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Summary

1) Westminster MD was underserved by incumbent providers despite meeting criteria for adequate broadband coverage.

2) In response to overwhelming constituent dissatisfaction, the City undertook to construct a municipally owned dark fiber network.

3) The City uses an innovative Pubic Private Partnership to light the network and provide services.

4) The existence in Westminster of the first community wide gigabit fiber network in the mid-Atlantic region creates unique economic opportunities for the community and provides critical infrastructure for economic growth in the 21st century data economy.

The Westminster Fiber Network (WFN) was born out of decades of frustration waiting for our incumbent providers to upgrade their infrastructure and service levels. Although technically Westminster meets current standards for broadband service availability, the City's survey of businesses and residents revealed widespread discontent and dissatisfaction with services at that time.

One anecdote in particular is illustrative. A local graphic design business, a "premium" customer of the one of the incumbents, needed to send a multi-gigabyte graphics file to a client in the Midwest for a rush job. Their business class internet connection kept timing out because the file transfer was so slow. To get the client's files delivered before the deadline, the business had to put them on a memory stick and overnight them in a mailing envelope. This is unacceptable in a 21st century data driven economy.

The WFN capitalized on the already completed Carroll County Public Network, a middle mile fiber network connecting all the schools, libraries, and government buildings across Carroll County, funded by County government. That network paid for itself within 5 years through cost avoidance from replaced leased lines across four government entities.

The BTOP broadband infrastructure grant program also enabled the construction of the WFN by creating backhaul connections between Carroll County and adjacent counties.

The existence of that public fiber infrastructure set the stage for the last mile fiber project connecting every home and business in Westminster that is now the WFN. The City conducted exhaustive research, business modeling, and public discussion exploring options, collecting data, and modelling various approaches to creating a municipal fiber network.

The City settled on an economic model, began construction of a pilot using reserve funds, released an RFP for business partners, and closed on a $21 M construction loan from Sun Trust that will convert to a General Obligation bond.

The WFN uses an innovative public-private partnership (P3) model to build the first community wide gigabit fiber network in the Mid-Atlantic region. Given the wide array of possible P3 models to choose from, accurately describing the Westminster Model requires a deeper level of detail to fully appreciate the potential applicability to other communities around the U.S.

Public-private partnerships have a long, and by some accounts uneven, history in the world of public infrastructure. While recognizing some of the more spectacular P3 failures, it's important to note that no model is impervious to the universal human failings of incompetence and malfeasance, and that the success or failure of P3 projects is more a function of the specifics of each project, rather than anything inherent to the P3 model.

Successful P3 projects are at their core true partnerships, where both parties achieve their goals, while sharing in the risks and rewards of that partnership in ways they are comfortable with and can sustain over the life of the deal. Striking that balance requires a very clear idea on both sides of the table what the strategic goals are for both parties, and those goals will in turn drive the decision making during the crafting of terms for the P3.

For the City of Westminster, we entered our discussions with potential partners with three core principles firmly in mind: 1) public ownership of the fiber network; 2) a multitiered service model for the network to partition risks and responsibilities to separate operational layers; 3) a commitment to open access at the service level as the end state of the service environment. Each of these is important on their own, but also closely interrelated with the others.

Public ownership is the starting point. As with all business relationships, ownership equals control, and control is absolutely necessary for a community to ensure that it achieves the economic development goals of a fiber project. The unmet expectations of the 1996 Telecom Act were in part because the last mile infrastructure of the nation's telecom networks were never truly opened up to unfettered

competition. The best way to ensure open access going forward is for local government to own and control the local infrastructure.

But that's not the only reason for public ownership. As stewards of the public interest, local government has a duty to ensure that public goods, like essential infrastructure, are widely deployed, well-maintained, and open for use by all citizens. Is there any more essential infrastructure in the 21st century than the physical assets necessary for high capacity data services?

Only with public ownership and control can current problems of redlining and the growing digital divide be comprehensively addressed and solved. A commitment to public ownership enables universal access, which in turn is a major source of public support for the resource commitment that network construction requires. In other words, when a local government assures its citizens that all will benefit from an infrastructure project, public support for the necessary expenditures to implement that project become much easier to secure.

From a financial perspective, the construction, maintenance, and ownership of dark fiber are a perfect fit with the other infrastructure obligations of local government. Just as municipalities and counties are responsible for building and maintaining roads, pipelines, sidewalks, curbs, and gutters, so too should they be tasked with building the basic pipelines for 21st century data services.

But that doesn't mean local governments should all become ISPs. Some have chosen that path, in many cases quite successfully. Just as not all municipalities are well suited to operate electric utilities or water utilities, not all local governments need offer data services. However, all local governments build and maintain roads, and fiber networks are the roads of our future.

Local governments can confine their role to simply owning and maintaining what is called the Outside Plant (OSP), the inert components of the network comprised of the fiber itself, the boxes and enclosures

to make connections and house equipment, and the conduit through which the fiber travels. All other components of the system, anything that requires power or transmits data, can be delegated to the private sector partner.

This is an obvious partitioning of ownership and responsibilities within the network because of the major differences in the useful life, cost, and the different risk tolerance and expected return horizons of the partners. Public sector entities epitomize "patient capital", able to make long term investments with no pressure to expect fast, high margin returns. Local governments routinely spend millions of dollars on infrastructure with the only expectation of return being the long term beneficial impact on the local economy and the consequent maintenance or improvement of the local assessable tax base, thereby maintaining tax revenues without rate increases.

Like most modern technology, network equipment has a useful life of between three and five years, after which it must be replaced with newer and faster equipment.   In contrast, fiber has a useful life of at least 50 years, since the first fiber networks were built in the 1970's and are all still in operation. Fiber strands do not decay, corrode, rot, wear, or expire, and if left undisturbed, will continue transmitting data for decades without any maintenance or upgrades.

Compared to asphalt or concrete, fiber is the perfect asset for a local government to invest in to improve the local infrastructure for economic development, and can be financed over time frames that are comparable to other public infrastructure projects, and in ways that the private sector cannot contemplate. Unlike concrete and asphalt projects, a properly configured P3 can provide the revenue stream necessary to support the financing of a fiber project without unduly burdening the other capital project obligations of the local government. Fiber infrastructure can be self-supporting.

By taking responsibility for the OSP, the public sector also improves the economics of any given network project. Approximately two thirds of the capital expense of building a network resides in the OSP. The

rest of the capital expense is for networking equipment and software. In contrast, the operating expenses for the OSP are minimal, as opposed to the significant overhead of staffing network operations and the provision of services.

By removing the capital expense of OSP construction from the ROI equation of the private partner, the economics of a broadband project are radically transformed, enabling a private partner to contemplate services in markets they otherwise would never consider. With the right partner, the local government need not embark on the expensive and much riskier enterprise of staffing and operating a network to provide services.

The partitioning of the OSP to the public partner also opens the door to further segmentation of roles within network operations. To see how this is possible, and why it is important for network services going forward, it's important to describe the history of telecommunications technology and how it informs existing telecom business models.

In the early years of telecommunications networks, the infrastructure consisted of copper wires that carried one channel of data (an analog sound signal), and the configuration of the connection between any two points on the network required the actuation of mechanical switches to create a temporary physical circuit. At first, that mechanical switch was a human operator who physically pulled plugs and replaced them to create the circuit, a function which eventually was automated. To ensure maximum control of the customer service relationship, the service provider had to own and control every last bit of infrastructure down to the telephone at end of the circuit.

As automation gradually replaced each component, and as software and IP technologies gradually transformed networks, the need for control of the infrastructure to provide services gradually disappeared. Today, a service provider can be entirely virtual, riding on someone else's network, using

someone else's fiber, and yet maintain a very close, reliable, and high touch relationship with their customer.

For 21st century networks, this enables a further partitioning of network services into two levels, entirely operated by the private sector: a Network Operator providing utility bandwidth services, and one or several Service Providers, which interface with individual customers and maintain the customer service relationship.

This division of operations and services into a wholesale and retail level creates several advantages. Specialization further decreases the capital expense and operating expenses of the providers at each level. Specialization also enables competition at the service level with very low barriers to entry. The wholesale Network Operator is motivated to bring more retail Service Providers onto the network to maximize utilization of their network assets, and is also motivated to create new retail revenue streams by increasing the diversity, as well as number of services.

Retail Service Providers benefit from the drastically reduced capital expenditures necessary to compete. Consumers benefit from lower prices, better service, more kinds of service, and the relentless pressure to improve that healthy competition in a truly open market fosters.

The fundamental reason for the success of this model is the allocation of expenses, which is really a proxy for risk, to the levels at which it is most appropriately handled. Each role has peculiar responsibilities and risks, which are handled best by entities most comfortable and experienced to mitigate that risk. Local governments are very good at building and maintaining infrastructure with a very long useful life of many decades (roads, pipes, fiber).

Network management is a distinct problem requiring a particular skill set, with particular capital and operating expenses. Security, stability and reliability are the key attributes that generate risk in that

arena.   The lifecycle of the services and infrastructure for network operations is measured in a few years.

Provision of services to residential and business customers requires significantly more investment in human capital, shorter product life cycles, higher risk of failure, but potentially much higher margins, especially when investments in OSP and network infrastructure are no longer needed. Timeframes in this arena are much shorter, in some instances as short as months. In a properly configured broadband ecosystem, this is where the innovation will occur to drive economic growth in the 21st century.

The multilayer service model lays the groundwork for the creation of a true open access environment at the service level, where customers can switch providers for any given service without barriers, they can try new services as they are developed, and where there is better transparency on cost and quality between providers. By lowering the barrier to entry for new providers, real competition can take place, and service providers delivering better services at lower prices will be rewarded. In addition, here are no barriers to entry for new, innovative services from any provider, accelerating innovation and economic development. The consumer wins in all instances.

The multilayer model also aligns the interests of all parties operating each layer of the network. More Service Providers increases revenues for the Network Operator, which in turn increases the incentive for the local government to continue expanding the physical network, as the Network Operator's financial success underwrites the expansion of the OSP. The larger the network footprint, the more potential customers, which in turn can support a larger ecosystem of competing Service Providers, which then incentivizes further growth, all while accomplishing the larger public interest goals of universal access, increasing utilization, competitive pricing, and more numerous and diverse services.

The Westminster Fiber Network is sufficiently overbuilt that other users of fiber infrastructure (wireless carriers, specialized business users, government agencies) may also lease fiber, separate from other users.

By the end of 2017, approximately 40% of the fiber construction will be complete, passing over 2600 serviceable addresses. The early phases are lit and customers signed up and installed, with more every day.   Future phases will complete construction inside the City limits over the next 2-3 years. Depending on subscription take rates, construction will speed up or slow down to match the demand. Eventually, the network will reach over 7000 homes and businesses inside Westminster, and if sufficient demand warrants, will be extended to another 8000 just outside City limits.

In summary, the Westminster Model of Public Private Partnership provides a scalable blue print for any local government of any size to implement a community wide broadband network in a financially sustainable manner. By focusing on public ownership of the infrastructure, partitioning of the network operations by layer, and a commitment to open access, any community in the country can realize the economic development potential of massive broadband. The project positions Westminster to survive and prosper through the disruptive economic transitions created by the transformational information revolution, and ensures that all our residents can participate in the economic growth and prosperity of decades to come.