The Potential for Open Access Networks in Minnesota: A New Community-Based Approach

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Current Broadband Status

The increasing importance of broadband telecommunication service as an essential component of community infrastructure has become well documented. Furthermore, broadband has been available long enough to quantify its economic impact, including through comparisons of communities that have the service with those that do not.[1] Today the question facing rural communities is no longer, "Do we need broadband?" Rather, the question is how to ensure that the broadband infrastructure we need for the future is built to deliver the most good to the greatest number of people.

While many institutional broadband users such as universities, hospitals and large businesses have developed their own broadband solutions capable of delivering 100+ megabits-per-second speeds in both directions (download and upload), the broadband speeds offered to homes and businesses by most local networks are much lower.[2] This range of service meets the Federal Communications Commission's (FCC) definition of broadband (200 kilobits per second in one direction), but falls short of international standards, which generally hover around 50 megabits up and down (synchronous). This higher speed is required to support the emerging services and applications necessary to compete successfully in the new global economy.

At this time, only fiber optic cable is capable of reliably delivering the higher speeds required to support the future information economy. These speeds are widely available in the fiber networks in Northern Europe and the Pacific Rim, where service providers also are able to deliver these higher speeds at lower costs than we currently pay for slower service in the United States. These lower costs and higher speeds are associated with:

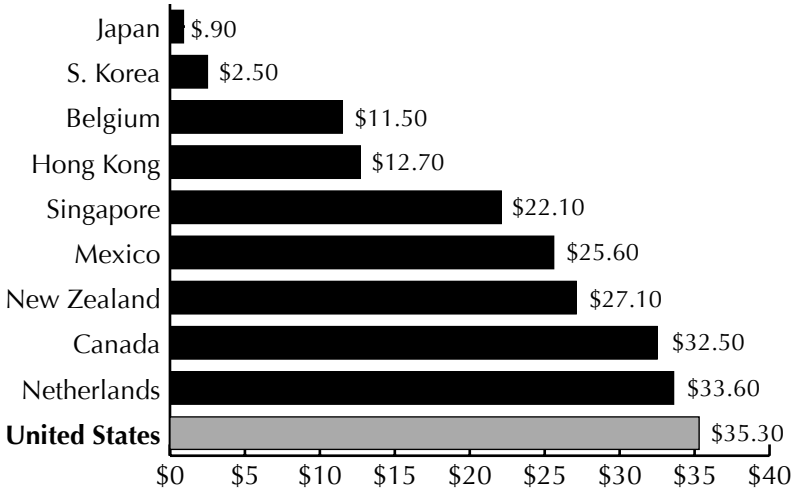

Figure 1: *Relative broadband cost per megabit.*

- Higher density populations and housing construction (i.e. Japan, Korea).
- Public subsidies and investment (Korea, Singapore, Sweden).
- Higher usage rates (the United States currently ranks in the mid-teens internationally when measuring the number of broadband users per thousand people).[3]

The greater bandwidth delivered over fiber networks stimulates entrepreneurial development and implementation of a wide variety of innovative services and applications through:

- Attraction and support of technology-based employers
- Attraction of "creative workers" who attract higher paying employers
- Increased efficiency and productivity of local government
- Improved competitiveness of local businesses
- Development of new services and applications that require the use of high-bandwidth infrastructure and can be delivered close to the markets where the services are use

America's current speed and price lag in telecommunications service comes at a cost. The United States, historically a leader in Internet development, has lost its technology edge. Our nation as a whole, and rural areas in particular, are falling behind in

Type	Optimal speed (Mbps)		Common service		Primary issues
	Download	Upload	Download	Upload	
Dial up (V.90)	.056	.336	Varies	Varies	Wire quality
xDSL ADSL ADSL2+ VDSL2+	 .256 to 8 .256 to 24 12 to 250	 .064 to 1.02 .064 to 3.5 12 to 250	 3 18 30	 .256 2 10	Length of copper wire portion, marketing
Cable (DCOSIS) Version 1.0 Version 2.0 Version 3.0	 38 40 160	 10 30 120	 3 8 n/a	 1 2 n/a	Number of users per coax loop, marketing
Wireless WiFi (802.1lb) WiMax (802.16e) EVDO Rev.A (cell)	 11 70 3.1	 11 70 1.8	 2 3 1.5	 1 1.5 .5	Legacy support and interference from buildings, trees, etc.
Fiber EPON (802.3ah) GPON	 5.6 to 1000 2400	 5.6 to 1000 1200	 10 30	 10 30	Marketing

Data compiled by Eric Lampland, Lookout Point Communications, May 2007.

***Table 1:** Relative broadband speeds (megabits per second).*

broadband penetration and utilization rates, as well as in a number of other technology-related indicators. The United States' ranking in broadband usage has slipped from 4th to 15th from 2004 to 2007.

The Market Approach: Leaving Rural Behind

No federal strategy is currently in place to build the broadband infrastructure of tomorrow or close the broadband gap between America and our global competitors. The Bush administration has set a goal of universal Internet access at 200 kilobits per second, a standard far below international measures and unsupported by any implementing strategy. Absent any federal effort to address this competitiveness gap, the task of redressing America's alarming decline in broadband competitiveness has been left up to incumbent service providers who have few incentives to invest in major upgrades to broadband infrastructure[4] because:

- Customers are not yet demanding higher bandwidth, in part because — as in the chicken and egg dilemma — they are not familiar with high bandwidth-dependent applications that can't be deployed over existing networks and

- Service providers generally can continue to get acceptable returns from their existing infrastructure

Fiber to the Home (FTTH) deployments are expensive ($1,500-$4,000 per household[5]) and yield little additional revenue from the customers who utilize this higher bandwidth infrastructure, in spite of the higher value that it delivers. Consequently, the only FTTH deployments under way tend to serve higher-income, high-density areas (such as in Verizon's largest urban market areas) or those that are receiving some kind of public investment. Clearly, market forces alone will not solve the investment problem for rural areas in particular. The relevant policy question is: "How can we most effectively structure public investment, and stimulate private investment, to ensure that Minnesota's rural and urban communities have the telecommunication infrastructure needed to survive and thrive in the global economy?"

Open Access Networks: A New Approach

The financial and policy challenges of increasing broadband capacity in the United States are not that different from those faced by many of our global competitors. Many of them, especially in Northern Europe, have similar economic and demographic characteristics and also have similar incumbent monopoly or duopoly (telephone and cable television) service providers that resist new models that bring increased competition. Policy makers in many of these countries recognize that increasing bandwidth is critical to future economic success. They view telecommunications infrastructure as similar to other public infrastructure, like roads, water and electricity, and have begun to explore innovative investment models. Direct public subsidies to individual service providers (like the Rural Utility Service funds) can accelerate infrastructure deployment, but do nothing to increase competition. In fact, direct subsidies and private ownership of infrastructure exacerbates problems that result from a monopoly.

The solution in some countries has been the creation of public-private partnerships to develop local Open Access Networks.[6] Primary drivers for public sector involvement vary, but according to the World Bank[7] the most often cited reasons include to:

- Improve the availability and affordability of broadband Internet services
- Lower the cost of providing municipal services

- Increase government efficiency and productivity
- Promote local economic development and competitiveness (including by facilitating an increase in the number of specialty niche service providers that can operate on the networks, i.e. telemedicine, video conferencing, data backup, home security, etc.).
- Redress "digital divide" concerns and promote quality of life and quality of place

Not only do Open Access Networks lend themselves to cross-sector collaboration, their corporate governance structure helps ensure that they deliver the greatest benefit to the most people. Open Access Networks are intentionally structured to ensure that the benefit and value of broadband is passed on to end users to a far greater extent than is the case under closed public and private sector-operated systems. The World Bank study noted that "the main driver for the development of Open Networks is the fundamental belief in the importance of ubiquitous and affordable broadband access to the economic and social development of the community."[8] In advice to the international donor community, the report concludes "encouraging and financing pilots and scalability projects may reap substantial economic and social benefit."

Open Access Networks are a public-private partnership-based alternative to the existing dominant model in the United States of closed and incumbent-owned and operated networks. Their key features include:

- True broadband capacity: This capacity is likely to be constrained only by the physical capability of the digital hardware/software that is deployed, rather than by some artificially imposed business model;
- Service to a local geographic community as a public utility;
- Corporate governance culture and structure that places emphasis on serving the "common good"; and
- Open access to the network by multiple, competitive service providers (voice, video, data, other).

The most distinguishing feature of Open Access Networks is that they are owned and controlled independently of any service or content that runs over it. This allows anyone connected to the network to take or provide content or service from or to anyone

else on the network. Private companies use the network to provide retail services such as voice (telephone), video (television), data (Internet), or others (home security, backup data storage, remote monitoring, etc.) and pay the network owner a license or lease fee to deliver their services. This is similar to air travel, where airlines pay airport authorities a fee for using the airports, or ground shipping, where trucking companies pay governmental entities license fees for using local roads. Imagine the inefficiency if every airline built its own airport, or if DHL, Federal Express and the U.S. postal service all built their own roads. If they did, the first to build them would have a great advantage over others, and they would not be inclined to share them. Open Access Networks reduce the cost of entry into a business by subsidizing the infrastructure with public investment and then facilitate competition and promote innovation by allowing multiple service providers on that shared infrastructure.

Open Access Network ownership can come in different forms. Some are totally publicly owned by a governmental entity — a country, municipality (or combination of municipalities) or a municipal subdivision, like a municipal utility. Some open networks are owned by public-private partnerships. A FTTH open network in Amsterdam currently under construction is partly owned by a large private real estate company. In the United States, some new suburban subdivisions have privately owned open networks, where the housing developer provides the infrastructure as part of the housing development and operates a private FTTH network.

Barriers to Open Access Networks

Cost: While *wireless* open networks are relatively inexpensive,[9] they generally do not provide the reliability or bandwidth necessary to meet many of the new applications and services available on the Internet.[10] The cost of FTTH networks is much higher, due in part to the added cost of connecting the community to the Internet, which often must be done through "captive" single-trunk lines for which incumbent operators can charge high access fees. It may be difficult to sustain the cost of a new FTTH deployment with revenues from existing voice, video and data services. New networks typically only initially capture 30% to 40% of a market — even if the new services offered are superior to incumbents' — unlike cable television, which tended to capture nearly 100% of new markets when introduced as the sole video service provider. New services that develop to take advantage of open network infrastructure can provide new revenues for the network, but it is difficult to forecast these revenues in a manner secure enough to attract initial infrastructure financing.

As in the case of most of the FTTH deployments in Minnesota, public subsidies, including low-interest loans and federal Universal Service funds, usually are required to help cover initial capital costs. Attracting public dollars to these investments can be challenging, as the necessary public investment in Open Networks must compete for scarce public resources with other critical needs such as schools, roads, water and sewer services. As the need for the higher speed that FTTH deployments deliver increases and the market share of new FTTH deployments increases, it is expected that the need for public subsidies will decrease.

Competition: The vast majority of incumbent voice, video and data service providers are strongly opposed to the emergence of Open Networks. The reason is easy to understand: Open Networks is a very disruptive concept. Some of the core and access technologies central to Open Access Networks (IP-based networks) undermine the business models underpinning the incumbent providers.

Most Minnesota communities are served by a duopoly — an incumbent telephone company and a cable television operator that has expanded to provide the "triple play": voice, video and data services. These incumbent providers face a serious dilemma. They are carrying debt from "legacy infrastructure" (often copper wire) and have difficulty generating the return on investment they need to finance a new FTTH network. New higher-quality infrastructure developed by a new market entrant stiffens their competition.

With the exception of a few Minnesota telephone cooperatives, private telecom service providers are usually reluctant to form partnerships with public entities, even to create a "closed" network. The typical response by incumbent service providers to the few new Open Access Networks in the United States has been to significantly reduce their prices or to use litigation to delay or weaken a new open network provider. Public officials are forced to choose between better broadband infrastructure and protecting incumbent service providers that frequently have made large investments in local infrastructure.

Qwest, the largest incumbent telephone company operating in Minnesota, has declined partnering with or providing retail service on a local open network project in development on the Iron Range. Such a move would require them to abandon their existing infrastructure, and the "stranded investment" option is not an attractive business choice for Qwest. In contrast, the incumbent telephone company in Vasteras, Sweden, home to an award-winning Open Access Network, recently decided to make its services

available over the local open network.

While competition is one of the essential components and qualities of Open Access Networks, the competition fostered as a result of their deployment is not only among providers of the traditional "triple play," video, voice and data services. By its very nature, a system that allows all users to receive and deliver content and services to and from all other users removes barriers to entry for a wide range of new and niche services that can operate on the networks, i.e. telemedicine, video conferencing, data backup, home security, etc.

Regulatory Challenges: The legal infrastructure necessary for Open Access Network development is ambiguous and confusing. In Minnesota, municipalities can provide the infrastructure for open networks under their "implied powers," but explicit authority is lacking. The municipality's authority to provide retail service — not necessary for an Open Network where private entities provide the retail services — is more restrictive. Voice, video and data services were all developed during different times and are regulated differently, even though the technologies all are converging in IP protocols. This regulatory uncertainty undermines the confidence necessary for large FTTH deployments, whether they are public open networks or private closed networks.

Open Access Networks in Minnesota

While a number of Minnesota communities have FTTH deployments, there are no operating Open Access Networks in Minnesota at this time. This may soon change. Twelve communities and one Indian band on the Iron Range of Northeastern Minnesota have entered into a joint powers agreement to explore the feasibility of creating an Open Access Network, called Iron Range Community FiberNet. An initial feasibility study has been completed by Dynamic Cities, the developer and operator of the UTOPIA open network in Utah. Initial projections show that a substantial public infrastructure subsidy in upfront capital costs will be necessary to launch the project. The need for public investment is due to:

- Low-density communities (high infrastructure cost per subscriber)
- High interconnection costs between communities due to large geographic area
- Modest subscriber rates, due to higher than normal percentage of elderly and lower-income residents.

FiberNet is currently looking at finance models for the project, including public and private debt and public and private equity.

Conclusion

Broadband telecommunications has become part of the essential community and economic development infrastructure, following similar progressions that occurred with railroads, highways, electricity and telephone utilities. Just as these earlier utilities were delivered by different institutional models as they matured, broadband will likely be delivered in new ways in response to changes in the scale, technology and other economic and environmental conditions. As the U.S. ranking in broadband telecommunications continues to decline, the importance of examining new approaches increases. Open Access Networks, a model that has emerged in countries that are leading broadband utilization and infrastructure investment, offer a new approach for consideration by Minnesota communities committed to meeting their future telecommunication needs.

References

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Endnotes

[1]Communities with broadband consistently demonstrate higher growth in employment, business establishments, and high tech businesses. See *Measuring Broadband's Economic Impact* under references.

[2] Today, at least 85% of rural Minnesota communities have some service,

with broadband access speeds ranging from 256 kilobits to 8 megabits down and 128 to 500 kilobits up, according to Broadband Access in Rural Minnesota study conducted in 2003 by the Center for Rural Policy.

[3] See the 2006 International Telecommunication Union rankings at http://www.itu.int/osg/spu/newslog/ITU+Broadband+Statistics+For+1+January+2006.aspx

[4] There are a few notable exceptions to this stagnation in U.S. broadband infrastructure improvement (relative to global standards):

- Verizon has begun a major fiber-to-the-home (FTTH) deployment in its largest markets; no rural areas are on deck to receive these investments.

- A few Minnesota telephone cooperatives, publicly financed by low-interest loans from the federal Rural Utility Service and subsidized by the Universal Service Fund, have installed FTTH in 5-10 small Minnesota communities.

- In Minnesota, a few municipalities, like Windom, have financed and developed complete municipal telecommunications utilities that provide voice, video and data services.

[5] Costs vary due to population density, central office equipment and customer premises equipment.

[6] Open Networks (both fiber and wireless) currently are deployed in Sweden, the Netherlands, Germany, Austria, Denmark, France, Ghana, Brazil, the United States, Canada, Nepal, Philippines, Macedonia, and India. However, Open Networks, especially those deployed over fiber optic cable, remain a relatively new phenomenon; the World Bank estimates there are fewer than 50 such networks worldwide.

[7] See the World Bank report under references.

[8] See the World Bank report under references.

[9] Wireless networks can cost as low as $300 per subscriber, including transmission tower and equipment and the local receiving equipment.

[10] A case in point is the recent recommendation by St. Paul's Broadband Advisory Board that the city explore fiber instead of wireless technologies, its original charge.