

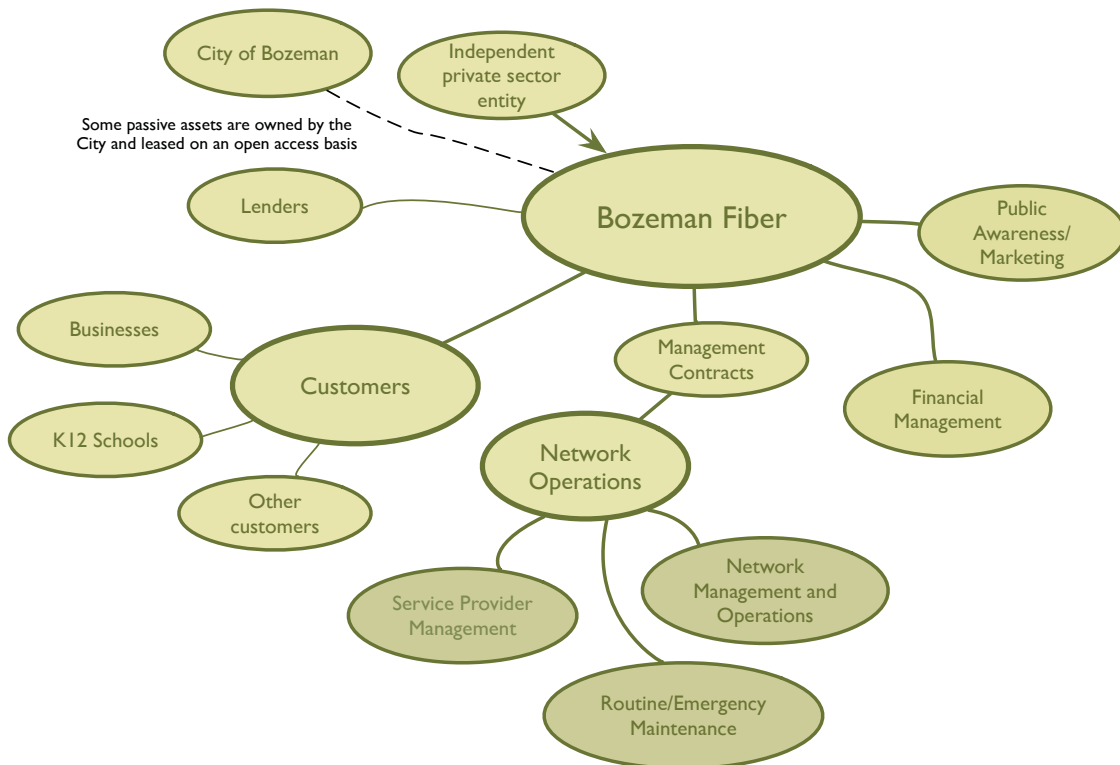
Overview of the Bozeman Fiber Concept

The Bozeman Fiber Master Plan and Feasibility Study recommends that the City of Bozeman partner with a private entity to manage and operate the proposed open-access network.

That entity, referred to here as, *Bozeman Fiber*, will be operated as an independent organization structured as a community nonprofit or LLC. The formal legal structure of this organization will be forthcoming, pending advice from legal counsel. Structuring Bozeman Fiber as an independent community enterprise will provide Bozeman Fiber with two important benefits:

- ▶ The enterprise will have the business and management flexibility needed to make decisions efficiently and effectively in the fast-moving broadband business environment.
- ▶ As a community enterprise with financing and equity from local stakeholders, the project is vested in the community and can be operated on behalf of the community priorities and economic development needs, but will not be limited by public sector restrictions on operations or decision-making.

The network will be operated as a single high performance fiber network available to any and all service providers, including incumbent providers who want access to the significant market opportunity represented by Bozeman. This shared business model is fundamentally different from the twentieth century copper-based networks where each provider has to build and operate a completely duplicated network (i.e. two providers each build a separate and duplicated network to reach the same customers, which results in higher costs across the board for customers).



In this model, the City of Bozeman may own at least some of the conduit/handhole assets and leases the assets to Bozeman Fiber. The lease arrangement will be structured for a minimum of twenty years, with a nominal annual lease fee and possibly a long term revenue share arrangement that would begin once Bozeman fiber begins to cover all operating expenses and debt service.

Depending on the form of the business entity, the structure could also allow ownership participation by local businesses and investors (i.e. an LLC rather than a nonprofit). As part of the Bozeman Fiber operating agreement, excess revenue that exceeded expenses and debt payments could be disbursed on a scheduled basis to any local businesses that made an investment in the project.

Bozeman Fiber will have a limited number of essential roles:

- ▶ **Contract Management** - Bozeman Fiber will hold contracts for outsourced network operations, outsourced network repairs and maintenance, outsourced construction of network extensions, and service provider contracts for the services offered on the network. Where it is efficient and effective, Bozeman Fiber would seek to use qualified private sector firms to handle the technical operations of the network to minimize the number of staff required by Bozeman Fiber.
- ▶ **Financial Management** - Bozeman Fiber will provide the financial management and administration of the business. Most routine bookkeeping and accounting would not require full time staff and could be handled by part time staff and/or outsourced to a local accounting firm.
- ▶ **Public Awareness** - Bozeman Fiber will maintain a modest, ongoing public awareness campaign to ensure that local businesses are aware of the opportunity to obtain higher performance, fiber-delivered services at attractive (lower) rates. While service providers would be responsible for their own sales, billing and customer management, Bozeman Fiber would focus on name and brand awareness in the community.

Bozeman Fiber, as a private sector entity, keeps the local government out of the business of broadband while preserving the opportunity to seek grants and other funding via nonprofit channels and/or leasing conduit from the City. Local businesses that choose to make an investment in Bozeman Fiber could look forward to recouping their initial investment over a period of several years, and in subsequent years could see a modest return on that investment.

Market and Need

There is much confusion about the “true” definition of broadband. From the perspective of economic development, there can be no upper limit on the definition of broadband. Saying that broadband (as an example) is 5 megabits/second of bandwidth or 10 megabits/second is to immediately tell businesses in the region that there will be structural limits on their ability to do business in the future—it is dictating the size of truck that can be used to deliver goods and services. Here is the only appropriate definition of broadband:

Broadband is whatever amount of bandwidth is needed to support a business' ability to compete in the global economy.

Broadband is a community and economic development issue, not a technology issue. The essential question is not, “What system should we buy?” or “Is wireless better or cheaper than fiber?” Instead, the question for Bozeman is:

“What do our businesses and residents need to be able to compete globally over the next thirty years?”

In short, Bozeman today has “little broadband” in the form of DSL and cable modem service, along with a very limited amount of “big broadband” in the form of fiber to a few businesses and institutions.

If Bozeman is to make investments in broadband and telecommunications infrastructure, it is absolutely critical that those investments are able to scale gracefully to meet business and economic development needs for decades. This drives the solution towards a high performance fiber network designed with a redundant multiple ring architecture that will meet the needs of the most demanding users of the network. Two key concepts that should drive community investments in telecom are:

“Broadband” is not the Internet and bandwidth is not a fixed number

Broadband and “the Internet” are often used interchangeably, but this has led to much confusion. Broadband refers to a delivery system, while “the Internet” is just one of many services that can be carried on a broadband network. The challenge for Bozeman is to ensure that businesses and homes have a broadband network with sufficient bandwidth to deliver all the services that will be needed and expected within the next three to four years, including but not limited to “the Internet.”

	Next 2-4 years	Next decade	Twenty years
Small business needs (1-9 employees)	10-25 megabits of symmetric bandwidth and 5-10 megabits of Internet access	100 megabits of symmetric bandwidth and 20-40 megabits of Internet access	Gigabit+ symmetric bandwidth and 50 to 100 megabits of Internet access
Medium-sized business needs (10-100 employees)	50-100 megabits of symmetric bandwidth and 10-20 megabits of Internet access	Gigabit symmetric bandwidth and 50 to 100 megabits of Internet access	Multiple gigabit symmetric circuits and lightpaths and 100+ megabits of Internet access
Large business needs (100-1000+ employees)	Gigabit+ symmetric bandwidth and 100+ megabits of Internet access	Multiple gigabit symmetric connections and 250 to 500 megabits of Internet access	Multiple gigabit symmetric circuits and lightpaths and 1 Gigabit+ of Internet access
Residential needs	25-50 megabits of symmetric bandwidth and 4-8 megabits of Internet access	100 megabits of symmetric bandwidth and 20-30 megabits of Internet access	A Gigabit symmetric circuit and/or lightpaths, with 50 to 100 megabits of Internet access

Bozeman faces a challenge in economic development infrastructure with primarily “little broadband” (i.e. DSL, wireless, and cable services) when many communities, regions, and countries have already made the decision to focus resources on the development of “big broadband,” which is typically fiber with a minimum capacity of 100 megabits or Gigabit to the premises.

- ▶ A third of IBM employees work from home at least part time, and the company has reported annual savings of \$110 million.
- ▶ Australia’s government is converting the entire telecommunications infrastructure for the country to an open access system by buying a major portion of Telstra assets. Telstra, which is currently the country’s primary incumbent telecom provider, will become a service provider on the new open network.
- ▶ Fiber to the premises attracts home buyers, who are willing to pay \$2000 to \$4600 more for a house with fiber service.
- ▶ Fiber to the home users say they are able to work from home more often, averaging 7.3 workdays per month, reducing their carbon footprint and decreasing wear and tear (and maintenance) on roads.
- ▶ More than 14% of homes in the U.S. had been passed by fiber by mid 2013.
- ▶ Nationally, less than 10% of homes have no access to any kind of broadband service, but in the region, more than 16% of homes still have no broadband access, or 50% higher than the national average.

Business Model

Bozeman Fiber will pursue a wholesale model, selling network transport (i.e. a shared digital road system) on a wholesale basis to retail service providers, who will market and sell to their own customers. Bozeman Fiber will be a shared infrastructure, multi-provider, multi-service network. Roads and airports are examples of common shared infrastructure used by both public and private entities to meet a wide variety of community business and government needs. Service providers will be the customers of Bozeman Fiber. Some of the outcomes of this approach are:



- ▶ More customers -- When the network capacity is shared among several providers, each provider has a much lower cost of infrastructure needed to enter a market. In smaller towns and regions, this is a critical difference. Community investments allow more companies to profitably offer services in smaller markets than a firm could do on its own.
- ▶ Lower costs -- When a provider can reach more customers via a shared broadband system, lower costs of service usually results. Typical reductions in cost in open access systems are usually on the order of 15%, and are frequently much more than that. It is not unusual to see the cost of telephone service decline by 40% or more.



Services aggregation occurs when communities build open networks, meaning that any qualified service provider can offer services using the community digital roadway. In this business model, there are usually several service providers competing for customers in each category of services (e.g. voice telephone service, TV, Internet access).

- ▶ More choice-- A natural outcome of more services is more choice for purchasers of services. Instead of a single monopoly provider of telephone or television, customers can pick and choose among a variety of service plans at various price points.
- ▶ More competition -- When more services are available, there is more competition for customers. Subsequently, service providers must sell services for the lowest possible price, and also creates incentives to provide excellent service to customers. Compare this to a monopoly environment where there is no competition and hence little pressure for a company to provide good service--customers have no other service options.
- ▶ More services -- When there is a wider choice of services on the shared system, there is more opportunity to use more services. This is, in part, what makes open service provider networks financially sound investments for communities: Open systems create a bigger market for telecom services, and thereby creates more revenue flowing through a community revenue sharing plan.

Goals and Objectives

The Bozeman Fiber network will have the following characteristics:

- ▶ **Standards-based** - The network will be based on an active Ethernet architecture for the core network and for delivery of business class services to key anchor institutions and businesses. If in the future the network begins to deliver fiber to the home on a wide-spread basis, a PON (Passive Optical Network) architecture may also be deployed.
- ▶ **Scalable** - The initial design of the network will support a graceful expansion over time to be extended to all areas of the city. The long term goal of the project is to deliver high performance, affordable broadband services to any residence, business, or institution in the Bozeman area that requests service, with Gigabit fiber as the standard minimum connection.
- ▶ **Affordable** - Bozeman Fiber will work with providers to ensure that a wide range of affordable services are available for businesses and families with limited resources.
- ▶ **Symmetric Bandwidth** - Upstream and downstream data capacity of the broadband network will be equal. Current broadband systems restrict upstream data capacity to a fraction of the downstream capacity, and thereby limits economic development, entrepreneurial activities, and work from home opportunities. Bozeman Fiber will help retain existing businesses and attract new ones, especially in Bozeman's business districts.
- ▶ **Business-class ready** - Businesses in Bozeman should have as much bandwidth as they need to do in order to maintain and enhance services globally. The network will deliver any amount of bandwidth needed by any business connected to the network, with any desired quality of service (QoS) required to make Bozeman businesses competitive in the world economy.
- ▶ **Redundancy and Resiliency** – The network will be designed with a redundant “ring” architecture to minimize downtime from accidental fiber cuts and network equipment failures. Bozeman businesses, local government, schools and anchor tenants will have a high reliability network.
- ▶ **Equal access to all providers** – The network will be operated on an open access, wholesale business model with all business and residential services provided by qualified private sector providers. A single public wholesale price list will be used to determine the cost of provider use of the network.
- ▶ **Equal access to all residents and businesses over time** – The goal of Bozeman Fiber is to deliver high performance fiber services to all residents and businesses as rapidly as possible consistent with fiscally conservative operations.
- ▶ **Competitive Marketplace** – Bozeman Fiber will be operated as a multi-provider, multi-service network with a wide range of competitive price and service options available to customers.
- ▶ **Limited Government Involvement** - Bozeman Fiber will be owned and operated independently of the City of Bozeman. It will function as a true public/private partnership with limited but important support from the City.

Critical Success Factors

Public/Private Partnership - Develop and maintain a relationship with key public and private stakeholders, including the City of Bozeman for equal access to City-owned conduit and fiber, to ensure timely access to right of way, and swift approval of permits.

Customer Focused - Build and maintain enduring relationships with key businesses and institutions in the community to ensure that Bozeman Fiber delivers a world class, affordable, resilient and redundant network to meet the needs of these customers.

High Quality Service Providers - Establish letters of intent and ultimately contracts with a variety of qualified service providers who will use the network to reach existing and new customers with a wide range of competitively priced services.

Operate as a start up business - Bozeman Fiber must be started and managed as an entrepreneurial start up in a competitive environment. Early staff hires will require a track record of successful business/administrative management and a demonstrable record of innovation. They should be flexible, knowledgeable about local government, and be comfortable with technology.

Fiscally Conservative Funding - Successful projects provide enough funding to support eighteen to twenty-four months of operations. There are a variety of fixed costs (staffing, outside plant maintenance, network operations, utility costs, office costs, etc.) that accrue beginning on day one, when revenue is low. While some community projects have been successful getting into the black operationally in year one, it sometimes takes longer.

Careful Financial Oversight - Broadband infrastructure projects require rigorous financial oversight. Projects that have developed financial problems have usually over-estimated early revenue, underestimated expenses, and/or simply spent too much without aligning expenses with revenue.

Use take rate targets as a key performance measure - Take rates directly affect revenue: if take rate projections are not being met, revenue shortfalls are likely. Take rates (both raw numbers and month to month growth rates) should be analyzed at least quarterly (monthly would be preferable).

Plan for marketing and public awareness efforts - It will be necessary to have a robust and regular marketing and awareness campaign to ensure that area businesses know that the new Bozeman Fiber network is available, that they know what service providers are available on the network, and they know how to order service. While service providers will be responsible for sales (that is, selling their services and signing up their own customers), the network itself will have to market general awareness of the network.

Plan to Grow - Most community-funded efforts start small. This appears to minimize financial risk, but over time, the network may not pass enough potential customers to meet take rate projections. Even small networks have a certain amount of fixed operational costs regardless of size, and the network needs enough revenue to pay those expenses, as well as make principal and interest payments on any loans.

Financial Feasibility Summary

Delivering high performance broadband to a community is a capital-intensive business, with potentially attractive long-term rewards. Once customers have connected to a fiber broadband network, they seldom terminate service. It is important to note that the multi-provider, multi-service business model allows end user customers to switch from one provider to another while still creating revenue for the network.

The initial three year development of Bozeman Fiber includes a business class fully redundant ring built around the city that will pass an estimated 500+ businesses, and over a ten year period the project expects to pass more than 95% of the businesses in the city.

A combination of grants, equity and loans, for a total of less than five million, will construct both the core network ring and all the laterals needed to connect City facilities, many institutional customers, and hundreds of large and small businesses. Bozeman Fiber projects being in the black operationally in year three, and beginning in year six will generate enough revenue to finance additional expansion. *Our ten year pro forma analysis projects that the proposed network is feasible and financially sustainable.*

In our financial analysis, operational expenses are have been divided into two categories: Salary, General, and Administrative (SG&A) projects expenses that are relatively independent of the size of the network, although this is only a rough rule of thumb. Costs like staff and marketing do tend to grow over time as the network expands. Network Operations costs identify expenses that are more tightly linked to the growth of the network.

Anticipated SG&A costs include:

- ▶ Staff costs, including salary, benefits, and staff-related expenses like travel, phone/Internet access, and miscellaneous overhead.
- ▶ General office expenses, including office supplies, computer supplies (e.g. ink, paper, toner), and shipping and postage.
- ▶ Marketing expenses, which are typically calculated based on the growth in customers.
- ▶ Other expenses, including legal counsel, consultants, insurance, and miscellaneous costs.

Operating expenses include:

- ▶ Support Fees, which are related to the cost of extended warranties for equipment and allocations for space parts, as well as software license fees.
- ▶ Network Operations Costs, which include any OSS/BSS software per subscriber fees, the cost of contracted network operations, and other infrastructure-related expenses.
- ▶ Outside Plant Maintenance, which budgets maintenance costs for fiber and wireless assets (e.g. fiber cable, handholes, cabinets, wireless towers, etc.).

Proposed Route Map

Proposed routes of the early stages of development.

