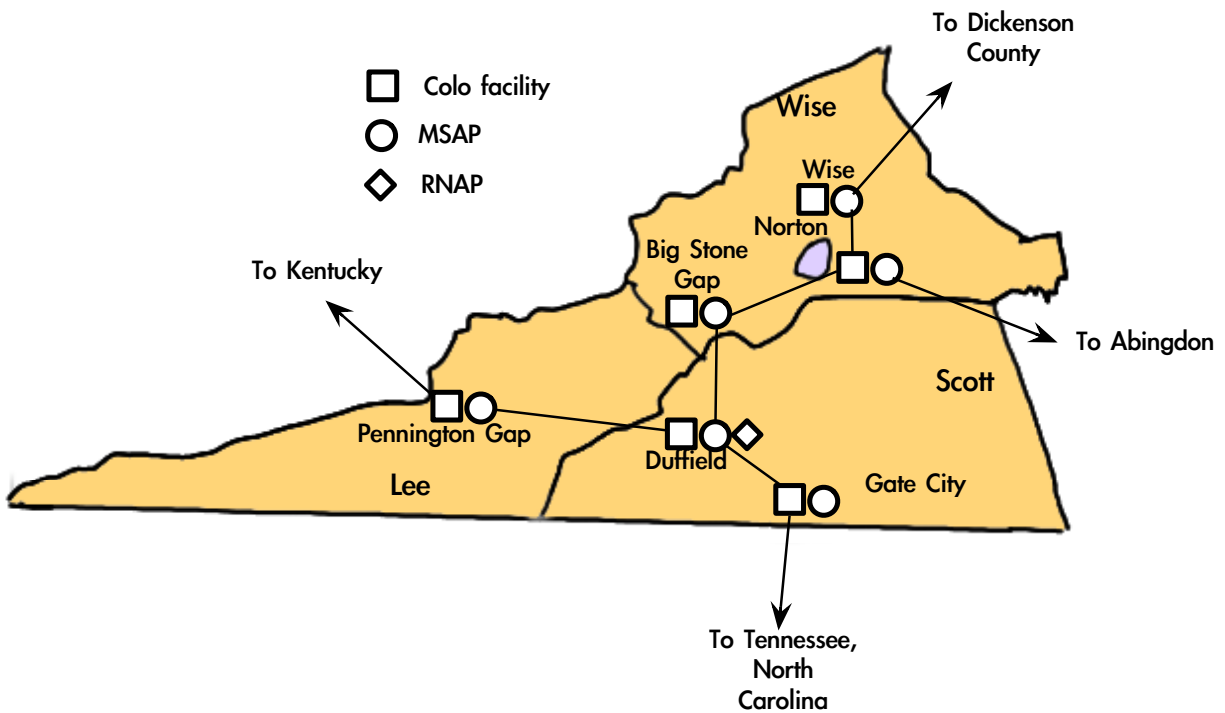


The Lenowisco

Technology and Telecommunications Master Plan

Section Two: Technology Primer



March, 2005

Prepared for the Lenowisco Planning District Commission

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1 Infrastructure

1.1 Community infrastructure investments

Community investments in infrastructure remain controversial. In late 2004, the City of Philadelphia announced an ambitious plan to create a wireless WiFi blanket throughout most of the city. It was immediately challenged by Verizon and other incumbents, who lobbied the legislature to pass a bill making it illegal for municipalities in Pennsylvania to offer telecom services, despite the fact that no company had offered to provide comprehensive wireless services in Philadelphia, including Verizon. A similar pattern of obstruction has occurred in other states, including Nebraska and Virginia, among others.

Local leaders, upon hearing about these battles, often shy away from community telecom investments, assuming that if they are not already illegal by state statute, they will become so if a town or county embarks on such an enterprise. Part of the confusion is the distinction between infrastructure investments and providing telecommunications services to end users. Further complicating the issue is the fact that most “successful” community telecom projects have been initiated by towns and counties with municipal electric service. Projects like Grant County, Washington and Bristol, Virginia are widely cited as model projects, but both had existing public electric service. Most communities do not have a municipal electric service, and for that reason alone, those models have limited generalizability for other communities.

There is a model that provides communities with a better path and direction than the electric utility. It is roads. Communities make investments in the construction and maintenance of roads, but they do not own the trucks that deliver goods and services to the community. In the road model, communities build and maintain a common, non-duplicated physical transport system, and make that available to residents and businesses on an open access basis--pursuant to basic safety rules, any business can use the roads to deliver goods and services throughout the community.

With the deregulation of the telecom industry in 1996, the legal monopoly status of incumbent telephone and cable providers was revoked to allow competition in the marketplace. But legal deregulation, as we have found, does not automatically create marketplace deregulation (that is, choice of providers and a range of services at various price points). Without the guarantee of a legal monopoly in a particular market, some communities are being bypassed for broadband systems, especially high performance broadband systems.

The issue is a simple one, and we can refer to the road model to understand it.

If the overnight package industry were being operating in the same regulatory climate that we have today for telecom and broadband providers, FedEx, UPS, and Airborne would each be expected to build and maintain their own roads to each customer.

This is immediately apparent as absurd--most customers would never have a road built to their house or business, much less three roads to accommodate each package delivery company. High volume shippers would get what they need, but small businesses and residential customers would have no roads or very limited capacity roads.

Communities routinely invest in all kinds of infrastructure because it accrues some benefit to the common good. Public safety, fire protection, libraries, schools, parks, and swimming pools are routinely built and maintained by communities for the common good, even though many of those facilities, like swimming pools, are used by a tiny minority of the community and have no direct benefit to the businesses of the community or economic development. Indirectly, there is usually agreement that facilities like pools contribute to the quality of life of the community, which indirectly helps economic development.

Broadband infrastructure benefits everyone in the community and directly affects businesses and economic development. It is worth reviewing a “common good” test for community broadband investments.

“Common Good” Test	
Equal access	Broadband is an essential 21st century utility
Economic opportunity	Broadband directly affects jobs creation and entrepreneurial activity
Quality of life	Broadband directly affects quality of life by improving network access and increased access to services. Broadband increases alternative work and lifestyle options
Scarce resource	Broadband directly affects community rights of way
Duplication of systems	Community investments reduces the cost of services, reduces wear and tear on roads and landscaping caused by overbuilding

From the table, it is easy to see that community broadband investments easily meet the common good test usually applied to community infrastructure.

1.2 Equipment and facilities

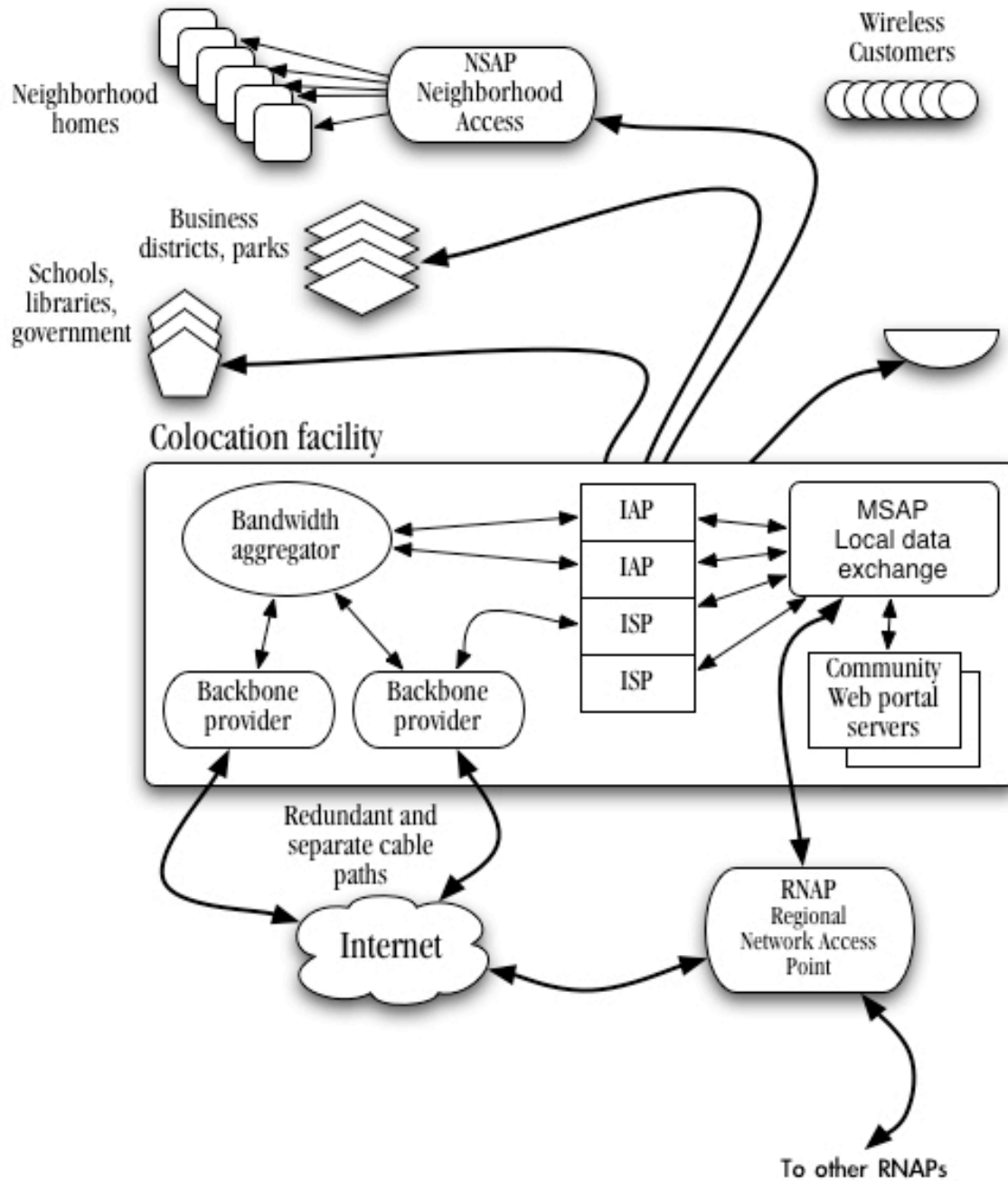


Figure 4-1: Model communitywide network architecture

1.2.1 Colocation facilities

A colocation facility as illustrated in Figure 4-1 is a controlled environment (i.e. heated and air-conditioned) room with Internet access via wired and/or wireless systems. The colocation facility will be a place where fiber, wireless, and copper-based network facilities meet. It will accommodate new economic models for ownership of last mile infrastructure. It will be equipped to house high-end network equipment, servers, and other electronic gear. A variety of middle layer network components and services can be located within the colo including, for example, directory services, replicated content servers, routing services, and other elements needed to deliver new multimedia services to the home and small office from multiple, competing providers. Characteristics of a colocation facility include:

- A reliable source of AC electric power is required, with backup UPS (Uninterruptible Power Supply) service available by an onsite generator.
- Controlled access to the facility (e.g. by electronic keycard) 24 hours/day, seven days a week.
- Racks for locating network equipment and servers, and optionally locked cages for equipment racks.

Functions of colocation facilities include:

- Hub for new broadband infrastructure development at the community and corporate campus level.
- Location for an MSAP, which is an exchange point for local service providers to peer reducing costs and increasing performance in a win-win-win scenario (keep local traffic local).
- Insertion point for multimedia services from multiple competing providers to reach subscribers over single broadband medium (fiber, wireless, other).
- Community, campus, or building point of presence for new middle layer components required to implement next generation Internet (directory services, caching, routing).
- Focal point for technical resources and management of community infrastructure.
- Aggregation point for low cost access to gigabit scale network services.

1.2.2 NSAPs (Neighborhood Service Access Points)

Neighborhood Service Access Points (NSAPs) give service providers (wired and wireless) a place to locate equipment cabinets, small huts, generators, and other equipment and facilities needed to provide broadband, cable TV, and telephone services to a neighborhood. The colocation facility will typically be an enclosed area designed to meet applicable industry standards such as Telcordia Distribution Components specifications and Network Equipment-Building Standards (NEBS). The facility will be designed to consider aspects of mechanical and structural protection, including: power systems, floor plans, fire protection and HVAC systems, raised floors, suspended ceilings, cable racking, and environmental threats. NSAP requirements include:

- Minimum of 100 square feet of level, usable ground.
- Should be located above flood-prone areas.
- Immediately adjacent to public right of way and accessible to service vehicles.
- Access to AC electric power.

1.3 Transport

- Telecom duct and duct routes – These routes throughout the community are determined by need and customer demand. Fiber routes tend to be located along public rights of way. Fiber can be direct buried, installed in duct, in microduct, or hung from utility poles (aerial installation). Telecom duct varies, but is typically 4” plastic duct, “quad” duct (four 1” tubes enclosed in a 4” pipe), or microduct. Microduct is especially suitable for community projects. It is smaller than conventional duct, and contains from one to 32 very small tubes, through which fiber bundles can be blown with compressed air at a later time. Studies have shown that microduct is often no more expensive than conventional duct because fewer pull boxes and pedestals are required, so construction and design costs for microduct tends to be lower. Microduct also allows the community or fiber owner to install fiber as needed, and makes repairs simpler and less expensive, especially when compared to direct buried (unprotected) fiber cables. Emtelle (www.emtelle.com) is the leading world manufacturer of microduct, and provides design and engineering services with its products. Communities should include a fiber overlay in their GIS systems that identifies future, desirable fiber routes. When street repaving or water/sewer projects take place along those routes, fiber or duct should be installed at the same time, which can dramatically lower the cost of installation. Over several years, the community will develop a robust fiber backbone system.

- Aerial fiber routes – Aerial fiber routes typically follow existing pole routes. Poles are usually owned by the electric utility or the telephone company, or a route may have a mix of pole ownership. Installing fiber on poles is typically faster than underground burial, but make ready costs and pole rental fees often offset installation and construction savings. Some communities have found that the poles they wish to use are “full,” in the sense that there is no space for additional cables. In that case, the pole owner often includes pole replacement in the make ready costs. Pole replacement may be \$500 to \$1500 per pole. Microduct can be used in aerial installations, which gives the fiber owner more flexibility in installation and capacity planning.
- Tower and antenna sites – Wireless systems (WiFi, WiMax, licensed frequencies) are inexpensive, and can provide broadband access quickly, especially in denser population areas (e.g. downtown areas, residential neighborhoods). However, wireless providers must procure access to tower sites and rights to mount antennas on existing structures and/or towers. This can be a significant time and money expense, especially when the potential customer base is low (e.g. in rural areas). Communities that perform site surveys to identify good locations for antennas and simplify procuring access to public structures (e.g. water towers, rooftops of municipal buildings, etc.) lower the cost of market entry for wireless providers.

1.4 Transmission

A somewhat religious argument has developed over the issue of fiber versus wireless. Wireless vendors will cheerfully tell a community that fiber is too expensive, and that wireless systems are the only way to go. Fiber design and engineering firms will swear that the bandwidth limitations and interference issues with wireless systems make them a poor choice.

Most communities will want and need both. To deliver high bandwidth applications like High Definition TV to entire neighborhoods, fiber will be required. But at the same time, we will all have wireless, multifunction devices that will include voice telephone services, Web access, text messaging, and other data-enabled services.

Choosing fiber or wireless is based on current and near term bandwidth needs, topography and terrain, the funds available, and economic development goals. All vendor claims should be considered carefully, and community needs and requirements should come first. Vendors often offer “free” design services, but these come at the price of a single vendor solution that may or may not meet community needs. A vendor-supplied “free” design will rarely include less expensive alternatives available from competitors.

1.4.1 Systems

- **Dark fiber** – Dark fiber provides the highest bandwidth capacity, but tends to have the highest initial cost for installation, since few communities have any existing fiber infrastructure. Fiber is future-proof, since the capacity of fiber can be increased by simply swapping the equipment located at each end of the fiber. Fiber is an excellent investment if the funds are available to install it. Dark fiber refers to fiber that does not have electronics at each end to “light” the fiber.
- **Legacy systems** – Legacy systems include dial up modem access to the Internet, DSL (Digital Subscriber Loop, and cable modem services. DSL, which comes in several variants with differing bandwidth capacities, is based on the one hundred year old copper-based telephone system. Current high end DSL systems will accommodate a single channel of High Definition TV, which is not likely to be adequate over the long term, since a majority of American households have three or more televisions, and not everyone wants to watch the same thing at the same time. DSL has distance limitations; over copper pairs, DSL typically cannot be provided at distances greater than 18,000 cable feet (about three miles) from the telephone switch equipment. Note that cable feet is not the same as a road mile or “as the crow flies.” In many cases, homes and businesses less than three miles from the equipment office cannot obtain DSL because the cable path is too long. Some newer DSL systems can go a bit farther (about 25,000 cable feet), but at reduced data rates. Cable modems use the fifty year old cable TV copper coaxial system to deliver data. Cable systems can deliver somewhat higher bandwidth than DSL, and most cable systems are now hybrid systems, with fiber to the neighborhood and copper cable to the home.
- **Fiber services** – Fiber services, as opposed to dark fiber, include electronics at each end of the fiber cable, and fiber service names (e.g. DS1, DS3, OC3, GigE, etc.) refer to the capacity of the electronic equipment, not the fiber cable itself.
- **Wireless** – Wireless systems have dropped dramatically in price over the past five years as demand for them has expanded. WiFi, the most popular system, uses unlicensed spectrum, meaning multiple installations in the same area can interfere with each other. The practical effect is to reduce the amount of bandwidth available to users. Wireless systems like WiFi (a point to multipoint system) also share the bandwidth among all users accessing a single access point (antenna), meaning that bandwidth drops as more users are connected, and single user downloading a large file or trying to watch a movie can severely degrade the service for other users connected at the same time. Nonetheless, wireless systems are an excellent way to provide some broadband access affordably and quickly. Higher capacity point to point wireless

systems using licensed radio spectrum (less interference) can be used to build backbone routes within a community or even between communities, over distance of many miles. Repeaters may be needed over long distances, if there are few tall structures, or if there are mountains in the area. Mountains can also be an advantage for wireless networks as they can provide excellent tower sites (note that AC power is an issue, but can be provided with batteries and solar panels in some applications).

1.4.2 Intracommunity routes

Intracommunity routes provide access in and out of a community. These routes are best planned and managed as a regional effort. These “backhaul” routes have become critical economic development issues, especially for rural communities. Businesses are increasingly looking for communities with at least two separate cable paths in and out of the communities, along different routes. Many businesses operate in real time, twenty-four hours a day, and use the Internet for critical business operations. If a cable is cut by a back hoe, the business stops and money is lost for every hour the cable is out of service.

Route redundancy can be addressed in part by long haul wireless systems, but some communities have been able to install intercommunity fiber for under \$10,000 per mile, which is dramatically lower than just a few years ago, when the rule of thumb was in the area of \$50,000 per mile.

1.5 Data connection points

1.5.1 MSAPs (Multimedia Service Access Points)

In the “old” style of telecommunications services, in which each provider builds unnecessarily redundant facilities and provides end to end services without any consideration for exchanging data and services with competitors. This made sense in a regulated, monopoly telecommunications environment, in which only there was usually only one provider of each kind of service. It also made more sense before the Internet offered a way to carry multiple services (i.e. data, voice, and video) over a single cable and/or via a single service provider.

The “new” style of community telecommunications design, in which the community considers two key changes:

- The deregulated telecommunications environment with multiple vendors in a community offering similar services, and
- the fact that the Internet is creating convergence of services, whereby it is possible to provide multiple services from multiple vendors (access) over a single cable (infrastructure).

Multimedia Service Access Points (MSAP) and colocation facilities are key components of a Next Generation Internet architecture enabling efficient, cost effective delivery of last mile services within communities. MSAPs serve as community hubs that provide data exchange and access points. Service providers and content providers of all types will have the opportunity to reach entire communities simply by extending their product to the MSAP. MSAPs will be deployed in a variety of ways designed to meet the specific requirements of the client community served. For example, an MSAP could be deployed within an information technology-enabled office park to provide service to tenants of the park. The generic MSAP facility will typically be located in a community-managed colocation facility.

1.5.2 RNAPs (Regional Network Access Points)

RNAPs bring the MSAP concept of keeping local data local to the regional level. RNAPs, like MSAPs, insert a new layer in the Internet to maximize performance at the local level (the MSAP) and at the regional level (the RNAP). While MSAPs would typically serve one community or several small communities near each other, an RNAP would provide a switching and routing layer for several MSAPs in a region. In the region, several MSAPs might be provisioned in larger towns and communities, and a regional RNAP would link those MSAPs to each other via fiber, wireless, or copper circuits. RNAPs also provide some measure of redundancy, but do not fully replace redundant cable paths.

1.6 Right of way

Right of way is a scarce resource, and as such, it is important that the community manage it fairly and equitably, and to the maximum extent possible, ensure that it is used wisely. In the past, communities rarely paid much attention to right of way. The electric company, the phone company, and the cable company had local crews that knew where the cables were and right of way management was done casually, and that worked fairly well in a monopoly environment. With deregulation, most local crews are gone, and the companies use out of town and often out of state contractors to install cable. Communities need to not only certify these cable installers, but must insist on being provided data suitable for the government GIS system so that cable installations can be tracked and managed. As the number of third party telecom providers increases, the number of cables being installed, even in smaller communities, has proliferated.

Right of way is not unlimited. Government must actively manage right of way as a scarce resource. Investments in community duct and fiber reduce demand for right of way, and help future proof the community.

2 Education and Training

2.1 Target groups

Target groups that would benefit from ongoing programs of technology training and education include:

2.1.1 Government

This group includes local elected leaders (county and municipal), state and Federal legislators, and planners and officials from other local and regional agencies.

- **Message** – Widespread availability and use of technology and broadband is important to the region as it directly impacts economic development and the future prosperity of the area. Affordable access and services helps existing businesses become more productive and competitive in a world economy. Access and services comparable to those in urban areas helps attract entrepreneurs and microenterprise business professionals to the area.
- **Groups** – State and Federal lawmakers, county commissioners; town council members; county public works staff and planners; regional planning officials; economic developers; other local and regional authorities (e.g. water authorities) where opportunities may exist for joint projects; public safety and other first responder officials (e.g. fire, rescue, 911, sheriff) that make use of wireless communications.

2.1.2 Businesses

Large businesses in the area should be included to ensure they are familiar with infrastructure and service opportunities. Large businesses can be valuable partners in broadband aggregation efforts, but only if they are fa-

miliar with alternative service options and programs. Small businesses need regular, ongoing support and training opportunities on a wide variety of technology projects.

- **Message** – Join a regional effort to aggregate broadband access needs to reduce costs for business access to the Internet. Local businesses have an opportunity to expand into new markets--regionally, nationally, and globally--by making better use of technology and the Internet in business plans and strategies. Technology offers small businesses the opportunity to compete successfully with larger companies from out of the area by enhancing productivity, driving down costs, and offering new and different ways of selling goods and services.
- **Groups** – Existing mall businesses; entrepreneurial startups; new and existing home-based businesses; medium-sized (25-100 employees) businesses; large businesses (100+ employees); chambers of commerce; downtown merchant groups.

2.1.3 Citizens

Individual citizens need regular access to short courses and seminars to help them make best use of computers and the Internet. Citizen training helps expand the pool of skilled workers. Increased use of broadband in homes and home-based businesses helps expand the local market for broadband access and services, and makes the region more attractive to service providers.

- **Message** – Widespread and regular use of the Internet in the community can open up new work and business opportunities. Technology and the Internet is not impersonal, but rather helps bring people together in the community. People that use the Internet tend to feel more connected to other people, groups, and activities in the community.
- **Groups** – Seniors; unemployed and underemployed; citizens at large; people that have not yet started using a computer and/or the Internet.

2.1.4 K12

Teachers need regular access to appropriate training that will help them make the best use of technology in the classroom. K12 technology spending represents a major portion of local budgets; training helps make the best use of those investments.

- **Message** – Widespread use of broadband services in the community offers the potential for enhancing a greater sense of community, can lower telecommunications costs for low income families, and helps foster increased parent–student–teacher interaction. Better communication and information flow between the classroom and the home can help improve student performance.

2.1.5 Builders and developers

Builders and developers have a major, long term influence on the region.

- **Message** – New homes and businesses should be fully equipped with structured wiring to support advanced data and video services. The cost of adding a complete structured wiring design is now a small fraction of the cost of the home, and increases the sale value of the home. Building “Internet-ready” homes and commercial office space enhances and support economic development efforts in the area, and will help attract new businesses and entrepreneurs to the region. Builders and developers should also work with local planning authorities to add telecommunications facilities to new neighborhood projects. With an aging population in the region, builders and developers can also build and sell “smart homes” designed specifically to extend independent living for senior citizens.
- **Groups** – Local builders; electricians and contractors; building inspectors; developers; real estate agents and brokers.

2.1.6 Community and civic groups

Local and regional community and civic groups can benefit from increased use of technology by becoming more efficient communicating with volunteer members and donors. Increased use of the Internet for communications can lower or eliminate printing and postage costs, which translates directly into more funds available for the

group's core mission. Studies in other communities suggests that civic groups that make good use of the Internet to manage their members and activities see higher levels of participation and support from the community.

- Message – Increased use of technology by community and civic groups can lower costs, help the group focus more on its core mission, attract new members, and increase attendance at meetings.
- Groups – Youth groups; social service and community aid groups; sports and athletic clubs; fraternal organizations; civic enhancement groups.

2.2 Skills requirements and issues

- Computer security has become an ongoing and continuous effort. Spam, viruses, denial of service (DOS) attacks, computer break-ins, filtering for pornography, and wireless systems security all require regular attention and management. The region has a need for qualified computer security personnel to help businesses, organizations, and individuals deal with these issues.
- The region needs to train and retain qualified network engineers that have the appropriate skills to help public and private enterprises manage their networks efficiently and effectively.
- Skills are being acquired at an earlier age. It is important to continuously review skill sets and skills requirements to ensure that K12 students are receiving appropriate training and education in technological competency.

3 Access

3.1 The role of access

The role of access is widely misunderstood, largely because access has always been bundled with infrastructure and service in the legacy telephone and cable television marketplaces. The following table illustrates these differences.

	Manufacturing Economy		Knowledge Economy
Service	Telephone	Cable TV	Varied
Infrastructure	Monopoly control of twisted pair cable to the home or business	Monopoly control of the coaxial copper cable to the home	Variety of infrastructure delivery systems, including copper cable, fiber cable, terrestrial wireless, and satellite wireless. No inherent monopoly control.
Access	Monopoly control of the connection to the Public Switched Telephone Network (PSTN)	Monopoly control of the connection to the cable head end	Open access network provides multiple vendors for IP address and bandwidth (i.e. Internet access).
Service	Monopoly control of dialtone – the ability to make a telephone call	Monopoly control of the television signals—the ability to watch a channel of television	Choice of vendors for services like Voice over IP (VoIP), Webcast video, Web site hosting, etc.

An open access communitywide network supports multiple Internet Access Providers (IAPs), which have been incorrectly identified as ISPs (Internet Service Providers) much of the time. The confusion developed because most IAPs also provide Internet services like email and Web hosting.

There are few examples of open access networks because they work best when the community has invested in at least some of the infrastructure. If a private company spends its own money on its own infrastructure (e.g. fiber cable, wireless towers and antennas), it is usually loath to share that infrastructure with competitors.

This debate over open access has raged locally and nationally since the telecom industry was deregulated in 1996. Proponents of requiring open access to privately-owned systems have argued that since the telephone company and the cable company have enjoyed legal market monopolies, these companies now have an obligation to share those networks with competitors. On the face of it, that is a sensible argument. Practically, this approach is not likely to work over the long term. The companies that own the infrastructure can always make it more difficult for competitors to use their systems, and the FCC ruling in late 2004 that the telephone companies could charge market rates for access to their telephone networks makes the discussion moot—the phone companies are now free to charge just enough to make competitor use of their systems entirely unprofitable.

Open access is likely to work best when the community treats infrastructure like roads. Communities build and maintain roads, but provide equal access to all businesses and companies that wish to deliver goods and services over those roads. Those that call open access systems untested are ignoring the roads model, which has worked quite well for nearly a century. Note that there was a time when communities did NOT build and maintain roads. Communities took on the ownership of road infrastructure when it became an economic development issue--increased mobility brought about by the automobile and truck led to the demand for increased access to services.

Access cannot be separated entirely from infrastructure, as the two each require the other to be meaningful.

- Infrastructure without an access provider is just a cable in the ground with no connection, or an antenna on the side of building with no signal.
- Access requires infrastructure to deliver the data.

Access can be viewed as bandwidth. Bandwidth is the amount of data that can be transmitted and received over a particular infrastructure.

3.2 Bandwidth and market aggregation potential and strategies

Aggregation is simply pooling of demand. Walmart is successful in part because its buying power allows it to drive down supplier prices for goods. Bandwidth aggregation works no differently. A pool of buyers negotiates with a group of sellers, and buys their collective bandwidth needs from the supplier with the best price (factoring in service levels as a contributing factor in the decision).

Few communities engage in bandwidth aggregation strategies. Individual institutional (e.g. local K12 schools, libraries, local government), business users, and local access providers all negotiate separately for their bandwidth needs. This occurs largely because Internet access as a budget item is still relatively new, and few organizations have experienced buying agents for Internet access.

It also occurs in part because of the unintended consequences of state and Federal policies. State education and government networks disaggregate demand by taking some of a community's largest bandwidth customers out of the common (community) buying pool. The government customers get lower rates, which appears to save tax dollars, but this is done at the expense of the rest of the community, who in effect pay a use tax in the form of higher fees to support the private state network.

On the Federal policy level, the eRate program has had somewhat the same effect. ERate payments have ended up largely benefiting the incumbent telephone companies, who are best positioned to provide bandwidth in bulk to institutional users like schools and libraries. The extensive paperwork required to receive eRate payments have ended up driving most eRate payments to incumbent providers. However, eRate users could participate in a community buying pool.

The first step in developing a bandwidth aggregation strategy is to poll big bandwidth users in the community to find out what kind of bandwidth they are using (typically a T1 or DS1 at 1.5 megabits) and at what cost (some businesses may not be willing to provide this information).

A community with a population of about 2200 people discovered to its surprise that between the schools, local government, and business users, there were more than ten T1s in the community. In Virginia, that is more than enough to meet the tipping point for purchasing a DS3 connection (45 megabits/second, or 30 T1 lines). By aggregating their bandwidth purchases, current users could have tripled the amount of bandwidth available and/or reduced their costs by as much as 20% or 30%. By lowering the cost of a T1 line, more users in the community could have access to bulk bandwidth.

Bandwidth aggregation is particularly important in communities that are underserved by access providers, as the biggest cost to provide Internet access to a community is often the cost of the backhaul from the community to a major Point Of Presence (POP). Internet Service Providers and Internet Access Providers should be included in all bandwidth aggregation discussions, as those firms can provide both technical expertise and they can act as the broker for services. The IAP can bring in the big connection and resell T1s, DS1s, or Ethernet circuits within the community, creating additional business for the company while saving every institution in the buying pool money.

Community colocation facilities, as discussed in Section 4, play a key role in bandwidth aggregation, as they provide a neutral location for a large backhaul connection that will be resold locally. Participation in a buying pool must be perceived as fair and equal. The MSAP and RNAP data exchange points, typically located in community colo facilities, also can be used to improve the performance of any and all bandwidth brought into a community.

4 Services

4.1 Private sector service services and development strategies

Private sector service offerings can be grouped into three areas, based on legacy service groupings. In the past, voice telephony and television (broadcast, cable, and satellite) were offered to consumers in a package that included the infrastructure (typically copper cable), the access (connection of the cable to the provider's system), and the service itself (dial tone or television programming).

The Internet's all digital packet-based technology, as opposed to the legacy analog systems, has made it both possible and practical to completely unbundle infrastructure (the transport system), the access (now an IP address on the Internet), and the service itself (dial tone, email, streaming video, radio, music downloads, etc.).

The challenge is to ensure that a variety of vendors are able to offer services to businesses and consumers in the region. If one or two access providers own most of the transport system (the infrastructure) in the region, it creates a de facto monopoly that will potentially limit choices in both access (to the Internet) and choices in services, since the owner of the infrastructure can control what vendors offer what services.

4.1.1 Voice telephony

Voice telephony is undergoing a major shift that is the most significant since the start of voice services a century ago. VoIP and direct computer to computer voice systems have made it possible to make phone calls without a direct connection to the Public Switched Telephone Network (PSTN). VoIP carriers are now offering local and nationwide calling packages for as little as \$30/month. All that is required is a broadband connection and an inexpensive converter box. The savings in the cost of local and long distance service can offset most if not all of the cost of the broadband connection.

If most citizens and businesses get their Internet access from a privately owned network infrastructure, the company that owns that infrastructure can limit the choice of telephony service offerings.

4.1.2 Video and video services

Traditional television programming will also undergo a sea change, although the bandwidth requirements of video will make the transition a slower process than voice telephony. The hardware of personal computers has been sufficient to handle the processing demands of streaming video for some time, and the accompanying software is now able to provide high quality audio and image quality.

The transition away from traditional broadcast television (which includes over the air TV, cable, and satellite) will be gradual and will depend on the availability and affordability of much higher bandwidth connections, especially to residential homes. Once the higher capacity systems are in place, however, an entirely new set of video services will be possible, including:

- Point to point videoconferencing (which will largely replace traditional voice calling);
- Multi-person videoconferencing, which is now expensive and technically complex, but will become commonplace;
- On demand video (primarily movies and live performance entertainment), which is available now in cable systems, but with limited choices and viewing options.
- Interactive gaming augmented with live voice and video connections between gamers.

As with digital telephony, buyers of services need access to an open marketplace, and vendors of these services need access to the same open marketplace. If a community's infrastructure is largely controlled and owned by a single private company, choice and variety of services is likely to be much more limited. It will also be more difficult for small local and regional service vendors to enter the marketplace, as the infrastructure owner will prefer to limit competition with their own service offerings.

4.2.3 Internet-based services

Over the past five years, there has been enormous growth in new kinds of digital service offerings, both free and fee-based. Online music stores that deliver high quality, commercial music have become a major force in the

music industry in less than two years, and in the future, “record” stores will disappear, driven out of business by the highly efficient delivery mechanism of digital music.

Other “advanced” services include things like commercial radio, which is already widely available and requires a broadband connection for reasonable audio quality. Over the network backups will become a common consumer and business service, as just one example of new Knowledge Economy businesses that are enabled by affordable broadband

It is safe to say that twenty years out, all services will be Internet–based. Legacy telephone and cable TV systems will be used in only a few places, if at all. But the transition will be different in different communities and regions, depending on the availability of open access systems that allow service vendors to enter the marketplace affordably. Choice in the kind, quality, and cost of service offerings will be directly related to the level of investment by communities to create a level playing field that will prevent re-monopolization of the digital delivery and transport system.

4.2 Kinds and types of community services

Every person in the community should have an Internet presence (email account) at an affordable cost. Accounts should be independent of how an individual or organization accesses the network.

- Technology service: email server with forwarding for all accounts.

Every community should support a community Web site portal as a community information publishing resource in cyberspace for local civic and government activities.

- Technology service: community Web site portal and affordable site hosting services for community and civic groups.

Every community should support a public, online directory of email and Web site addresses of all personal, nonprofit, community, and businesses entities.

- Technology service: Web-enabled database directory system using open source tools, especially LDAP.

Every community should support wide use of mailing lists to facilitate discussions on any and all topics of interest to the community, especially local government issues, public education, and to facilitate the work of civic groups.

- Technology service: mailing list server

Every community should support an RSS-based news syndication service to provide all public and private organizations in the community an opportunity to include timely and appropriate news items.

- Technology service: RSS news syndication server

Every community should provide community and civic groups with a rich set of communications tools to facilitate participation in the life of the community.

- Technology services: Web site hosting, email accounts, mailing lists, online calendars, Web discussion forums, small group collaboration tools.

Every community should provide a common authentication and authorization mechanism for business, government, and nonprofit use. Authentication validates that someone is who they say they are (important for business and government transactions, voting), and authorization determines what they are able to do (e.g. access certain files or Web pages, but not others).

- Technology services: Public Key Infrastructure (PKI) services, directory services using LDAP, SourceID package from the Liberty Alliance, and/or other Open Source initiatives.

Local libraries and other public facilities should be supported as a partner in any community network to provide network access for those who do not have network access at home, and as a source of and access point for network-based information.

- Technology service: community technology center

Every community should provide neighborhoods with a set of services to facilitate neighborhood news and collaboration.

- Technology services: Web site hosting, mailing lists, online calendars, Web discussion forums

Every community should provide neighborhoods with a set of services to facilitate neighborhood news and collaboration.

Technology services: Web site hosting, mailing lists, online calendars, Web discussion forums

Every community should support local Usenet server and news groups to facilitate a "town commons" where people can meet to discuss issues of interest asynchronously and to facilitate discussion and local commerce.

- Technology service: Usenet server

Every community should support online conference facilities to support moderated asynchronous meetings and civic discussions.

- Technology service: Web-based discussion forum server

Every community should support a community historybase to help document and preserve an online, archival record of important community activities and events.

- Technology service: Web-enabled database publishing server

Every community should support an affordable small group collaboration system (e.g. shared address books, shared personal and group calendars, shared to-do lists, document management, etc) to provide every civic and community organization with a high quality, Web-based tool to facilitate small group interaction.

- Technology service: LAMP platform and an Open Source small group collaboration package

Common client intake system for social service agencies that facilitates referrals, reduces repetitive questioning of clients, and provides for client-controlled information sharing among agencies and faith-based groups.

- Technology service: Web-enabled database client intake and case management system.

Service	Enabling Technology	Who Benefits?	Cost Recovery Potential
Email accounts	Linux-based email server with forwarding for all accounts	All community members and organizations that use it.	Cost recovery for most users.
Email hosting for nonprofits, local government	Linux-based email server with Web administrative interface and delegation of account management	Lower costs and increased reliability for all organizations that use it.	Full cost recovery for all users (still much less expensive than multiple servers).
Civic/community group service package.	LAMP platform with Web hosting, email accounts, mailing lists, online calendars, discussion forums, small group collaboration tools.	Every community and civic group gets access good tools with the same level of quality and support to which corporate and business users are accustomed.	Should be fee-based, but cost should not be a deterrent to small civic groups (e.g. Cub Scouts, Girl Scouts, charities)
Common authentication and authorization mechanism	SourceID package from the Liberty Alliance provides a comprehensive identity management system.	Businesses are a major beneficiary because it makes determining who someone is more reliable at lower cost. Local government can be both the enabler and beneficiary, by providing IDs to local citizens for both government and business use.	Could be fee-based, but cost of an ID should be kept very low to encourage wide local use. May be useful to provide them for free for a period to gain rapid acceptance.
Community online directory	LAMP platform using custom database and/or LDAP server	Local businesses, community groups, and social clubs will be easier to learn about and check on products/services or local activities.	Should be offered free to encourage wide use.
Community Web site portal	LAMP platform	The entire community benefits. A well-designed and well-maintained site helps economic development, can increase civic participation, and can help boost tourism and travel to the area.	Should be offered free to encourage wide use.
News syndication service	RSS news syndication server	The RSS server aggregates news items from a variety of sources, and allows any public or private entity to reuse the news items easily.	Should be offered free to encourage wide use.
Conference, discussion forums	LAMP platform with Web-based discussion groups (moderated and unmoderated)	Town hall meetings, public discussions, and small group work efforts are facilitated with this service.	May be fee-based; cost should not be a deterrent to use.

Service	Enabling Technology	Who Benefits?	Cost Recovery Potential
HistoryBase	LAMP platform with custom Web application	An online community archive of historical events can get many groups in the community involved in online activities (especially youth and Seniors)	Should be offered free to encourage wide use.
Neighborhood Networks	LAMP platform with Web hosting, email accounts, mailing lists, online calendars, Web discussion forums.	Neighborhood associations, crime watch groups, local public safety, local government, and law enforcement all benefit from better communications directly to neighborhood residents	Ideally, this would be underwritten by the local government or other interested third party.
“Town commons”	LAMP platform with Usenet server Local news groups give people a place to meet to discuss issues of interest asynchronously. Should be offered free to encourage wide use.	Local news groups give people a place to meet to discuss issues of interest asynchronously.	Should be offered free to encourage wide use.
Small group collaboration system	LAMP platform with an Open Source collaboration system.	Groups using this can see improved communications, more efficient and effective meetings, more work accomplished between meetings.	Full cost recovery for nonprofits with full time staff; reduced fee for some civic groups, charities.
Common client intake system	LAMP platform using custom Web application.	Local social service agencies, faith-based aid groups would have better access to information about people in need. People applying for aid would get help more quickly, with fewer intrusive questions.	Underwritten by local aid agencies because of increased efficiency and effectiveness and reduced costs, better reporting.
Community resource directory	LAMP platform with custom Web application to provide searchable access to all social service and community aid programs.	People in need get better access to services. Groups offering services reduce costs of producing redundant, overlapping directories. Public safety and social service agencies have better, more timely access to information.	Should be offered free to encourage wide use. Ideally, one or more sponsors would agree to underwrite costs (because of internal cost savings).

5 Content and Content Providers

5.1 Local content development

The availability of locally developed content (primarily available via the Web, but not exclusively) is a key component of a strategy to increase demand for broadband. It is local content that gives many people a reason to go online and/or make the jump from dial-up access to broadband access.

The Growing Digital project in southern Virginia (<http://www.growingdigital.net/>) is a perfect example of the potential of local content to spur the use of broadband connections. Terry McGhee, the Director of Growing Digital, identified five traits he found common in rural communities:

1. Insufficient population density and service demand to justify broadband Internet
2. Insufficient existing wire-line infrastructure
3. Most individuals watch lots of television
4. Most parents do everything they can to make their kids computer-literate
5. Most kids enjoy using cameras and the Internet

McGhee's objective was to promote technological literacy among middle school students by giving them real world work experience that was firmly grounded in community service. The Growing Digital project routinely broadcasts local sporting events (e.g. high school football and basketball games) via Internet webcasting (video over the Internet). Most of these games are never broadcast on commercial channels because of the limited

audience for such games, but via the Growing Digital program, local events are now available to a worldwide audience (anyone with a broadband connection).

The availability of such programming can have an impact on the take rate for broadband services. It may also influence access providers who will see a “connected” community with broadband content already available.

The Blacksburg Electronic Village (BEV) project, widely hailed as a model for other community projects, never had any dedicated funding for infrastructure. Instead, the project focused on creating a wide variety of local content. The BEV staff trained dozens of community and civic groups to create and manage their own Web sites. The strategy was a variant of the “Teach people to fish, don’t feed them” philosophy. As more and more people in Blacksburg became adept at posting content online, it created corresponding demand for such content. As the demand grew, commercial access providers began building out a broadband infrastructure in the community.

Despite the success of Blacksburg and other communities with community network projects, maintaining a Web site and keeping content fresh and up to date has, until recently, been a onerous task. In the past eighteen months, fourth generation Web site management tools (generically called “Content Management Systems”) have matured to a point that they are easy to install and easy to use by almost any group, large or small.

These content management systems eliminate the need to have an extensive understanding of HTML and Web site organization. Most information can be posted to a Web site without any HTML or coding at all, by using a simple fill in the form Web page that posts the material to the Web site with a click of a single button. The new page is available immediately.

Community and civic groups need some modest training to design their site and to use the content tools, but once trained, the groups can easily update and maintain their own material.

Web logs, or blogs, have become popular; a blog is simply a Web page, usually written and maintained by one or just a few people, on a particular topic. Political blogging sites were extremely popular in the 2004 Presidential election, and there are an estimated 2 million blogs on the Web. Most have very small readership and tend to be

personal in nature, but some blogs have become extremely popular and generate traffic rates comparable to some newspapers.

Blogging tools are widely available, and are built into many of the Web management systems. A community portal should offer personal blogs as part of its set of services, and the blog pages can be used by both individuals interested in trying out the new medium and by community groups who do not need their own dedicated Web site.

Most blogging tools also support RSS (Real Simple Syndication), which is an automated method of distributing Web-based content to a wider audience. RSS allows other Web sites to easily include content from a variety of Web sources. RSS news feeds can be updated hourly, daily, or on any schedule appropriate for the material.

Local government also has a role to play in providing local content, both for residents and as an economic development issue. Companies and entrepreneurs considering relocation to the region make heavy use of the Web to do initial research. If the region is using modern Web tools, has a wide variety of RSS news feeds, and local government provides news feeds on topics of interest (e.g. public safety, education, zoning, public works) it can be a persuasive marketing tool for the region.

5.2 Community directories

Community directories play an important content aggregation role. As community and civic groups go online, it is vital to provide a “one stop” source for finding these Web sites. Directories play a key role in the design of a community Web portal. The Blacksburg Electronic Village has an extensive business directory (<http://www.bev.net/mall/>) that consistently generates a high number of monthly visitors, suggesting that people do want to shop locally on the Web. The Carroll County, Virginia community portal is another example of a business directory (<http://business.chillsnet.com/>), organized somewhat differently from the BEV business listings. Community directories may include:

- **Business directory** – Using Google or other national search engines to locate a local business or service is usually an exercise in frustration. A local business directory gives both local residents and visitors quick access to local products and services.
- **Civic directory** – A directory of community and civic groups also provides quick access to the full range of activities, sports, and special interest groups in the community. The civic directory is also an important economic development marketing tool, as a comprehensive directory projects an image of a connected community. Typical categories in the civic directory may include sports groups, youth groups, hobby and special interest groups, churches, civic, and fraternal organizations.
- **Arts and Entertainment** – A directory of arts activities, night life, live music, theatre, and related activities. This kind of content is also important as an economic development marketing tool, as it helps project a vibrant community/region with lots to do (important to the families of businesspeople considering a move to the area).

5.3 Commercial and business content providers

5.3.1 Commercial providers of content

One of the best examples of the “old economy” content providers is the cable and satellite TV companies. Millions of households nationwide pay between \$30 and \$60 per month on average for access to a wide variety of video programming. An example of a Knowledge Economy, internet-based content business is music downloads. Fee-based music downloads are barely two years old, but it is creating drastic changes in the music business. It has been extremely popular in the 18 to 25 age group, and will eventually eliminate the distribution of music on a physical medium (e.g. CD, DVD, cassette tape).

Fee-based video programming delivered via the Internet has not yet achieved widespread popularity, due in the part to the lack of market opportunities. Video is extremely bandwidth intensive, and a single channel of low quality video in a small window (e.g. 3 inches x 4 inches) requires between 200 kilobits and 500 kilobits (1/2 megabit) of bandwidth. However, as more households acquire broadband connections, the market will grow, and eventually all cable, satellite, and broadcast (through the air) television programming will move to the Internet as the primary delivery mechanism.

High Definition TV (HDTV) will prove to be particularly taxing to existing broadband networks, as a single channel of HDTV uses between 3 and 20 megabits per second of bandwidth (it depends on who you ask and the quality of the signal). At the low end, upgraded DSL and cable modem systems could just barely provide a single channel of HDTV. At the high end (10 to 20 megabits), fiber or very high performance wireless are required.

Movies on demand will also drive commercial content, and all the major phone companies are planning to upgrade their DSL networks to be able to deliver more video programming. The limitation with copper-based delivery systems (DSL and cable) is that both will only be able to deliver a single channel of video (TV, movie, etc.) at a time. U.S. households are accustomed to being able to have multiple television sets watching different channels or movies at the same time.

Online gaming is already an important niche market, and broadband is highly desirable for gamers as it improves responsiveness. Many online gaming environments already support live voice chat between players, and live video feeds of players is waiting in the wings as bandwidth availability improves.

5.3.2 Business providers of content

Any business with a Web site is by definition a content provider. In 2004, a half billion dollars of goods and services were sold by businesses via their online Web site and catalogues; that was more than double the amount of business done in 2003. In South Korea, a third of all business transactions are conducted via the Web.

Business use of the Web is intimately tied to the issue of content. Local businesses in the region have the potential to sell to a worldwide market of potential customers. The content they develop—online brochures, Web pages, downloadable sales information, video product demonstrations, online catalogues, and real time purchases—all represent significant content that creates jobs and helps local businesses to grow in direct proportion to their sales success.

Business owners and managers, if their businesses are to thrive in the global economy, must have an understanding of the kinds of business content that customers expect (e.g. responsive, easy to use online catalogues, real time purchases and downloads, etc.). These businesses also must have access—ideally locally—to businesses that can provide the expertise to design and build online stores affordably.

5.4 Emerging content trends

Over the next three to four years, personal videoconferencing will be the live content use that will drive demand for broadband. Personal videoconferencing works acceptably at lower rates of 100 to 200 kilobits per second. The software and computer hardware needed to support this is mature, sound quality is excellent (as good as a phone call), and picture quality is adequate for the casual nature of a video phone call.

Podcasting is another emerging trend that may or may not become a widely used service. Podcasting is an audio version of weblogs, in which the author provides a downloadable audio file that can be played on a desktop/laptop computer, or downloaded onto a portable MP3 player (typically an iPod, hence the name “pod” casting). As the publishing tools for audio content mature (it’s still somewhat clumsy to work with audio), audio content will become more widely available, and represents opportunities for both commercial providers and local community content providers (for example, the community portal could provide audio guided tours of the town or region).

Other unexpected content types will emerge—no one could have predicted podcasting even two years ago. What is predictable is that future content will be media rich, meaning bandwidth needs will continue to increase over time, well beyond the ability of DSL and cable modem systems to provide it.

6 Entrepreneurship and Economic Development

6.1 The changing face of economic development

Rick Smyre, President of Communities of the Future and a faculty member of the National Economic Development Institute, is fond of reminding his audiences that, “Industrial recruitment as a primary strategy peaked in 1983.” In other words, it has been more than twenty years since simply trying to attract jobs and businesses from outside a region has worked well for most areas.

There are a variety of job creation statistics available, but data from all of them point to the fact that 75% to 90% of all new jobs are being created by small businesses (25 employees or less). This means that if a region’s economic development strategy is focused solely on recruiting new companies to the region, as much as 90% of the potential jobs creation is being missed.

The differences between the Payroll Survey (the traditional measure of jobs growth) and the Household Survey illustrate the dramatic changes in economic development over the past two decades.

The traditional measure of economic development and jobs growth has been the Payroll Survey. The growing problem with the Payroll Survey is that it measures Manufacturing Economy growth (or lack of it). It measures only payroll changes. But in the Knowledge Economy, more and more workers are self-employed and/or have multiple streams of income, and these new businesspeople and entrepreneurs have little or no payroll. Many of these self-employed workers and business owners, if they expand, hire other self-employed workers on a project

by project basis. This means that while they are providing employment for others, they are not adding to the Payroll Survey.

The Household Survey tries to take these other employment measures into account. Contrast the results of the two surveys in July of 2004. The Payroll Survey reported an anemic 62,000 jobs added to the economy. The Household Survey reported a stunning 629,000 jobs added to the economy.

For communities, it is critical to understand the difference between the two and to adjust economic development strategies appropriately. These numbers are nonpartisan statistics gathered by the Department of Labor. If the success of your economic development program is measured by the local growth of payroll jobs, you are missing (potentially) some 90% of the new jobs being created, based on the July numbers.

This is an important issue for communities trying to measure the impact of new and diversified economic development efforts, like investments in getting affordable broadband and small business training and development. If economic developers are being rewarded for increases in payroll jobs, the community is losing out--that's not where the growth is.

Not only that, a factory floor payroll job is not necessarily equal to a self-employed job. A prosperous microenterprise owner with a gross business income of \$150,000/year and take home "pay" of half that has a much larger impact on the economic health of the community than a \$12/hour full time hourly worker, and it's probably much more than just a simple 3x factor. Gary Larrowe, an economic developer from Carroll County, Virginia, thinks that the impact of a single self-employed professional in the community might be worth as much as ten shop floor jobs, because of the indirect effect. Self-employed professionals are spending some of their business income on local businesses--attorneys, accountants, copy services, and other professionals in the community, which supports those businesses and helps them grow.

Are your economic developers shifting course and reallocating resources to better foster growth locally of self-employed workers, microenterprise businesses, and small business? If not, your region is at a major disadvantage--just look at the numbers.

Outsourcing of U.S. jobs to other countries, depending upon who you believe, is wrecking the country or no big deal. Based on data developed by business experts like Peter Drucker, who says three U.S. jobs are created for everyone that is outsourced, outsourcing does appear to be a major concern as a national issue.

As a local issue, if your area has been losing jobs, it's certainly a major concern, hence the confusion about outsourcing--it is a matter of geography. Nationally, we are creating jobs. But in some localities, real jobs are being lost and workers and their families affected materially.

The real question is what to do about it. Hence, insourcing. Insourcing is looking through the other end of the telescope. Instead of bemoaning the loss of jobs, communities should be studying the potential of insourcing, or the jobs and companies that are coming to the United States. If Drucker is right that 3 jobs are being created for every job that leaves, then the real opportunity is to figure out to be attractive to those international companies coming to the United States.

The Organization for International Investment has compiled state by state statistics on insourcing. In Illinois, 268,400 jobs that represent a 39% increase. In New Hampshire, the state gained 38,400 workers with a 43% increase over five years. In Virginia for example, in 2004, there are 146,000 insourced jobs, which is a 25% increase over the past five years.

How do a community or region get insourced jobs? International companies are relying heavily on the Web to do their research because they cannot afford the high cost of travel to every prospective community. Local community, government, regional, and economic development Web sites need to be attractive, vibrant, well-designed, and professional. They need to tell a good story. One suggestion: create "Welcome" pages in some of the dominant languages of trade (Spanish, French, German, Japanese, and Chinese) would be a good start. It's not expensive, and it will project that your community embraces the global economy.

To successfully adjust to this new climate, communities need a diversified economic and entrepreneurship development strategy and the job descriptions and reward structure for local economic developers must be adjusted accordingly to reward effort directed toward the new goals. A Knowledge Economy approach to economic and entrepreneurship development should include:

- Continued efforts on industrial recruitment of “big” companies of 50-100+ employees (20% of total effort).
- Growth of existing businesses in the region, especially those with 25 employees or less (40% of total effort).
- Development of new business startups from entrepreneurs already located within the region (25% of total effort).
- Insourcing recruitment of international companies interested in establishing a local presence in the United States (15% of total effort).

5.2 Knowledge Economy business needs

Most communities are trying to chart a path for themselves in the Knowledge Economy. But there is still a lot of stovepipe thinking going on. Economic developers are rarely talking to town planners. Town planners are rarely talking to business people. Hardly anyone is talking to work at home businesspeople.

A widely misunderstood issue is broadband itself. Broadband is simply a means to an end; it is not the end goal of community technology and telecommunications efforts. Businesspeople that are engaged in the new economy don't care about broadband. What they care about is being able to meet their customers needs and expectations. Broadband is needed to do that, but broadband is not really an issue for them--what they are able to do with it is an issue.

Broadband is simply one part of a bigger picture for communities, and the bigger picture, for the entrepreneurial, microenterprise businessperson (remember that small businesses are creating 75% of new jobs), is that businesspeople need a variety of services and amenities in a community to be able to meet their customer needs and expectations. It's never just one thing (like broadband). What are some of those things?

- Affordable, world class business office space -- Incubators continue to be important, but too many are heavy on the industrial look and feel, and short on the kinds of finishing details that are not always expensive but that project, "We're doing Knowledge Economy business here." Many communities putting slab-steel siding buildings far out of town in a former industrial park would be much better off rehabbing

empty buildings on Main Street, like they did in Norton, Virginia, where they rehabbed a 1920s era hotel, got tax credits to do so, won awards for excellence, and are filling the space faster than they can finish the remaining floors. The Norton downtown is enjoying a modest renaissance as the workers in the “vertical incubator” buy meals at Main Street restaurants, run errands at Main Street businesses, and shop at lunchtime and after work in the evening.

- Communities need a great coffee shop, like the one in Franklin, Pennsylvania started by someone who just moved back to their hometown after ten years in California. Coffee shops with great coffee, an upscale ambiance, and a private meeting room are a key requirement of work at home businesspeople, who need a place to meet clients, have a light lunch, or just "get out of the office" to do some work. These clean, well-lit, upscale establishments are also important for traditional businesspeople who need a place to take clients for coffee and/or a quick meal.
- You need a clean, well-lit place to get a quick, hot breakfast. Businesspeople travel, and not everyone wants to eat donuts and biscuits at the free breakfast buffet at the motel by the interstate. And a lot of business gets done at breakfast, and the buffet room in the motel is not conducive to that.
- Business lunches and dinners are also important. Clients do come to the community to visit work-at-home businesspeople as well as traditional businesspeople, and that means the community needs an upscale restaurant for more formal business lunches and dinners. Just one good restaurant in a community makes all the difference to businesspeople.
- Business visitors to a community want more news than one can get out of the local paper. The Wall Street Journal, USA Today, and at least one "big city" paper should be available in easy to find locations, like the coffee shop or the breakfast eatery.
- Copying and printing services are the lifeblood of "just in time" Knowledge Economy businesses. The value of being able to walk into a Kinko's and get things printed right from a CD or a laptop is invaluable. Does your community have a local copying/printing store that offers these services and is easy to find?
- Public WiFi access is critical. Visiting businesspeople want to be able to check their email, catch up on news from the Web, and take care of business via the Internet. Can a visitor easily find a hotspot in your community? Is there a place to sit down and work?
- A good place to stay is also important. A B&B is fine if the town is too small to support a hotel, but the B&B owners need to know about the needs of businesspeople. Rooms should have a phone (for privacy and dial out Internet access), and a desk is essential--too many B&B rooms have no place to sit and work. A B&B with a few rooms designed to meet the needs of visiting businesspeople, along with wireless (or wired) broadband access would be very popular.

- A great community Web site portal with up to date local news and information (e.g. where to eat, where to find a hotspot, where to find copy services, where to buy a newspaper) is a vital economic development marketing tool. It telegraphs to businesspeople that the community is progressive and understands the Knowledge Economy.
- Finally, affordable broadband, as always, is critical.

Today, hundreds of entrepreneurs and small businesspeople are thinking of moving back to a smaller community with good quality of life. How many things on this list does your community have? Have you reoriented your economic development strategies to ensure your community has the kinds of amenities that businesspeople want and expect?

A recent article in The Roanoke Times (June 14, 2004) had a major feature on the glacial pace of trying to develop a more coherent and connected set of hiking/biking trails around the city. The article related that recently, a Colorado high tech company was considering relocating to Roanoke. Did they ask about business parks and incubator buildings? No. Were they interested in water and sewer capacity? No. What they wanted to know about was the biking trails, and here are some of their questions.

- Was there a fully interconnected trail between two major biking spots--Carvins Cove and Explore Park? (no)
- Was there a connection from downtown to Mill Mountain biking trails? (no)

The paper notes that the company was willing to give up skiing to move to southwest Virginia, but ultimately decided to stay in Colorado.

That particular company was making a relocation decision, at least in part, based on quality of life, lifestyle options (like good biking trails), and a regional approach to recreation. Communities often discount the recreational potential of their area, and also often assume that bikers, hikers, and other small businesspeople with interests in recreation are all in their twenties. One of the leading bike trail advocates in Roanoke cheerfully admits to gray hair. In Blacksburg, Virginia, which has a fast-growing entrepreneur community, the local cycling groups have large numbers of members over 40.

Many rural areas take their recreational amenities for granted--not only do they not market them as part of a comprehensive approach to economic development, many communities fail to fund and develop them at levels high enough to make them effective drivers of economic development.

Another quality of life issue is appropriate housing for the families of these Knowledge Economy workers and businesspeople. Many rural areas lack adequate housing stock that meets the needs of middle managers and white collar employees.

Housing can play a critical role in relocation decisions, because a self-employed businessperson who can work anywhere there is affordable broadband makes the relocation decision in large part based on family needs, not business needs.

Regions can enhance their attractiveness to self-employed entrepreneurs by working with developers, builders, and real estate agents to make sure all those parties understand the housing and related family needs of these workers. New homes should be designed to support work at home businesses; traditional floor plans rarely meet business needs, but the cost of redesign before the house is built is minor, and having homes designed for entrepreneurs can give the region an edge.

In the book *The Hidden Power of Social Networks* (by Rob Cross and Andrew Parker), the importance of social networks to businesses is explained. In the Manufacturing Economy (1850 to 1950), where you were located mattered because stuff was heavy. Being near an airport, a highway, or a river was a key part of an economic development strategy. In the Information Economy (1950 to 2000), what you had mattered. What kind of technology you had--computers, networking equipment--often created a competitive edge, especially in the last ten years of that era.

In the Knowledge Economy, many goods and services are weightless--software, music, and videos can be delivered over the Internet, among many other services and products. Location is less important, and if you don't already have the computers and networking stuff, your business is dead or nearly so. So what counts in the Knowledge Economy?

In the Knowledge Economy, we are awash in an ocean of information. We can't possibly absorb all of it. It flows into our computers in an ever-increasing torrent. It is now impossible to master any field of study; there is simply too much to know. Collaboration is fast becoming not just a nice thing to do, but a business and organizational necessity. To survive and prosper, you have to have a trusted network of associates, peers, and colleagues to whom you can direct questions and get answers.

In the Knowledge Economy, who you know is what matters (all other things being equal), not where you are or what kind of technology you have .

Developing and maintaining a network of reliable colleagues is hard work--but with a big payoff. Part of a diversified economic development strategy that supports entrepreneurship should include attention to local business networking opportunities. One might remark that most communities already have “networking” institutions like the Rotary Club and the Chamber of Commerce, but in most areas, those organizations are still focused (in large part) on traditional retail business needs, and in many communities, most of the retail businesses that had created a vibrant Main Street economy are long gone. Knowledge Economy entrepreneurs and businesspeople need vital, active, and local social and business networking support.

7 Governance and Management Planning

As the region continues to develop a community-funded infrastructure, the long term challenge will not be technology choices (e.g. fiber, wireless, etc.), but rather governance and administration.

7.1 Governance and business model alternatives

7.1.1 Third party nonprofit

In many communities, a community nonprofit often acts as the coordinator of activities and as fiscal agent. Technology and telecommunications are typically not directly related to the core mission of the organization. The board and/or the Executive Director make a decision to get involved based on community need, a personal interest in telecommunications, or more commonly, a mixture of both.

Projects tend to be started on an ad hoc basis, and often follow funding opportunities that arise, rather than using a systemic approach (e.g. identifying specific needs and objectives and then pursuing funding). Good work is often accomplished on a project by project basis.

Advantages

This approach avoids the overhead, cost, and effort of creating yet another community nonprofit. In smaller communities and regions, it may be difficult to find board members with specific qualifications, talents, and interest in telecommunications to serve on a nonprofit focused on technology and telecommunications. Some communities also suffer from “nonprofit fatigue,” in which too few people end up serving on too many boards and projects. By using an existing nonprofit, these problems are avoided.

There are also ongoing cost efficiencies related to sharing office space, staff, and other overhead expenses. It should be noted that it is possible for two legally separate nonprofits to share staff and other expenses, so this is not an inherent obstacle.

Disadvantages

The primary disadvantage to this approach is the difficulty of maintaining focus. The board and ED have usually been selected for their expertise in other community development areas, and the nonprofit itself must necessarily tend first to its core mission. The technology and telecommunications issues may end up getting less attention than is really required to move the region ahead. Staff burnout is also an issue unless additional ongoing funding is available to assist with the increased workload. The ED is particularly vulnerable to burnout and work overload problems, as the job description has effectively been expanded by nearly a factor of two, coordinating two disparate sets of activities--two sets of grant writing tasks, two sets of project management activities, two sets of meetings to attend, and so on.

7.1.2 Do nothing

This approach deserves mention because so many communities adopt this as a working strategy, although it may be too kind to call it a “strategy.” Local leaders in this situation are typically intimidated by technology, and choose to do nothing as a way of avoiding risk—that is, mistakes are avoided by doing nothing. A structural reason for the frequency with which this occurs is that local governments in the United States tend to use “management by crisis” as an operating style. Local governments are comfortable with and generally do a good job providing basic services that have a long history in the community—trash collection, water and sewer, fire and public safety are examples of services that are generally handled well. But communities with part time elected leaders tend to have more trouble being proactive in areas that have a high degree of future uncertainty, and telecommunications is among these.

In those situations, governments tend to wait until there is a crisis, and then act. Unfortunately for communities and especially rural communities, telecommunications and technology, at the community level, are tied intimately to economic development. What this means is that it is difficult to identify a crisis situation and respond, as compared to a broken water main or roads that require repairs. Instead, the lack of focus and activity makes it more

difficult to attract businesses to the area and/or makes it more difficult for existing businesses to grow and prosper. In other words, the “crisis” is a glacial one that is conspicuous in its absence.

Advantages

There are no advantages to this approach from a community perspective. From a leadership perspective, some leaders see this as advantageous because they do not have to risk making a decision.

Disadvantages

The disadvantages are numerous. Like it or not, telecommunications is no longer provided by a one or two franchised monopolies that are obligated to provide universal service to the community. Communities and regions must take an active, futures-oriented approach to telecommunications if for no other reason than to secure the economic future of the community. Telecommunications is a direct economic development issue, although many local leaders still view it as a kind of optional luxury service. This happens in part because they themselves make only little or no use of the Internet and services like email and the Web. In their world view, if it is not important to them personally, they have a difficult time imagining that it could be important to the community at large.

7.1.3 Holding company

The holding company, perhaps structured as a regional authority with bonding powers to raise funds, aggregates assets (typically dark fiber, and perhaps certain facilities like a public colocation site, etc)) from a variety of public and quasi-public sources. In turn, the holding company leases out the entire infrastructure (typically for ten years) to a private company that will invest in the electronics needed to make the system operational. This company would pursue a series of strategies to deliver access and services via the infrastructure. The company would pay a flat annual fee for use of the infrastructure and facilities (or an annual fee plus some small portion of revenue). The Mississippi MegaPOP project has adopted this approach to manage the assets of a rural long haul fiber route.

Advantages

This is a very simple model for the local government entities that choose to participate. The holding company has a small budget (e.g. \$200K annually) to support a contract manager, small office, and associated activities and expenses. There is a very clean handoff to the private sector, and no public entity has any involvement in of-

fering services to users. The holding company issues RFPs for services, support and maintenance, selects an appropriate vendor, and follows up on an ongoing basis by assessing vendor performance and making contract changes and adjustments as needed.

An alternate approach would be work with multiple vendors for various parts of the network and related service activities. This spreads the risk (of choosing the wrong vendor) across several companies, but complicates management of the assets somewhat.

This is one way to aggregate the assets of individual projects in a region. As a community or other political entity brings telecom assets online, the holding company assumes responsibility for these assets and issues a new contract or adjusts a current contract to allow the vendor to begin using those assets to deliver services. This is one way to relieve local communities and political entities (e.g. towns, counties) from the ongoing responsibility of managing and maintaining complex digital networks.

As an example, suppose a town, as part of Main Street project, installs microduct conduit. They simply lease it to the regional entity for forty years, and get a share of any proceeds received by the regional entity when it or fiber in it is leased out. In that model, the regional entity serves as an infrastructure aggregator. It's a win-win situation.

- A number of communities all make modest investments, spreading costs out across the whole region, rather than requiring one or a few very large investments.
- Communities get to offload management of small pieces of infrastructure to the regional entity, saving them additional (and inefficient) costs and also get to recoup their investment over time by getting a piece of the revenue.
- Private sector providers win because they can go to a single regional entity that can negotiate for access to big chunks of aggregated infrastructure, instead of having to go town by town to get access to little bits of it.
- Broadband users win because the regionally aggregated infrastructure attracts service providers and competition, bringing more and better bandwidth across the region at lower cost.

Disadvantages

This is an "all the eggs in one basket" scenario. If the entire infrastructure is leased out to a single company, company receiving the contract would have to be vetted with great care to ensure they have both the technical resources to manage the network and the business experience to market and sell services successfully. As mentioned in the Advantages section, the risk could be reduced by taking a multivendor approach, but in turn, that reduces the financial reward as the income from services is now spread across multiple companies. A multivendor approach may make it more difficult to find a vendor willing to make the initial financial investment to take over management of the network and delivery of services.

NetworkVirginia, a statewide education system, avoided the one vendor syndrome by issuing two RFPs (Request For Proposals). One RFP was for delivery of access to end users of the network, and the other contract was for management of a statewide backbone network. The contracts were performance-oriented (delivery of a certain amount of bandwidth with specified Quality of Service levels) rather than specifying exactly what kind of network (equipment, etc.) had to be provided.

7.1.4 Coop model

A "data coop" is formed locally using the time-tested coop model, with a local board of directors. Users of coop services are shareholders and owners in the company. The coop would perform the same work as the holding company (aggregate local infrastructure assets), but would also market and sell a variety of access and services from the private sector, just as a farm coop sells products from a variety of for profit vendors. The coop aggregates in two ways: infrastructure aggregation and marketplace aggregation (by aggregating buyers of services).

Although the coop model is well understood, I have not been able to identify a single new coop formed as a "pure" data coop. Many existing telephone coops and some electric coops are offering broadband, but they are leveraging their existing business experience and assets to move into a new area, which is very different from starting a new coop from scratch.

I believe one of the problems here is that coops are so old and so well-established that there no longer exists a pool of people experienced in starting new coops. Nonetheless, coops receive special protection from Congress that makes them less vulnerable to legal attacks from incumbent providers, and the USDA has a pool of funds

specifically earmarked for starting new coops. In addition, the USDA has a pool of low cost loan funds earmarked for coops.

Advantages

The coop is vested in the local community, and could not be sold or taken over in the same way that a typical for-profit firm could be. In the holding company scenario, the for profit firm holding the contract could be bought out or sold to a third party that no longer wants to work with or offer services in the area. A coop should also create more private sector business opportunities, as the coop would be marketing and selling access and services from a variety of vendors. It is possible this could also happen in the holding company model, but not nearly as certain.

Disadvantages

The coop is a more complex business entity (but one that rural communities have been managing very well for 70+ years). A larger initial investment would be required to get started (although coops have lots of ways to raise and borrow money). With the coop as network manager and services broker, the initial staffing of the coop would be critical--very experienced managers and businesspeople would be needed to make it successful. It could not be operated as a local patronage opportunity. Managing the network as an open access, multivendor services environment is also more complex.

8 Policy and Legal Issues

8.1 Federal view of broadband

Although the FCC continues to define broadband as access speeds of 200 kilobits or more on both directions, this bar is set too low for future growth and economic development. South Korea's target bandwidth to the home is 155 megabits, or 775 times faster. Hong Kong recently announced plans to provide Gigabit Ethernet (GigE) fiber service to more than a million homes. Many other countries are also developing high capacity fiber and/or wireless broadband transport systems. The target capacity, 4-5 years out, is a sustained throughput to a single home or business of 25-50 megabits/second, with 3x burst capacity (75-155 megabits/sec). The reason all that capacity is needed to support entertainment and business needs. Among the uses for that bandwidth will be:

- Four channels of HDTV (5-20 megabits/channel)
- Voice telephone service (multiple lines)
- Radio programs
- Music and video downloads
- Online interactive gaming
- Web surfing
- Outgoing data--business servers, video streaming, videoconferencing

The U.S. government has mixture of confused and conflicting policies administered by a wide variety of large and small agencies, including the Appalachian Regional Commission, the Department of Commerce, the Department of Education, and the Department of Agriculture. Each agency has its own funding lines, each with different sets of rules and guidelines. This complicates obtaining funding for local projects, as the region must take the primary responsibility for identifying appropriate funding, and then must have the capacity to write a competitive grant.

Because much of the funding (e.g. the Commerce TOP program) is competitive, it often means that the communities most in need of help are least likely to have the capacity to complete a competitive grant application. The Federal government also tends to try to distribute funds to states on a somewhat equal basis, so a state with higher needs may or may not get funds in direct proportion to the existing needs.

The FCC must manage legacy providers and stay out of the way of new providers and services. The result is that FCC ruling are often confusing and contradictory, as the agency tries to prop up incumbent providers, which still provide the bulk of telecom services in the country, while simultaneously trying to encourage competition.

Congress has a major influence on key policy areas like piracy, pornography, privacy, security, but often is overly influenced by incumbent industry providers, especially on content issues (e.g. copyright, digital rights management, etc.). Our national policy can be summed up as “Broadband is good,” but the country lacks a clear national direction for how to get affordable broadband to every home and business in the country.

8.2 State policy issues

Policy at the state government level and its effects varies widely across the country.

- Some states do little or nothing – These states typically have no statewide policies or funding initiatives. In the absence of state level efforts, communities are left on their own.
- Some fund local efforts; a few fund regional efforts – Some states provide modest assistance to communities. In Virginia, the Tobacco Commission has funded substantial investments in community infrastructure, but only in the authorized tobacco-growing regions of the state. The rest of the state does not have access to the same levels of funding.
- States are funding network islands – The piecemeal approach to funding has led to the development of “network islands” within states and across the country. Some communities, either on their own initiative and/or with state assistance, are building a variety of broadband networks, ranging from inexpensive wireless efforts to full blown fiber to the home projects. The problem with piecemeal community projects is that network investments are most effective when addressed and executed regionally; a high performance fiber to the home project within a community cannot achieve its full potential unless corresponding high performance regional network connections (including redundant cable paths) is part of the long term effort.

- Lack of clear boundaries of responsibility – The generally apathetic direction-setting at the state level leads to overlapping project efforts, duplication of infrastructure in some cases, and “holes” in the network (the network island problem), and increases the amount of effort expended to address lack of network capacity locally and regionally.
- Grants end up driving spending – In the absence of clear state level policy, grant opportunities often end up driving local and regional planning, as the requirements of the grant end up defining community investments, rather than community needs driving technology investments.
- State education networks disaggregate demand – Some states have invested heavily in statewide networks that are restricted to educational and state agency use. These networks have lowered bandwidth costs for those entities, but from a community perspective, those private networks have removed the largest bandwidth users, or anchor tenants, from the community bandwidth buying pool. Subsequently, other private, business, and civic bandwidth users end up paying more than they would if the anchor tenants joined the community buying pool.

8.3 Local policy issues

- Communities are building network islands – Network islands are a local problem as much as a state problem, and while communities may have limited ability to affect state level policy, community investments, at a minimum, should be made in a regional context.
- Backhaul and lack of route redundancy – Related to the network island problem is the backhaul and cable path redundancy problems. Investing in fiber or wireless to the home within a community is limited in value and impact if high performance routes in and out of the community are not available.

About Design Nine

Design Nine provides telecommunications project management, technology master planning, and advisory services to communities, businesses, and organizations trying to make wise technology and telecommunications expenditures. Our commitment is to provide each of our customers with the highest quality service.

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