By D. Corwin Jackson, guest contributor

In Ten Sleep, a rural Wyoming town of roughly 300 residents, a state of the art high-speed communications network is allowing teachers to instruct language students on the nuances of English pronunciation over the Internet.[1] Their students, however, do not live in Ten Sleep or even in Wyoming. They live over 5,800 miles away in South Korea. High quality video conferencing enables teachers in Ten Sleep to *show* their students how to make English language sounds. South Korea has one of the most advanced "broadband" networks in the world, with residents enjoying fiber-optic connections to the Internet and extremely high-speed service. Ten Sleep is served by a similar network. Few such services exist elsewhere in the Rocky Mountain region, giving Ten Sleep a surprising advantage over other Rockies rural populations in attracting business opportunities such as the fledgling distance learning program.

Connectivity may revitalize the Rockies' existing communities and redefine their future in a globalized world while still accommodating local ideals. Many policymakers have linked broadband connectivity to economic development and growth. According to Federal Communications Commission (FCC) Chairman Kevin Martin,

> *Broadband technology is a key driver of economic growth. The ability to share increasing amounts of information, at greater and greater speeds, increases productivity, facilitates interstate commerce, and helps drive innovation. But perhaps most important, broadband has the potential to affect almost every aspect of our lives.*[2]

While the promise may be extraordinary, broadband availability in the United States lags behind that in many other nations. The Organization for Economic Co-operation and Development (OECD) reports that the United States, despite being home to many of the inventors of broadband technology, ranks 12th among OECD members in the number of broadband subscribers per 100 inhabitants.[3]

Understanding the current distribution and uses of domestic broadband services is critical as policymakers look to broadband technology as an engine for innovation and prosperity. This section of the *State of the Rockies Report Card* outlines what is meant by broadband service: a term used to describe high-speed Internet access. It then frames the burgeoning policy debate by describing some of the history driving the broadband discussion in the United States, and reasons why broadband connectivity matters. Finally, data from the FCC showing the state of the broadband market in the Rockies Region are presented. The data show robust competition for broadband consumers in some parts of the region. Though the data are not without problems, an empirical understanding of the state of this communication market is critical to crafting policies to promote connectivity in all parts of the Rockies.

Broadband and its Applications

Broadband is a central term in modern communications technology, policy, and colloquy. Like the name suggests, a broadband system has a wide band of frequencies (or a wide "bandwidth") for transmitting information. Wider bandwidth allows more information to be sent in shorter periods of time. For example, broadband connections allow information from the Internet to be more rapidly delivered to a user compared with older dial-up modem connections.

Definitions of what constitutes broadband vary. In general, however, broadband systems range from 200 kilobits per second ("kbps", or thousands of bits of information per second) at the low end, to between 1 and 5 megabits per second ("mbps", or millions of bits per second) for most commercial services. More advanced platforms, such as the network that serves Ten Sleep, Wyoming, can provide speeds as high as 100 mbps.

Broadband service is available over a variety of physical platforms. Americans most commonly subscribe to a cable modem service, which transmits data over a coaxial cable television system, or to a Digital Subscriber Line (DSL) service, which transmits data over a standard telephone line. Next-generation wireline connections include dedicated fiber-optic lines and broadband over power lines. Consumers may also subscribe to wireless services, both satellite and ground-based. Finally, cellular telephone companies are rapidly deploying *mobile* broadband services.

The applications offered by broadband telecommunication services are even more diverse. Consumers seek entertainment by watching their favorite television shows online, as well as parodies of those shows posted on YouTube. Firms try to increase productivity and security by storing critical data in remote locations connected by broadband links.

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Finally, broadband affects lifestyles. Broadband connectivity is influencing the design of novel communities in the Rockies Region. Mesa del Sol is a planned community near Albuquerque, New Mexico, designed by Peter Calthorpe based on the principles of New Urbanism—a movement to transform urban centers and combat suburban sprawl and traffic congestion by creating walkable communities that integrate various businesses, services, and housing options around vibrant community centers. Central to this goal is Mesa del Sol's connectivity. High-quality Internet connections allow residents to videoconference with co-workers and clients around the world, without the personal sacrifice and energy dependence of commuting and extensive travel.[4] Connected communities need not be planned to facilitate such travel, nor is proximity to traditional commercial centers of primary concern.

Broadband Statistics and Policies

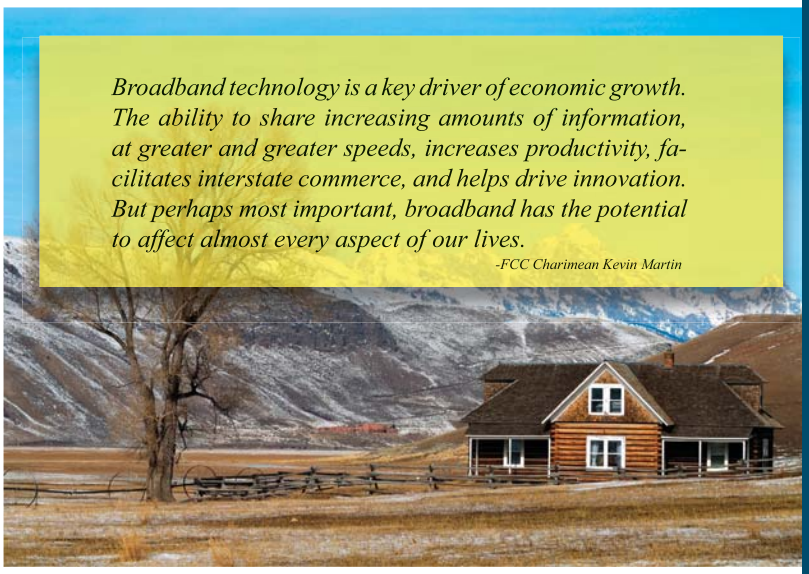
By many accounts, broadband service has the potential to improve the lives of Rockies' citizens. As noted above, the United States still lags behind a number of other countries in terms of broadband deployment. Thus, it is important to collect and examine statistics on broadband distribution to monitor our nation's connectivity: the current state of broadband deployment should guide policymakers who may regard the service as a tool for economic and social development.

For example, as part of a broader scheme announced in 2004 touted to promote economic growth and socially beneficial applications, President George W. Bush set a goal of "universal, affordable access to broadband technology by 2007."[5] The 2008 presidential candidate Barack Obama has suggested a system of "broadband lines through the heart on inner cities and rural towns all across America."[6] In 2006, Senator Hillary Clinton also proposed the Rural Broadband Initiative Act to encourage rural broadband availability.[7] Policymakers often promise that broadband will promote economic development and enhance social welfare. When it comes to implementing policy to achieve such availability, however, proposals differ.

The current policy trend for promoting broadband deployment is to craft a regulatory regime that will not inhibit innovation and yet promote deployment. Some measures aim to eliminate barriers to entry into the broadband market by rival platforms such as wireless and broadband over power line technologies. On the other hand, traditional telephone providers are heavily regulated but have achieved what is commonly referred to as "universal service." Despite the ubiquity of telephone service, regulators have been reluctant to impose similar regulations on broadband services for fear of stifling the nascent industry. These relatively minimal regulatory regimes are quite contrary to the history of the connectivity policy that historically helped deploy the telephone network.

Universal and affordable access to telephone service has long been a U.S. social policy, although the best methods for its implementation have been questioned. In 1907, for example, AT&T president Theodore Vail espoused "one system, one policy, universal service."[8] Vail's vision is subject to interpretation (One affordable rate? One interconnected network? One monopoly provider?), but the Telecommunications Act of 1996 evidences a national commitment to affordable and universal access to communications:

> *Consumers in all regions of the Nation, including low-income consumers and those in rural, insular, and high cost areas, should have access to telecommunications…at rates that are reasonably comparable to rates charged for similar services in urban areas.*[9]



Universal service has been traditionally achieved through a system of implicit rate subsidies. Above cost rates for long-distance service, business service, local network interconnection and geographic rate averaging have historically been used to offset high rural telephone costs. Competition in this market from converging technological platforms and applications, as well as the increasing availability of lower cost alternatives to traditional telephone networks, undermines the allure and even the feasibility of such subsidies. Further, this national policy of affordable access to basic telephone service has been largely devoid of tests to determine whether consumers are willing to pay more cost based prices.[10] While needs-tested subsidies exist for low income telephone service consumers, most funds distributed under the current universal service regime merely target services that are above a nationwide average cost. The system of taxes and distributions is also confined to the communications industry itself and lacks the oversight and political accountability of the general appropriations process even though in 2006, $7.3 billion is estimated to have been distributed.[11]

The telephone system has historically been considered a regulated monopoly, and universal service policies have reflected this market structure. The telephone market service market, however, is becoming competitive. Certainly, competition stresses implicit subsidies, but even explicit support may be misguided in competitive industries. For example, the efficacy of universal service policies in fueling the growth in telephone service availability has been questioned.[12] It is argued that the early market for telephone service was competitive, and that this competition drove telephone service penetration into communities and rural areas. This suggests that instead of government intervention, short term unregulated monopoly as a reward for capital expense and innovation may more efficiently drive availability.

Nevertheless, the system of supporting and encouraging ubiquitous telephone service has spilled over into broadband service. The federal universal service support system finances Internet service in schools and libraries and supports a rural health care initiative. At the same time, a low cost loan program administered by the U.S. Department of Agriculture funds rural broadband access platforms.

While these are measured steps, broader economic rationales are sometimes used to argue in favor of added plans.

In network industries, the value of a network is directly proportional to the number of subscribers to it. Such "network effects" and "network externalities" (e.g., how the abandonment of a network by one subscriber impacts other subscribers) are guiding concepts for competition policy and sometimes universal service rhetoric.[13] Akin to the network effects principle outlined above is the idea that a robust platform market will spur the development of new applications—a sort of positive feedback loop. Thus, early yet active support for broadband platform deployment may be beneficial.[14]

Applications such as "telemedicine" initiatives benefit from this type of support. The Eastern Montana Telemedicine Network, for example, is a system of interconnected hospitals and health clinics. Specialists in a variety of fields from the Billings Clinic can examine patients and confer with other physicians in towns throughout eastern Montana, many hundreds of miles from Billings. Other telemedicine successes include remote dentistry in insolated parts of Alaska.[15] In this manner, rural areas can enjoy the benefits of medical specialists who are generally concentrated in urban areas.

A competitive, widely available service probably does not need a support system similar to that adopted for telephone service in the U.S. Should availability and competition prove scant, active support may become more attractive.. The following statistics provide a cursory view of the Rocky Mountain West's broadband connectivity.

Broadband Availability as of December 31, 2005 - The FCC's Data

The Federal Communications Commission is statutorily charged with promoting the deployment of "advanced services."[16] To this end, the FCC collects data on broadband deployment semiannually. The data collected by the FCC as of December 31, 2005, are the basis for the summary below.

For reporting purposes, the FCC defines broadband transmission as a customer's ability to send or receive information at 200 kbps in at least one direction (either uploading or downloading from the Internet). Holding companies (groups of affiliated providers) and other facilities-based broadband service providers (those who own or lease the physical facilities needed to transmit data, including for wireless transmission) are required to report the zip codes in which they serve at least one customer, with the assumption that subscribership indicates broadband availability. If subscribership to multiple entities is reported in a zip code, there is competition between those entities for subscribers. As discussed below, there may be some problems with the use of subscribership as a proxy for deployment.

According to the FCC's report, at the end of 2005 there were roughly 50 million broadband service subscribers (both residential and business) in the United States.[17] Of U.S. zip codes, 99% reported at least one high-speed service provider, with the vast majority having broadband service from a satellite-based service provider. Increasingly, cellular telephone companies are reporting broadband subscribers. Cable modem service and DSL are not as geographically ubiquitous as satellite service, but are by far the most widely adopted technologies.

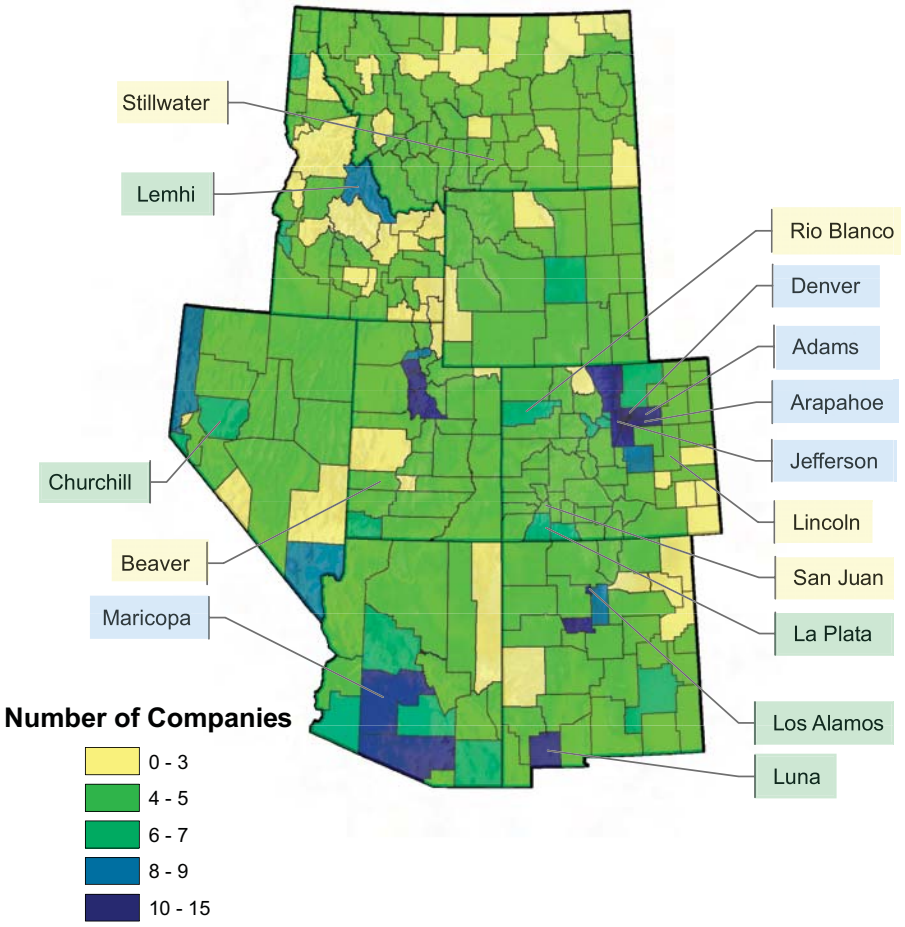
The data show pervasive connectivity and robust competition in the Rocky Mountain region. Naturally, population centers such as Denver, Salt Lake, and Maricopa Counties have abundant providers (Figure 1). The overwhelming majority of Rockies counties—both rural and urban—have at least four providers of broadband service. Given the traditional difficulties of connecting rural citizens, this is a remarkable figure.

The FCC's collection and reporting methods, however, are often criticized. First, the FCC's defines "broadband" by a low minimum capacity value. It is difficult to provide many of the cutting-edge applications with a 200 kbps connection (note that the OECD statistics cited above also define broadband as only 256 kbps.). Further, few providers define their service territories on the basis of zip codes, and entities need only serve one customer in a zip code to report providing service there. It is thus unclear whether entire zip codes are served. The Governmental Accountability Office (GAO) has recently reported that "although these data indicate that broadband availability is extensive, we found that FCC's…data may not be useful for assessing broadband deployment at the local level."[18] Further, the GAO states that "we believe that the use of subscriber indicators at the zip-code level to imply availability, or deployment, may overstate terrestrially based deployment."[19] In Kentucky, for example, the GAO found that the FCC's statistics may have overstated availability by nearly 25%.[20]

The Road Ahead

While the FCC data are open to question, collecting data on a local level is important. Without understanding how the industry is developing and serving the Rockies Region now, it is difficult to craft policy to affect development in the future. To the extent that competition is an important factor for pushing service into new areas with better connectivity, the data collected for this snapshot of Rockies connectivity are encouraging. If, on the other hand, true access in rural and poor areas remains sparse but socially and politically desirable, then aggressive new policy initiatives are needed. Without world-class communication in all parts of the Rockies, the region risks being disconnected just as the world moves from traditional landline telephone service into the new frontier of rapid and robust broadband communications.

Figure 1
Average Number of Holding Companies Reporting High Speed Subscribers as of Dec. 31, 2005
Source: Federal Communications Commission



Top 5
Metropolitan Counties

County, State	Average number of holding companies
Arapahoe, CO	13.5
Denver, CO	13.1
Maricopa, AZ	13.0
Jefferson, CO	12.8
Adams, CO	12.6

Top 5
Micropolitan Counties

County, State	Average number of holding companies
Los Alamos, NM	11.0
Luna, NM	10.0
Lemhi, ID	8.5
La Plata, CO	7.2
Churchill, NV	7.0

Top 5
Rural Counties

County, State	Average number of holding companies
Rio Blanco, CO	6.0
San Juan, CO	5.0
Beaver, UT	4.9
Lincoln, CO	4.4
Stillwater, MT	4.1

Endnotes

[1]Ruffin Prevost, "Wyoming Call Center Caters to S. Koreans," *Billings Gazette*, Feb. 20, 2007).
[2]Remarks of FCC Chairman Kevin J. Martin, "Imagining the Digital Healthcare Future in the Rural West," Montana State University – Bozeman Burns Technology Center July 7, 2006 http://hraunfoss.fcc.gov/edocs_public/attachmatch/DOC-266347A1.pdf .
[3]OCED Broadband Statistics to June 2006, http://www.oecd.org/document/9/0,2340,en_2649_34223_37529673_1_1_1_1,00.html#Data2005 .
[4]"The Easiest Commute of All," *BusinessWeek Online*, 12/12/05, http://www.businessweek.com/magazine/content/05_50/b3963137.htm .
[5]http://www.whitehouse.gov/infocus/technology/economic_policy200404/chap4.html .
[6]http://www.washingtonpost.com/wp-dyn/content/article/2007/02/10/AR2007021000879.html .
[7]http://clinton.senate.gov/news/statements/details.cfm?id=264465 .
[8]Jonathan E. Neuchterlein and Philip J. Weiser, *Digital Crossroads: American Telecommunications Policy in the Internet Age*, MIT Press, 2005: p 387.
[9]47 U.S.C. § 254(b)(3) (2007). The Telecommunications Act of 1996 was intended to make the traditionally implicit system of subsidization explicit, and purported to adopt an evolving standard of service to be subsidized.
[10]Jonathan E. Neuchterlein and Philip J. Weiser, *Digital Crossroads: American Telecommunications Policy in the Internet Age*, MIT Press, 2005: 352.
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[15]Remarks of FCC Chairman Kevin J. Martin, "Imagining the Digital Healthcare Future in the Rural West," Montana State University – Bozeman Burns Technology Center July 7, 2006
[16]47 U.S.C. 157.
[17]High Speed Services for Internet Access: Status as of December 31, 2005, Industry Analysis and Technology Division, Wireline Competition Bureau (July, 2006) http://hraunfoss.fcc.gov/edocs_public/attachmatch/DOC-266596A1.pdf .
[18]Broadband Deployment is Extensive throughout the United States, but It Is Difficult to Assess the Extent of Deployment Gaps in Rural Areas 15, GAO Report to Congressional Committees, GAO-06-426 (May, 2006) available at http://www.gao.gov/new.items/d06426.pdf.
[19]*Ibid.* P. 17.
[20]*Ibid.*