from this requirement and AB 1458 repeals this exclusion.

Chapter 9. Conclusions and Recommendations

In accordance with SB 1563, this report makes recommendations on ways to eliminate barriers to deployment of broadband services in California. Nothing in this Chapter is intended to prejudge matters pending in a current CPUC proceeding.

9.1 Make Broadband Deployment and Access a Priority

California should establish a statewide policy identifying broadband deployment and accessibility as a priority. Such a policy could take the form of an Executive Order or a statute. The purpose of an explicitly stated policy objective is to direct state agencies, boards and commissions to weigh the impact of all existing and proposed regulations on the accessibility and deployment of broadband infrastructure and advanced telecommunications services and to eliminate barriers to deployment wherever possible.

9.2 Develop a California Broadband Task Force

California should develop a statewide Broadband Task Force charged with the ongoing task of identifying barriers to deployment of broadband infrastructure and access to advanced telecommunications services, and making recommendations to eliminate such barriers. The Broadband Task Force should be comprised of senior representatives from state agencies, boards and commissions having a role in infrastructure development, information technology and economic development, representatives of California's private sector technology and investment industries, and representatives of community based organizations and lower-use communities.

The first task of the Broadband Task Force, working in conjunction with the CPUC, should be to produce a more accurate and complete assessment of what broadband technologies are deployed in the state, and where they are deployed. Information should also be collected concerning the location of broadband infrastructure in the state. This information must be detailed, with the information on broadband technology availability mapped by census block, or with even greater granularity.

9.3 State Government Should Lead by Example

California state government should be the undisputed leader in the use and availability of broadband and advanced telecommunications services for both government operations and public access. California's Web portal, "MyCalifornia.com" has been recognized nationally as a model of accessibility. By using and offering advanced telecommunications services and digital content, state government will in turn promote greater deployment of broadband networks. In addition to promoting the use and deployment of broadband, these initiatives have the benefit of making state government more efficient, more effective, and more accessible.

The state should develop multi-agency internet kiosks, so that Californians without broadband in their homes can nevertheless access the increasing number of state services available on the internet. These kiosks should be placed at public libraries, state government buildings, and other locations that are easily accessible by the disabled.

California, and its agencies, departments, boards and commissions should be required to:

- Maintain websites by a date certain that enables Californians to obtain basic information, apply for permits, schedule appointments and file comments and applications electronically. State government Web sites should be accessible to persons with disabilities and those not proficient in English.

- Provide Webcasting of all public meetings.[222]

- Utilize videoconferencing as a means of increasing public access to agencies. For example, the CPUC sets aside time at each public Commission meeting for public comment.[223] Members of the public often must travel hundreds of miles and sometimes stay overnight in order to participate in Commission meetings, which are held in San Francisco. The public should be able to speak from the Los Angeles or Sacramento CPUC offices via videoconferencing instead of having to appear in person.

- Ensure that the CalNet system takes advantage of the significant technological and market-based developments in the telecommunications industry, including an examination of the cost-effectiveness of using VoIP telephony and other IP-based services as part of the CalNet system.

9.4 Assist Lower Use Communities

The Broadband Task Force or CPUC should develop a baseline and metrics for measuring broadband usage in specific geographic areas and among demographic groups in the state. Each year penetration rates should be measured using those metrics, and efforts should focus on increasing broadband deployment and/or usage in communities with use rates 10% or more below specific geographic or demographic averages. All programs aimed at encouraging broadband in lower use areas should be measured by their contribution to improvements in the use rate above the baseline.

Specific Programs to Encourage Broadband in Lower Use Areas and Communities:

- Provide time-limited tax incentives to providers deploying broadband facilities in geographic areas and communities with lower use rates.[224]

- Establish a state Software Development Fund to stimulate the development of educational software applications to be made available to individual students and classrooms over broadband.

- Provide infrastructure grants and low-interest loan guarantees for construction of broadband facilities to serve low penetration areas and communities.

- Expand the CPUC Deaf and Disabled Telecommunications Program to provide subsidized customer premises equipment for VoIP, broadband and assisted services for people with disabilities, including JAWS screen-reading and voice recognition software.

[222] The CPUC currently offers webcasting of its Commission meetings.
[223] Only members of the public who are not parties to any proceeding can use the time set aside for comments from the public.
[224] The term “lower use” should be defined as suggested above (e.g., at least 10% below baseline) and not left open to interpretation and endless subsidies.

- Provide state funds (general fund, Public Goods Charge or Universal Service Fund) for a matching grant program to encourage public/private partnerships for the deployment of broadband in lower use areas and communities (one-third state, one-third local government or CBO, one-third private funds or in-kind contribution). For example, Microsoft awarded grants to San Francisco low-income housing agencies to develop community-based technology learning centers.[225] Hewlett Packard donated computers and equipment to build a wireless broadband Internet backbone for the Tribal Digital Village project near San Diego.

- Assist lower use communities with demand aggregation strategies and programs, so that communities currently without access to broadband services are able to negotiate effectively with providers for the deployment of those services.

- Establish a special tax deduction for donation of used laptop and desktop computers to CBO projects that facilitate broadband access in lower use areas and communities.

- Provide state funds for computer literacy programs at CBOs that serve lower use areas and communities. These programs should include a focus on educating members of lower use communities on the benefits of broadband and the applications available over broadband.

9.5 Reform Rights of Way

Legislation should be enacted to reform the process for obtaining Rights of Way (ROW) permits from state agencies and local governments for construction of broadband infrastructure in California. The ROW permit process is cited as one of the most significant barriers to deployment.

There are three recommendations on ROW:

- Standardize the ROW Process. California should enact legislation requiring local governments to use a standard ROW application, to make decisions concerning the grant of a ROW using standard criteria, and to make that decision within an established period of time. The state should require all state agencies granting ROW to adhere to the same process requirements imposed on local jurisdictions.[226]

- Limit ROW Fees. California should aggressively pursue enforcement of the limitation on ROW fees assessed by local governments that has been established by the Mitigation Fee Act and the *Williams* case. The state should impose the same restriction on all state agencies granting ROW. As a means of encouraging compliance, legislation and CPUC regulations should condition eligibility for state and federal programs that encourage broadband access to adoption of "best practices" for ROW permitting, including adherence to limitations on the fees and charges assessed. Programs that should be linked to ROW compliance include: the California Rural Infrastructure Grant Program, the federal Rural Utilities Service (RUS) programs, the California Teleconnect Fund, the Digital Divide Account, Universal Service Fund programs, the CA High Cost Fund A and B, and any other program designed to promote broadband and Internet access.

[225] http://www.microsoft.com Citizens Housing Corporation project
[226] AB 1874 would have required state agencies to act within 45 days of the application.

- Provide Effective Dispute Resolution. California should establish a ROW dispute resolution process that is either binding upon local governments, state agencies, and providers, or part of a "best practices" guide that must be adopted and implemented by local and state agencies in order for them to be eligible for state and federal grant programs.

9.6 Streamline CEQA Process for Broadband

Legislation and/or regulations should be enacted that streamline and eliminate inconsistencies in the CEQA review process for broadband projects. Specifically:

- Provide a categorical exemption from CEQA for certain broadband projects. Broadband projects that do not require a change in the functionality of existing infrastructure, such as stringing fiber optic cable on existing utility poles, should be granted a categorical exemption from CEQA.

- Change CPUC policy to ensure that the CEQA requirements are consistent for all providers. Providers applying for CEQA review for broadband projects should not be subject to different application processes or regulations based on whether they are an Incumbent or Competitive carrier, or whether they are a common carrier or non-regulated entity.

9.7 Streamline Certification Process for New Carriers Deploying Broadband Facilities

The CPUC should streamline the certification process for new carriers deploying broadband facilities. CPUC rules should allow new carriers deploying their own facilities to obtain a CPCN before applying for environmental review, consistent with the CPUC process for carriers who lease facilities.

Specifically, the CPUC must develop a process for timely granting of those CPCNs that require CPUC approval and hence require a review of the environmental impacts, if any, of the deployment of the network. The CPUC should return to the process it utilized prior to 1999 to approve such requests until such time as it develops a better means of addressing the issue.

9.8 Reform Public Utilities Code Section 851

Legislation should be enacted to amend Public Utilities Code Section 851 to categorically exempt broadband deployment projects from CPUC approval.[227]

Specifically, legislation and regulations should be enacted to:

- Exempt Broadband Projects from Section 851. California should amend Section 851 to categorically exempt broadband deployment projects from CPUC approval. This can be done through legislation, or by the CPUC adopting a categorical exemption for such projects under Section 853(b).[228]

- Reform Section 851 Policies to Encourage Utility Investment in Broadband. The CPUC should adopt a policy regarding Section 851 and the ratemaking treatment of revenues that accrue to utilities for leasing their facilities for broadband deployment projects in such a way that incentives are created for utilities to allow use of their structures and Rights of Way.

9.9 Change Cable Franchise Law

Legislation should be enacted to make California Cable Franchise Law consistent with the federal Open Video System designation, and require local governments to permit competitive entry into a franchise area without requirements to serve the entire franchise area.

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[227] Section 851 states:
No public utility other than a common carrier by railroad subject to Part I of the Interstate Commerce Act (Title 49 U.S.C.) shall sell, lease, assign, mortgage, or otherwise dispose of or encumber the whole or any part of its railroad, street railroad, line plant, system or other property necessary or useful in the performance of its duties to the public, or any franchise or permit or any right thereunder, nor by any means whatsoever, directly or indirectly, merge or consolidate its railroad, street railroad, line, plant, system or other property, or franchises or permits or any part thereof, with any other public utility, without first having secured from the commission an order authorizing it so to do. Every such sale, lease, assignment, mortgage, disposition, encumbrance, merger, or consolidation made other than in accordance with the order of the commission authorizing it is void. The permission and approval of the commission to the exercise of a franchise or permit under Article 1 (commencing with Section 1001) of Chapter 5 of this part, or the sale, lease assignment, mortgage, or other disposition or encumbrance of a franchise or permit under this article shall not revive or validate any lapsed or invalid franchise or permit, or enlarge or add to the powers or privileges contained in the grant of any franchise or permit, or waive any forfeiture.
Nothing in this section shall prevent the sale, lease, encumbrance or other disposition by any public utility of property which is not necessary or useful in the performance of its duties to the public, and any disposition of property by a public utility shall be conclusively presumed to be of
property which is not useful or necessary in the performance of its duties to the public, as to any purchaser, lessee or encumbrance dealing with such property in good faith for value; provided, however, that nothing in this section shall apply to the interchange of equipment in the regular course of transportation between connecting common carriers.

[228] P.U. Section 853(b) authorizes the CPUC to exempt a public utility from Section 851 review when it finds that such review "is not necessary in the public interest."

9.10 Encourage Broadband Over Powerlines

California should encourage deployment of BPL by its electric utilities by providing regulatory certainty in the areas of its affiliate transaction rules, in the treatment of BPL program expenses and revenues, and exemption from Section 851 requirements for the use of utility assets. The CPUC is currently planning to open a Rulemaking to develop this policy framework proactively, without waiting for an application to be filed by an electric utility for a BPL project, in order to provide the regulatory certainty necessary for California's utilities to move forward with BPL deployment projects.

9.11 Keep VoIP and Other New Technologies Free from Unnecessary Regulation

Regulatory certainty and forbearance from unnecessary regulation are key to the development of VoIP and other new technologies. The FCC's recent decision that VoIP is inherently interstate and thus subject to exclusive federal jurisdiction attempts to provide clarity and regulatory certainty to VoIP providers. In explicit recognition and support of this policy, the CPUC has recently withdrawn an appeal challenging this FCC decision. California should continue to advance statutory and regulatory policies that protect VoIP and other new technologies from unnecessary regulation and taxation.

There are two recommendations for embracing VoIP.

- Recognize that VoIP is Interstate Information Service. California should continue to support the FCC's determination that VoIP is inherently interstate and therefore subject to federal regulation except as designated by the FCC or Congress.

- Reform Universal Service. California should reform its methods of funding Universal Service, both to high cost areas and to low income consumers, to ensure continued funding as VoIP gains market share. In addition to ensuring that California develops new ways to ensure continued funding of Universal Service programs, state legislation should make providers of IP-based voice services eligible to draw from Universal Service funds when they are serving a low-income customer or customer in a high-cost area.

9.12 Remove Barriers to Bundling of Services

Laws and regulations that discourage bundling of services impede the competitive pressures that result in lower prices for consumers. The CPUC should reform its affiliate transaction and Implementation Rate Design rules to eliminate barriers that make pricing and marketing of products and services in a bundled package by regulated and non-regulated entities difficult.

Specifically, the CPUC should modify or eliminate regulations that require carriers to file individual tariffs for products such as call waiting, caller ID, call forwarding, voice mail, three-way dialing, and call return to allow telecommunications carriers to offer any product the customer chooses as part of a bundled package. CPUC rules should allow carriers to include those products as part of a single-priced package along with high-speed Internet, video and other services, without maintaining a price floor or manipulating the tariffed price of each product, in order to allow carriers to lower the package price in response to competition.

9.13 Aggressively Seek Federal Funds

Billions of dollars in federal grants, loans and other incentives are available every year for state broadband deployment and development projects. Many of these funding programs are focused on facilitating broadband deployment in lower-use communities. The Broadband Task Force should be charged with coordinating efforts among state agencies, community based organizations and local governments for obtaining and maximizing such grants, and providing assistance to local governments and community-based organizations in applying for assistance.

Appendix A

Rights of Way Codes in the U.S.

Compiled through original research by NTIA, with reliance on existing research by NARUC and NATOA. http://www.ntia.doc.gov/ntiahome/staterow/rowtableexcel

States	Jurisdiction	Rights of Way Compensation Code
Alabama	Ala. Code § 11-49-1 (2002): Requires consent from city or town authorities before using public lands for the construction or operation of any private utility or private enterprise. Ala. Code § 11-50-B-3 (2002): Government agencies at the state and local level have the authority to manage public rights-of-way, and to require fair and reasonable compensation from telecommunications providers for the use of such rights-of-way.	Ala. Code § 11-50-B-3 (2002): Fair and reasonable compensation to municipalities for use of ROW is allowed. Ala. Code § 40-21-50 (2002): Telecommunications providers subject to 2.2% state gross receipts tax. Ala. Code § 40-21-64 (2002): Counties prohibited from levying privilege/license tax.
Alaska	Alaska Stat. § 29.35.010 (2002): Municipalities granted the power to regulate rights of way. Alaska Stat. § 38.05.810(e) (2002): The Director of the Mining, Land and Water Division may negotiate with licensed public utilities or common carriers for the lease, sale, or other disposal of state land. Such negotiations must have the approval of the commissioner, and may only be entered into if the utility or carrier reasonably requires the land to conduct its business.	Alaska Stat. § 42.05.251 (2002): Fee not to exceed actual cost to the municipality of the utility's use of the public way and of administering the permit program. Utilities may recover fee costs by applying them to customers' utility bills as a surcharge.
Arizona	Ariz. Rev. Stat. §§ 9-581 - 9-583; Ariz. Rev. Stat. § 9-583(A) (2001): A political subdivision (city, county, municipality, etc.) has the authority to manage its public highways and exercise its police powers, but may not exercise such power to prohibit the ability of any telecommunications company to provide its service.	Ariz. Rev. Stat. § 9-582(B) (2001): Any application or permit fees must be related to the costs incurred by processing the application, and must also be assessed within a reasonable amount of time after those costs are incurred. Ariz. Rev. Stat. § 9-582(D) (2001): Arizona permits a political subdivision and a telecommunications licensee or franchisee to agree to an in-kind arrangement, but the costs of the in-kind facilities offset the provider's obligation to pay local transaction privilege taxes or linear foot charges (applicable to interstate services) and must be equal to or less than the taxes or charges. Ariz. Rev. Stat.§ 9-582(D) (2001): "The in-kind facilities . . . shall remain in possession and ownership of the political subdivision after the term of the existing license or franchise expires." Ariz. Rev. Stat. § 9-582(D) (2001): "Notwithstanding subsections A and B of this section, in a license or franchise, a political subdivision and a telecommunications corporation may agree to in-kind payments for use of the public highways different from those specified in subsection A or B of this section." Ariz. Rev. Stat. § 9-582(E) (2001): "... .The license or

States	Jurisdiction	Rights of Way Compensation Code
		franchise shall be structured so that the in-kind payments made for use of the public highways to provide interstate telecommunications services under the license or franchise are less than or equal to and are offset against any linear foot charge owed pursuant to section 9-583, subsection C, paragraphs 2 and 3."
Arkansas	Ark. Code Ann. § 14-200-101(a)(2) (2002): Cities and towns have jurisdiction to assess franchise fees and other terms and conditions of franchise agreement. Ark. Code Ann. § 27-67-304(b) (2002): As long as it does not interfere with public use of the highways, any political subdivision, rural electric cooperative, rural telephone cooperative, private cable company or public utility may use state Highway Commission lands under existing permits, or under subsequent permits approved by the commission.	Ark. Code Ann. § 14-200-101(a)(1)(A) (2002): Local franchise fees not to exceed 4.25% of gross receipts from local service or higher amount agreed to by affected provider OR the voters. Ark. Code Ann. § 14-200-101(a)(1)(D) (2002): Affected utilities may recover fee costs by charging customers an amount equal to the right-of-way fee.
California	See Section 6.2 of the Broadband Deployment in California Report	See Section 6.2 of the Broadband Deployment in California Report
Colorado	Colo. Rev. Stat. §§ 38-5.5-101 - 38-5.5-108; 38-5.5-104 (2002): Any telecommunications provider authorized to do business in Colorado may construct facilities on state public lands upon payment of just compensation and compliance with the requirements set by the state Board of Land Commissioners.	Colo. Rev. Stat. § 38-5.5-107(1)(b) (2002): Any application or permit fees must be related to the costs incurred by processing the application, and must also be assessed within a reasonable amount of time after those costs are incurred. Colo. Rev. Stat. §38-5.5-107(3) (2002): In-kind fee provisions are not allowed, nor may a municipality require one as a condition of consent to use a highway.
Connecticut	Conn. Gen. Stat. § 7-130d (2001). Municipalities are granted authority to regulate right-of-way. Conn. Gen. Stat. § 7-148 (2001). Municipalities may regulate installation of facilities and control excavation procedures. Conn. Gen. Stat. § 16-228 (2001): Telecommunications companies may construct their lines along public roads or navigable waters, as long as such construction does not obstruct the roads or waters.	Conn. Gen. Stat. § 7-130 (2001). Municipalities are granted authority to charge fees.

States	Jurisdiction	Rights of Way Compensation Code
Delaware	Del. Code Ann. tit. 26, § 901 (2002): Local authorities are explicitly granted authority over right-of-way management. Del. Code Ann. tit. 22, § 103 (2002): "Street openings. No person shall open or excavate the bed of any street or highway of any city, town or village in this state for the purpose of laying or placing pipes, wires or other conductors therein without first obtaining the consent of the duly constituted authorities of such city, town or village. Nothing in this section shall require such consent before opening or excavating the bed of any such street or highway for the purpose of repairing any pipes, wires or other conductors theretofore lawfully laid or placed in such street or highway."	Del. Code Ann. tit. 30, § 5501 (2002): 4.25% Gross Receipts Tax assessed by PSC on intrastate telecommunications services, including cellular service. Providers may pass through to customers. Del. Code Ann. tit. 30, § 5502(4) (2002): "A tax is imposed upon any distributor of cable television communications commodities and services which tax shall be at the rate of 2.125% of the gross receipts or tariff charges received by the distributor for such commodities or services distributed within this state." Del. Code Ann. tit. 26, § 115 (2002): Gross revenues assessment on all public utilities for cost of regulation. Del. Code Ann. tit. 8, § 501-518 (2002): Corporate Franchise Tax: "Every telegraph, telephone or cable company . . . to be incorporated under the laws of this state, shall pay an annual tax, for the use of the state, by way of license for the corporate franchise as prescribed in this chapter."
DC	D.C. Code Ann. § 10-1141.03 (2002). The Mayor may issue permits to occupy or otherwise use public rights-of-way, public space, and public structures for any purpose. He may do so without regard to whether the permittee owns the property abutting the public areas, and he may revoke the permit at any time. Any leasing or subleasing of the public areas must be with the express consent of the mayor. When a permit is revoked or expires, the Mayor may require the permittee to remove any apparatus constructed in the public areas. D.C. Code Ann. § 43-1454(a) (2002): "Any telecommunications provider in the District shall have the right to utilize the public right-of-ways of the District for installation, maintenance, repair, replacement, and operation of its telecommunications system..."	D.C. Code Ann. § 10-1141.04 (2002): Right-of-way access permit fees to cover costs of reviewing permit applications. "The Mayor may allow a permittee to pay a fixed charge for a set period of time, pay an amount based upon the amount of the public right-of-way or public space used or occupied, pay an amount based upon a revenue sharing formula, or provide in-kind services to the District in lieu of a monetary payment, or the Mayor may require a permittee to pay a combination of these items." D.C. Code Ann. § 47-2501(3) (2002): "After May 31, 1994, pay to the Mayor 10% of these gross receipts from sales included in bills rendered after May 31, 1994, for a telephone company. . ."

States	Jurisdiction	Rights of Way Compensation Code
Florida	Fla. Stat. Ch. 202.10-202.41 (2002) COMMUNICATIONS SERVICES TAX SIMPLIFICATION LAW Prohibits municipalities and counties from requiring a telecommunications company to enter franchise, license or other agreements. Municipal and county right-of-way rules and regulations may only address placement and maintenance of facilities. Requires local governments to provide notice of proposed right-of-way ordinances to FL Department of state.	Fla. Stat. Ch. 202.10-202.41 (2002) COMMUNICATIONS SERVICES TAX SIMPLIFICATION LAW Municipalities & counties may charge permit fees to recover actual costs (not to exceed $100) and tax rate reduced by .12%. If no permits, may increase tax rate by .12%. Fla. Stat. Ch. 202.10-202.41 (2002) Florida enacted a harmonized state and local communications services tax system, which functions as a sales or use tax assessed on the retail price of telecommunications services. Fla. Stat. Ch. 337.401(3)(c), (2002). The local tax component varies by locality. Of the combined state and local tax rate (which can exceed 10%), 0.24% is earmarked to replace permit fees foregone by local governments that opt to participate in the tax collection system instead of collecting fees. Fla. Stat. Ch. 202.24(2) (2002). Prohibits in kind compensation.
Georgia	Ga. Code Ann. § 32-4-92 (2002). Authorizes permitting authority of local governments. Locals may establish reasonable regulations for the installation and construction of facilities in right-of-way, but the regulations may not be more stringent than those enforced by the Dept of Transportation to regulate state highway right-of-way. The locality may require a written application specifying the nature, extent and location of the facilities in the area. They may also require the applicant to furnish indemnification bond or other acceptable security to pay for any damage to public road or member of the public. Ga. Code Ann. § 46-5-1(a) (2002): Any telecom company has the right to construct, maintain, or operate its lines along the state public highways, as long as the local municipal authorities approve.	Ga. Code Ann. § 46-5-1(a) (2002): A telecom company may have right-of-way access to construct and maintain its lines over any state lands, railroads, or private lands as long as it pays due compensation for such use. Ga. Code Ann. § 48-5-423 (2002): "Ascertainment of valuations of special franchises; levy and collection of tax. (a) In arriving at a proposed assessment, the commissioner shall not be bound to accept the valuation fixed for a special franchise in the return made but shall review the return and valuation. When the commissioner refuses to accept the return, the subsequent proceedings shall be in all particulars the same procedures as are provided by law in the case of refusal to accept the returns made by public utilities of their tangible property. (b) Special franchises shall be taxed at the same rate as other property upon the value of the special franchise as returned or upon the value determined by the county board of tax assessors. The tax on special franchises shall be levied and collected in the same manner as is provided by law in the case of the tangible property of public utilities."
Hawaii	Haw. Rev. Stat. § 264-13 (2002). The governor or the director of transportation may dispose of easements or rights-of-way along state highways under any terms that are within the public interest.	Haw. Rev. Stat. § 264-7(b) (2002): The director of transportation established the fee schedule for permits. The fee schedule should be calculated to recover any costs spent on issuing the permit. The applicant shall pay the fee, but the director may waive the fee where he determines that the work to be done will improve the highway or otherwise benefit the state. No fee is required where the only work to be done is the setting of poles to carry overhead wires.

States	Jurisdiction	Rights of Way Compensation Code
Idaho	Idaho Code § 62-618 (2002): Municipalities are not permitted to regulate telecommunications companies. Idaho Code § 62-701 (2002): Telecommunications providers may erect facilities and structures on any public lands, including along public roads, waterways, or other lands, as long as those facilities don't disrupt the use of such roads, etc. Idaho Code § 62-701A(2) (2002): "With respect to the installation of its facilities within public rights-of-way, the telecommunications provider shall at all times be subject to the authority of a city, county or highway district. No grant of authority pursuant to this section shall be deemed to waive other rights or requirements of the codes, ordinances or resolutions of a city, county or highway district regarding permits, reasonable fees to be paid, manner of construction, or the like, nor to grant any property interest in the public rights-of-way."	Idaho Code § 50-329A (2002). Municipal franchise fees may be levied on providers, but levy may not exceed 3% of gross operating revenues; providers may pass through to customers. This franchise fee is in lieu of any other tax or fee imposed by the municipality related to easements, franchises, rights of way, utility lines and equipment. Idaho Code §§ 61-1001 & 1004 (2002). Utilities pay yearly gross revenue fee to the Public Utilities Commission to reimburse for cost of regulation. This fee is based upon a consideration of the time and expense devoted to the supervision and regulation of each class of . . . public utilities during the preceding calendar year, including salaries and wages of the commissioners and employees and all other necessary and lawful expenditures of the commission.
Illinois	None Indicated	35 Ill. Comp. Stat. 635/5 (2002): Recognizing that telecommunications providers were becoming more competitive, the Illinois General Assembly abolished municipal franchise fees and established a uniform municipal infrastructure maintenance fee. Although this fee is meant to replace the revenue that municipalities lost from the franchise fees, the statute provides that the fee may not be related to the use of public rights-of-way or to the costs of maintaining and regulating such use. 35 Ill. Comp. Stat. 636/5-60 (2002): With the implementation of the municipal infrastructure maintenance fee, municipalities were deemed to have waived their rights to any compensation that might subsequently accrue under a franchise agreement executed before January 1, 1998, if: 1) the municipality imposes a tax at a rate exceeding 5%; 2) the municipality affirmatively waives such fees; or 3) the municipality has a municipal infrastructure maintenance fee in place. 35 Ill. Comp. Stat. 635/15 (2002): The state fee portion of the municipal infrastructure maintenance fee is .05% of the gross retail revenues. 35 Ill. Comp. Stat. § 635/20 (a), (b) (2002): The municipality's portion of the municipal infrastructure

States	Jurisdiction	Rights of Way Compensation Code
		maintenance fee may not exceed 1% of gross retail revenues in areas with a population of 500,000 or less, or 2% in areas with a population of 500,000 or more. 35 Ill. Comp. Stat. 635/30 (2002): With the implementation of the municipal infrastructure maintenance fee, municipalities may no longer assess franchise fees or other charges on telecommunications providers.
Indiana	Ind. Code § 8-1-2-101(b) (2002): Municipalities or county executives may operate and maintain the public roads and other lands for the benefit of public safety. They may also manage the rights-of-way associated with the public roads or other lands, and may require compensation for their use. Such compensation must be competitively neutral and non-discriminatory.	Ind. Code § 8-1-2-101(b) (2002): Compensation may not exceed the municipality's direct and actual costs of managing the right-of-way for the public utility. These costs shall be assigned individually to the public utility creating the costs. Ind. Code § 8-1-2-101(b) (2002): Management costs may include the costs of: 1. Registering occupants; 2. Verifying occupation; 3. Inspecting job sites and restoration projects; 4. Restoring work inadequately performed; 5. Administering a restoration ordinance that ensures the right-of-way will be returned to its original condition; and 6. any management costs associated with the implementation of any other ordinance associated with rights-of-way. These costs may not include rents, franchise fees, or any other fee paid by a public utility for occupation of the right-of-way.
Iowa	Iowa Code § 364.2(4)(a) (2002): "A city may grant to any person a franchise to erect, maintain, or operate plants and systems [for telecommunications systems and other utilities] . . .within the city for a term of not more than 25 years. When considering whether to grant, amend, extend, or renew a franchise, a city shall hold a hearing. The franchise may be granted, extended, or renewed only by an ordinance, but no exclusive franchise shall be granted . . . Iowa Code § 477.1 (2002): Any telecommunications provider may construct its system along the public roads, along public waterways, or through public or private lands. However, construction along a primary road is subject to rules adopted by the state department of transportation. Iowa Code § 480A.1- § 480A.6 (2002). § 480A.1: "Purpose. The general assembly finds that it is in the public interest to define the right of local governments to	Iowa Code § 480A.3 (2002): The only fee that a municipality can recover from a utility are those management costs caused by the utility's occupation of the right-of-way. If the management costs are attributed to more than one entity, the costs shall be allocated proportionately to the users of the right-of-way. Any other obligations must be imposed on a competitively neutral basis. Iowa Code § 480A.4 (2002): A municipality may not allow in-kind services in lieu of fees, nor may it require in-kind services as a condition for use of the right-of-way.

States	Jurisdiction	Rights of Way Compensation Code
	charge public utilities for the location and operation of public utility facilities in local government rights-of-way."	
Kansas	Kan. Stat. Ann. § 17-1902(B) (2002) (Amended by Senate Bill 397, effective Jul 1, 2002): Any provider has the right to construct systems and related facilities along the state's public rights-of-way. The systems and facilities must be constructed so as not to obstruct other entities' use of the rights-of-way. Kan. Stat. Ann. § 17-1902(k) (2002) (Amended by Senate Bill 397, effective Jul 1, 2002): A city may require a telecommunications provider to repair all damage to a right-of-way cause by the use of that right-of-way. If the provider fails to make such repairs, the city may effect the repairs and charge the provider for their cost.	Kan. Stat. Ann. § 17-1902(N) (2002) (Amended by Senate Bill 397, effective Jul 1, 2002). A city may charge for the reasonable, actual, and verifiable costs of managing the city right-of-way. Fees may include: a permit fee, excavation fee, inspection fee, repair and restoration costs, performance bond. Kan. Stat. Ann. § 17-1902(h) (2002) (Amended by Senate Bill 397, effective Jul 1, 2002): A city may not require a telecommunications company to provide it with in-kind services. Kan. Stat. Ann. § 12-2001(g), (j). Each city may assess a one-time franchise application fee to cover the costs of reviewing the application. It may also impose either an access line fee of up to $2.00 per access line per month, or a gross receipts fee of up to 5% on local services.
Kentucky	Ky. Rev. Stat. Ann. § 278.540 (2002): Once just compensation has been made, the provider gains the right to construct, maintain and operate its lines through any public lands of this state and across and along any public road.	Ky. Rev. Stat. Ann. § 278.540(1) (2002): Just compensation for right-of-way access is authorized. Ky. Rev. Stat. Ann. § 278.130 (2002): Cities are prohibited from assessing occupational license tax on public utilities. Instead, PSC assesses annual license tax on utilities.
Maine	Me. Rev. Stat. Ann. tit. 35-A § 2502 (2001): Statutes specifically designate licensing authority among municipal, county, and state governments, based on the location of the right-of-way. Me. Rev. Stat. Ann. tit. 35-A §§ 2503-2505 (2001): Permits may require description of facilities. Terms and conditions of permits may specify other requirements determined necessary in the best interests of the public safety and use of the right-of-way so as not to obstruct use for public travel.	Me. Rev. Stat. Ann. tit. 35-A §§ 2503, 2510 (2001): There are two permits, the right-of-way location permit and the right-of-way excavation permit. Each one has its own fee. Me. Rev. Stat. Ann. tit. 35-A § 2510-1 (2001): Local excavation fees may not exceed the reasonable cost of replacing the excavated pavement.

States	Jurisdiction	Rights of Way Compensation Code
Maryland	Md. Ann. Code art. 23A, § 2(13) (2002): Municipalities have the express power to grant exclusive or non-exclusive franchises to a community antenna system or cable systems that use rights-of-way. The municipality may impose franchise fees and establish rates, rules and regulations for the franchises.	None Indicated
Michigan	Mich. Comp. Laws Ann. §§ 484.3101-484.3120 (2002) Metropolitan extension telecommunications rights-of-way oversight act. § 484.3103: "(1) Pursuant to section 27 of article VII of the state constitution of 1963 and any other applicable law, the metropolitan extension telecommunications rights-of-way oversight authority is established as an autonomous agency within the department of consumer and industry services." Mich. Comp. Laws Ann. § 484.3115 (2002): Municipalities shall grant providers a permit to use any public rights-of-way located within the municipal jurisdiction. If an application involves an easement or public place, then the municipality should act promptly in granting the permit.	Mich. Comp. Laws Ann. § 484.3108 (2002) Maintenance fee. "...(3) Except as otherwise provided under subsection (6), for the period of November 1, 2002 to March 31, 2003, a provider shall pay an initial annual maintenance fee to the authority on April 29, 2003 of 2 cents per each linear foot of public right-of-way occupied by the provider's facilities within a metropolitan area, prorated for the period specified in this subsection. (4) Except as otherwise provided under subsection (6), for each year after the initial period provided for under subsection (3), a provider shall pay the authority an annual maintenance fee of 5 cents per each linear foot of public right-of-way occupied by the provider's facilities within a metropolitan area. (5) The fee required under this section is based on the linear feet occupied by the provider regardless of the quantity or type of the provider's facilities utilizing the public right-of-way or whether the facilities are leased to another provider. (6) In recognition of the need to provide nondiscriminatory compensation to municipalities for management of their rights-of-way, the fees required under this section shall be the lesser of the amounts prescribed under subsections (3) and (4) or 1 of the following: (a) For a provider that was an incumbent local exchange carrier in this state on January 1, 2002, the fees within the exchange in which that provider was providing basic local exchange service on January 1, 2002, when restated by the authority on a per access line per year basis, shall not exceed the statewide per access line per year fee of the provider with the highest number of access lines in this state. The authority shall annually determine the statewide per access line per year fee by dividing the amount of the total annual fees the provider is required to pay under subsections (3) and (4) by the provider's total number of access lines in this state. (b) For all other providers in an exchange, the fee per linear foot for the provider's facilities located in the public rights-of-way in that exchange shall be the same as that of the incumbent local exchange carrier. Mich. Comp. Laws Ann. § 484.3106 (2002): When applying for a municipal permit, a provider must pay a $500 application fee. This fee must be paid to each municipality where the provider needs access to a right-of-way.

States	Jurisdiction	Rights of Way Compensation Code
Minnesota	Minn. Stat. § 237.04 (2002): The Minn. Department of Commerce has the authority to establish rules for the use of right-of-way by public utilities. These rules shall include regulations for construction, maintenance, and operation of facilities along right-of-ways. Minn. R. 7819.4000 (2002) Municipalities may establish a right-of-way mapping system to facilitate right-of-way management, enhance public safety, improve right-of-way design, and encourage cooperation between municipalities.	Minn. Stat. § 237.163(6)(a) (2002): "A local government unit may recover its right-of-way management costs by imposing a fee for registration, a fee for each right-of-way permit, or, when appropriate, a fee applicable to a particular telecommunications right-of-way user when that user causes the local government unit to incur costs as a result of actions or inactions of that user. A local government unit may not recover from a telecommunications right-of-way user costs caused by another entity's activity in the right-of-way." Minn. Stat. § 237.163(6)(b) (2002): "Fees, or other right-of-way obligations, imposed by a local government unit on telecommunications right-of-way users under this section must be: (1) based on the actual costs incurred by the local government unit in managing the public right-of-way; (2) based on an allocation among all users of the public right-of-way, including the local government unit itself, which shall reflect the proportionate costs imposed on the local government unit by each of the various types of uses of the public rights-of-way; (3) imposed on a competitively neutral basis; and (4) imposed in a manner so that aboveground uses of public rights-of-way do not bear costs incurred by the local government unit to regulate underground uses of public rights-of-way." Minn. Stat. § 237.163(7)(d) (2002): "A local government unit may not collect a fee imposed under this section through the provision of in-kind services by a telecommunications right-of-way user, nor may a local government unit require the provision of in-kind services as a condition of consent to use the local government unit's public right-of-way." Minn. R. 7819.1100(3) (2002): "Degradation fee. A right-of-way user may elect to pay a degradation fee in lieu of restoration. However, the right-of-way user shall remain responsible for replacing and compacting the subgrade and aggregate base material in the excavation and the degradation fee must not include the cost to accomplish these responsibilities." Minn. R. 7819.1000(1) (2002): "Permit fee. A local government unit that requires a permit for excavation in or obstruction of the public right-of-way shall make its permit fee schedule available to the public. The permit fee schedule must be established in advance and designed to recover the local government unit's actual costs incurred in managing the public right-of-way." Minn. R. 7819.1000(2) (2002): "Allocation of permit fees. Permit fees must be based on an allocation among all users of the public right-of-way, which shall include the local government unit itself, so as to reflect the proportionate costs imposed on the local government unit by each of the various types of users of the public rights-of-way. Although the local government unit must be allocated its proportionate share of permit fees, the local government unit need not transfer funds to pay permit fees. Permit fees

States	Jurisdiction	Rights of Way Compensation Code
		must be allocated in a competitively neutral manner and must be imposed in a manner so that aboveground uses of public rights-of-way do not bear costs incurred by the local government unit to regulate underground uses of public rights-of-way." Minn. R. 7819.1000(3) (2002): "Delay penalty. A local government unit may establish and impose a reasonable penalty for unreasonable delays in right-of-way excavation, obstruction, patching, or restoration. The delay penalty must be established from time to time by resolution of the local government unit's governing body. A delay penalty must not be imposed if the delay in project completion is due to circumstances beyond the control of the applicant, including without limitation inclement weather, acts of God, or civil strife."
Mississippi	Miss. Code Ann. § 21-27-1 (2002): Municipalities do not have the right to grant exclusive use of rights-of-way, nor may they grant a franchise without compensation, or for a period of more than 25 years.	None Indicated
Missouri	Mo. Rev. Stat. § 67.1832 (2001): Municipalities shall permit telecommunication companies and other public utilities to construct, maintain and operate their systems on public rights-of-way.	Mo. Rev. Stat. § 67.1840.2(1) (2001): "Right-of-way permit fees . . . shall be: [b]ased on the actual, substantiated costs reasonably incurred by the political subdivision in managing the public right-of-way." Mo. Rev. Stat. § 67.1830(5) (2001): ""Management costs" or "rights-of-way management costs", the actual costs a political subdivision reasonably incurs in managing its public rights-of-way, including such costs, if incurred, as those associated with the following: (a) Issuing, processing and verifying right-of-way permit applications; (b) Inspecting job sites and restoration projects; (c) Protecting or moving public utility right-of-way user construction equipment after reasonable notification to the public utility right-of-way user during public right-of-way work; (d) Determining the adequacy of public right-of-way restoration; (e) Restoring work inadequately performed after providing notice and the opportunity to correct the work; and (f) Revoking right-of-way permits." Mo. Rev. Stat. § 67.1842.3 (2001): Prohibits in-kind compensation.

States	Jurisdiction	Rights of Way Compensation Code
Montana	Mont. Code Ann. § 7-13-2220 (2002): "Right-of-way across state lands. The right-of-way is given, dedicated, and set apart to locate, construct, and maintain district works over and through any lands which are the property of this state, and the district has the same rights and privileges relating to the right-of-way as are granted to municipalities." Mont. Code Ann. § 7-3-4449 (2002): "The commission shall have all powers to grant rights to occupy or use the streets, highways, bridges, or public places in the municipality that now are or hereafter may be granted to municipalities by the constitution or laws of Montana. Every ordinance or resolution passed by the commission granting the right to occupy or use streets, highways, or public places of municipalities shall be complete in the form in which it is finally passed and remain on file with the commission for inspection by the public for at least 1 week before the final adoption or passage thereof."	None Indicated
Nebraska	Neb. Rev. Stat. Ann. § 86-704(1) (2002): A telecommunications company or other public utility may construct its system facilities along the public state roads, public lands, or private lands if necessary. The construction of this system may not impede road use, and any wires or cables must be at least 18 feet above highway crossings.	Neb. Rev. Stat. Ann. § 86-704 (4)(a) (2002): "A municipality shall not levy a tax, fee, or charge for any right or privilege of engaging in a telecommunications business or for the use by a telecommunications company of a public highway other than: (i) An occupation tax authorized under section 14-109, 15-202, 15-203, 16-205, or 17-525; and (ii) A public highway construction permit fee or charge to the extent that the fee or charge applies to all persons seeking use of the public highway in a substantially similar manner. All public highway construction permit fees or charges shall be directly related to the costs incurred by the municipality in providing services relating to the granting or administration of permits." Neb. Rev. Stat. Ann. § 86-704 (2002): (4)(a)(ii): Any highway construction permit fee or charge shall also be reasonably related in time to the occurrence of such costs. "(6) Taxes or fees shall not be collected by a municipality through the provision of in-kind services by a telecommunications company, and a municipality shall not require the provision of in-kind services as a condition of consent to the use of a public highway."

States	Jurisdiction	Rights of Way Compensation Code
Nevada	Nev. Rev. Stat. § 707.280 (2002): Anyone constructing a telecommunications line has the right-of-way for that line and any other lands, public or private, that may be necessary to construct and operate that line. Nev. Rev. Stat. § 707.250 (2002): A telecommunications company registered in the state of Nevada may construct and maintain their lines through any public or private lands, along public roads, or along navigable waters, provided the lines do not cause an obstruction. Nev. Rev. Stat. § 268.088 (2002): "Municipalities are not authorized to impose any terms or conditions on a franchise for the provision of telecommunications service other than terms or conditions concerning the placement and location of the telephone lines and fees imposed for a business license or the franchise, right or privilege to construct, install or operate such lines."	None Indicated
New Hampshire	N.H. Rev. Stat. Ann. § 231:161, I. (a)-(c) (2002): Permits to access state-maintained right-of-way must be acquired from the NH Transportation Commission. Local right-of-way access must be obtained from local governments. N.H. Rev. Stat. Ann. § 48:17-10 (2002): Municipal or county government consent must be obtained before accessing right-of-way under their jurisdiction.	N.H. Rev. Stat. Ann. § 231:165 (2002): Payment for the town clerk's services and fees should be made by the provider. A minimum $10 fee is authorized by state statutes.
New Jersey	N.J. Stat. Ann. § 48:17-11 (2002): "The municipal or county government may regulate the use of all right-of-way with police and other regulations and restrictions."	None Indicated

States	Jurisdiction	Rights of Way Compensation Code
New Mexico	N.M. Stat. Ann. §3-42-2A (2002): "If previous to the incorporation of a municipality, the board of county commissioners has granted to any person right-of-way over, upon, in and about the streets of the municipality for the erection, construction, maintenance or operation of a public utility, and such person has erected, constructed, or in good faith commenced the erection or construction of such a utility, the governing body shall, without a vote by the electorate: (1) authorize the completion of the system; (2) authorize the continued or subsequent operation and maintenance of the system; (3) recognize the rights acquired by the person erecting or constructing such a system; and (4) grant such a person a franchise for the maximum term of years allowed by law upon such terms as are fair, just and equitable to all parties concerned. state ROW rules governing state administration of ROW for telecoms." N.M. Stat. Ann. § 19-7-57(2002): The Commissioner may grant rights-of-way and easements to telecommunications providers and other public utilities. The grantee shall pay the price set by the Commissioner, and this price will be at least the minimum price for the lands.	None Indicated
New York	N.Y. Gen City Law § 20 (Consol. 2002): Cities have the right to grant franchises or rights to use public waters, streets, or lands located within the city. N.Y. Transp. Corp. Law § 27 (Consol. 2002): Telecommunications companies may construct their lines along public roads, navigable waters, or other public lands, provided that the lines do not impede the use of such roads, etc.	None Indicated

States	Jurisdiction	Rights of Way Compensation Code
North Carolina	N.C. Gen. Stat. § 62-39 (2002) Public Utility Commission has the power to regulate crossings of telephone, telegraph, electric power lines and pipelines and rights-of-way of railroads and other utilities by another utility N.C. Gen. Stat. § 62-182 (2002): Telecommunications companies and other public utilities have the right to contract with private land owners for rights-of-way.	None Indicated
North Dakota	N.D. Cent. Code § 49-09-16 (2002): Municipalities may grant rights-of-way, on the public lands and roads under their jurisdiction, for the construction of a telecommunications system or other public utility system. The municipality granting the right of way may also specify the rules and conditions attached to the right-of-way.	N.D. Cent. Code § 49-21-26 (2002): After December 31, 1998, all telecommunications recovery fees must be approved by the municipality electorate. N.D. Cent. Code § 49-21-26 (2002): A municipality may request that a telecommunications company move its facilities from the public right of way, and the telecommunications company must pay for such removal. N.D. Cent. Code § 49-21-26 (2002): Recovery fess may only include the municipality's costs of managing the right of way; any other fees must be assessed on a competitively neutral basis. If the management costs are attributable to more than one entity, the recovery fee must be assessed to all parties on a proportional basis. N.D. Cent. Code § 49-21-27 (2002): Municipalities may not require in kind services in lieu of a fee or as a pre-requisite to right-of-way use.
Ohio	Ohio Rev. Code Ann. § 4939.01 - 4939.09 (Anderson 2002); § 4939.02: Ohio's policy regarding rights-of-way grants authority to municipalities to manage rights-of-way, ensures lawful fee recovery, and promotes municipal coordination and standardization.	Ohio Rev. Code Ann. § 4939.05 (B) (Banks-Baldwin 2002): Municipalities may charge different fees for the use of their rights-of-way, based on the amount of public land used, the type of public utility, or any other different treatment justified by public health and safety concerns. This includes a complete waiver of the fee. Ohio Rev. Code Ann. § 4939.05 (C) (Banks-Baldwin 2002): Fees charged may only reflect actual costs of managing the rights-of-way, plus any demonstrable future costs. Ohio Rev. Code Ann. § 4939.05 (A) (Banks-Baldwin 2002): Ohio prohibits the use of in-kind services in lieu of fees.

States	Jurisdiction	Rights of Way Compensation Code
Oklahoma	Okla. Const. Art. IX, § 2: Telecommunications companies and other public utilities have a right to construct their lines within the state, and to connect with like lines at the state border. Okla. Stat. Tit.11 § 36-101(2003): Municipal governments are authorized to regulate and control use of ROW in the municipality. Okla. Stat. Tit.18 § 601 (2003): Telecommunications companies are granted a right of way over public and private lands and roads, subject to the local authorities.	None Indicated
Oregon	Or. Rev. Stat. § 221.515 (2001): Municipalities have the authority to regulate and collect taxes for the use of rights-of-way within their jurisdiction.	Or. Rev. Stat. § 221.515 (2001): Municipalities may collect a privilege tax for the use of rights-of-way, not to exceed 7% of the gross revenues (earned within the municipality) of a telecommunications provider. Or. Rev. Stat. § 221.515 (2001): If a telecommunications company is paying the privilege tax, then it does not have to pay any other compensation. To the extent that any other fees are levied, they will be deducted from the privilege tax.
Pennsylvania	71 PA. Cons. Stat. § 194 (2002) (Adm. Code § 514): Municipalities may not grant easements or rights-of-way without the express authority from the General Assembly. However, municipalities may grant licenses to public service companies to construct lines if those lines will give state buildings better service, or if such line is necessary to serve the public.	72 PA. Cons. Stat. § 6164 (2002): If a fee dispute is heard in court, the court will determine the license fee necessary to compensate the municipality for its services performed in regulating the license, and the amount determined will be the maximum amount charged to the licensee. 71 PA. Cons. Stat. § 194 (2002): (Adm. Code § 514): Licenses shall provide the amount of compensation due to the Commonwealth for the use of its property.

States	Jurisdiction	Rights of Way Compensation Code
Rhode Island	R.I. Gen Laws § 39-17-1 (2002): Municipalities are granted franchising authority to regulate access to ROW. R.I. Gen. Laws § 37-7-8 (2002): "Grant of easements and rights of way over acquired lands. Whenever, in the opinion of the acquiring authority, an easement or right of way may be granted in land owned or held by the state without thereby jeopardizing the interests of the state, and the granting of the easement or right of way will be for the public good, the acquiring authority, with the approval of the state properties committee, is hereby authorized and empowered to grant the easement or right of way by proper instrument, approved as to substance by the director of administration and as to form by the attorney general, for such consideration, and in such manner and upon such terms and conditions as may, in the judgment of the state purchasing agent, be most advantageous to the public interest."	R.I. Gen Laws § 39-17-3 (2002): Franchise holders must pay franchise tax up to 3% of gross earnings in that locality, on a quarterly basis. R.I. Gen Laws § 39-17-8 (2002): Cities and towns may not charge for use of streets, except as provided through the franchise tax authorization.
South Carolina	S.C. Code Ann. § 58-9-2240. A municipality may not use its authority to regulate rights-of-way as a means to impose additional regulations on telecommunications companies or public utilities. S.C. Code Ann. § 58-12-10 (2002): Before a cable company may place its lines, it must get permission from the agency in charge of the lands, roads, and public waters. If the cable must traverse public lands, the cable company must get permission from the public landowner.	S.C. Code Ann. § 58-9-2220 (2002). South Carolina authorizes municipalities to implement a two-tiered tax system. (A). A business license tax of up to 0.75% of retail telecommunications gross income. A franchise or consent fee for the installation or construction of physical facilities in public rights-of-ways. The maximum permissible fee is based on municipal population and ranges from $100 for a population of 1,000 or less to $1,000 for a population of more than 25,000.

States	Jurisdiction	Rights of Way Compensation Code
South Dakota	S.D. Codified Laws § 49-32-1 (2002): Telecommunications companies are granted rights-of-way over public lands and along public roads, subject to control by the proper authorities. S.D. Codified Laws § 9-35-1 (2002): Municipalities have the right to determine charges for local telephone service, subject to the PUC's powers, and to regulate the placement of telephone poles, lines, and other facilities.	None Indicated
Tennessee	Tenn. Code Ann. § 65-21-201 (2002): Telecommunications companies or their equivalent are granted rights-of-way along public roads, over public lands, along navigable waters, and on private lands. Tenn. Code Ann. §13-24-303 (2002): Protects authority of locals to exercise reasonable municipal and county police powers.	None Indicated
Texas	Tex. Loc. Gov't. Code Ann. § 283.001 (2002): "(b) It is also the policy of this state that municipalities: (1) retain the authority to manage a public right-of-way within the municipality to ensure the health, safety, and welfare of the public;" Tex. Loc. Gov't. Code Ann. § 282.002 (2002): "General Authority of General-Law Municipality. (a) A general-law municipality has exclusive control over the public grounds of the municipality."	Tex. Loc. Gov't. Code Ann. § 283.001 (2002): "(b) It is also the policy of this state that municipalities: (2) receive from certificated telecommunications providers fair and reasonable compensation for the use of a public right-of-way within the municipality." Tex. Loc. Gov't. Code Ann. § 283.051 (2002): "Right-Of-Way Fee. (a) Notwithstanding any other law, a certificated telecommunications provider that provides telecommunications services within a municipality is required to pay as compensation to a municipality for use of the public rights-of-way in the municipality only the amount determined by the commission under Section 283.055." Tex. Loc. Gov't. Code Ann.. § 283.055 (2002): The Texas Public Utilities Commission shall set the per-line rate that a municipality can charge for use of its rights-of-way. Tex. Loc. Gov't. Code Ann. § 283.055 (2002): Municipalities are prohibited from receiving services without compensation or at below market prices.

States	Jurisdiction	Rights of Way Compensation Code
Utah	Utah Code Ann. § 54-4-25 (2003): Telecommunications companies and other utilities must obtain certification from the PUC that construction is required before they may begin construction on a right-of-way. Utah Code Ann. § 72-7-102 (2003): Local highway authorities (county or municipal) may allow excavating, installation of utilities and other facilities or access under rules made by the [local] highway authority[ies] and in compliance with federal, state and local law as applicable. Utah Code Ann. § 72-3-109 (2003): "(1) Except as provided in Subsection (3), the jurisdiction and responsibility of the department and the municipalities for state highways within municipalities is as follows: ... (c) (i) A municipality has jurisdiction over all other portions of the right-of-way and is responsible for construction and maintenance of the right-of-way."	Utah Code Ann. § 72-7-102 (4) (2003): The Highway Authority may require compensation from utilities for use of their rights-of-way, but such compensation may only include those management costs caused by the utilities' activity. Utah Code Ann. § 72-7-102 (4) (2003): The Highway Authority's fees must be charged on a competitively neutral basis. If more than one utility is responsible for the management costs incurred, the fees must be allocated to each company or entity proportionately. Utah Code Ann. § 72-7-102 (4)(e) (2003): Providers are entitled to recover ROW access fee costs from their customers.
Vermont	VT. Stat. Ann. tit. 19 § 1111(a) (2002): "Permits. -- Permits must be obtained by anyone or any corporation wishing to use as described in this section any part of the highway right-of-way on either the state or town system. Notwithstanding any other statutory requirement, a permit shall be required for any use of any highway right-of-way, consistent with the provisions of this section. The authority given to the board, the secretary and the attorney general under this section shall also apply to the legislative bodies of towns."	None Indicated

States	Jurisdiction	Rights of Way Compensation Code
Virginia	VA. Code Ann. § 56-458 (2002): Telecommunications companies have the right to build its system along public roads and railroads, on public lands, and along navigable waterways.	VA. Code Ann. § 56-468.1 (2002): In Virginia, the state Department of Transportation annually calculates the Public Rights-of-Way Use Fee as an annual average rate per access line. The average weights public highway miles at $425 per mile and new installations at $1 per linear foot. VA. Code Ann. § 56-458(E) (2002). In-kind fees prohibited.
Washington	Wash. Rev. Code § 35.99.020 (2002): "Permits for use of right of way. A city or town may grant, issue, or deny permits for the use of the right of way by a service provider for installing, maintaining, repairing, or removing facilities for telecommunications services or cable television services . . . " Wash. Rev. Code § 35.99.040 (2002): Municipalities may not use the right-of-way permitting process as a means of regulating service providers, except where permitted by federal law.	Wash. Rev. Code § 35.21.860(1) (2002): Municipalities may charge fees for the use of their rights of way that recover their administrative costs related to the permit process, and a site-specific charge to wireless providers for the placement of new structures in the right-of-way. Wash. Rev. Code § 35.99.070 (2002): Washington permits cities and towns to obtain access to ducts, conduits, or related structures of a service provider, subject to conditions that include the payment of compensation sufficient to recover the provider's incremental costs. If the municipality allows the in-kind facilities to be used to provide service to the public, it must compensate the provider on the basis of fully allocated costs.
West Virginia	W.Va. Code § 8-31-1,2 (2002): Municipalities and counties have franchising authority and may impose terms and conditions for those agreements. W.Va. Code § 17-4-8 (2002): Telecommunications companies and other service providers are prohibited from constructing facilities on state roads except under the conditions as may be prescribed by the state road commissioner.	W.Va. Code § 17-16A-13 (2002): The Parkways Authority has the power to fix and collect fees for the use of rights-of-way along the state parkways.

States	Jurisdiction	Rights of Way Compensation Code
Wisconsin	Wis. Stat. § 196.58 (2002): Municipalities may determine whether and on what conditions a public utility may enter and occupy their rights-of-way. Wis. Stat. § 196.499(14) (2002): "EXTENSION OF FACILITIES. Any telecommunications carrier may extend its facilities into or through any municipality for the furnishing of its services, subject to the reasonable regulation of the governing body of the municipality relative to the location of poles and wires and the preservation of the safe and convenient use of streets and alleys to the public. Upon a petition for relief made by a telecommunications carrier, the commission shall set a hearing and if it finds a contract, ordinance or resolution under this subsection to be unreasonable, the contract, ordinance or resolution shall be void."	None Indicated
Wyoming	Wyo. Const. Art. 10, § 17 (2002): "Rights of telegraph companies. Any association, corporation or lessee of the franchises thereof organized for the purpose shall have the right to construct and maintain lines of telegraph within this state, and to connect the same with other lines." Wyo. Stat. Ann. § 15-1-103(a)(xi) (2002): Local governments granted authority to take all necessary action to plan, construct. maintain and regulate the use of streets, including the regulation of any structures there under.	None Indicated

Appendix B

Broadband Policies and Practices in the U.S.

Independent Research Conducted by the California Public Utilities Commission

2004

APPENDIX B

		ALABAMA	ALASKA	ARIZONA	ARKANSAS	CALIFORNIA	COLORADO	CONNECTICUT	DELAWARE	DISTRICT OF COLUMBIA	FLORIDA	GEORGIA	HAWAII	IDAHO	ILLIONIS	INDIANA	IOWA	KANSAS	KENTUCKY	LOUISIANA	MAINE	MARYLAND	MASSASCHUSETTS	MICHIGAN	MINNESOTA	MISSISIPPI	MISSOURI	
1	Does State have a definition for "advanced services"?																						X					
2	Is there a designated lead State agency for broadband deployment?	X	X	X			X	X			X	X			X	X	X	X	X	X		X		X				X	
3	Does State maintain databases or maps of existing broadband facilities?		X	X			X								X			X	X		X	X		X					
4	Does State limit municipal deployment of broadband services?				X						X														X		X		
5	Does State have expidited rights-of-way policies?		X				X				X						X	X						X			X		
6	Does State set rates for broadband services?																												
7	Does State regulate broadband service-quality?																												
8	Does State have an enhanced E-government initiative?	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		
9	Does State utilize universal service mechanisms to attract broadband deployment?		X					X										X				X			X		X		
10	Does State offer grants to broadband providers?						X					X																	
11	Does State offer private-sector grants targeted to deployment in underserved areas?		X	X			X				X				X	X		X	X					X	X				
12	Does State offer loans to broadband providers?														X									X					
13	Does State offer private-sector grants targeted to deployment in rural areas?		X	X			X				X				X			X						X	X				
14	Does State offer private-sector loans targeted to deployment in underserved areas?		X				X								X			X	X					X					
15	Does State offer tax incentives to broadband providers?						X					X		X	X			X						X		X			

APPENDIX B

		MONTANA	NEBRASKA	NEVADA	NEW HAMPSHIRE	NEW JERSEY	NEW MEXICO	NEW YORK	NORTH CAROLINA	NORTH DAKOTA	OHIO	OKLAHOLMA	OREGON	PENNSYLVANIA	RHODE ISLAND	SOUTH CAROLINA	SOUTH DAKOTA	TENNESSEE	TEXAS	UTAH	VERMONT	VIRGINIA	WASHINGTON	WEST VIRGINIA	WISCONSIN	WYOMING	
1	Does State have a definition for "advanced services"?														X												
2	Is there a designated lead State agency for broadband deployment?	X	X		X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
3	Does State maintain databases or maps of existing broadband facilities?								X		X	X		X		X				X		X	X				
4	Does State limit municipal deployment of broadband services?		X	X										X		X		X	X	X		X	X				
5	Does State have expidited rights-of-way policies?										X					X			X	X		X	X				
6	Does State set rates for broadband services?																										
7	Does State regulate broadband service-quality?											X				X											
8	Does State have an enhanced E-government initiative?	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
9	Does State utilize universal service mechanisms to attract broadband deployment?										X								X								
10	Does State offer grants to broadband providers?		X															X									
11	Does State offer private-sector grants targeted to deployment in underserved areas?		X					X	X		X	X		X		X			X	X	X	X		X			
12	Does State offer loans to broadband providers?								X					X		X			X	X							
13	Does State offer private-sector grants targeted to deployment in rural areas?		X					X	X			X		X		X			X	X				X			
14	Does State offer private-sector loans targeted to deployment in underserved areas?		X						X					X		X			X	X							
15	Does State offer tax incentives to broadband providers?	X	X						X				X	X		X			X	X							

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No broadband programs were found to exist in Delaware at this time.

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No broadband programs were found to exist in Hawaii at this time.

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http://www.seacoastonline.com/2001ne ws/2_12biz.htm
Telephone Association of New England, New Hampshire Telecommunications Association
A Nation of Laboratories: Broadband Policy Experiments in the States, Alliance for Public Technology (APT) www.apt.org
State Broadband Initiatives, Telecommunications Industry Assn.
http://www.tiaonline.org/policy/states.cfm
Action Ideas for Cities and States, The Children's Partnership, http://www.techpolicybank.org/

New Jersey

"New Jersey Creates a $100-Million Broadband Network for Its Colleges"
http://chronicle.com/free/2002/04/2002 040901u.htm
New Jersey Telecommunications Network Upgrade
https://www.nascio.org/publications/Newsletters/0601statetrends.cfm
Njedge.net http://www.njedge.net/
A Nation of Laboratories: Broadband Policy Experiments in the States, Alliance for Public Technology (APT) www.apt.org
State Broadband Initiatives, Telecommunications Industry Assn.
http://www.tiaonline.org/policy/states.cfm
Action Ideas for Cities and States, The Children's Partnership, http://www.techpolicybank.org/

New Mexico

Broadband Management Advisory Committee http://www.cio.state.nm.us/BMACChart er.pdf
A Nation of Laboratories: Broadband Policy Experiments in the States, Alliance for Public Technology (APT) www.apt.org
State Broadband Initiatives, Telecommunications Industry Assn.
http://www.tiaonline.org/policy/states.cfm
Action Ideas for Cities and States, The Children's Partnership, http://www.techpolicybank.org/

New York

Diffusion Fund www.nysed.gov/otpad/diffuse.htm
Regional Fiber Optic System http://www.uwnyc.org/technews/v2_n5 _a6.htmltm
New York State Telecommunications Association
A Nation of Laboratories: Broadband Policy Experiments in the States, Alliance for Public Technology (APT) www.apt.org
State Broadband Initiatives, Telecommunications Industry Assn.
http://www.tiaonline.org/policy/states.cfm
Action Ideas for Cities and States, The Children's Partnership, http://www.techpolicybank.org/

North Carolina

North Carolina's Rural Internet Access Authority: e-NC http://www.e-nc.org
North Carolina Telephone Association
A Nation of Laboratories: Broadband Policy Experiments in the States, Alliance for Public Technology (APT) www.apt.org
State Broadband Initiatives, Telecommunications Industry Assn.
http://www.tiaonline.org/policy/states.cfm
Action Ideas for Cities and States, The Children's Partnership, http://www.techpolicybank.org/

North Dakota

STAGENet http://www.stagenet.nd.gov
North Dakota Association of Telephone Cooperatives, North Dakota Telephone Association
A Nation of Laboratories: Broadband Policy Experiments in the States, Alliance for Public Technology (APT) www.apt.org
State Broadband Initiatives, Telecommunications Industry Assn.
http://www.tiaonline.org/policy/states.cfm
Action Ideas for Cities and States, The Children's Partnership, http://www.techpolicybank.org/

Ohio

Third Frontier Project www.state.oh.us/gov/thirdfrontier.htm
Ohio SchoolNet http://www.ohioschoolnet.k12.oh.us
Ohio Telecommunications Industry Association
A Nation of Laboratories: Broadband Policy Experiments in the States, Alliance for Public Technology (APT) www.apt.org
State Broadband Initiatives, Telecommunications Industry Assn.
http://www.tiaonline.org/policy/states.cfm
Action Ideas for Cities and States, The Children's Partnership, http://www.techpolicybank.org/

Oklahoma

OneNET http://www.onenet.net
"Wireless Broadband Opens Doors for Rural U.S. Communities"
http://www.wirelessnesfactor.com/perl/story/12805.html
Oklahoma Telephone Association
A Nation of Laboratories: Broadband Policy Experiments in the States, Alliance for Public Technology (APT) www.apt.org
State Broadband Initiatives, Telecommunications Industry Assn.
http://www.tiaonline.org/policy/states.cfm
Action Ideas for Cities and States, The Children's Partnership, http://www.techpolicybank.org/

Oregon

ORTCC http://www.ortcc.org/
Oregon Broadband Tax Credit http://www.econ.state.or.us/telecom/div 106.htm
Oregon Telecommunications Association
A Nation of Laboratories: Broadband Policy Experiments in the States, Alliance for Public Technology (APT) www.apt.org
State Broadband Initiatives, Telecommunications Industry Assn.
http://www.tiaonline.org/policy/states.cfm
Action Ideas for Cities and States, The Children's Partnership, http://www.techpolicybank.org/

Pennsylvania

"Digital Divide Projects Announced" http://www.121.org/news/newsarticle.html?ID=219
Technology Based Education Initiatives – Link 2 Learn/Pennsylvania Education Network/Ben Franklin Technology Development Authority http://www.inventpa.com/default.aspxid=135
Pennsylvania Telephone Association
A Nation of Laboratories: Broadband Policy Experiments in the States, Alliance for Public Technology (APT) www.apt.org
State Broadband Initiatives, Telecommunications Industry Assn.
http://www.tiaonline.org/policy/states.cfm
Action Ideas for Cities and States, The Children's Partnership, http://www.techpolicybank.org/

Puerto Rico

No broadband programs were found to exist in Puerto Rico at this time.

Rhode Island

Rhode Island Network for Educational Technology (RINET) www.ri.net/RINET/index.html
A Nation of Laboratories: Broadband Policy Experiments in the States, Alliance for Public Technology (APT) www.apt.org
State Broadband Initiatives, Telecommunications Industry Assn.
http://www.tiaonline.org/policy/states.cfm
Action Ideas for Cities and States, The Children's Partnership, http://www.techpolicybank.org/

South Carolina

"Bill Seeks to Exempt Internet Service From Regulation"
http://www.computeruser.com/news/03/02/17/news5.html
South Carolina Information Network (SCINET)
www.state.sc.us/http://www.edweek.org/sreports/tc/policy/states/sc.htm
A Nation of Laboratories: Broadband Policy Experiments in the States, Alliance for Public Technology (APT) www.apt.org
State Broadband Initiatives, Telecommunications Industry Assn.
http://www.tiaonline.org/policy/states.cfm
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South Dakota

"Building the Digital Dakota Network"
http://www.state.sd.us/deca/DDN4Learning/Conclave/DDNHist.htm
South Dakota Telecommunications Association
A Nation of Laboratories: Broadband Policy Experiments in the States, Alliance for Public Technology (APT) www.apt.org
State Broadband Initiatives, Telecommunications Industry Assn.
http://www.tiaonline.org/policy/states.cfm
Action Ideas for Cities and States, The Children's Partnership, http://www.techpolicybank.org/

Tennessee

ConnecTEN www.connect-tn.org
Tennessee Telecommunications Association
A Nation of Laboratories: Broadband Policy Experiments in the States, Alliance for Public Technology (APT) www.apt.org
State Broadband Initiatives, Telecommunications Industry Assn.
http://www.tiaonline.org/policy/states.cfm
Action Ideas for Cities and States, The Children's Partnership, http://www.techpolicybank.org/

Texas

Telecommunications Infrastructure Fund http://www.lonestarbroadband.org
Texas Telephone Association, Texas Statewide Telephone Cooperative
A Nation of Laboratories: Broadband Policy Experiments in the States, Alliance for Public Technology (APT) www.apt.org
State Broadband Initiatives, Telecommunications Industry Assn. http://www.tiaonline.org/policy/states.cfm
Action Ideas for Cities and States, The Children's Partnership, http://www.techpolicybank.org/

Utah

Utah Telecommunications Open Infrastructure Agency www.utopianet.org
Utah Education Network www.uen.org
Utah Telehealth Network http://www.utahtelehealth.net
EDNET http://www.uen.org/ednet
Utah Rural Telecom Association
A Nation of Laboratories: Broadband Policy Experiments in the States, Alliance for Public Technology (APT) www.apt.org
State Broadband Initiatives, Telecommunications Industry Assn. http://www.tiaonline.org/policy/states.cfm
Action Ideas for Cities and States, The Children's Partnership, http://www.techpolicybank.org/

Vermont

Vermont Broadband Council www.vtbroadband.org
Telephone Association of Vermont
A Nation of Laboratories: Broadband Policy Experiments in the States, Alliance for Public Technology (APT) www.apt.org
State Broadband Initiatives, Telecommunications Industry Assn. http://www.tiaonline.org/policy/states.cfm
Action Ideas for Cities and States, The Children's Partnership, http://www.techpolicybank.org/

Virgin Islands

"INSTALLGUYS Surpasses Customer's Expectations" http://www.installguys.com/vi-userprofile.cfm
A Nation of Laboratories: Broadband Policy Experiments in the States, Alliance for Public Technology (APT) www.apt.org
State Broadband Initiatives, Telecommunications Industry Assn. http://www.tiaonline.org/policy/states.cfm
Action Ideas for Cities and States, The Children's Partnership, http://www.techpolicybank.org/

Virginia

Blacksburg Electronic Village (BEV) http://www.bev.net
eCorridors http://ecorridors.cc.vt.edu/index.shtml
Center for Innovative Technology (CIT) http://www.cit.org
Net.Work.Virginia http://www.networkvirginia.net
"Virginia's Center for Innovative Technology Awards Grants to Augusta, Highland, and Nelson Counties" http://www.cit.org/press_releases/01-07-25PR%20ACAF%20Augusta%20County.pdf
Carolina-Virginia Telephone Membership Association
Virginia Telecommunications Industry Association
A Nation of Laboratories: Broadband Policy Experiments in the States, Alliance for Public Technology (APT) www.apt.org
State Broadband Initiatives, Telecommunications Industry Assn. http://www.tiaonline.org/policy/states.cfm
Action Ideas for Cities and States, The Children's Partnership, http://www.techpolicybank.org/

Washington

Access Washington www.wa.gov/dis/k20
Washington Independent Telephone Association
A Nation of Laboratories: Broadband Policy Experiments in the States, Alliance for Public Technology (APT) www.apt.org
State Broadband Initiatives, Telecommunications Industry Assn. http://www.tiaonline.org/policy/states.cfm
Action Ideas for Cities and States, The Children's Partnership, http://www.techpolicybank.org/

West Virginia

YAS Broadband Initiative http://www.lcsee.cemr.wvu.edu/yas
West Virginia Department of Education Office of Technology http://access.k12.wv.us
West Virginia Network (WVNET) http://www.wvnet.edu/wvndex.shtml
West Virginia Telephone Association
A Nation of Laboratories: Broadband Policy Experiments in the States, Alliance for Public Technology (APT) www.apt.org
State Broadband Initiatives, Telecommunications Industry Assn. http://www.tiaonline.org/policy/states.cfm
Action Ideas for Cities and States, The Children's Partnership, http://www.techpolicybank.org/

Wisconsin

Wiscnet http://www.wiscnet.net
Wisconsin State Telecommunications Association
A Nation of Laboratories: Broadband Policy Experiments in the States, Alliance for Public Technology (APT) www.apt.org
State Broadband Initiatives, Telecommunications Industry Assn. http://www.tiaonline.org/policy/states.cfm
Action Ideas for Cities and States, The Children's Partnership, http://www.techpolicybank.org/

Wyoming

Southwestern Wyoming Enhanced &Expanded Telecommunications Network (SWEETnet) http://www.sweetnet.us
Wyoming Equality Network http://www.k12.wy.us
A Nation of Laboratories: Broadband Policy Experiments in the States, Alliance for Public Technology (APT) www.apt.org
State Broadband Initiatives, Telecommunications Industry Assn. http://www.tiaonline.org/policy/states.cfm
Action Ideas for Cities and States, The Children's Partnership, http://www.techpolicybank.org/

Appendix C

Glossary of Broadband Terms

Glossary

- **3G** – *Third Generation*: Intended to be the nest great wireless technology, wideband mobile services and applications offering users faster access to the web.

- **ADSL** - *Asymmetric Digital Subscriber Line*: DSL service with a larger portion of the capacity devoted to downstream communications, less to upstream. Typically thought of as a residential service.

- **ATM** – *Asynchronous Transfer Mode*: A data service offering by ASI, that can be used for interconnection of customer's LAN. ATM provides service from 1 Mbps to 145 Mbps utilizing Cell Relay Packets.

- **Bandwidth** – The amount of data transmitted in a given amount of time; usually measured in bits per second, kilobits per second, and megabits per second.

- **Bit** – A single unit of data, either a one or a zero. In the world of broadband, bits are used to refer to the amount of transmitted data. A kilobit (Kb) is approximately 1,000 bits. A megabit (Mb) is approximately 1,000,000 bits.

- **BPL** – *Broadband Over Powerline*: A theoretical technology that would provide broadband service over existing electrical power lines.

- **BPON** – *Broadband Passive Optical Network*: BPON is a point-to-multipoint fiber-lean architecture network system which uses passive splitters to deliver signals to multiple users. Instead of running a separate strand of fiber from the CO to every customer, BPON uses a single strand of fiber to serve up to 32 subscribers.

- **Broadband** – A descriptive term for evolving digital technologies that provide consumers with integrated access to voice, high-speed data service, video-demand services, and interactive delivery services (e.g. DSL, Cable Internet).

- **CAP** – *Competitive Access Provider*: (or "Bypass Carrier") A Company that provides network links between the customer and the Inter-Exchange Carrier or even directly to the Internet Service Provider. CAPs operate private networks independent of Local Exchange Carriers.

- **CBO** – *Community Based Organizations*: Groups serving a community that are eligible for California Teleconnect Fund (CTF) Subsidy.

- **Cellular** – A mobile communications system that uses a combination of radio transmission and conventional telephone switching to permit telephone communications to and from mobile users within a specified area.

- **CEQA** – *California Environmental Quality Act*: Enacted in 1970, it requires government agencies to evaluate the environment impact of public construction projects.

- **CLEC** – *Competitive Local Exchange Carrier*: Wireline service provider that is authorized under state and Federal rules to compete with ILECs to provide local telephone service. CLECs provide telephone services in one of three ways or a combination thereof: a) by building or rebuilding telecommunications facilities of their own, b) by leasing capacity from another local telephone company (typically an ILEC) and reselling it, and c) by leasing discreet parts of the ILEC network referred to as UNEs.

- **CO** – *Central Office*: A circuit switch where the phone lines in a geographical area come together, usually housed in a small building.

- **Coaxial Cable** – A type of cable that can carry large amounts of bandwidth over long distances. Cable TV and cable modem service both utilize this technology.

- **CPCN** – *Certificate of Public Convenience and Necessity*: Authorization given by the CPUC to telecommunications carriers in order to provide service in the state of California.

- **CPUC** – *California Public Utilities Commission*: The organization mandated by the state Constitution to regulate public utilities in California.

- **CTF** – *California Teleconnect Fund*: A public program that provides subsidizes phone and data service to schools, hospitals, CBOs, and other qualified institutions in California. Benefits are calculated net of E-rate Federal subsidy.

- **CWDM** – *Coarse Wavelength Division Multiplexing (WDM):* is generally held to be WDM with less than 8 active wavelengths per fibre.

- **DDTP –** *Deaf and Disabled Telephone Program*: A public program that provides benefits, including specialized equipment, to qualified California disabled customers.

- **Dial-Up** – A technology that provides customers with access to the Internet over an existing telephone line.

- **DLEC –** *Data Local Exchange Carrier*: DLECs deliver high-speed access to the Internet, not voice. DLECs include Covad, Northpoint and Rhythms.

- **Downstream** – Data flowing from the Internet to a computer (Surfing the net, getting E-mail, downloading a file).

- **DSL –** *Digital Subscriber Line*: The use of a copper telephone line to deliver “always on” broadband Internet service.

- **DSLAM** – *Digital Subscriber Line Access Multiplier*: A piece of technology installed at a telephone company’s CO and connects the carrier to the subscriber loop (and ultimately the customer’s PC).

- **DWDM** – *Dense Wavelength Division Multiplexing (WDM):* A SONNET term which is the means of increasing the capacity of Sonet fiber-optic transmission systems.

- **E-Rate** – A Federal program that provides subsidy for voice and data lines to qualified schools, hospitals, CBOs, and other qualified institutions. The subsidy is based on a percentage designated by the FCC. CTF benefits are calculated net of the E-rate subsidy.

- **EON** – *Ethernet Optical Network*: The use of Ethernet LAN packets running over a fiber network.

- **EvDO** – *Evolution Data Only*: EvDO is a new wireless technology that provides data connections that are 10 times as fast as a regular modem.

- **FCC** – *Federal Communications Commission*: A Federal regulatory agency that is responsible, among other things, of regulating VoIP.

- **FTTN** – *Fiber To The Neighborhood*: A hybrid network architecture involving optical fiber from the carrier network, terminating in a neighborhood cabinet with converts the signal from optical to electrical.

- **FTTP** – *Fiber To The Premise (Or FTTB – Fiber To The Building)*: A fiber optic system that connects directly from the carrier network to the user premises.

- **GPON** - *Gigabyte-Capable Passive Optical Network*: GPON uses a different, faster approach (up to 2.5 Gbit/s in current products) than BPON.

- **GPS** – *Global Positioning System*: A system using satellite technology that allows an equipped user to know exactly where he is anywhere on earth.

- **GSM** – *Global System for Mobile Communications*: This is the current radio/telephone standard in Europe and many other countries except Japan and the United States.

- **HFC** – *Hybrid Fiber Coaxial Network*: An outside plant distribution cabling concept employing both fiber optic and coaxial cable.

- **IEEE** - *Institute of Electrical and Electronics Engineers*

- **ILEC** – *Incumbent Local Exchange Carrier*: The traditional wireline telephone service providers within defined geographic areas. Prior to 1996, ILECs operated as monopolies having the exclusive right and responsibility for providing local and local toll telephone service within LATAs. ILECs include regional Bell operating companies such as SBC and non-Bell affiliated companies such as SureWest, both in California.

- **IP-VPN** – *Internet Protocol -Virtual Private Network*: A software-defined network offering the appearance, functionality and usefulness of a dedicated private network

- **ISDN** – *Integrated Services Digital Network*: An alternative method to simultaneously carry voice, data and other traffic, using the switched telephone network.

- **ISP –** *Internet Service Provider*: A company providing Internet access to consumers and businesses, acting as a bridge between customer (end-user) and infrastructure owners for dial-up, cable modem and DSL services.

- **Kbps** – *Kilobits per second*: 1,000 bits per second. A measure of how fast data can be transmitted.

- **LAN** – *Local Area Network*: A geographically localized network consisting of both hardware and software. The network can link workstations within a building or multiple computers with a single wireless Internet connection.

- **LATA** – *Local Access and Transport Areas*: A geographic area within with a divested Regional Bell Operating Company is permitted to offer exchange telecommunications and exchange access service. Calls between LATAs are often thought of as longs distance service. Calls within a LATA (IntraLATA) typically include local and local toll services.

- **Local Loop** – A generic term for the connection between the customer's premises (home, office, etc.) and the provider's serving central office. Historically, this has been a wire connection; however, wireless options are increasingly available for local loop capacity.

- **MAN** – *Metropolitan Area Network*: A high-speed date intra-city network that links multiple locations with a campus, city or LATA. A MAN typically extends as far as 50 kilometers.

- **Mbps** – *Megabits per second*: 1,000,000 bits per second. A measure of how fast data can be transmitted.

- **Overbuilders** – Building excess capacity. In this context, it involves investment in additional infrastructure project to provide competition.

- **OVS** – *Open Video Systems*: OVS is a new option for those looking to offer cable television service outside the current framework of traditional regulation. It would allow more flexibility in providing service by reducing the build out requirements of new carriers.

- **PON** – *Passive Optical Network*: A Passive Optical Network consists of an optical line terminator located at the Central Office and a set of associated optical network terminals located at the customer's premise. Between them lies the optical distribution network comprised of fibers and passive splitters or couplers. In a PON network, a single piece of fiber can be run from the serving exchange out to a subdivision or office park, and then individual fiber strands to each building or serving equipment can be split from the main fiber using passive splitters / couplers. This allows for an expensive piece of fiber cable from the exchange to the customer to be shared amongst many customers thereby dramatically lowering the overall costs of deployment for fiber to the business (FTTB) or fiber to the home (FTTH) applications.

- **Rights-of-Way** – Legal rights of passage over land owned by another. Carriers and service providers must obtain rights-of-way to dig trenches or plant poles for cable systems, and to place wireless antennae.

- **RPR** – *Resilient Packet Ring*: RPR uses Ethernet switching and a dual counter-rotating ring topology to provide SONET-like network resiliency and optimized bandwidth usage, while delivering multi-point Ethernet/IP services.

- **RUS** – *Rural Utility Service*: A division of the United States Department of Agriculture, it promotes universal service in unserved and underserved areas of the country with grants, loans, and financing.

- **SONNET** – *Synchronous Optical Network*: A family of fiber-optic transmission rates.

- **Streaming** – A Netscape innovation that downloads low bit text data first, then the higher bit graphics. This allows users to read the text of an Internet document first, rather than wait for the entire file to load.

- **Subscribership** – Subscribership is how many customers have subscribed for a particular telecommunications service.

- **Switched Network** – A domestic telecommunications network usually accessed by telephones, key telephone systems, private branch exchange trunks, and data arrangements.

- **T-1** – *Trunk Level 1*: A digital transmission link with a total signaling speed of 1.544 Mbps. It is a standard for digital transmission in North America.

- **T-3** – *Trunk Level* 3: 28 T1 lines or 44.736 Mbps.

- **ULTS** – *Universal Lifeline Telephone Service*: A public program that provides subsidized basic telephone service to qualified low-income individuals in California.

- **UNE** – *Unbundled Network Elements*: Leased portions of a carrier's (typically an ILEC's) network used by another carrier to provide service to customers.

- **Universal Service** – The idea of providing every home in the United States with basic telephone service.

- **Upstream** – Data flowing from your computer to the Internet (sending E-mail, uploading a file).

- **VDSL** – *Very High Data Rate Digital Subscriber Line*: A developing technology that employs an asymmetric form of ADSL, with projected speeds of up to 155 Mbps.

- **Video On Demand** – A service that allows users to remotely choose a movie from a digital library and be able to pause, fast-forward, or even rewind their selection.

- **VLAN** – *Virtual Local Area Network*. A network of computers that behave as if they are connected to the same wire even though they may actually be physically located on different segments of a LAN.

- **VoIP** – *Voice Over Internet Protocol*: A new technology that employs a data network (such as a broadband connection) to transmit voice conversations.

- **VPN –** *Virtual Private Network*: *VPN is* a network that is constructed by using public wires to connect nodes. For example, there are a number of systems that enable you to create networks using the Internet as the medium for transporting data. These systems use encryption and other security mechanisms to ensure that only authorized users can access the network and that the data cannot be intercepted.

- **WiMax** - WiMax is a wireless technology that provides high-throughput broadband connections over long distances. WiMax can be used for a number of applications, including "last mile" broadband connections, hotspot and cellular backhaul, and high-speed enterprise connectivity for businesses.

- **Wireless** – Telephone service transmitted via cellular, PCS, satellite, or other technologies that do not require the telephone to be connected to a land-based line.

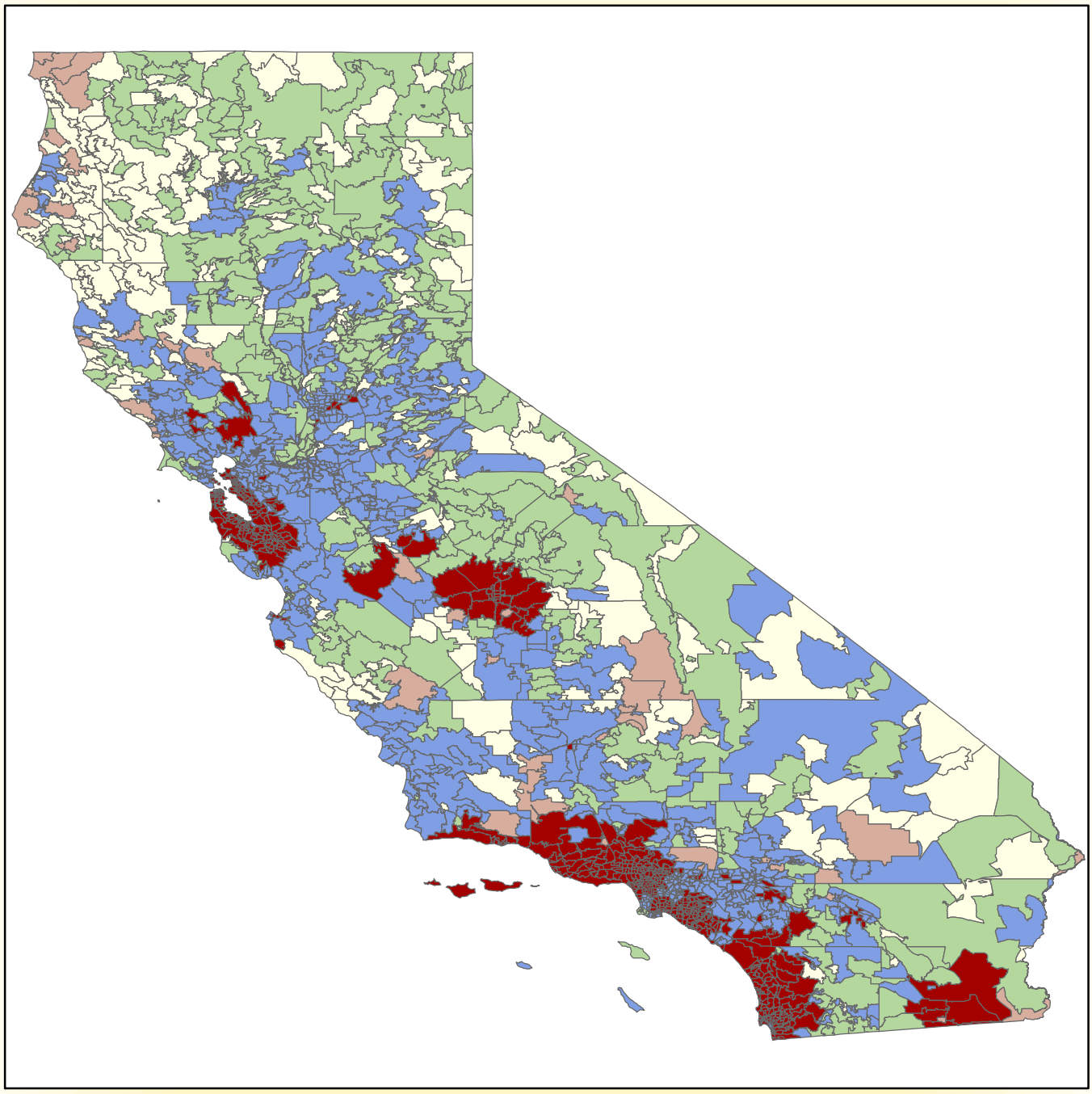
- **Wireless Internet** – 1) Internet applications and access using mobile devices such as cell phones and palm devices. 2) Broadband Internet service provided via wireless connection, such as satellite or tower transmitters.

- **Wireline** – Service based on infrastructure on or near the ground, such as copper telephone wires or coaxial cable underground or on telephone poles.

Sources include the Glossary of the July 5, 2002 report on "The Status of Telecommunications Competition in California" submitted to the California State Legislature by the CPUC, the FCC Website, the Intel.com Website, Webopedia.com, the Passive Optical Networks Forum, and Newton's Telecom Dictionary, 16th Expanded and Updated Edition.

Map 1

BROADBAND AVAILABILITY ILLUSTRATED BY ZIP CODE
As of June 2004



Broadband Technologies per Zip Code

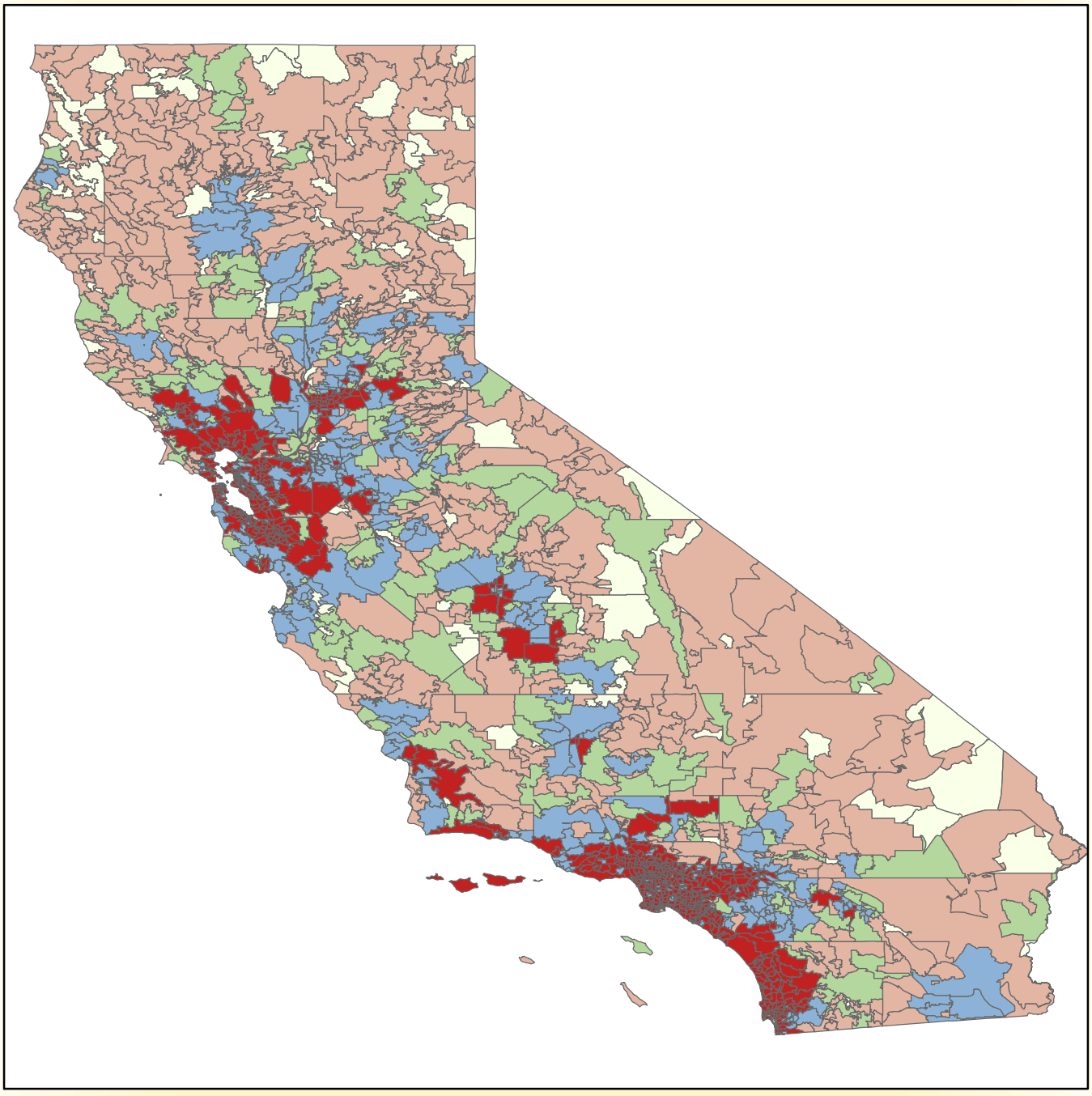
- Satellite Only
- Cable/Satellite
- DSL/Satellite
- Cable/DSL/Satellite
- Cable/DSL/Satellite/Wireless

Sources: FCC Form 477 Data, as of June 2004.
Independent CPUC staff research.

Form 477 data establishes that reporting California broadband providers have at least one customer within the identified zip code area. This representation does not depict the availability of broadband for every resident in each identified zip code area.

Map 2

NUMBER OF SERVICE PROVIDERS ILLUSTRATED BY ZIP CODE
As of June 2004



# of Broadband Service Providers per Zip Code:

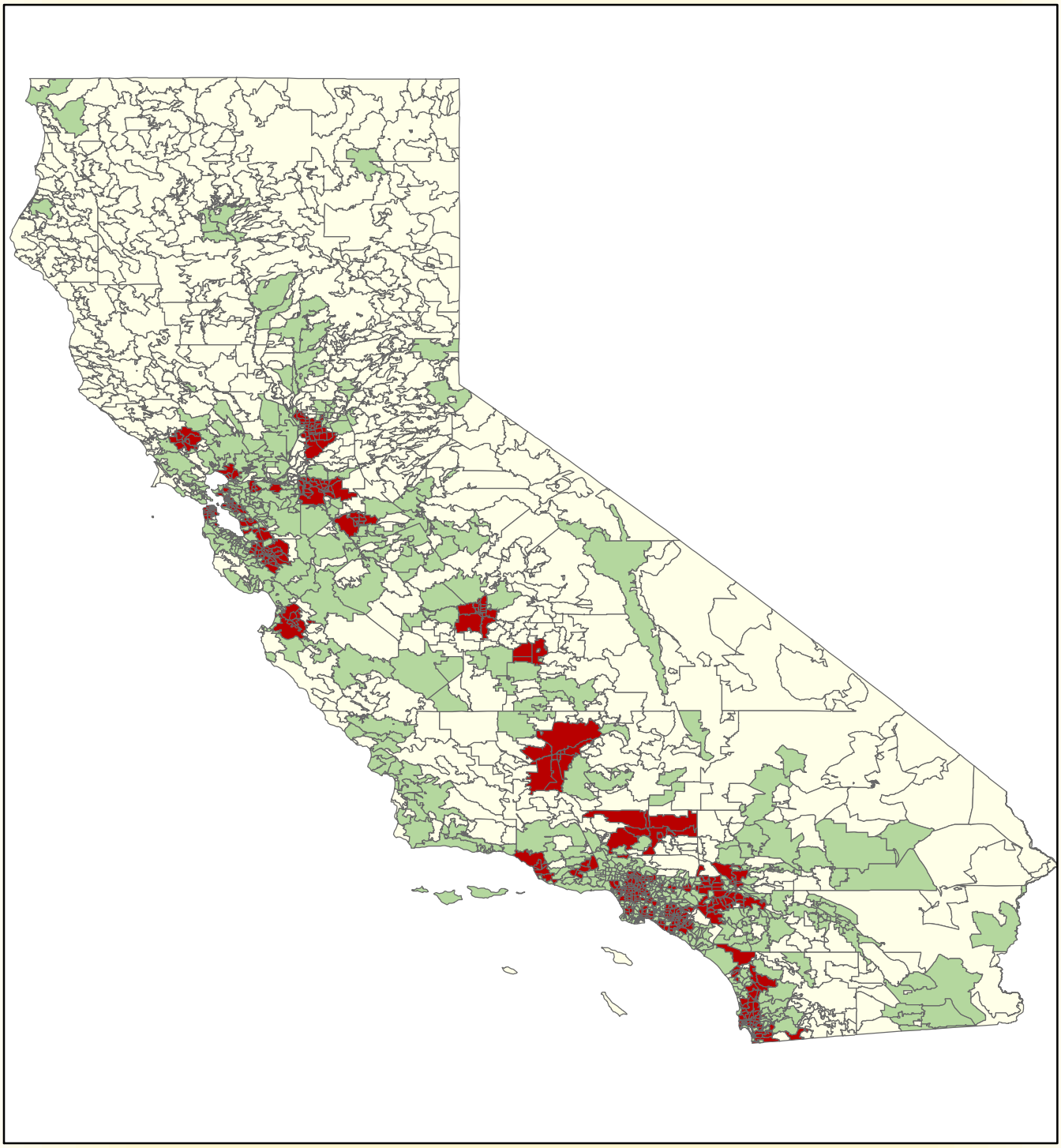
- 1
- 2 - 3
- 4 - 5
- 6 - 10
- 11 - 23

Sources: FCC Form 477 Data, as of June 2004.
Independent CPUC staff research.

Form 477 data establishes that reporting California broadband providers have at least one customer within the identified zip code area. This representation does not depict the availability of broadband for every resident in each identified zip code area.

Map 3

CALIFORNIA POPULATION ILLUSTRATED BY ZIP CODE
As of January 2004



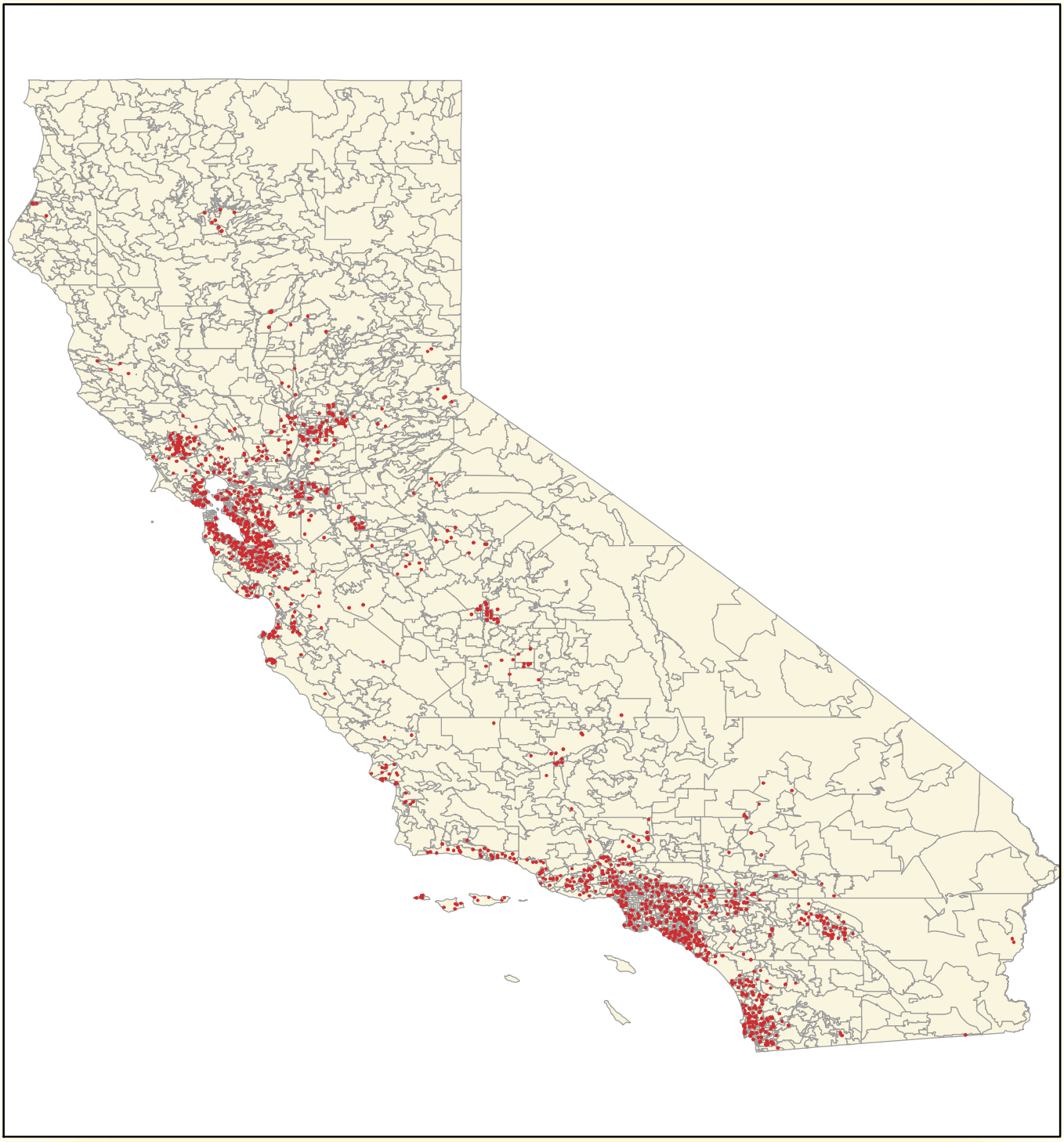
Population per Zip Code:

- 1 - 5,000 (51%)
- 5,001 - 100,000 (28%)
- 100,001 - 3,912,200 (21%)

Source: California Department of Finance, Demographic Reseach Unit

Map 4

WiFi HOTSPOTS ILLUSTRATED BY ZIP CODE
As of January 2005



State of California
WiFi Hot Spots by Zip Code:
1 Dot = 1 Hot Spot Location

Source: http://intel.jiwire.com/browse-hotspot-united-states-us-california-ca-5