Appendix A: Common Objectives for Fiber-to-the-Premises Networks

DRAFT

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1 Introduction

Many localities nationwide are exploring the feasibility of deploying new broadband networks or expanding their existing fiber infrastructure to better meet community connectivity needs. It is important for localities to make informed choices about planning, deploying, and expanding fiber-to-the-premises networks to strategically meet evolving connectivity needs. Each locality must carefully weigh the costs and benefits of implementing a fiber-to-the-premises network, and possibly how best to pursue potential public–private partnerships for the greatest community benefit.

This analysis considers the changing definition of open access, its potential impact on a Fiber Optic Enterprise, and possible public–private partnerships. This analysis evaluates common broadband objectives that many communities prioritize and considers how these may affect a locality's decision-making process. Choosing which goals to prioritize can be challenging, and this analysis seeks to arm the City of Ocala (City) representatives with information to empower decisions about connectivity needs that will have ongoing positive outcomes.

1.1 Open Access Defined

Historically, the term “open access” has been defined as one network infrastructure over which multiple, separate providers can offer service. Often the infrastructure is publicly owned and Internet service providers enter into an agreement to enable them to provide service over the public, open infrastructure.

Open access arrangements are usually fostered by public entities that wish to stimulate competition by providing access to infrastructure for multiple providers to offer service. Such an arrangement enables private providers to offer services without having to construct expensive infrastructure—known as overbuilding. Instead, providers can enter into wholesale transport, dark fiber lease, or indefeasible right of use agreements with the locality, and these Internet service providers can then offer retail data, video, and voice services over the network. Whether providers gain access via dark or lit services, open access has historically meant that multiple providers offer services over one central infrastructure, which is usually publicly owned.

One of the primary goals of open access is competition—public entities develop infrastructure to enable numerous providers to offer services to consumers, thus providing choices where perhaps none previously existed. Consumer choice is typically the other primary goal of open access networks. Traditionally, public entities sought to develop open access networks to promote competition and thereby empower consumers with greater choice in selecting providers.
Communities are finding that they may be able to achieve their open access goals even without a traditionally open-access network. That is, network owners may find that it is no longer necessary to provide access to physical infrastructure in order to promote and support competition. Open access goals can potentially be achieved through enabling multiple over-the-top providers to offer various services over a locality’s high-capacity data network. Over-the-top content (typically video and voice) is delivered over the Internet by a third-party application or service—the Internet service providers provides the data connection over which the content is served, but does not directly offer video and voice services.

Over-the-top content delivery is particularly effective over ultra-high speed fiber optic broadband networks that offer top tier speeds and are provisioned for affordable data service at 1 Gigabit per second speeds and beyond. Such high capacity networks possess the capacity to provide a variety of different over-the-top applications to meet consumers’ needs. Consumers are likely to pursue alternatives to conventional video and voice services as additional and increasingly varied content becomes available over-the-top, and as access to high-speed data connections becomes more prominent and affordable. Although the definition of open access is technically unchanged, communities have alternative paths for meeting the goals typically associated with administering open access networks.

1.1.1 Open Access Goals

We noted that the chief goal of most open access networks is to enable competition. Open access networks are meant to enable numerous providers to deliver service over the network, give consumers greater choice and flexibility in picking a provider, and ultimately to broaden availability. Communities are beginning to understand that the objective of competition is key, and that providing a competitive marketplace for consumers may not look like what has traditionally constituted open access. In other words, data enables cloud-based applications and services. A public offering that provides a robust retail data service and competitively priced wholesale transport access brings the open-access objectives to the market.

If a Fiber Optic Enterprise delivers an unfettered data offering that does not impose caps or usage limits on one use of data over another (i.e., does not limit streaming), it has essentially created an open access network on the applications side. All application providers (data, voice, video, cloud services) are equally able to offer their services, and the consumer’s access to advanced data opens up the marketplace.

A Fiber Optic Enterprise as a premium data-only provider fosters access in the near-term to create an open network. This is a building block toward potentially opening the network further in the future as a Fiber Optic Enterprise evolves, if this form of open access remains an ongoing goal. Achieving traditional open access has been challenging in the United States, and focusing on other means to achieve open access goals may be appealing for communities.
1.1.2 Evolving Over-the-Top Providers

Over-the-top or “value added” services is not a new concept, though it has been quicker to evolve in the voice market than in video. Recent announcements regarding expanded over-the-top video offerings suggest that consumers are seeking alternatives to traditional video services and the market is responding. Earlier this year, Verizon FiOS announced an “a la carte” offering called Custom TV, which allows consumers to choose from bundled packages that more appropriately reflect their programming desires and include less unwanted channels.\(^1\) While this is not a true over-the-top application, it demonstrates the recognition within the incumbent market that consumers are dissatisfied with traditional content delivery and are seeking alternate choices.

Changes in the landline telephone industry over the past decade may inform potential shifts in the video content industry. Home telephones were still nearly ubiquitous as recently as ten years ago, even in households where all members subscribed to wireless phone service. Data from a December, 2013 National Institutes of Health report showed that nearly half the households in Florida were wireless only with no landline telephone.\(^2\)

National usage has continued to decline—January through June 2014 was the first six-month period during which a majority of U.S. children lived in households with wireless-only telephone service.\(^3\) This decline was possible due to increasingly accessible and affordable cellular and wireless service along with other alternatives to landline, over-the-top voice content providers like Skype and Google Voice, services like Vonage and Lingo, and technology like magicJack and Ooma.

The cable industry is likely to experience a similar shift toward nontraditional technologies, applications, and services that allow consumers greater flexibility and choice. This will likely be more gradual than the changes to the voice industry because of cable content owners’ great degree of control, but an increased propensity inclination toward over-the-top offerings could significantly impact the cable industry.

Even Google Fiber found when it entered the Kansas City market just a few years ago that a data product alone was not strong enough to obtain the necessary market share to make the endeavor viable. If it wanted to get people to switch providers, Google had to offer cable, deviating from its original plan and introducing more cost and complexity than the simple data

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service it had anticipated. If over-the-top content delivery were more widely available when Google entered the Kansas City market, Google likely would have found that offering traditional cable television was unnecessary. It will likely eventually phase out its traditional cable offering in favor of promoting over-the-top content. However, because it was forced to set a precedent of offering traditional cable services when entering the Kansas City market, Google Fiber has necessarily continued offering these services in its subsequent markets.

Dish Network launched an over-the-top service in early 2015 that offers sports programming on channels such as ESPN as well as other programming and popular TV channels without a cable subscription. The service, called Sling TV, is streamed over the Internet. It does not require any additional hardware and is enabled by installing an application on a device such as a smartphone, tablet, laptop, or Internet-connected television. Sling TV currently is priced at $20 per month with no time commitments, but it is complex and fraught with limitations and restrictions. Traditional cable content providers’ attempts at over-the-top have seen varying degrees of success, but it is significant in the industry for these providers to even acknowledge the need for these services.

In addition to recent entrants to the over-the-top market, there are numerous established services and applications that will likely continue to promote change in the cable industry and drive an increase in consumers’ desire for greater choice and control over how they access content. Standalone media-streaming boxes like Apple TV and Roku have enabled consumers to stream content with applications such as YouTube, Netflix, and Hulu without a cable subscription since 2008. These “cord-cutters” cancel their cable subscriptions in favor of accessing their favorite content via applications and services streamed over the Internet—or, over-the-top content.

Since the debut of Apple TV and Roku, similar devices like the Chromecast, Google Nexus, and Amazon Fire TV have entered the market, allowing consumers greater choice. Further, consumers can now purchase smart TVs, which come with preinstalled platforms that support streaming applications. These devices require no additional hardware—with only an Internet connection, consumers can stream music, TV shows, movies, and even play games.

HBO announced last year its plans to offer its own over-the-top service, and as of early 2015 it began offering HBO NOW over Apple devices and to Optimum service subscribers. Access to

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4 [https://www.sling.com/](https://www.sling.com/), accessed April 2015
premium programming like sports and HBO has been a stubborn barrier to customers who want to eliminate their cable subscriptions (and to competitors that want to disrupt the market). Often, consumers would happily give up enormous cable bills in favor of more streamlined, inexpensive services—but they do not take the leap because they want specific programming that is only available over cable. It is significant when a content powerhouse like HBO acknowledges the importance of change in the industry.

Companies that hope to compete in the video market will likely find that they must adjust their business models, marketing strategies, and understanding of consumer demands and desires. Perhaps one of the most significant illustrations of this is that, for the first time ever, Comcast’s broadband subscribers outnumbered its cable subscribers in 2015—an unprecedented and major shift in the industry.8

The City can essentially “court” over-the-top providers and promote these applications by requiring a public–private partnership’s data-only offering to provide unfettered access. The City may opt to outline this requirement in its Invitation to Negotiate documentation to ensure that potential partners are aware that this is an important City goal.

### 1.2 Community Broadband Objectives

Competition and consumer choice are often major reasons a locality may pursue fiber-to-the-premises deployment, but they are only two of several objectives that may drive a community’s pursuit of a publicly owned fiber optic network. Many public entities share certain objectives when it comes to considering investment in a community broadband network:

- Ubiquity
- Consumer Choice
- Competition in Market
- Ownership and Control of Assets
- Performance
- Affordability
- Risk Aversion
- Cash Flow

Each of these is understandable in the context of what is best for a community, though they do not necessarily all align with one another. In fact, some common objectives that communities prioritize when planning their networks actually conflict with one another. In light of this, communities benefit from careful consideration of which objectives they deem most important

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to adequately meet their needs. Further, not every community will value each objective in the same way, and the locality should factor in the unique concerns of its consumers when considering network deployment.

As an example of the potential for these objectives to clash, risk aversion is top priority for some communities—it may be politically challenging to build a network, and the only way to complete it is to assure key stakeholders and the public that there is minimal risk involved. Yet risk aversion directly conflicts with building the network throughout an entire community, and such universal deployment or network ubiquity may be the most important objective for a different community.

Each locality must find the balance that most effectively meets its needs so that it can achieve its goals without sacrificing important community objectives. Another key consideration is how each objective may tie in with potential private sector partnership(s)—while a locality may not have the resources to pursue ubiquitous deployment, it may find that its private partner(s) prefer to pursue ubiquity. Thus, the locality may find that it must prioritize ubiquity to successfully participate in a public–private partnership.

Table 1 below illustrates the intersection of common objectives; the sections that follow explain these in greater detail, along with how they align and differ—and how prioritizing one objective may impact another.

As the key at the top of the following table shows, objectives may have no impact on one another, they may be in alignment, they might conflict, or they may be inapplicable.

<table>
<thead>
<tr>
<th>A: Align</th>
<th>C: Conflict</th>
<th>NI: No Impact</th>
<th>NA: Not Applicable</th>
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<td>Ubiquity</td>
<td>Choice</td>
<td>Competition</td>
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<tr>
<td>Ubiquity</td>
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<td>Risk Aversion</td>
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<td>Cash Flow</td>
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Figure 1 below shows a visualization of Table 1 to illustrate the relationship between objectives.
There are numerous possible outcomes associated with different objectives, and each locality has to determine what it believes will best serve its unique needs and have the greatest impact on its community. This analysis does not seek to urge any locality in any particular direction, but it does make recommendations about some of the objectives that may well serve any public network.

For example, performance is an objective that either interacts favorably or not at all with other objectives, and prioritizing performance can have a significant positive impact on a Fiber Optic Enterprise’s viability by setting it apart from incumbent providers. Thus, there are no real disadvantages to making performance a top priority for a Fiber Optic Enterprise because doing so does not have to be at the exclusion of any other objectives. Further, some objectives can and should be pursued in parallel.
2 Ownership and Control of Assets

Most communities that pursue some form of network implementation prefer to retain ownership and control of the “assets.” This usually includes at least the fiber in the ground or on poles and all accompanying ducts, splice cases, and other network components known as the “outside plant” or OSP. It may also entail ownership of network electronics such as routers and other equipment at the network core or central office, though the locality’s risk increases as it opts to retain ownership of additional infrastructure and equipment.

Communities typically find that retaining ownership of assets is an important way to ensure some control of the network, particularly in the context of a public–private partnership. One way that a locality may increase its control and minimize its risk is to retain ownership of the fiber and all outside plant infrastructure while allowing a partner to control network electronics such as head end and customer premises equipment.

A good way to balance risk and reward is for the locality to maintain ownership and control of the assets while it assigns operational responsibilities to a private partner. This enables both parties to perform functions that highlight their strengths while not having to expend resources and energy attempting to carry out tasks for which they are ill-equipped. Further, assigning responsibility for network electronics to a private partner means the locality can avoid the ongoing costs of equipment replenishment—and retaining control of the fiber means the locality has those assets to fall on if the partnership does not work out.

Ownership and control of the assets may conflict with cash flow—if a locality wants to retain control, it will likely be required to use its own capital to fund network construction. The degree to which cash flow is impacted also depends in part on what level of assets the locality wishes to control. That is, ownership will conflict less with cash flow if the locality aims to own and control only the fiber as opposed to owning and controlling fiber and network head end equipment and CPEs. Maintaining a fiber optic network can be costly, particularly if the City opts to be the retail provider for the service. Operational expenses are a sizable and often unpredictable portion of overall network cost, and it can be difficult to get the take rate necessary to reach cash flow.

Other objectives either interact favorably or not at all with ownership and control of the assets. If a locality retains complete control of the assets, it can make determinations about which provider(s), if any, can offer services over the network. It can regulate which service providers offer services and to what degree, thus allowing for considerable quality control. For example, if a locality offers dark fiber agreements to multiple Internet service providers, it can determine specific metrics that guide the providers’ service.
Similarly, if a Fiber Optic Enterprise opts to partner with one private entity, the locality can oversee and maintain the network—a function with which it may be well accustomed and for which it may already be staffed—and rely on the partner to deliver retail services. A locality may also be able to govern price points to support consumer affordability and service speeds to enhance performance. And because the locality owns the network itself, it is in control of performance at that level.

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9 Localities and Fiber Optic Enterprises that are associated with existing utilities—such as a municipal electric provider—are more likely to possess the personnel and infrastructure to support deployment and expansion of a fiber network.
3 Ubiquity

As we noted, universal service or ubiquity—which refers to designing and building the network so that it connects every structure in the community—is often a key objective for localities. From Connecticut to Minnesota to Oregon, communities (and community organizations) large and small prioritize ubiquity as a primary goal in their broadband pursuit.\(^\text{10}\)

Further, some private entities may pursue ubiquity as part of a partnership agreement with a locality. Depending on the terms of a partnership contract, the private entity may need to pursue a ubiquitous build-out (or as close to ubiquity as possible) to make the most business sense. That is, it may be prudent for a private entity to reach as many locations in a community as possible to drive down the overall cost of deployment.

Ubiquity is a respectable objective for any community, and it makes sense that leaders want to bring service to the entire community—but immediate, community wide build-out often entails significant risk and cost. The financial risk alone is significant and in order to make the model sustainable, the service may have to be priced out some consumers’ reach if a locality is pursuing network build-out and retail service on its own. If the locality is partnering with a private entity that must build to the greatest number of locations possible, each partner may have to shoulder some of the cost of extensive build-out.

3.1 Interactions between Ubiquity and Other Objectives

Overall risk aversion conflicts directly with the notion of a full-scale community build-out, as the locality and/or its partnership will likely face stringent construction deadlines and much higher capital costs than those associated with a phased built-out. The locality and/or the partnership is also more likely to be required to seek financing to support the capital investment and startup costs for a ubiquitous network build, which greatly increases the locality’s risk.

Because the locality will likely need to seek financing from an outside source, and due to high capital investment for large-scale construction, it is likely that the Fiber Optic Enterprise will be forced to raise monthly service fees. This reduces the affordability of the Fiber Optic Enterprise’s offering and to some degree defeats the purpose of ubiquitous build-out. If the service reaches the entire community but it is priced too high for many residents and businesses to afford it, this fails to meet the locality’s goal of providing access to its citizens—it is essentially inaccessible.

This challenge may be best mitigated by a partnership arrangement in which the locality and partner work together to find creative ways to serve the entire community in an attainable, cost-effective way. For example, the partner may agree to offer discounted service pricing for certain portions of the population, based on the locality offering to offset the partner’s cost in some way for doing so.

Cash flow is another objective that conflicts with ubiquity. If a locality is operating its own Fiber Optic Enterprise and providing retail services directly, it likely will not expect to make a profit. But it is important for the entity to become able to financially sustain itself, including operating costs and any debt service payments. This is often referred to as “cash flow” or “breakeven”. The higher cost of building out to every structure in the community means that the point at which the Fiber Optic Enterprise is able to cash flow will come much later than if the locality or its partnership slowly built out and began generating subscriber revenue earlier on in the process.

3.2 Impact on Business Model

A key consideration for network implementation is how to finance both capital construction costs and ongoing operational expenses. The importance of factoring in the ongoing cost of operations cannot be overstated—these expenses fluctuate based on the success of the enterprise, and can vary considerably each year, and even month to month. The capital and operating costs associated with a full-scale communitywide build-out will be significant, and localities will likely have to seek outside financing to support construction and the Fiber Optic Enterprise’s startup costs. It is also possible that outside financing or some internal subsidy will be necessary to support ongoing operations—everything from network equipment license fees to direct customer support.

A locality may be able to go out for bond (i.e., borrow funds) to enable construction of a fiber-to-the-premises network. There are two types of bonds that municipalities typically rely on for capital projects.

General obligation bonds are directly tied to a public entity’s credit rating and ability to tax its citizens. This type of bond tied to citywide taxes and revenues that can be used to repay the debt; it is not related to any direct revenues from specific projects.

Depending on the approval process (e.g., whether the public must authorize the locality to seek financing), general obligation bonds may be politically challenging. Even when the public entity is able to make its own bonding decisions without direct authorization from the community, there still may be considerable scrutiny for projects that are not seen as being in the overall public’s best interest. Because of the politically polarizing nature of general obligation bonds, they are generally issued for projects that will clearly serve the needs of the entire community.
such as roadway improvements. It is challenging in many communities to make the case for a fiber enterprise serving the public to such a degree that general obligation bonds are warranted.

Revenue bonds are directly tied to a specific revenue source to secure the bond and guarantee repayment of the debt. For example, if a locality operates its own electric, natural gas, or water utility, the revenue stream from those enterprises may be used to secure a revenue bond. These are viewed in the bonding community as a stable source of income. In theory, any municipal service that generates some sort of revenue that could be used to pay back the debt might potentially be used to secure a revenue bond—municipally owned public transportation or hospitals, for example. It would seem, then, that a locality could tie a revenue bond to its Fiber Optic Enterprise’s revenues, but this is typically not an accepted practice in the bonding community, particularly with fiber-to-the-premises endeavors. The locality would likely need to consider other revenue sources it could tie the enterprise to if it aims to seek revenue bonds.

Seeking bonds increases the locality’s overall risk and it is much more likely to require outside financing if it intends to pursue a ubiquitous build-out. At the same time, a locality may find that a clearly stated goal of ubiquity eases the process of general obligation bond approval, which could be beneficial. That is, if the locality pledges to serve all members of its community, the Fiber Optic Enterprise may be viewed more favorably. If a locality anticipates a need for outside financing for any construction and expects that it may be politically complex to seek bonding, ubiquity may be a reasonable conduit through which to achieve that goal.

Bonding aside, any locality’s Fiber Optic Enterprise is harder to oppose if ubiquity is its primary objective. If a locality’s Fiber Optic Enterprise made it a priority not to not cherry pick (that is, build only to economically desirable neighborhoods, which are usually middle-to-upper class and exclude low-income areas), it can make a strong case in favor of its implementation. The Fiber Optic Enterprise could serve areas that have been historically underserved and build infrastructure to parts of the community where perhaps none previously existed. This would not only bring the Fiber Optic Enterprise’s offering to those parts of the community, but could also enable local Internet service providers to provide service over the Fiber Optic Enterprise’s infrastructure and gain market share in areas that had previously been too costly to serve.

A locality may determine that it will be best served by not partnering with multiple Internet service providers but seeking one partner to manage and operate the network. Whether the locality pays for network construction will determine whether a ubiquitous network is attractive to a private partner. If the locality requires ubiquity but is not prepared to fund significant portions of the network, it will likely find that private entities have little desire to partner. Conversely, if the locality pays for significant portions of construction of a ubiquitous
network that a private partner can then expand and operate,\textsuperscript{11} it may find that it is an attractive community for private investment. Further, such an arrangement could be beneficial for the locality itself—a private partner may be required to pay the locality on a per-subscriber and/or per passing basis. Thus, the greater the number of locations connected, the greater potential revenue for both parties.

Figure 2 shows conflicts, alignments, and potential outcomes associated with prioritizing ubiquity.

\textbf{Figure 2: Ubiquity Alignments, Conflicts, and Potential Outcomes}

\begin{itemize}
  \item Affordability
  \item Cash Flow
  \item Risk Aversion
\end{itemize}

\begin{itemize}
  \item Service to underserved areas
  \item Greater consumer choice
  \item Attractiveness for private investment
\end{itemize}

\begin{itemize}
  \item Choice
  \item Competition
  \item Ownership
  \item Need for municipal bonds/loans
\end{itemize}

\textsuperscript{11} For example, if a locality already owns and operates an existing fiber optic backbone, this may be sufficient to attract partnership for expansion, or a locality may opt to pay for network expansion to key economically desirable areas to entice private investment to build to the remainder of the community.
4 Consumer Choice

As we noted in Section 1.1.1, localities often pursue open access as a means to increase consumer choice, and this is an important consideration and a high priority for many communities. Incumbent cable and Internet providers may have little economic incentive to expand to areas of the community where they believe they will not recover significant portions of their cost. Unfortunately, this often means that low-income areas are underserved, and the services to which they do have access are either extremely slow or too high priced to be attainable.

An overarching goal of developing an open access network is to level the provider playing field to reduce monopolistic and oligopolistic practices by incumbents, and to give consumers greater choice in service providers.

Most other objectives that a community decides to pursue will interact favorably with consumer choice. A ubiquitous network that fosters open access, boosts competition, and reaches all parts of the community enhances consumer choice on a number of levels. In addition to gaining access to residential services that may have previously been unavailable, consumers often end up with greater flexibility to access services at various community locations. Ubiquity and competition enable enhanced services at community centers, religious institutions, educational facilities, and other locations that benefit residents.

Affordability of services is an important component in access that ties directly with competition and consumer choice—being able to pay for services is often a major barrier for consumers. Having affordable access to services with competitive speeds can significantly improve quality of life, make residential areas more desirable, and spur business growth. Access to premium residential services at affordable prices can also incite home-based businesses, support continued education, and enable better access to basic human services like healthcare and education.

Risk aversion could negatively impact consumer choice. If a locality decides that it will slowly and organically build out its network and does not take steps to prioritize particularly vulnerable areas, it is possible that only the consumers who have traditionally enjoyed provider choice will be positively affected. The same is likely true if a locality partners with a private entity that will cherry pick and serve only the most economically desirable areas. A locality may find that it can balance risk mitigation with community benefit by deliberately funding service
to portions of the community that may be undesirable for a private entity. If the locality chooses to seek partnership, this could be negotiated.\footnote{The Urbana-Champaign Big Broadband (UC2B) public network negotiated a similar partnership with a private entity.}
5 Competition in Market

Fostering competition in the market is generally the second component of an open access pursuit. That is, localities often seek to develop an open access infrastructure to enable multiple providers to offer service over the network and enhance competition. Like consumer choice, this is generally a major reason communities attempt to pursue a traditional open access infrastructure. Similar to consumer choice, competition in the market can be achieved through open access in the traditional sense as well as through other means.

The key for most objectives is to determine whether they are primary, how they may conflict with others, and how best to pursue the objectives a locality deems its most important goal(s). Competition both upholds and is upheld by all other potential primary objectives—it either aligns with, does not impact, or is not impacted by other common community objectives.

Choice and competition go hand in hand, and seeking ways to encourage competition will likely only result in greater consumer choice in communities. Similarly, a ubiquitous network build will probably result in greater competition among local providers. This is not only through providers potentially offering services over the locality’s network, but also in the form of incumbent providers lowering prices and enhancing services in response to improved services by other providers. This also speaks to competition vis-à-vis affordability and network performance: the greater the market competition, the greater the likelihood that other providers will seek to improve their services and lower their prices.

Competition in the market and consumer choice can be prioritized simultaneously with other objectives without negative consequences, and localities often find that focusing on the overall well-being of their communities and citizens has numerous advantages.

It is important to note, however, that there may be some risk involved with creating competition in the market. The service provider industry can be inhospitable, particularly to a public provider. A major challenge faced by networks built and operated by public institutions is opposition from existing, private-sector providers. There are a number of reasons for this, some of which are related to perception while others relate to the market itself. Criticisms will range from allegations of cross-subsidization of expenses, using general or other funds for debt service coverage, to questioning the need or demand for public based connectivity services. These challenges will be greatest for localities that enter the retail market on their own, and may be mitigated if the locality supports market competition by enabling private sector providers instead of competing directly with them.

6 Performance and Reliability

Network performance and reliability can be a powerful differentiator for a community broadband endeavor. Many communities are already served to some degree by incumbent provider like large national cable or telephone companies, small local Internet service providers, or a combination. Convincing customers to switch providers can be difficult, a locality may stand out by distinguishing its service (direct retail or through a partnership) as highly reliable with unmatched performance.

It may even be necessary for a locality to prioritize performance and reliability to make the offering stand out among existing broadband providers. Market entry is generally a major challenge for municipal retail providers, and even a public-private partnership will likely benefit from focusing on one or two highly specialized offerings to allow it to thrive among incumbents.

Attempting to compete with incumbent providers by offering services similar to existing packages is unlikely to bode well for any locality or public–private partnership. Instead, it is important to recognize gaps in the existing broadband market and seek to fill those with a unique service offering that is not readily available at present. We believe that a 1 Gigabit per second niche service may enable an Fiber Optic Enterprise to either directly serve customers with an exceptional offering, or will enable a private partnership to enter the market and avoid competing with a “me too” offering.

Performance and reliability interact favorably or not at all with other objectives, which is shown in the visual breakdown in Figure 2. There are no disadvantages to prioritizing performance and reliability as a key objective when deploying a fiber network, and we believe that this should be a main focus of any fiber enterprise.

A 1 Gigabit per second service offering can significantly disrupt the market by enabling over-the-top content and enabling consumers to make more flexible choices about the services they subscribe to and the providers they select. This enables choice and competition in the market.

As we noted, if a locality retains ownership of its assets, it also has better control over performance. The locality’s Fiber Optic Enterprise —whether acting as the retail provider or overseeing a private entity who is serving end-user customers—can command the performance (and reliability) that it deems appropriate to best serve the community’s needs.

Risk aversion and cash flow interact well with performance. Localities may be be able to minimize risk by entering the market with a premium 1 Gigabit per second high-performance network. A Fiber Optic Enterprise can set itself apart from other providers by offering a high-speed data product that incumbents cannot. It can differentiate itself by having an always-on
extremely reliable service that customers can use in new and beneficial ways—like to operate a home-based business or telecommute to their job or pursue an advanced degree.
7 Affordability

Affordability is a common barrier to access for a community’s low-income residents, and the persistent digital divide is evidence of a continued and pervasive lack of affordable broadband options. Broadband providers have traditionally been able to cherry pick, or build only to neighborhoods and areas in the community where they believed they stood the best chance to recover construction and operation costs. Historically this has meant building almost exclusively to middle and upper class neighborhoods and excluding low-income areas altogether. And when legislation or franchise agreements have required providers to build to these areas, often the services are priced beyond what consumers can afford.

Providing affordable service to the entire community could create tremendous benefit for a locality through improvements like enhanced quality of life and economic benefit. These “benefits beyond the balance sheet” are not quantifiable on a financial statement, but their impact communitywide is often profound. Bringing ultra-high speed affordable access to portions of the community that may have previously had little to no access to any connectivity stands to significantly enhance the quality of life, thus often raising a community’s overall desirability.

Further, the demographics of “low-income” are changing as more college-educated individuals of the “millennial” generation (often referred to simply as “millennials”) find they are underemployed or unable to find well-paying positions.14 These consumers are more nomadic than previous generations,15 and cities across the nation are scrambling to find ways to attract young people to live and work there. These “digital natives”16 are particularly interested in relocating to cities where rental housing is safe and affordable, and where they have access to reasonably priced high-speed broadband. A locality may find that it not only protects its most vulnerable populations by providing affordable access, but that it can also attract top talent by appealing to millennials. Further, localities can appeal to intersectional desires of millennials by prioritizing social responsibility.17

Section 3.1 noted that prioritizing ubiquity may come at the exclusion of affordability for some consumers unless the locality is able to offset costs in some other way. The locality could negotiate an agreement with one or more private partners that includes sensitivity to the need for affordable, accessible services in all parts of the community. Similarly, the locality may decide that it is politically palatable to subsidize services for certain portions of the community.

Choice, competition, and ownership all interact favorably with affordability. If the locality is able to reduce pricing to a level that is attainable to all of the community’s consumers, the expansion of choice and the likelihood of increased competition will be notable. And if the locality retains ownership of its assets, it can make choices about affordability similar to the control it can exert over performance.

If the locality decides to subsidize services, it may find that it becomes more difficult to prioritize risk aversion and cash flow. The more debt and responsibility the locality takes on, the higher its risk and the longer it will take for its Fiber Optic Enterprise to be cash-flow positive. Similarly, even if the locality does not directly subsidize services, prioritizing affordability may mean pricing the product low enough that it is challenging to also prioritize risk aversion and cash flow. It will be important for the locality to determine its priorities, and to strike a balance so that one objective is not achieved entirely at the exclusion of another.
8 Risk Aversion

Risk aversion is important and it is equally important to balance risk and reward. It may take considerably longer to design, build, and deploy a network if risk aversion is the locality’s top objective. The “slow and steady” approach is not without merits, but it also does not necessarily give a community a competitive edge.

Figure 3 shows a risk and reward matrix that highlights any locality’s most likely low-risk-low-reward, low-risk-high-reward, high-risk-high-reward, and high-risk-low-reward outcomes. The lowest risk with the highest potential reward lies in building the network in a phased approach, specifically based on the Google build-to-demand model.\(^{18}\) This approach signs up a community by neighborhood (known as “fiberhoods” in the Google model) and once a neighborhood has reached a certain threshold, fiber will be built there.

![Figure 3: Risk and Reward Matrix](image)

If the locality chooses this approach, it must recognize that it necessarily sacrifices certain other objectives like affordability and consumer choice. Risk aversion will generally come at the expense of objectives like these, and is especially in conflict with a ubiquitous build-out.

These objectives do not have to be mutually exclusive; instead, the locality has to decide to what degree it wants to prioritize which objective, and be prepared for possible conflicts and how to mitigate those. For example, if the locality chooses a phased approach, it may opt to first expand service to a location that can demonstrate the power of the network. This will support marketing, and can potentially help convince consumers to sign up for service, thereby achieving ubiquity in a lower risk fashion.

Risk aversion conflicts with ubiquity, choice, competition, and affordability. As we previously noted, it will be challenging to obtain a ubiquitous build-out at all and especially not within a few years if the locality prioritizes risk aversion as its key objective. Because the network is unlikely to be built out quickly in this case, it also reduces the likelihood of increased competition and choice. Further, affordability becomes more difficult to achieve because the locality must align service fees to support self-sustaining operations. This means the monthly service will be priced higher to avoid locality subsidy.

If the community chooses to prioritize risk aversion, it will align with ownership, cash flow, and performance. As we noted in Section 2, ownership of the assets usually means lower risk for the locality because it has greater control and flexibility.
9 Cash Flow

Becoming cash flow positive is a common important goal for any business or entity, and it is also a bit complex to define. Net income is often referred to as “cash flow”, though this is technically incorrect because depreciation—or the decrease of an asset’s value over time—is a non-cash expense. Every component of a fiber network will depreciate over time, though at different rates. For example, the life of the fiber itself is expected to be approximately 20 to 30 years while network electronics and customer premises equipment depreciate much more quickly, which we discuss in more detail below.

Earnings before interest, taxes, depreciation, and amortization is the difference between operating revenues and operating expenses; it is a key metric in designing a viable financial model, along with net income. In a capital intensive business such as a fiber-to-the-premises enterprise, earnings before interest, taxes, depreciation and amortization must become positive quickly to keep the enterprise afloat. When earnings before interest, taxes, depreciation, and amortization becomes positive, the business can be said to be cash flow positive. Net income then deducts interest, taxes, and depreciation.

Revenues are tied to an enterprise’s ability to be sustainable or cash flow positive. Collecting revenues to pay off debt and support business operations bolsters the net income and increases the likelihood that it will become positive.

Several objectives may conflict with cash flow, like affordability, ownership, and ubiquity. As we noted, revenue collection directly impacts cash flow so higher revenues mean a greater likelihood of being cash flow positive. If the service is priced affordably, this may mean lower monthly service fees and a longer path to the enterprise becoming cash flow positive, or self-sustaining.

Ownership may also impact cash flow, especially if the Fiber Optic Enterprise elects to retain ownership of all network electronics, including customer premises equipment. Depreciation costs are significant, and it is important to reserve funds for equipment and infrastructure replacement. Typically, last mile and customer premises equipment is replaced after approximately five years, core network equipment is replaced after seven years, and outside fiber and facilities are replaced after 20 to 30 years.

Another element of ownership in the context of cash flow is the need for network maintenance and locating costs. If a locality already owns and operates a fiber network and has experience with locating, these additional costs will likely be incremental and less significant than a startup enterprise. Yet increased costs associated with serving an increased volume of end users may be significant in terms of both locating and replacing equipment at customer homes and businesses.