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Maine's Three Ring Binder

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Connectivity and Access

Although Maine is a rural state, it has had success in keeping pace with technological changes since the rise of the Internet 20 years ago. In this section, authors describe some of these successes and the challenges faced by both consumers and libraries in the new digital environment. Fletcher Kittredge presents the history and promise of Maine's "Three Ring Binder," a new and important fiber optic network that will bring high-speed broadband connectivity to rural parts of the state. The Three Ring Binder is expected both to improve economic opportunities for businesses and to increase high-speed Internet access for underserved populations. Tom Welch describes the development and importance of the Maine School and Library Network, a pioneering effort that has brought inexpensive high-speed connectivity to all schools and libraries in Maine. Janet McKenney discusses the recent BTOP [Broadband Technology Opportunities Program] federal grant that has increased the number of computers, workstations, and videoconferencing units in Maine libraries and is providing training and online learning resources to unemployed, low-income and senior citizens, along with assistance to local librarians to increase their technology skills. New technologies and new forms of digital media pose challenges for both for publishers and libraries, as discussed by Tom Allen and Maureen Sullivan in their articles on e-books. Allen presents the publisher's perspective on this potentially disruptive technology, while Sullivan examines the issue from the perspective of libraries and their historic mission of providing universal and unencumbered access to materials.

Maine's Three Ring Binder

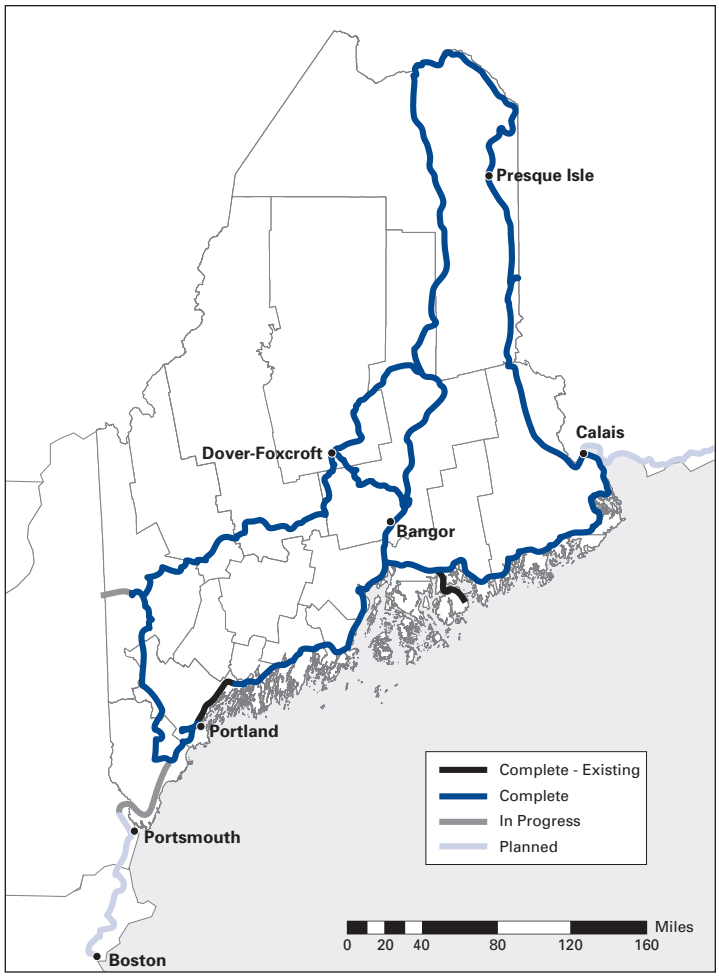
By Fletcher Kittredge

INTRODUCTION

To be competitive in today's economy, Maine needs to have Internet infrastructure capable of quickly transmitting large amounts of data. The Internet is composed of many networks of networks, but its existence requires physical elements such as cables. Transmission mediums that are "broadband" have the ability to transport multiple signals and traffic types simultaneously. Broadband, as the name implies, has greater bandwidth capacity and, therefore, greater and more reliable capacity for Internet "traffic." A speedier, more reliable Internet helps businesses, banks, schools, hospitals—anyone who relies on the Internet for his or her livelihood or well-being—to be more productive. And, it makes the state more attractive to outside investors.

After three years of construction, a major upgrade of Maine's economic and social infrastructure was completed in 2012. This upgrade, called the Three Ring Binder (or 3RB), is expected to have a significant positive effect on Maine's economy in the decades to come. The upgrade is a 1,100-mile fiber optic network spanning the rural regions of the state in the form of three large rings. (See map, Figure 1.) The rings are interconnected with each other and with the major urban service centers of the state, thus tying rural and urban Maine together. The rings are also connected via multiple paths to Canada and the U.S. Internet grid for the first time, placing Maine at the center of the global Internet rather than on an edge. The network allows users in rural Maine access to some of the fastest Internet service in the country.

FIGURE 1: **Three Ring Binder Map**



The 3RB brings many economic opportunities to rural Maine. This has been recognized by institutions such as the U.S. Chamber of Commerce, which in 2011 ranked Maine #1 in the country for technology infrastructure thanks partly to the 3RB (Mainebiz 2011).

The 3RB is an example of a successful public/private partnership, with 80 percent of the capital funding coming from the federal government and 20 percent from private investors. The structure of that partnership and the responsibilities it places on the private owners of the 3RB are rare if not unique. In 2010, an Act of the Maine Legislature established the legal framework to make the project possible. The 3RB is held up as a model project nationwide both for technical design and for the structure of the public/private

partnership. In this article, we discuss the history of the 3RB that will illuminate the motivations behind its design, its legal structure, and its potential for reshaping Maine.

HISTORY

Maine is a rural state, with limited financial or technical resources. Despite the lack of resources, since the rise of the Internet 20 years ago, Maine has had some success at keeping pace with the constant technological changes and demands of consumers. This has mostly been accomplished by a small, informal band of people and institutions that share an interest in making Maine well connected. The membership of this informal coalition has changed over time, and it only comes together around particular issues. The coalition is diverse in political outlook and doesn't seem to have any unifying qualities other than an interest in rural Internet service. After an issue is addressed, the group dissipates only to coalesce again when the advance of technology brings new problems. Institutions and stakeholder groups represented are the telecommunications industry; state regulators such as the Public Utilities Commission (PUC); the Office of the Public Advocate (OPA); technology workers in the state government such as the Chief Information Officer (CIO) and lead network engineer; consumers with a particular interest; librarians and educational folk such as college professors; Bowdoin College's chief information officer; the University of Maine; and the head of the Maine Schools and Libraries Network (MSLN).

Despite the lack of resources, since the rise of the Internet 20 years ago, Maine has had some success at keeping pace with the constant technological changes and demands of consumers.

The first time this coalition came together was early in the 1990s. The problem at the time was civilian Internet access via dial-up modem. For rural Maine, many dial-up calls were subject to high long-distance fees. At the time, long-distance fees could exceed $.10 per minute, making it expensive for rural Mainers to access the Internet.

The solution in 1995 was for the legislature to amend existing policy in state law to read:

> 4. Information access. The Legislature further declares and finds that computer-based information services and information networks are important economic and educational resources that should be available to all Maine citizens at affordable rates. It is the policy of the State that affordable access to those information services that require a computer and rely on the use of the telecommunications network should be made available in all communities of the State without regard to geographic location (35-AMRSA § 7101[4]).

The immediate impact of this policy statement was that the PUC made rules promoting fixed rate "toll free" long-distance lines for specific use only by Internet service providers (ISPs). This allowed ISPs to serve the entire state "toll free" from one modem bank in a central location. Over the long term, regulators and state employees have repeatedly made decisions based on that policy statement that have promoted the availability of the Internet at increasing speeds in rural as well as urban Maine. Among those decisions was the state's support of the grant application for the 3RB.

The next problem to arise was the issue of the Internet and education. Maine schools and libraries all needed to connect to the Internet to further education. Again the same coalition came together and laid the groundwork for the founding of the MSLN in 1996 and the continued funding of that entity via a state tax on telecommunications (Maine Telecommunications Education Access Fund [MTEAF]) and federal E-Rate funds). Today, MSLN connects more than a thousand Maine schools and libraries via high-speed Internet connections (see Welch, this issue).

While dial-up Internet access was universal and schools and libraries were well connected, by the

middle of the next decade, lack of rural broadband was becoming a real problem. The public Internet was about a decade old and was increasingly becoming vital to economic and social activity. Schools were starting to make use of the Internet in their standard curriculum. For K–12 students, lack of broadband at home meant they needed to stay after school or go to the library for access, a real burden for families. The group coalesced again. This time, in 2005 it was formalized by Governor Baldacci as the Broadband Access Infrastructure Board. The group released a report in November 2005 (Maine Broadband Infrastructure Board 2005). This led to the legislation that established the ConnectME Authority in 2006. The charter of ConnectME is to provide broadband to unserved and underserved portions of Maine; it "develop[s] proposals for broadband expansion projects, demonstration projects and other initiatives; administer[s] the process for selecting specific broadband projects; and provid[es] funding, resources and incentives" (PL 2005, c. 665).

Much of ConnectME's activity has been focused around providing grants to provide broadband to unserved areas. ConnectME is funded by a 0.25 percent tax on telecommunications. The ConnectME Authority is one of the smallest state agencies and the amounts awarded are modest. The grants provided total roughly $1.5 million per year.

ConnectME made progress extending broadband to unserved rural Maine, but there were many needs still unmet. During this decade, the importance of the Internet increased to the point where lack of broadband would effectively disenfranchise a citizen economically, educationally, socially, and politically. Pressure grew from unserved areas to make broadband universally available. All ConnectME grants had been awarded to small, local broadband ISPs that focused on rural areas. Universally, these ISPs told the ConnectME Authority that the biggest obstacle they faced was the lack of available high-speed, high-capacity connections to the rural communities they wanted to serve. These ISPs could connect up individual households via wireless or DSL broadband, but they lacked the ultra-high-speed lines to connect the entire community back to the Internet. DSL, cable, and wireless don't have enough capacity to connect up a whole hamlet or town; that requires fiber optic cables.

Fiber Optic Cables and the "Middle Mile"

Fiber optic cables are made up of many tiny strands of glass, each the size of a human hair. Data are transmitted down the fiber via light supplied by lasers. The lasers can be turned on and off very rapidly. This, combined with modern data-encoding techniques, makes it possible to transmit millions of times more data than in a cable or DSL system of the same physical size or power. For that reason, "middle mile" communications links are fiber optic cable in all modern communications systems.

In a communications network, the middle mile is the link that connects regions together. The "last mile" is the part of a communications system that connects individual dwellings or offices. Using our highway analogy, the middle mile is the equivalent of the interstate system and state highways. It is the segment of a telecommunications network that connects the core network with the central office (CO), commonly found in the center of towns. The last mile is the equivalent of town roads and driveways. It is the final segment of a telecommunications network that connects the CO to the customer or end-user. Sometimes you will hear synonyms for middle mile such as "backhaul" or inter-office facility (IOF). "Local loop" is sometimes used to describe the last mile.

Development of the Three Ring Binder

At the same time that ConnectME grantees were struggling with the lack of rural middle mile service, rural economic development officers were struggling with a related problem. Increasingly, companies needed ultra-high-speed Internet access in order to locate in rural areas; DSL and cable were not fast enough. Due to lack of ultra-high-speed Internet, rural areas in Maine were already at a competitive disadvantage compared to urban locations in other parts of the U.S., and it was clear the problem was only going to get worse in the future.

These problems were not unique to Maine. Nationwide, rural areas were suffering from the same problem. Given the trends, if Internet capacity in rural areas were (and are) not significantly increased, great

strain would be placed on rural economies. Political pressure grew for the federal government to help increase the high-speed capacity of rural Internet service. The recession that started in 2007 multiplied the pressure.

Driven by these concerns, soon after taking office in January 2009, the Obama Administration signaled that it would include rural broadband in the proposed stimulus package.The American Reinvestment and Recovery Act (ARRA) passed in the spring of 2009 included $7.2 billion specifically for rural broadband. The National Telephone and Information Agency (NTIA) of the U.S. Department of Commerce was given oversight of the largest portion of that, $4.7 billion, in the Broadband Technology Opportunities Program (BTOP). In its rulemaking, the NTIA recognized the importance of middle mile connectivity to rural regions and specifically set aside a funding pot for middle mile projects. As part of the ARRA legislation, it was stipulated that each state would get at least one grant.

Dark Fiber

Dark fiber is an unused, or unlit fiber optic cable. Fiber optic cables transmit information in the form of light pulses. Dark fiber refers to a fiber optic cable where light pulses are not being transmitted. Customarily, dark fiber is sold to telecommunications providers who then light the cable, allowing for information to pass through.

Once again, Maine's informal coalition interested in rural Internet coalesced. This time, the ConnectME Authority existed, so it could act in a supporting role while Jeff Letourneau of the University of Maine acted as the convener. Because there was real money at stake, there was far more interest from all parties, particularly businesses. The conveners and ConnectME made a significant effort to reach out to every conceivable interest.

The recession was particularly bad in 2009, so there was great urgency in distributing the stimulus funds in ARRA. The application time line was compressed into 30 days, from July 14th to August 14th.[1]

This situation drove the following conclusions:

- The short time period necessary to produce an application mandated a simple project.
- The large number of stakeholders and industry players mandated a "competitively neutral" project that would not favor one party over any other. Fortunately, the grant rules required "open access," so a competitively neutral project would be an advantage.
- The coalition determined that there was not enough federal funding to bring in all the ultra-high-speed Internet necessary to the state. Therefore the decision was made to build the foundation of a system that would entice private investors to build the rest.
- Maine was locked into a situation where it was replacing telecommunications infrastructure every five years. Given the U.S. government's debt situation, it was not clear that there would be federal money available again to upgrade Maine's rural telecommunications infrastructure. Therefore, the project should be as future proof as possible.
- The project had to result in significant cost benefit to rural companies and consumers. If the project resulted in an expensive network, then rural customers could not afford it.
- It seemed the missing piece of the system was middle mile fiber optic cable. This was the chokepoint. The University of Maine system, MSLN, and ConnectME all reported this was their largest problem. ConnectME reported that almost universally, its grantees were saying they could supply the last mile, but middle mile fiber network was missing.

The University of Maine proposed a dark fiber optic network running in three rings around rural Maine, but also passing through the major urban centers of Bangor and Portland. Twelve of 16 county seats would be on the rings, with the exceptions being Alfred (York), South Paris (Oxford), Auburn (Androscoggin), and Augusta (Kennebec). The fiber ring would also touch all campuses of the University of Maine System. The rings, in turn, would be connected via at least two points to the U.S. telecommunications grid via New Hampshire and via at least two points to the Canadian telecommunications grid via New Brunswick. Effectively, this would connect the three

rings in the state to rings in the south and north. Telecommunications engineers love rings because if you cut a ring at any one point, all other points on the ring still have a path to communicate. It is impossible to build a reliable network, cost effectively, without rings.

The coalition had a design and a dark fiber, middle mile network spanning unserved rural areas of Maine in three rings totaling 1,100 route miles. The next question was "how to pay for it?" The estimate was it would cost about $33 million to build. Under the terms of ARRA BTOP, the federal government would supply 80 percent leaving a 20 percent match of about $7 million.

The first plan was that, as in other states, the state government would supply the matching funds. Unfortunately, in the summer of 2009, the state of Maine was dealing with significant fiscal problems and was having to cut back a large number of programs. Getting funding for a new project was not going to be possible in the 30-day application window. The next plan was to have the University of Maine System (UMS) supply the matching funds. Within a week, UMS, which was also undergoing deep budget cuts, determined it did not have funds it could allocate.

The coalition then turned to private industry. The first thought was to have Fairpoint build, own, and operate the network. Since Fairpoint was preparing to enter bankruptcy at the time, GWI offered to raise some or all of the funds for them. This seemed like a pretty good deal: Fairpoint would essentially get the network for free. Unfortunately, Fairpoint was unwilling to build the network in the agreed upon form. Fairpoint already had a considerable degree of control over retail communications services and facilities in Maine and was opposed to the proliferation of dark fiber facilities that could benefit potential competitors. The plan had been to use dark fiber to meet the open access requirements of the grant program. Further, if Fairpoint had a monopoly on the network, it would not meet the needs of ConnectME grantees, and there was no motivation for other companies to support the application.

The initial tentative plan then became that four smaller companies, Otelco, Oxford Networks, Pioneer Broadband, and GWI would each put up $2 million for the $7 million match and each would own one-quarter of the network. This ended up not being workable. With the application window closing, in the end, GWI decided to go ahead and apply for the ARRA BTOP grant on its own, based on interest expressed by financiers Bobby Monks and Dwight Allison in providing private capital to meet the application requirements. Dwight Allison was a long-time independent board member of GWI and was familiar with the proposed grant.

GWI committed clearly and in writing to honor the intent of group: if GWI won a grant, it would turn the money over to an independently run company that would provide open access to fiber to any qualified provider. This independent company is now known as Maine Fiber Company (MFC).

During this period, the Maine State Legislature established a Broadband Strategy Council (BSC) whose charter was, among other things, to evaluate and potentially endorse ARRA grants on behalf of the state. Rep. Cynthia Dill was the key figure in establishing this council. The BSC formally endorsed GWI's grant application, as did the ConnectME Agency and Governor Baldacci. Maine's congressional delegation also supported the 3RB along with the Maine PUC, both the Maine State House of Representatives and the Maine State Senate, and later, Governor LePage's office. Without such support, the project may never have come to fruition.

On December 17, 2009, U.S. Commerce Secretary Gary Locke came to Orono to the University of Maine to announce the award of $25.4 million to help fund the 3RB. The award was the first ARRA BTOP award announced and has been a model project ever since. In the summer of 2012, MFC announced that the 3RB was substantially complete.

BUSINESS DESIGN

Being a public/private partnership, the 3RB is an unusual beast. In designing the business model and structure, a number of design objectives were followed. These goals were in alignment with GWI's goals because GWI was going to receive the grant and then give it away to MFC. GWI was expecting to be a customer of MFC and wanted to ensure that MFC would be a good and fair vendor. GWI also wanted to keep the other members of the coalition happy, as it is a small state and the company has long-standing

relationships with almost everyone, relationships that it plans to continue in the future.

First, the coalition wanted to avoid having a publicly funded monopoly. Eighty percent of the capital funding for the project was to come from the federal government. The purpose of the project was to build an infrastructure that would be vital to the economy and public good of rural Maine for at least 20 years.[2] There is no comparable infrastructure to compete with the 3RB. For that reason, the coalition wanted to avoid a monopoly as monopolies increase prices, impede innovation, and are against the public interest. To meet this goal, MFC was created as a completely separate company instead of as a subsidiary of GWI. GWI transferred the grant to MFC in the summer of 2010. Dwight Allison resigned from the board of GWI to become CEO of MFC.

Given the goals of BTOP [Broadband Technologies Opportunity Program], the 3RB needed to be focused primarily on the areas of the state that were unserved or underserved for Internet broadband.

Second, the open access provisions of the grant had to be enforced. Open access is one way to avoid the problems caused by monopolies. To receive the grant, it was necessary to give the federal government assurances that the network would be an open access network. In April of 2010, the state of Maine passed a law to allow MFC to become a "dark fiber provider," giving it the right to attach to utility poles without offering services to end customers. This was necessary because of the measures taken by the grant to ensure open access. MFC is required to sell only dark fiber and not sell any "lit" services to end customers. MFC cannot compete directly with carriers such as GWI, Otelco, or Oxford Networks.

Third, a competitively neutral platform had to be created. There was a great deal of concern in the industry about the creation of a publicly subsidized entity that would unfairly dominate competitors. To address this, MFC is required to file all its rates with the Maine PUC and publish them on its web site. Prices are required to be "just, reasonable and not unreasonably discriminatory." The same terms and conditions will be offered to all comers for a set period. The MFC is required to sell no more than 20 percent of the fiber in any one location to any one entity. This should ensure there is at least the potential for five competitors serving any one location, creating a competitive market.

Finally there had to be a sufficient return on investment to attract private investors. For any partnership to work, it must meet the needs of all partners. Private investors were taking the risk of supplying the capital because the Maine state government, the University of Maine, and private telecommunications companies were unable or unwilling to take the risk. It was important to ensure that that risk was rewarded.

TECHNICAL DESIGN

There were several technical goals in designing the 3RB, which led to development if its technical design features.

Serve Rural Areas

Given the goals of BTOP, the 3RB needed to be focused primarily on the areas of the state that were unserved or underserved for Internet broadband.

The route traverses the most rural parts of the state, mostly following Route 1 along the coast up from Biddeford in York County to Calais in Washington County, then follows Route 1 as it takes its long run along the New Brunswick border through Houlton, Presque Isle, Caribou to Madawaska and Fort Kent. The 3RB then returns south via Route 11 and Route 16 to Millinocket, Dover/Foxcroft. It then follows Route 2 and other major highways through the mountains to Skowhegan, Farmington and south back into York County.

The route is in the form of three rings. If you look at the map of the 3RB, you will notice that it

is actually one large ring made of three interlocking rings. This architecture is even more reliable because the existing major fiber optic artery of the state runs up the I-95 corridor through the urban areas of Maine, from Portland/Lewiston/Augusta/Waterville to Bangor. The 3RB was designed to avoid these urban areas so they are the "hole in the doughnut" of the 3RB rings. Combining this existing fiber with the 3RB makes for six interlocking rings and even more redundancy. The redundancy is made even better because the three rings of the 3RB are now interlocking with fiber rings to the south in New Hampshire and to the north in New Brunswick. These rings are being built in response to the construction of the 3RB. The New Hampshire ring is part of the Network New Hampshire Now second-round ARRA BTOP project, which was partially patterned off of the 3RB. The New Brunswick ring is being built by a number of companies, including the New Brunswick company F6 Networks in response to Canadian business opportunities created by the 3RB.

Speed

The 3RB should be capable of the fastest speeds possible given current and future technologies over the 20-year lifespan of the project. State-of-the-art speeds will be a significant positive factor in future economic development. Lasers sending signals via fiber optic cables are the fastest type of data transmission known to current science. One strand of fiber can carry all the data flowing in the current Maine telecommunications network. Nevertheless, "high strand count fiber" (see sidebar) was used: 288 strands in built up areas and 144 strands in remote areas. This is to ensure there will always be enough fiber for the highest speeds.

Reliability

The 3RB needed to have the best reliability available under current technology. The Internet is already vital today and its availability will only become more important in the future as more medical, public safety, and economic applications depend on it.

Future-proof

The 3RB must be financially and technically viable throughout its 20-year lifespan. The design should be viable not just for today, but for the years to come. Given the decades-long lead time to deploy new theoretical types of data communications, it is highly unlikely that any form of data communications will become faster during the 20-year lifespan of the project. The electronic equipment used to send signals evolves constantly, so the project only includes dark fiber and does not include the equipment. It is the responsibility of private entities to upgrade the equipment. Using high strand count fiber optic cable also protects against future growth in the network.

High Strand Count Fiber

Fiber optic cable is made up of multiple strands of fiber, each as thick as a human hair. Lasers and sensors can be attached to each end of the fiber to send and detect light pulses. Normally, fiber optic cable has strands in bundles (called "sheaths") of eight. High strand count fiber is fiber optic cable that has more than 96 strands (12 sets of eight). Since it is possible to send more than 100 terabits/sec (100,000 gigabits/sec) down one strand of fiber, high strand count ensures huge capacity for the future. It makes it possible to use the fiber efficiently, say by allocating a whole strand to one customer and still have plenty for all.

Security

A vital resource such as the Internet needs to be available and secure. Much of the burden of security falls on parts of the network not included in the dark fiber. It is difficult to tap into dark fiber and essentially impossible to do so undetected. Again, high strand count networks means fiber does not need to be shared between customers, increasing security.

Support Both Middle Mile and Last Mile

The nature of rural Maine is that roughly two-thirds of businesses and much of the population density is within a half-mile of US Route 1 or other highways. While the 3RB serves as a middle mile connector between regions, with proper routing, frequent splice points and local connectors, it can also serve as a significant amount of last mile network. Support for last mile as well as middle mile takes the form of high strand count fiber optic cable making fiber available for both uses. It also takes the form of frequent splice points and local connectors.

Support Many Carriers

As outlined in the Business Design section, it is a goal of BTOP to be open access. It is also a goal of MFC to make money. Both goals are satisfied if the 3RB is usable by all communications carriers doing business in Maine. In so doing, it would develop a vibrant market based on the 3RB.

Directly Connect Community Anchor Institutions (CAI)

Another of the goals of the BTOP was to directly connect as many CAI as possible: schools, libraries, municipal governments, public safety, child and elder care. The project set aside $1 million to build connecting laterals off of the 3RB to local institutions that meet the CAI criteria. That list includes 10 campuses of the University of Maine System; three community colleges; 13 county courthouses; 11 county jails; 14 of Maine's DHHS district offices; and many hospitals, doctors' offices, K–12 schools and libraries.

In the 3RB, Maine now has one of the fastest networks in the nation running through its rural areas.

HOW HAS THE 3RB WORKED OUT?

In September of 2012, MFC announced that the 3RB was substantially complete, ahead of schedule and on budget. There will be some small additional work done to finish up details, such as individual connections, with the last federally funded work to be completed by the summer of 2013. Even though the construction is just being finished, it is already possible to see progress on the project's goals.

A key goal of the 3RB was to be useful to ConnectME grantees in bringing broadband to unserved and underserved regions of Maine. Already, the leading ConnectME grantees, Pioneer Broadband, Midcoast Internet Solutions[3], Cornerstone Communications, and Axiom Technologies, are using the 3RB for middle mile connectivity. Pioneer Broadband and Cornerstone Communications are particularly interesting examples because they use the 3RB as part of fiber-to-the-home (FTTH) systems in rural Maine. The connectivity provided by these companies to small rural hamlets in Aroostook and Piscataquis counties is among the fastest in the nation and the fastest in Maine.

A second goal was to provide high-speed access to CAIs such as colleges, universities, schools, libraries, municipal buildings, healthcare, and elder and child care. As of January 2013, hundreds of CAIs have already been connected either directly by MFC, MSLN, or one of the companies buying dark fiber from MFC. This list will continue to grow over the next few years.

A third goal of the 3RB was to create a vibrant, competitive market for high-speed Internet access in rural Maine. According to MFC, they have signed contracts with 13 entities using fiber in Maine and are negotiating with another 29. GWI has noticed significantly greater competition in rural areas.

A fourth goal was for MFC to be sustainable. Were MFC not to be sustainable, the federal investment would potentially be stranded; no other commercial entity was willing to build the network on its own. The calculation was that with 80 percent of the capital supplied as a subsidy, MFC would have enough forward financial momentum to get off the ground. MFC is a privately held company, and its finances are not public information. However, there are reasons to believe it is meeting its financial goals. First, the announced number of signed contracts with carriers is healthy. Second, MFC has announced that it is extending the 3RB through New Hampshire and the north coast Massachusetts to Boston using entirely private funding. It would not be taking on this expansion if it did not feel it was a profit-making venture.

A fifth goal of the 3RB was to improve economic development by building infrastructure ties between the U.S. and the Canadian Maritimes via Maine. Because most telecommunications traffic between the U.S. and Europe makes landfall in the Maritimes, good connections between Maine and the Maritimes will

lead to much of this traffic traversing Maine, bringing with it economic development and opportunity.

THE THREE RING BINDER'S POTENTIAL FOR FUTURE ECONOMIC DEVELOPMENT

The 3RB's meeting of its early goals is encouraging. However, the potential future economic benefits far outweigh what has already been accomplished. Ultra-high-speed Internet access is a vital component of future economic development. In the future, regions that have ultra-high-speed Internet access will be at a competitive advantage. In the 3RB, Maine now has one of the fastest networks in the nation running through its rural areas. There is a vibrant and competitive communications industry using the 3RB. The combination of these factors results in enormous economic potential. Let's look at four areas.

The first is the opportunity to attract companies that need ultra-high-speed Internet to locate in rural Maine. As there are few places in the U.S. that now have access to this level of telecommunications services, rural Maine has become an attractive place to locate not only due to superior connectivity, but also the availability of inexpensive land and the lifestyle and beauty of rural Maine.

The second is fostering the growth of new ventures that use ultra-high-speed Internet in innovative ways. Maine has a number of ventures that are promoting innovation and entrepreneurship. Some of the most prominent are the University of Maine with its Innovation Engineering program; USM and Colby College with their entrepreneurship programs; and nonprofits Blackstone Accelerates Growth, Midcoast Magnet, and the Maine Center for Entrepreneurship Development. The availability of a state-of-the-art network fits well with these efforts.

The third is attracting highly educated, high-income individuals to move to rural Maine. Over the last 30 years, highly educated, high-income individuals have had a greater impact on the world's economy; this trend will continue and accelerate. As telecommunications shrink distance, people in this category can live anywhere they want and do their jobs via the network. There are many doctors, lawyers, engineers, financial professionals, and artists who would love to live in a beautiful location and raise their families in strong, tight-knit communities. This is rural Maine.

The fourth is to lower the costs of doing business and living in rural Maine. Telecommunications shrink distances; the more advanced the telecommunications, the more distance is diminished. A large part of the cost of living and doing business in rural Maine is its distance from service centers. As telecommunications allow more services to be delivered to rural residents and allows rural residents and businesses to participate fully in the economy and society without leaving home, the "rural tax" imposed by distance goes down.

CONCLUSION

The federal government and private investors have made a $32 million investment in rural Maine's infrastructure in the form of a very high-speed network connecting rural Maine to the Internet, Maine to the rest of the U.S., and Maine to Canada. This open access network is broadly available to many communications providers, creating a competitive market leading to low prices and high quality of service being available in rural Maine. In locations in rural Maine near the 3RB, the Internet is as good as anywhere in the U.S. (Praxis Strategy Group 2011). This, in turn, creates significant economic opportunity.

With the nationally recognized Three Ring Binder now complete, the next mission for policymakers, political leaders, and the private sector to focus on through the Broadband Strategy Council is this: How do we all work together to pursue a comprehensive, statewide economic development program to take advantage of the network and attract good jobs to Maine?

ENDNOTES

1. The deadline was later extended to August 20th, but this was not known at the time.
2. Twenty years is the standard accounting depreciation cycle of fiber optic cable. Frequently, fiber optic systems stay in use for longer periods.

3. In 2012, GWI acquired the assets of Midcoast Internet Solutions (www.gwi. net/policy/news/gwi-continues-expand-acquires-midcoast-internet-solutions-adds-2495-business-residential-customers-bath-belfast-fixed-wireless-expertise/) [Accessed April 19, 2013]

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