

Telecommunications for neighborhoods and communities: four key areas of investment

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This paper discusses the key structural impediments to an open telecommunications marketplace in communities and neighborhoods, reviews some of the history of community infrastructure investment, and offers some steps that communities can take to begin to create a level playing field for open, private sector investment in telecommunications. This discussion can be summarized as follows:

- There are many instances in the past that demonstrate clearly that leaving all infrastructure development to the private sector is not in the best interest of communities. Road management in communities had to be taken over the public sector in the early part of the 20th century to ensure that all members of the community had adequate access to paved roads. In the 1930s and 1940s, electric services and telephone services had to be either subsidized by the government (e.g. Rural Electrification Act, TVA) or by the community, in the form of telephone and electric co-ops.
- The legal deregulation of the marketplace is not enough to stimulate and support local and regional telecommunications companies. The regulated telephone and cable television companies have had decades to amortize significant infrastructure investments in a protected monopoly environment. Just as roads are managed by the community but are used freely by the private sector for commerce of all kinds, it may be necessary for communities to invest in telecommunications “roads” to level the playing field.
- There are four key low risk areas in which communities can invest: telecommunications duct, dark fiber, co-location facilities, and local exchange points (MSAPs). Modest investments in these four key infrastructure components, will, like investments in roads, spur much greater private investment, creating jobs in the community, expanding the tax

base, and providing citizens and public sector with much greater choice in services at lower cost.

Background

Public investment in telecommunications seems like a novel idea today. The United States has enjoyed a century of continuously expanding telecommunications services, and in all that time, few communities have had to think much about telecommunications. In fact, for many communities, it was and still is a source of income. In return for permitting our telecommunications companies (telcos) to operate in a regulated environment free of competition, we have taxed them.

The federal Telecommunications Deregulation Act of 1996 has changed all that, irrevocably. Congress and the President decided that communities and citizens would benefit from more competition in the local marketplace, just as the landmark 1984 breakup of AT&T created more competition and lower prices for long distance. Yet four years after the Deregulation Act was passed, few communities have seen lower prices for local services, or have any competition at all.

Although the Deregulation Act changed the political and regulatory landscape, this was only a first step to achieving competition in local markets, although it was clearly the necessary first step—companies had to have the legal right to compete before they could or would make the investment necessary to actually enter local markets dominated by the large telcos.

But in a world accustomed to operating on “Internet time,” with new business ventures forming and reforming literally overnight, why has so little changed in our communities with respect to choice in the telecommunications marketplace? The key issue is related to local infrastructure. The regulated monopoly service providers (the telephone companies and the cable companies) have enjoyed protected status for decades. These companies have been able to invest in infrastructure (local switching and equipment facilities, cable plant, etc) in a risk free business environment with a guaranteed rate of return.

In the new, unregulated environment, local and regional entrepreneurial start-ups not only ***do not*** enjoy that advantage, they must compete against the established monopolies who have enjoyed that advantage. The Deregulation Act made it legal to compete, but did not (and should not have) address the issue of creating a level playing field in the marketplace.

The solution is for communities to invest in minimum amount of telecommunications infrastructure needed to create a level playing field for the private sector, and to do no more than that. This notion often provokes strong reactions from elected leaders, some government officials, and the private sector (notably the incumbent monopoly companies). The most common remark is that there is no precedent for public investment in this area. Other comments include dire warnings about the expansion of government, predictions of higher taxes, and other, sometimes implausible, predictions about the danger of government entering this area.

Yet, there is ample precedent for community investment for the common good. Communities have long invested in all sorts of services when it was deemed essential for the health of the community--the common good. Communities routinely invest in parks, recreation facilities, roads, public libraries, public safety, sanitation, and many other kinds of services--because it has been deemed important for the future of the community.

One of the biggest problems facing communities today is that fact that most of these services have been provided for fifty to seventy-five years without much change and without adding any significant new services. In other words, communities have forgotten their own history--especially elected leaders. Our current generation of elected leaders all entered public office long after the last significant community debate on adding new services.

Another argument against public investment comes primarily from the private sector. Some companies seem to wish to argue that the private sector has a natural "right" to provide telecommunications services without having to consider the common good. The argument in support of this view can be boiled down to "well, that's the way it has always been done." But every service now offered in communities at one time was provided by the private sector. Road building, sanitation, clean water, and education were all "provided" by the private sector prior to public investment and management. All these services were taken over by local government after it became clear that public investment was needed for the common good.

That conversation must now take place again if communities hope to remain viable in the Information Economy. Just as access to interstate highways and other transportation systems drove economic development in the second half of the Twentieth Century, in this century, access to affordable, high bandwidth network services will determine whether communities will prosper.

Components of a community telecommunications infrastructure

Figure 1 illustrates the relationship among the four key parts of a community–managed telecommunications infrastructure. A tetrahedron is used to represent the inter–dependent relationship among the four elements. The four–sided tetrahedron collapses if any one element is missing.

- Duct is simply plastic pipe placed underground, along with pull boxes and pedestals (where fiber cable is “pulled” out to provide services to buildings). Most of the cost of installing fiber cable is related to the effort of digging up sidewalks and streets and placing the duct. Communities and local government have decades of experience digging holes in the ground, placing pipes in them, and maintaining those pipes. Duct is particularly easy to install and maintain because it is inexpensive, flexible, and does not leak.
- Dark fiber is simply fiber optic cable that has no electronics at each end of the cable to “light” it. Fiber is very inexpensive; it can be damaged by improper installation, so crews must be trained to handle fiber differently from copper telephone and electric cables.
- Co–location facilities provide telecommunications providers with a place to put their equipment. One of the chief advantages incumbent telephone companies have is that they own real estate in virtually every community they serve; this real estate was purchased and paid for many years ago. Any company wishing to provide competitive services in a community must pay market real estates prices (often very expensive for centrally located prime space).
- The MSAP, or Multimedia Services Access Point, is a new kind of network function required in a multi-vendor service environment. The MSAP provides a common exchange and switch point for local voice, video, and data services. The current Internet architecture was not designed to provide high capacity services within communities, and in many communities, delivering a piece of email from one side of town to the other requires hauling that email data hundreds or thousands of miles on major national Internet backbones. MSAPs eliminate those long hauls and reduce costs for consumers and all telecommunications providers connected to the MSAP.

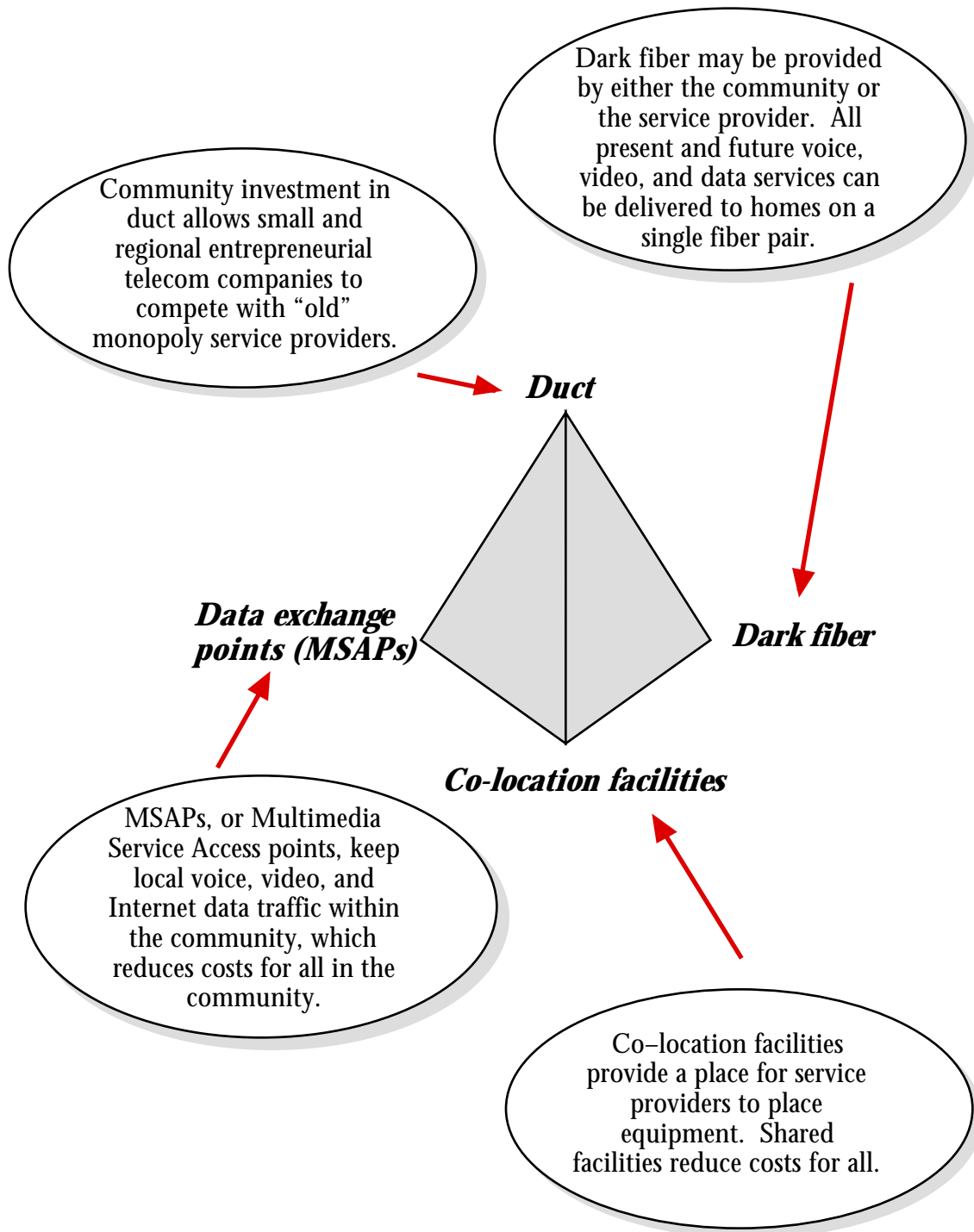


Figure 1: The community telecom service tetrahedron

The Blacksburg model

In Blacksburg, work is underway to develop a comprehensive plan to provide a competitive, “level playing field,” marketplace for telecommunications in the community. The opportunity to provide fiber direct to homes in a new, low income neighborhood construction project led to discussion among the non-profit builder of the project (VMH, Inc.), Town of Blacksburg planning and public works staff, and the Blacksburg Electronic Village staff about how to provide services to this neighborhood. But from the beginning the of those discussions, it was agreed that the long term goal was to develop a sustainable model for the deployment of new infrastructure for all new and existing neighborhoods in Blacksburg.

Blacksburg, widely publicized as the most wired community in the world, has more than 87% of residents online, and most of them complain (good-naturedly) about wanting much higher bandwidth services, especially to neighborhoods where single family homes predominate. Currently about half of Blacksburg residents have high bandwidth (Ethernet) Internet services at home or at work, but investment in this area has been limited to high density apartment complexes and townhomes.

In this model, there are four constituencies that must be served:

Citizens– Citizens want high speed access wherever they live in the community, at an affordable price.

Local government – The Town of Blacksburg must balance the needs of citizens with private sector company needs. Any investment by the town must be sustainable from both a financial perspective and a long term installation and maintenance perspective.

Builders and developers– Builders and developers are willing to share costs, but must understand how the technology fits into existing building design specifications, and need help calculating labor and parts costs.

Neighborhoods– Few if any communities can afford to wire the entire town at one time. Smaller, more manageable neighborhood wiring projects permit towns to learn more slowly and explore maintenance and finance issues with less risk. But the location of duct, the location of

neighborhood co-location facilities, and connections across private property to individual homes is best handled on a neighborhood basis.

Lessons learned

Identify co-location facilities early

- Community-wide co-location facilities must be located early in the process because the duct system must be home runned back to that facility.
- The same is true in neighborhood projects; neighborhood duct must be run back to a co-location hut or leased space in a convenient neighborhood building. This location must be determined before duct can be installed. In suburban sub-divisions, the site for co-location spaces can be a challenge.

Manage duct as a public utility

- Pipe is understood by town government. Public works department already have the staff and equipment to install and maintain telecommunications duct.
- In new neighborhoods, the town would provide duct to the edge of the property, just as it does today with water and sewer services. Builders would be required to connect homes and buildings to the community duct system, using specifications provided by the town planning and engineering department. This works well because developers build duct installation expense (a small fraction of total cost) into the sale price of the home.
- In existing neighborhoods, the town would install duct throughout a neighborhood, but residents would pay for the “last 100 feet” to connect a home to the municipal system. This spreads costs out among a large number of users rather than requiring the town to bear all the costs. It also follows the model taken by water sewer, in which homeowners are responsible for the pipe that crosses private property.

- A clear demarcation point is established for repairs and maintenance. If homeowners have a problem with a water or sewer pipe on their side of the town connection, they are responsible for repairs. If a telecommunications duct is damaged when a homeowner puts in shrubbery, the homeowner is responsible for repairs. The town is responsible for the backbone duct system running throughout the neighborhood.
- This model provides an economical way to provide access in existing neighborhoods because not every home has to be connected all at once, which can dramatically lower construction costs.

Local government issues

- Local government tend (correctly) to be conservative about taking on new missions. Elected leaders and appointed officials must understand the costs and maintenance issues.
- There must be sufficient demand by citizens and businesses for broadband access. Early financial models suggest about 40% of a neighborhood must be willing to hook up to the system to make it financially feasible.
- The technology and support issues must be understandable to town planning, engineering, and public works staff.
- The cost of the entire system (duct, co-location facilities, MSAP) must understood so that duct service fees reflect a level of revenue adequate to support the existing system, to provide future maintenance needs, and to provide some capital funds for expansion.

Developer issues

- Connecting homes to the local duct system and installation of cable and equipment in the home raises costs. Builders are most likely to adopt these new features if they can build in the costs early in the design process.
- Builder construction crews are not always familiar with the installation and equipment needs for telecommunications, and may require additional training to ensure proper

installation.

Citizen and neighborhood issues

- Citizens are price sensitive, and telecommunications systems must be affordably priced to ensure adoption of community-managed systems.
- Neighborhoods are sometimes hard to organize and to develop a consensus on where to locate duct and co-location facilities. A key advantage of new developments is that builders can make these decisions much more quickly and easily. In existing neighborhoods, time must be allocated to get the message out and to have a period of discussion about costs and location concerns.

Telecom service provider issues

- Local and regional telecom companies are likely to be enthusiastic supporters of community-managed systems because it lowers their market entry costs. However, it still takes time to discuss pricing and location issues with them. Not all telecom companies will agree to connect immediately.
- Incumbent telecom providers may resist efforts to level the playing field, including going to state legislatures to prevent the development of such systems. Ironically, the incumbents would also enjoy lower costs of service and could introduce new and improved services more quickly if a community invests in this area.
- It may not be necessary for communities to invest in dark fiber at all. If the community provides duct, the dark fiber can be pulled and maintained easily even by relatively small local companies. In communities where most telecom services are still delivered on poles rather than buried cable, it may be better to have the community install the fiber on poles and leasing fiber pairs (rather than leasing duct). This decision must be made carefully, for it affects long term maintenance and costs.

Advantages of community investment

There are several advantages to community investment in telecommunications infrastructure.

- Just as access to roads spurred economic development in America after World War II, access to fiber roads will determine the success or failure of community economic development in the first half of the 21st century. Communities without adequate bandwidth will fail, just as communities that were not located near adequate transportation services did. Economic development projects that do not address telecommunications services on a community-wide basis will fail.
- A well-demarcated community-managed telecommunication system will keep most investment and virtually all jobs creation in the private sector, where they belong. Modest community investment in telecommunications will create new, local companies and new, local jobs, increasing the tax base.
- Community investment lowers costs across the board for service providers, for citizens, and for government purchasing services. In Abingdon, Virginia, the county government cut telecommunications costs in half after the Town of Abingdon installed a public fiber system.
- Public investment eliminates redundant overbuilding of telecommunications infrastructure by competing companies. Shared facilities decrease road cuts, attendant costs and maintenance, and provides more and better services at lower cost.

About the author

Dr. Andrew Michael Cohill is an information architect with an educational background in architecture, ergonomics, and computer science. He is the Director of the Blacksburg Electronic Village (BEV) at Virginia Tech and an adjunct professor in the Department of Architecture at Virginia Tech. He teaches courses on community networking and information architecture regularly.

As Director of the BEV, he is responsible for the design and development of electronic village services, supervises a research and development group, and oversees an operations group that manages the BEV office and administrative services. He also directs the long range planning effort for the group, and serves as an advocate for networking in the university and around the Commonwealth of Virginia. Cohill has served as Director of the project since July of 1993.

Blacksburg has become widely known as the "most wired community in the world." In the fall of 1999, more than 87% of the town's residents were using the Internet, and over two-thirds of the town's businesses had made the Internet a regular part of their marketing.

Cohill has an international reputation for his work network design for communities, and spoke recently in Paris on his work. He is also a member of the National Advisory Board for Communities of the Future, a national coalition of thinkers and policy makers concerned with sustainability and health of communities. He is a member of the Association For Community Networking, and is currently serving (1999 - 2001) on the AFCN Board of Directors. He is the President of the AFCN, starting in , July 2000.

He has also published numerous papers and book chapters, and is an author and co-editor of the popular book about Blacksburg (*Community Networks: Lessons learned from Blacksburg, Virginia*), now in its second edition, and recently translated into Japanese. He is currently working on a new book on communities and technology that will be published in the fall of 2000.

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Community network design and development information

http://www.bev.net/project/digital_library/

<http://www.bev.net/project/evupstart/>