

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

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

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

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

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

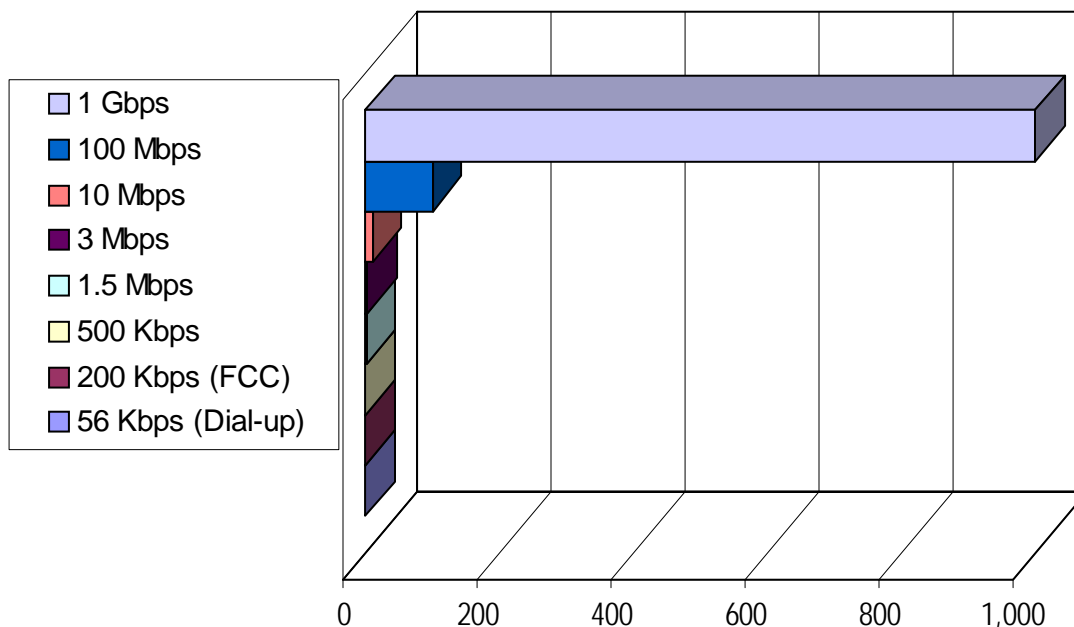
The proliferation of bandwidth-intensive applications is the key driver of broadband adoption. Access to a “pipe” is merely a means of obtaining products and applications such as the Internet, video on demand, news services, interactive gaming, chatting, telephony and countless other services. Policies 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 DVD¹³ from New York to California.

Figure 1.2
Speed and Bandwidth¹⁴

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.