Northern Michigan Broadband Cooperative

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A Cooperative Solution to Rural Broadband in Northern Michigan

A White Paper on Cooperative Development of Broadband Services in Northern Michigan

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Orientation

Remarkably, after more than 12 years since the Internet burst onto the popular scene, rural areas of Northern Lower Michigan still remain devoid of Broadband services. This lack of ubiquitous Broadband service suppresses economic development, hinders public education, affects the availability of critical services, and therefore directly affects the quality of life for our citizens and the vitality of our community. This is all the more remarkable in that Northern Michigan was ahead of the curve in the distribution of early dial-up Internet services, with many areas, including most of our rural communities, having access before many more populated areas down-state.

The reasons Broadband development has stalled here are both simple and complicated. Simply put, the return on investment for Broadband development in rural Northern Michigan is inadequate to drive successful private network development. More specifically, the difficulties of distribution through the hills and vegetation of Northern Michigan and the complex mix of technologies required to transport and deliver Broadband services to a marginal density of potential customers across that terrain exceed any reasonable return one might expect to realize. To be blunt, the numbers simply aren't there—or so it would seem.

Recently, frustration about the lack of Broadband services in Northern Lower Michigan, and the real and significant impact it has on our daily lives, has brought this depressing scenario to the forefront of concern. The important question is whether we can focus this frustration toward the development of some functional solution to the problem and, perhaps more importantly, whether there is in fact viable solutions within our grasp. Personally, I believe the key is large-scale aggregation of demand and a cooperative development of common Broadband resources. This document outlines what that means and suggests a framework for solving the availability of Broadband throughout much of Northern Lower Michigan.

Chuck Scott

Definition of Broadband

The Federal Communications Commission defines Broadband both as "*...data transmission speeds exceeding 200 kilobits per second...*"[1] and as a term for technology that offers "*...integrated access to voice, high-speed data service, video-demand services, and interactive delivery services*."[2]

This generally accepted definition of Broadband has evolved over the recent years and will continue to do so as the applications provided over the Internet similarly evolve. For reference, here's a list of different speeds and what they may offer.

Connection	Speed	Typical Web Page[3]	Typical Softw are Dow nload[4]	Video Quality
Poor Dial-Up Connection	14 Kb/s	4 Minutes	23 Hours	Very marginal low quality, barely identifiable
Good 56K Dial-Up	47 Kb/s	2 Minutes	7 Hours	Low quality, identifiable but not at all clear
Entry Level DSL/Cable	128-512 Kb/s	5 – 25 Seconds	32 Minutes – 2 Hours	Medium quality, good resolution, not full motion
Common DSL/Cable	.5-2 Mb/s	2 - 5 Seconds	8 – 32 Minutes	Good quality, near to full motion
Commercial T-1	1.5 Mb/s	2 Seconds	11 Minutes	Good quality, full motion
High Performance DLS/Cable	2-5 Mb/s	.6 – 2 Seconds	20 – 50 Seconds	Very good quality, full motion
Commercial DS3	45 Mb/s	< 1 Second	2 Seconds	High-definition broadcast quality
Residential Fiber	1 Mb/s - 2 Gb/s	2 Seconds or less	.5 Seconds – 16 Minutes	Numerous high-definition feed
Commercial Fiber	2 Gb/s – 15 Tb/s	Very fast	< .5 Seconds	Carrier-class video distribution

Kb/s = Kilobits/Sec, Thousands of bits per second, Mb/s = Megabits/Sec, Millions of bits per second, Gb/s = Gigabits/Sec, Billions of bits per second, Tb/s = Terabits/Sec, Trillions of bits per second

It should be clear from the chart above that useful speeds for residents and small business users should now be considered to be in excess of 500 Kb/s. Larger businesses that might have 10 or more people using the network at the same time should be looking at 2 Mb/s or faster. This sets the bar for minimum Broadband performance and therefore the minimum objectives of Broadband development efforts.

These minimum performance numbers will continue to increase into the future to support more sophisticated content and therefore Broadband development efforts should be engineered and managed to be extensible as well.

Need for Broadband

Access to Broadband services affects quality of life on par with access to power and telephone. As more services become available over the Internet and as those services are embraced by Broadband users throughout the world, it becomes ever more important for our community organizations, businesses, and individuals to have the same access. Whether it's remote medical diagnostics, review of a class assignment, or a picture of a new grandchild, access to Broadband services makes competing and living in a modern world safer, more productive, and more rewarding.

Universal access to broadband also improves the services we receive and reduces the cost of those services. This is particularly important now due to the economic difficulties our state is experiencing. With Broadband service available to all residents, our county, city, and township offices, as well as schools, hospitals, and businesses, can reduce the quantity of documents and materials that need to be sent by mail. Not only does this substantially reduce direct costs, but it can also reduce employee work load and free them to provide more productive services. Having a better network infrastructure between facilities also improves services and permits better consolidation, which means less money spent duplicating systems and services.

Job creation and retention is critical to the Northern Michigan's economy and Broadband services are required to attract and retain those employees. New businesses are less inclined to locate in an area without Broadband because the employees they need to attract are demanding it. Existing residents also need Broadband connectivity for access to on-line job training and information required to obtain work and perform their jobs.

Education, health care, and emergency services not only need high levels of Broadband services for themselves, but also need to be well interconnected and require broadband services for their students, patients, faculty, physicians, and service providers. Access to remote medical monitoring, on-line educational materials, and remote access to in-house resources are critical to efficient and effective health and educational services. Availability of broadband both in facilities and on the road are critical to efficient operation of our emergency services, eliminating unnecessary travel and providing more timely information.

Beyond these needs, Northern Michigan residents and visitors deserve the benefits of technology. The evolution of Internet based services has created a wealth of opportunities for staying in touch with family and friends and keeping up with the world around us. Living and traveling in Northern should not mean limited access to technology.

History of Broadband Development in Northern Michigan

Early adoption of dial-up Internet Services

As early as 1995, Northern Michigan residents and businesses were reaping the benefits of Internet access. Through the efforts of Merit Networks, North Central Michigan College, Northland Library Cooperative, and various entrepreneurs, dial-up Internet services spread rapidly and were available nearly everywhere phone service could reach. These early dial-up services were sufficient to support the mostly text-based services available over the Internet at the time. In fact, only a few 56 Kb/s circuits served users throughout much of Northern Michigan and delivered the fledgling local Web services.

Within a few years, the Internet had matured to the point where images were common on Web sites, the files being exchanged were growing, and E-Mail was becoming a popular means to communicate. To stay ahead of the curve, providers in Northern Michigan quickly migrated to T-1 (1.5 Mb/s) Internet backbone connections. While users were still on dial-up services, those services were improving as technology pushed the speeds available up from 28 Kb/s to “56K”, which was most often in the range of 40 to 50 Kb/s. These changes required providers to replace virtually all of the equipment they had installed only a year or so earlier and to move to faster DS3 (45 Mb/s) backbone feeds to keep up with the traffic and the few businesses migrating to dedicated T-1 connections.

Introduction of Broadband

As the new century arrived, the demands for user bandwidth exploded. We were quickly moving into an age of cheap mega-pixel digital cameras, large E-Mail attachments, and interactive Web based services complete with full-motion video. To meet these needs, service providers started moving toward technologies such as DSL, cable Internet, and wireless services that could deliver speeds upwards of 200 Kb/s. For the third time in less than a decade, everything had changed again, as providers began replacing equipment that had been only recently installed.

This is when rural Northern Michigan began falling seriously behind. Faster Internet connectivity over DSL, cable, and some wireless system were sprouting up in more concentrated communities. It was in these few areas where customer densities justified the much higher cost of equipment and system to support these speeds. Most of rural Northern Michigan saw little if any such development and languished on existing dial-up services that are simply insufficient for today's Internet.

Attempts at Rural Development

Rural broadband services have been attempted in Northern Lower Michigan, but with mixed results and outright failures. Over the last 5 to 8 years, a series of wireless Internet offerings have sprung up to deliver Broadband Internet to rural customers. In most cases, these services were based on performance representations by wireless equipment manufacturers and vendors that were unrealistic for the terrain and vegetation in this area. The result in most cases was a failure to provide the promised services to their customers and an inability to reach the number of customers required to offset the cost of the provider's equipment. In some cases these providers have simply reshaped their plans to serve a more limited set of customers and attempted to reduce the amount and cost of the equipment they deploy. A few are still in business, but more than a few simply gave up or were forced to shut down.

Other providers have sought to deliver their own Broadband services over existing telephone lines. They (Competitive Local Exchange Carriers - CLECs) pay the local phone company on a monthly basis so they can place their own equipment in the local telephone offices and deliver their services over the phone company's existing lines. To some limited extent, this resulted in Broadband DSL type services becoming available in a few communities where no prior services existed and provided a competitive offering in communities where it did. These CLEC's, however, are limited on where they can install such equipment and how far from those locations services can be delivered. Again, there was limited return on investment to justify going beyond the population concentrations into rural areas.

The Michigan Broadband Development Authority

As a result of the state's “Link Michigan” initiative, the “Metro Act” (2002 PA 48) implemented a fixed right-of-way fee, a standardized application process, a central authority for fee collection, a 45 day time limit on municipality action on permits, a streamlined process for resolution of disputes, and limits on local regulations to improve access to right of way. In associated legislation, 2002 PA 49 created the Michigan Broadband Development Authority (MBDA) to provide loans to broadband providers and users in an effort to fill in the gaps of deployment to under-served communities. While the former continues to streamline access and level use of right-of-way, the MBDA failed to achieve the stated goal of stimulating broadband

development in under-served areas throughout much of Michigan.

Michigan Telecommunications Act and VNXX Train Wreck

On November 21, 2005, Governor Granholm signed the 2005 PA 235 amendment to the Michigan Telecommunications Act. This legislation reformed Michigan telecommunications law in a variety of ways. One consideration received by the ILECs was adjustment of compensation considerations for the delivery of "Virtual NXX" (VNXX) calls. These are calls placed to a local phone number, but that are instead delivered to destinations that are not physically local.

Up to this point, VNXX calls have been billed as local to the person placing the call and a compensation mechanism provided for the cost of delivering these calls to their physical destination. That mechanism was upset by the development of large central facilities down state where the majority of dial-up Internet calls now terminate. With the development of these dial-up centers to replace "modem pools" that used to be located locally throughout the state, a large number of calls to Internet providers, most of which last much longer than normal voice calls, required delivery to a distant location. The costs of transporting and delivering the calls fell disproportionately on the telephone carriers and not those placing the calls nor the Internet provider receiving the calls. The 2005 MTA revisions provided for these carriers to receive appropriate compensation—in effect permitting these calls to be designated as long-distance.

With this change, it's possible that the cost of dial-up Internet services for many could become so high that they are no longer an option for residents who have no other service available. Fortunately, Michigan legislators foresaw the effect this change could have on the cost of dial-up Internet services throughout the State. Included in the legislation was a moratorium on the implementation of the VNXX changes during which a working group would be established to sort out solutions to the problem. There was also an expectation that by the expiration of the moratorium, local broadband services would be available throughout the state. The working group has now convened, deliberated, and delivered their final report.[5] The conclusion of that report states...

> "*In closing, the VNXX working group has made considerable efforts since its establishment shortly after the enactment of PA 235. At this time however, no consensus has been reached for a recommendation to the Commission. Parties acknowledge the FCC is likely to act in the near term future on network architecture and inter carrier compensation issues that will impact the VNXX issues being discussed in the working roup."*

To the best of our knowledge, the FCC has not yet taken any action to avert a VNXX "train wreck", and the moratorium expires on December 31st 2007. Since many areas of Michigan still have only dial-up Internet services and not local Broadband solutions, this could be a disaster in the making. Fortunately, the carriers were required to file their intentions earlier this year and all have stated that they do not at this time plan to begin charging for delivery of these VNXX calls. That, however, may only be temporary.

Challenges in Serving Northern Michigan

Northern Michigan, with all of the advantages we appreciate every day, offers unique challenges for the distribution of Broadband services. These challenges fall primarily into two categories: economics, and technology.

Economics

The economic challenge facing Broadband distribution in Northern Michigan is mostly due to area demographics. Beyond the few small cities and towns, Northern Michigan is mostly rural with relatively low population densities. Aside from the more populated lake shores and occasional residential developments, there is little concentration of demand for Broadband services. Even where population densities are higher, there are few businesses or organizational facilities that represent any significant demand for these services to encourage Broadband development.

This profile affects the profitability Broadband service providers can realize and the result is that they tend to serve only those areas where the density and demand is more favorable. Because of this, the telephone and cable companies have focused exclusively on the larger cities and a few smaller towns but are not addressing availability in the rural areas. Smaller service providers have been able to offer limited services in some rural areas, but have only been able to do so slowly and therefore will not likely reach most rural areas for some time to come. Unfortunately, the limited Broadband market simply is not providing sufficient economic motivation for Broadband development in Northern Lower Michigan.

Technology

A major factor affecting the profitability of rural Broadband development here is the significant technical challenge facing distribution and delivery of services. Northern Michigan is blessed with beautiful wooded hills and charming river valleys. It is, however, that very nature of our terrain that significantly increases the difficulty, and therefore the cost, of Broadband service delivery. It would be a simple matter to blanket the rural areas with wireless Broadband service if only those areas were flat farmlands. There are, unfortunately, no such simple technical solutions for us at this time.

Of the various technologies available for the distribution of Broadband services, each has limitations when applied to Northern Michigan.

- Distribution using Fiber Optic cable, while the ultimate in capacity and reliability, is expensive to deploy, would require significant bundling of services and fees to afford, and necessitates a large capital investment that is difficult to offset with revenues from low customer densities.
- Common wireless services, which can be very effective over flat, unobstructed terrain, simply don't penetrate far through vegetation or over hills, and wireless spectrum that does penetrate better is limited and expensive to obtain. Also, there appears to be little tolerance for a large-scale proliferation of new towers.
- Broadband over Power Line (BPL) services require frequent amplifiers and repeaters to distribute any distance, can be susceptible to or cause radio interference, and require participation by the power services to deploy.
- DSL, which is so common in our larger cities, can only go a few miles and requires a significant investment to deploy in rural areas. The incumbent phone carriers seem to have little interest in developing DSL services in these rural areas and instead appear to be focusing again on lucrative high-density markets.
- Satellite based services, which would seem to be available anywhere, require a clear view of sky that might be obstructed by trees or hills, are considerably slower than terrestrial services, are severely impeded by heavy weather, and suffer from significant latency and other technical limitations.

While no single technology is a magic bullet, appropriate application of a mix of these and other potential technologies may work.

The Broadband Cooperative

Considering all of the above, the outlook for rural Broadband development in Northern Michigan may seem bleak. Limitations on technologies available today are a road-block to the development of Broadband services in rural Northern Michigan. Means to overcome those limitations, such as large-scale proliferation of tall towers for the delivery of wireless services, are not likely to be well received. With limited return on investment, providers are not inclined to build services in these rural areas and there appear to be few funds available to outright subsidize the development and operation of these services, as was the case for rural electrification and exists today for basic telephone service. However, there may yet be a solution.

Aggregation

One particular characteristic of Rural Northern Michigan is the distribution of small and large existing and potential users of Broadband services. For the most part, the larger users of Broadband services are in and near higher population densities, which are mostly areas with existing good Broadband services. Rural areas with lower population densities have within them few larger consumers of Broadband services and not surprisingly are areas without any Broadband services. In reality, this represents why rural Broadband services have not been built. The question then becomes one of how the consumption of Broadband services in currently served areas can be leveraged to build services in currently unserved areas. While that may seem counter-intuitive, there is an answer and that answer rests in the needs of many of those larger Broadband consumers.

Educational institutions, health care services, libraries, emergency services, county government, and even businesses have needs that extend throughout our region. They have offices and facilities in the larger communities, but also need to communicate with other locations. In some cases, such as rural health care, some schools, and public safety, these facilities exist in the rural areas, which for the most part do not have good Broadband available. Most of the organizations that do interconnect their facilities do so with dedicated leased lines or by using separate Internet connections. By aggregating the Broadband needs of these organizations, sharing resources, and developing a common network to support those needs, they cannot only improve those services, but also reduce the cost of delivery. Additionally, such a network would of necessity traverse much of the rural areas to reach various scattered organizations and to interconnect concentrations of those organizations. That overlying network could certainly be designed to provide services to the rural facilities that do not currently have good services available, thus further increasing the service aggregation.

Another common need of these organizations is to technically reach out and “touch” the rural residents of Northern Michigan. Those residents are their employees, students, constituents, and customers. The availability of Broadband services to those rural residents further improves the efficiency and performance of the organization. Therefore, actions that stimulate rural Broadband availability serve the needs of those organizations and potentially reduce their costs.

Improved Area-Wide Transport

An offshoot of aggregation is the availability of much more robust area-wide transport. Interconnected organizations in this area most often rely on leased-line T-1 or fractional T-1 services (<1.5 Mb/s). While these lines may represent adequate data transport at this time, or for specific applications, they are not adequately robust to carry these organizations into the future or to permit the use of more varied applications. A cooperatively constructed network would, of necessity, be composed of higher capacity technologies and could, as a result of cost savings though aggregation, be constructed to offer considerably greater bandwidth than needed at this point to serve these organizations. This offers the opportunity to permit considerably greater throughput between organizations and facilities.

In situations where organizations currently rely on Internet connections with a separate provider local to each facility, the performance between those facilities may be worse than expected. This is because Internet traffic generally must transit between separate providers at NAPs (Network Access Points that exchange traffic between providers) located downstate or even outside of Michigan. This adds latency (delays) to this traffic, reduces the ultimate performance of the connections, and reduce reliability. Interconnecting organizations using a common area-wide network would not introduce these delays.

Convergence

“Convergence” refers to the mixing of varied services over Broadband. Typically this means at least Internet, phone, and video services. Bundling these services over a common network increases the revenues the network can generate, which helps to fund a more robust network. Since most rural areas of Northern Michigan do not have cable television service available, including that service into a

Broadband development project adds considerable value to the network. Also, while nearly all of these rural areas have phone service, those services are predominantly delivered over copper wire, limiting the number of lines available and the range of advanced features. Bundling these services over a common Broadband network therefore provides benefits beyond simple Internet connectivity. In effect, convergence is another means to aggregate services which in turn enables the cooperative to provide better and more economical services to its members.

Bulk Purchasing

Another aspect of aggregation is the ability to purchase equipment and services in larger bulk quantities and therefore to reduce their cost. This is as true with Broadband services as it is with other types of purchasing. The cost of Internet backbone connection services per unit is less when obtaining those services in larger units creating two opportunities—the ability to deliver more bandwidth to organizations at the same or lower price and the ability to obtain bandwidth from multiple sources to improve reliability. The ability to purchase network infrastructure and end-user equipment in bulk further decreases costs and offers opportunities to obtain better equipment and systems.

Redundancy

The more organizations use Broadband services, the more they rely on them. Migrating services to delivery by Broadband can improve the delivery and reduce the cost of those services, but the result is then that interruptions in Broadband connectivity directly affect the availability of those services. In extreme cases, such as emergency services, the interruption of services may not only be costly, but may be directly harmful. Aggregation that permits purchasing of Internet backbone services from multiple and spatially diverse sources significantly improves reliability through the elimination of single points of failure. Similarly, aggregation that results in multiple circuit paths between facilities further improves reliability.

Better Coverage

A network designed to interconnect an aggregation of organizations, some of which may already have good service available, can certainly be constructed to support services to others within reach of the network. The common network will need to have diverse paths to ensure performance and reliability and those paths can be designed to more easily reach rural users. Additionally, comprehensive aggregation of smaller rural users, such as community facilities, fire halls, small businesses, and concentrations of groups of rural users areas, provides an improved model for rural Broadband deployment.

An Attractive Solution

Assuming that large-scale aggregation of demand is the key to rural development, why hasn't that yet happened? To a large extent the problem is a matter of attracting the organizations and individuals to a comprehensive solution within a short span of time. Any of several Broadband providers in Northern Michigan can tell you that it's easy to convince a few people to acquire services at the same time, but encouraging larger associations and communities to purchase services in bulk is extremely difficult. One reason is that there is a natural skepticism of private sector solutions positioning themselves as a community resource and asking for special consideration. The popular alternative is to create a collaborative organization to perform that function.

Clearly, the development of rural Broadband services in Northern Michigan requires the formation of an organization that is palatable to a wide range of Broadband users and can therefore attract significant aggregation of demand and do so in a relatively short period of time. The logical organizational structure for this is a non-profit cooperative.

Cooperatives, common for the development of other types of necessary services in rural areas, are member oriented and function with the sole purpose of providing service to those members. As such, a rural Broadband cooperative should be attractive to both public and private sector Broadband users and can reasonably apply a sense of group spirit and desire to achieve common goals to encourage others to join for the better good of the community.

How large

The first question that comes to mind is how large of a rural Broadband cooperative is appropriate for Northern Lower Michigan. This question is answered in two ways that come to essentially the same conclusion. From a perspective based purely on common needs, concerns, and challenges, an area defined roughly as from Grayling to Mackinaw City and from Charlevoix to Alpena seems to make sense. Also, the size of a cooperative network needs to make technical sense. Considering that aggregation of

demand best enables development of a network that can support rural services when the distribution of larger participants roughly encompasses those rural areas, that same region seems appropriate.

From a technical perspective, such a region provides for an array of spatially diverse Internet backbone interconnection points that would enable development of a robust and reliable network. Specifically, Internet backbone connections from multiple providers within a local area often take the same path and frequently use the very same resources. Redundancy achieved using these spatially associated services is compromised by their vulnerability to common failures. The region defined above includes at least four likely paths for Internet backbone traffic to flow—from the U.P. through Mackinaw City, up the West side of the state through Charlevoix and Petoskey, up the east side of the state through Alpena, and up the center of the state through Grayling and Gaylord. Having critical connections to the world through these four separate paths offers a level of redundancy that is otherwise hard to achieve. Since greater aggregation means relying more on common assets, that higher level of redundancy is imperative.

The matter of common needs is important. Organizations and facilities that commonly support each other are best served when they collaborate. The roughly eleven county area represented above includes health-care facilities, emergency services, and educational institutions that already engage in common services and support and could do so more aggressively with the development of better Broadband transport between them. Common needs for economic development are similarly represented by this region. It seems appropriate that this defined area, as large as it may seem, should have a cohesive approach to solving Broadband availability.

Funding Opportunities

Funding construction of a large Broadband network is certainly a concern. To build such a network from scratch, and to do so in some reasonably short period of time, requires the application of substantial financial resources. A large scale cooperative has the ability to attract long-term and low-cost financing to make this possible and being a not for profit organization supporting economic development and quality of life enables grant opportunities that may not otherwise be available.

A key to funding Broadband development is accumulating adequate service commitments and incorporating adequate resources to support the substantial long-term loans that will be required. A cooperative that operates solely for the benefit of its members is an organization that readily attracts these commitments. Early discussions with both public and private sector organizations shows this to be true. A private-sector Broadband service provider would find it difficult to obtain sufficient commitments from the public sector, such as school systems, county government, and others that represent a large portion of Broadband demand in Northern Michigan. However, these entities seem ready to participate when shown the cost savings and service benefits large-scale aggregation through a cooperative can offer.

Likewise, one key to rural Broadband development is attracting existing and new consumers of network services from rural areas. Where it may be difficult for a conventional provider to encourage smaller communities and townships to step up and agree to participate by bringing services into their community centers at some cost, a cooperative whose objective is to progress toward better services for their residents to improve their quality of life seems attractive. By agreeing to participate at some basic level, these communities introduce locally available access and function as a stepping stone toward the development of a comprehensive Broadband network that can directly serve residents and rural businesses.

With these commitments in hand, the Broadband cooperative has an array of funding options available. For example, the USDA offers programs ranging from long-term loans for construction of Broadband infrastructure to grants for the development of specific critical resources. Coupling infrastructure loans for network construction with USDA aid for rural economic development, and even loans and grants to help small communities develop the resources they need to take advantage of Broadband connectivity extends the ability of the cooperative to rapidly build out services. As a cooperative, other opportunities that would not materialize for other types of organizations might include local and regional loan and grant sources seeking to stimulate economic development or to support specific community needs.

Assistance is also available for the creation and retention of jobs and even specifically for the development of cooperatives. While some of these programs may not be specifically financial support, they would provide assistance in the development of a Broadband development cooperative and therefore improve startup time and lower startup costs.

Startup

Funding is not the only barrier to rapidly building a Broadband network. In the absence of an existing infrastructure, building a network from the ground up would delay the availability of services and the advantages realized from aggregation. Fortunately, there are existing aggregations of customers who

are potential cooperative members and who represent an initial level of services and demand adequate to begin delivery of services in the short-term and sufficient enough to serve as a springboard for fast startup of a cooperative.

At least one such commercial organization representing existing services to a variety of public and private organizations throughout the area is interested in being integrated into a cooperative and others may also wish to do so or participate at some level. Incorporating these existing network into the creation of the cooperative includes the advantage of starting with already functional infrastructure and expertise. If other such organizations can be identified, then startup time would further be reduced. If nothing else, having a functional network with a track record of serving a mix of public and private sector organizations should help to alleviate concerns about joining a newly forming Broadband development cooperative.

Access to Infrastructure and Right of Way

A cooperative that includes as members government entities and organizations that own or otherwise have access to useful infrastructure or right-of-way may be able to streamline network deployment and reduce costs. This is yet another reason that including these entities is important since they may have their own existing antenna towers, own right-of-way, or at least be able to streamline access. Even if these entities do not actually become members of the cooperative themselves, they may very well be able to contribute such assets for use by the cooperative as a significant public need.

Deployment Objectives

An overriding concern regarding deployment of Broadband services by a cooperative should be the long-term viability of that network and the long-term advantages for rural Northern Michigan. Trading off short-term gains in rural Broadband development to the detriment of future network coverage and performance may be rational for a private business that needs a quick return on investment. A non-profit cooperative can instead afford to take a more long-term approach to development of services and to apply long range funding strategies to their best advantage.

The best long-term advantage for rural Northern Michigan results from the development of a network that supports increased demands on network capacity well into the future. At this time, technologies that can support these future demands primarily include dedicated fiber and robust (not common) wireless transport and delivery. Fiber, in particular, is not only sufficient for current use, but has proven to be extensible into the future simply by upgrading the electronics driving the fiber. A primary objective of the cooperative should therefore be to build rural broadband services based on these technologies.

Taking the long-term approach may cause some up-front delay in deployment of services. To help offset that, the cooperative should consider a portion of the early deployment using robust wireless technologies. While wireless will certainly not reach all areas and cannot support services to all rural customers, it can support the initial needs of the communities, bringing services into rural areas and closer to unserved residents. These wireless network can then be migrated over time to become alternate backup links for added redundancy and to support newer wireless services that might be used to provide a basic level of service for hard-to-reach areas that may not see full deployment for some time.

Deployment Time-Line

The time-line for deployment of a cooperative Broadband network will depend on a variety of factors, including the degree of aggregation that can be achieved, availability of funding, access to assets and right-of-way, weather, and organizational factors. An advantage of larger aggregation and the ability of a non-profit cooperative to build membership and streamline access to resources is that it can move forward more rapidly with deployment. A cooperative, having the nature of a community resource itself, should also attract participation in the way of additional members obtaining services in a shorter time frame. It should, in any case, be an objective of the cooperative to layer deployment to achieve a compromise between fast delivery of initial critical services, and the development of a robust and extensible network that can serve the community well into the future.

Deployment layers

- Aggregate an initial set of members that have existing or immediate and substantial Broadband needs and migrate services for those members into a common network based on fast-start technologies and rapidly available existing networks and infrastructure.
- Identify additional major Broadband needs and begin work on integrating them into the common network.
- Encourage rural communities to participate by attaching community centers to the cooperative network to provide close-in Broadband availability in those areas and work on migrating these

connections into the initial network.

- Secure funding and develop engineering plans for long-term and robust network deployment throughout target areas and begin deployment of final network infrastructure.

Summary

Northern Lower Michigan is by any definition an under served area with regard to Broadband services and access to the Internet. In a way that is not only a problem, but it is also an opportunity. While some areas of the state have benefited from the deployment of Broadband services using various technologies, few areas outside of the major population centers have seen deployment of truly high-performance and robust networks down to the residential level. Rural areas of Northern Michigan therefore represent somewhat of a clean slate on which to build a modern and extensible network capability. Frustration that Broadband services are not currently available in many areas is high and there appears to be an opportunity to leverage that frustration toward a solution. The one single solution that stands out is large-scale aggregation of demand and services into a regional non-profit cooperative and through that cooperative the development of a common network infrastructure to serve economic growth and quality of life throughout Northern Lower Michigan well into the future.

1http://www.fcc.gov/cgb/consumerfacts/highspeedinternet.html

2http://www.fcc.gov/glossary.html

3Typical size for a Web page used is 300 Kilobytes. Actual performance depends on many factors.

http://www.mackinawcity.com/ 196 KB

http://www.microsoft.com/ 333 KB

http://www.nytimes.com/ 522 KB

4Typical size for software download used is 100 Megabytes.

Adobe Reader 22.3 MB

Open Office 109 MB

Ubuntu Linux 659 MB

5VNXX Working Group Report - http://www.dleg.state.mi.us/mpsc/comm/**vnxx**/**vnxx**final**report**.pdf