## Connecting the Dots for 2007 and Beyond: National, State, and Local Policies for Sensible Community Investments in Broadband Andrew Michael Cohill, Ph.D.

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During the recent presidential election, both candidates set 2007 as a goal to have broadband to all communities, businesses, and citizens of the United States. Unfortunately, neither candidate provided a detailed plan on how we, as a nation, should get there. One of the recurring problems is the lack of well–defined roles for appropriate investments at the national, state, and local level. This paper outlines policies and roles at all three levels that should lead to achieving affordable broadband for all citizens.

"A modern technology footprint will greatly increase opportunities for small and rural communities. The role of government is to expand opportunities for entrepreneurs."

Thomas Dorr, Undersec'y for Rural Development, USDA

Dorr's statement gets at the heart of the justification for local, state, and national investments in broadband-business and economic growth. Communities are no longer competing with neighboring towns and counties, they are competing with other countries. State are no longer competing for business with the adjacent state, it is provinces and prefectures a half a word away. And the country is now part of the global Knowledge Economy. Manufacturing, distribution, and sales are global efforts (or should be) for virtually all businesses large and small in the United States.

# "Community and homeowner investment in networks is essential, so that there is no 'natural monopoly' that can be exploited by a single company."

Dr. Alan McAdams, Cornell University economist

McAdams, who has studied the economics of communitywide fiber networks extensively, feels that community and property owner investments in broadband are essential to a free, open, and competitive marketplace for broadband services. Communities that leave broadband infrastructure investments entirely to the private sector risk putting their businesses at a competitive disadvantage because they will either lack access to services, or will be required to pay too much, or both.

# "Create a level playing field for telecom that does not favor one company or technology over another, and don't let the Federal government get in the way."

Senator Conrad Burns, Montana

Senator Burns focuses on the notion of the level playing field. Companies quite rightly adopt business strategies that seek to increase their market share and limit the ability of other companies to acquire market share. Without community investments in broadband to help level the playing field for local and regional access and service providers, it will be very difficult for new companies to offer services in an underserved community because of the high cost barriers. Community investments in broadband lower those barriers and level the playing field--creating competition and driving down the cost of broadband access and broadband services.

### What is 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. Many other countries are also developing high capacity fiber and/or wireless broadband transport systems. The target capacity, 4-5 years out, should be 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 (multiple lines)
- Radio programs
- Music and video downloads
- Web surfing
- Outgoing data--business servers, video streaming, videoconferencing

### History of community technology investments

Community investments in technology date back more than twenty years. The history of community network efforts can be characterized as follows:

First age of CNs 1985 to 1997 – Early experiments in online social networks, information sharing, and rudimentary dial access to online services.

- Access--dial access to FreeNets, BBSes, Internet
- Education/training--basic skills

Second age of CNs 1998 - 2002 – With the concurrent rise of the Internet and the Web, community networks began to focus less on infrastructure and access and began to offer a broader range of information services to communities. Training became an important part of the work, and many community networks supported place-based community technology centers. There were a few community fiber and broadband projects, but during the dot-com era, there was much pressure from incumbent providers and some state regulators to keep communities out of infrastructure development.

- Services--email, nonprofit Web hosting, mailing list, community Web sites, etc.
- Education/training--advanced skills

Third age of CNs 2003 - 2010 – After the collapse of the dot–com bubble, it became increasingly clear that the private sector would not be able to provide universal broadband services, or would do so only at high prices and limited services. Communities began to make substantial and enduring investments in broadband infrastructure as part of an overall community and economic development strategy.

- Infrastructure--transport layer only
- Education/training--collaborative work
- Services--sophisticated info. mgmt systems

### Benefits of community network (CN) investments

- CNs provide access to education and training resources to help train and retrain workers for the Knowledge Economy.
- CNs are advocates for open access infrastructure and competitive access and services
- CNs help increase demand for commercial products and services, especially local products and services
- CNs act as brokers for access by aggregating demand and encouraging public/private partnerships
- CNs provide community portals to organize and to improve access to content (especially local content)
- CNs provide business incubator services and training to entrepreneurs and microbusinesses
- CNs create a "connected" community with services to youth groups, churches, sports clubs, and civic/nonprofit groups
- CNs provide a safe and secure place for online youth activities and a neutral environment to discuss community issues

### **Getting Everyone Connected**

Some community projects have faltered because of an overemphasis on infrastructure and a lack of attention to other key success factors.



· Users need to take more control and provide direction

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### Education and Training

- Users have to have the skills to use the system
- Multiple organizations play roles
- Uplearning is a critical capacity
- Learning webs help create uplearning

#### Infrastructure

- Infrastructure is the transport system
- Necessary precondition but not sufficient
- Should not be owned by any single public or private entity
- Includes both fiber and wireless
- Open access transport spurs competitive pricing for access

### Access

- Access providers give content users and providers an onramp to the infrastructure
- Ideally, most access is provided by the private sector
- Private network access deals create pockets of have-nots
- Identify opportunities to aggregate demand and reduce costs

#### Services

- Services deliver content (e.g. email, the Web, mailing lists, etc.)
- Ease of use still a problem--little incentive for industry to improve services because most services are not "owned"
- Industry attempts to create "owned" services limit competition and choice
- Users need to take more control and provide direction

### **Content Providers**

- Content providers use the transport infrastructure to deliver content via services
- Wide variety of providers -- government, business, community, and individuals
- Access provider attempts to limit content providers (walled gardens) is counterproductive
- Everyone should have the option of creating and distributing content

#### Content

- Tools to create content are finally maturing
- Education and training play key roles
- Rich local content is a driver of demand for access and commercial content and services

### **Content Users**

- Affordable access is essential for increased use
- Inexpensive or free wireless access spurs use and creates demand for higher capacity fiber systems
- Users "get connected" when training is available
- View neighborhoods as new business districts

### **Current policy situation**

#### Federal

- Mishmash of confused and conflicting policies
- FCC must manage legacy providers and stay out of the way of new providers, services
- Commerce, Education, Agriculture all have funds
- Congress--piracy, pornography, privacy, security National policy -- "Broadband is good"

### State

- Some states do little or nothing
- Some fund local efforts; a few fund regional efforts; statewide efforts are rare
- States are funding "network islands"
- Lack of clear boundaries of responsibility; grants end up driving spending
- State education networks disaggregate demand

#### Local

- Communities are building "network islands"
- Backhaul and lack of route redundancy big problems

### **Defining the Dots**

- Most investment is at the local and regional level
- NSAPs neighborhood level colo
- Community colo community-managed public colo space
- MSAP community level data exchange point
- RNAP Regional data exchange point



### NSAP

- Neighborhood Service Access Point
- A place to locate equipment close to customers
- All new neighborhoods should be required to have NSAPs

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- Existing neighborhoods need them
- Characteristics Small plots of land (10' x 10' up to 20' x 20')
- Adjacent to public right of way
- Access to electric power

### **Community Colocation Facility**

- Telcos control existing colo facilities
- Telcos not interested in sharing
- Inefficient and costly to require each provider to provision colo space
- Community colo facility lowers cost barrier to local markets
- Solves chicken and egg problem where to terminate fiber, wireless

### Characteristics

- Modest space 150 ft2 to 500 ft2
- Good AC, backup power generator, raised floor
- If convenient, close to telco colo building

### MSAP

Multimedia Services Access Point keeps local data off Internet backhaul routes Advantages

- Improves network performance Reduces cost of service Enables local high bandwidth services (e.g. video) Access providers will pay to connect
- Blacksburg MSAP in service since 1999 \$360/month for a GigE port
- Small amount of equipment located in the community colo

### RNAP

- Regional Network Access Point Provides high performance regional networking
- Partial solution to need for redundant cable routes
- A high performance multiport, multiprotocol router/switch
- Located in an appropriate community colo facility

See the next page for an illustration of the network.

### **Making the Connections**

- Appropriate community investment is at the transport layer
- Transporting data
- Fiber and wireless are both needed
- Not a religious argument Intercommunity routes mostly fiber Last mile (first mile) is primarily a community responsibility
- Not enough funds available at state and national levels to get the job done
- Communities routinely provide roads, water, sewer, and other local services
- Some state and Federal assistance is appropriate where need is greatest

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### Local Policy Issues

At the local level, there are two key issues facing communities.

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.

Local roles in broadband

- Communities have primary responsibility for first mile connections
- Public Works departments have maintenance, finance role for duct, fiber, and tower/antenna sites
- Communities provision colo facilities to attract private sector access and service providers
- Create opportunities for bandwidth aggregation
- MSAPs enable high bandwidth uses, lower costs for all
- Facilities operated on cost plus basis
- No "revenue enhancement"

#### Local Funding and Management

- Financed by bonds, just like water and sewer
- Pass-by fees help pay for initial investment--just like water and sewer Revenues from lease payments fund maintenance and expansion
- Dept. of Public Works plays a role in infrastructure maintenance
- Most communities would manage only passive systems--telecom duct, dark fiber, towers Less complicated than water and sewer
- Most work could be contracted out (e.g. fiber splices, etc.)

#### 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.

### State Roles in Broadband

- States build regional connections (i.e. fiber, wireless) between community colo facilities with MSAPs
- One RNAP serves multiple MSAPs
- States provide funding to regions for RNAPs
- RNAP funding is reduced or eliminated after 2007
- Communities and regions have believed they avoid risk by doing nothing
- This approach creates risk by doing nothing

### State Funding and Management

- Initial financing of Intercommunity routes,
- RNAPs comes from reallocation of 5% of current road budget
- Maintenance and expansion financed by cost plus use fees
- No "revenue enhancement"
- State highway department manages assets
- Active network management handled via competitive private sector contracts

### Federal Policy Issues

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. Many other countries are also developing high capacity fiber and/or wireless broadband transport systems. The target capacity, 4-5 years out, should be 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.

The U.S. government has mixture of 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, which has now been eliminated) 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 rulings are often please no one, as the agency tries to support 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 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.

Federal roles in broadband

- Federal government provides funds to build interstate connections between RNAPs
- LambdaRail fits this approach well
- Funds for interstate connections eliminated after 2008
- States that refuse to invest in regional connections and RNAPs risk loss of Federal funds
- Federal funding continues for local projects in communities in need
- Communities must show regional collaboration

#### Federal Funding

- Interstate routes use 90-10 financing, just like highways 90% Federal, 10% state
- Assets are turned over to the respective states when construction is complete
- Maintenance paid from use fees

### **Summary**

- Communities and regions have to begin taking this seriously
- Not enough state, Federal funds for all local first mile investments
- Local infrastructure is financed locally States build the data equivalent of state highways (fiber, wireless) and interchanges (RNAPs)
- Only where communities have built off-ramps (MSAPs)
- Federal government builds the data equivalent of interstate highways
- Only where the states have provided interchanges (RNAPs)

## About the Author

Dr. Andrew Michael Cohill is the President and CEO of Design Nine. He is an information architect with an educational background in architecture, ergonomics, and computer science. Cohill has an international reputation for his work advising communities on technology and telecommunications issues. In the United States, he has worked with rural communities across the country, with recent work in Virginia, Illinois, New Mexico, Louisiana, Pennsylvania, New Hampshire, and Texas.

He was the Director of the world renowned Blacksburg Electronic Village (BEV) at Virginia Tech from 1993 to 2002. He is a widely published writer, and author and coeditor of the popular book about Blacksburg (*Community Networks: Lessons learned from Blacksburg, Virginia*), now in its second edition. He served as co-chair of the Governor's Task Force on eCommunities for the Commonwealth of Virginia for the duration of the task force (2001-2002).

- He is a member of the Wireless Future Advisory Board.
- He is a member of the National Advisory Board for Communities of the Future, a national coalition of thinkers and policy makers concerned with the sustainability and health of communities.
- He is a member of the Association For Community Networks, and has served two terms on the Board of Directors and two terms as President.
- He is a member of the Rural Telecommunications Congress, has served on the Board of Directors, and served as Secretary.
- He is the founder of the Knowledge Democracy Center, a think tank looking at issues relating to communities, governance, and technology in the Knowledge Economy.
- His technology news blog receives heavy traffic because of its rich content on community technology news (www.designnine.com/news/)

In the nineties, Blacksburg became widely known as the "most wired community in the world." In the fall of 1999, more than 87% of the town's residents were using the Internet, and over 75% of the town's businesses had made the Internet a regular part of their marketing. Today, virtually all of Blacksburg's businesses and residents are estimated to have one or more broadband access options at home, at work, or at both. Cohill served as Director of the community network project since July of 1993; he was responsible for the design and development of electronic village services, supervised a research and development group, and managed an operations group that manages the BEV office and administrative services.

Cohill's work at the BEV became a widely copied model for "connected communities" around the world. Cohill was the architect of the now widely imitated MSAP (Multimedia Services Access Point) concept; Blacksburg was the first community to have a working MSAP. Much of Cohill's recent work has been closely connected to telecommunications master planning and economic development. He presents seminars regularly to communities leaders and economic developers on strategies for getting communities connected to the new Knowledge Economy.

He is wide demand as a speaker on economic development issues and technology because of his clear explanations, shrewd insights, and engaging manner. For more information about Cohill's work, send a note to cohill@designnine.com.