Big Broadband:
Public Infrastructure or Private Monopolies

By Wayne Caswell, CAZITech Consulting

ABSTRACT: *I recently returned from an Economic Summit in Loudoun, VA, where I was invited because of a paper I wrote earlier this year, "Reviving the FORGOTTEN Information Superhighway." The summit expanded my thinking about the role of government in telecommunications policy and led to an invitation to speak at Austin InnoTech, a regional conference and exhibition with focus on the mutual relationship between technologies and innovation. This newer paper summarizes and expands on that presentation, which was called "Fiber, Wireless and Bandwidth for TeleWork."*

INTRODUCTION

I live in Austin, TX where the growth in population and highway traffic has made the daily commute painful and time consuming even though this high-tech community took a big hit during the recession and the jobless rate is high. Luckily I work from a fairly well equipped home office with an always-on broadband connection through Time Warner's RoadRunner cable modem service, but it's not really fast enough for video conferencing and other advanced applications.

My average download speed of 3.3 Mbps (measured with FTP file transfer) is moderate and plenty fast enough for email, web browsing, and even live streaming of compressed video with slow frame rates and small windows, but it's not nearly good enough for standard-definition television programming and far too slow for HDTV. My average upload speed of 330 Kbps is even more limiting, so I think I need to move to a community where I can get Big Broadband with 100 Mbps in each direction. That probably means fiber-to-the-home (FTTH), but so far Avery Ranch is the only Austin community with FTTH, and since they don't yet have a service provider offering Big Broadband, I'm considering a move out of Austin!

While Austin fights over toll roads and light rail, other high-growth regions are driving economic development with telework programs and high-speed fiber optic and wireless networks. They know that technology innovation depends on sharing knowledge and that telecommunications infrastructure is just as vital to future economic growth as transportation systems were in the past, where industries benefited by being near major highways, waterways, railroads, and airports.

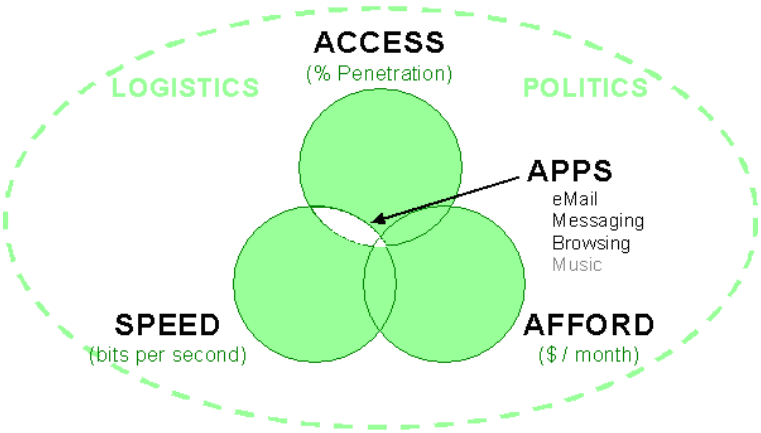
The purpose of this paper is to examine ways of getting access to Big Broadband and the merits of waiting for ISPs to build private monopolies with a triple-play service bundle or treating broadband as public information infrastructure where service providers pay for right-of-way access on an open and nondiscriminatory basis. I will contrast the business model challenges of private broadband and public broadband.

For ISPs to justify building private networks, they need a large take rate (% of population subscribing) and a large RPU (revenue per user). And because stockholders are impatient and want a quick return on investment, ISPs need monopoly power and only tend to install new fiber infrastructure where they think they can get it.

Public broadband, on the other hand, is more like airports, where cities can endure a longer payback period than commercial companies, where development funds are raised with long-term bonds that get paid off with ISP access fees, and where both network construction and operation are outsourced. The communities that have already done this (over 200 of them across the country) have enjoyed significant economic development benefits from more competitive choices, lower prices, better features, and faster performance.

TOPICS

These three overlapping circles highlight the main points of this paper – Speed, Affordability, Access, and the Applications they enable. Surrounding these issues are the logistical challenges of extending fiber deep into the network, and the politics and business models that cause the deep-pocketed incumbents to feel threatened.



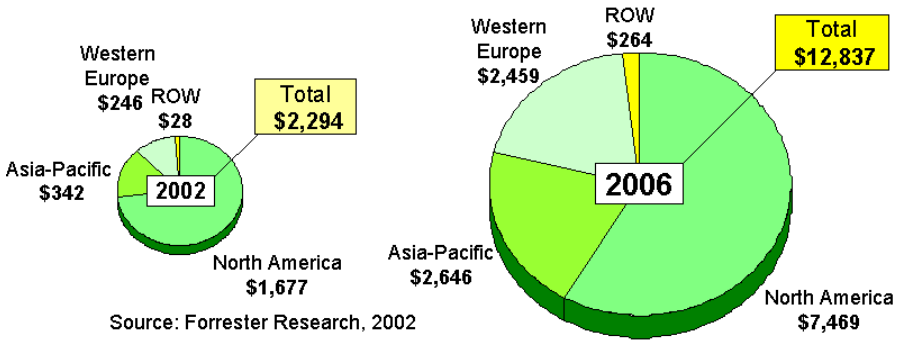
What's at stake is economic development worth Trillions of dollars worldwide and Millions in individual communities. It has to do with the overlap and the chicken vs. egg dilemma, where new applications aren't developed until enough bandwidth and users justify it, where faster networks aren't installed until the apps demand them, and where users don't subscribe until there's compelling benefit.

The FCC officially defines Broadband as having enough network capacity to carry 200 Mbps of information in each direction, both to the premise and from the premise. Little Broadband, as it is often called, is like Cable and DSL modems – faster than dialup but not as fast as the Big Broadband networks in regions with more proactive governments, such as Japan, South Korea and over 200 municipalities in the U.S. that are tired of waiting for ISPs to build the networks.

SPEED: for Economic Development

Big Broadband supports compelling consumer apps such as standard- and high-definition television, compelling business apps such as e-commerce and telework, and apps that benefit all of society such as telemedicine and distance learning.

Growth of Worldwide e-Commerce (B-B and B-C)



Source: Forrester Research, 2002

North America dominates but is losing ground.

North America	45% ACGR
Asia-Pacific	67% ACGR
Western Europe	78% ACGR
Rest of World	74% ACGR

A study by Forrester Research in 2002 showed worldwide e-commerce revenues of nearly $2.3 Trillion, with most of that coming from business-to-business transactions in North America, but North America is losing ground due to its slower growth rate, and by the end of 2006 we'll still dominate e-commerce but with a smaller share of the pie. While some of that is expected as other countries catch up, the United States remains the only G7 country without a national broadband policy, and it's losing technological leadership and its share of the global economy. That is cause for grave concern and should be a wake-up call to policy makers and voters alike.

SPEED: for Telework

Telework benefits employers, employees, the environment, and national security. The benefits are enhanced with telepresence and enabled by Big Broadband.

- **Employers** – Telework programs let employers hire and keep the best talent wherever they may be while improving their productivity (10-20% in some studies), and the cost of such programs (measured in $100's) is more than offset by the savings (measured in $10,000's).

- **Employees** – By eliminating the daily commute, teleworkers have more family time. The timesavings alone are worth an extra $4,000 per year for each person who avoids rush-hour traffic and $700 per year for others who still commute but with less traffic.[1]

- **Traffic & the Environment** – Telework reduces traffic congestion and emissions while saving fuel and wear & tear on the cars and roads. Interstate-35 is part of the Highway System that President Eisenhower introduced after World War II as an investment in national security to facilitate quick movement of goods and heavy equipment for an industrial society. But the highways have become crowded with workers commuting each day to offices where they can interact with each other, and for today's digital society we now need an Information Superhighway.

- **National Security** – A distributed workforce is less likely to be crippled by bad weather or wiped out by a terror attack. Since we must protect both the physical security of our workers and the continuity of key business and government operations, Congressman Frank Wolf (R-VA) has funded the TeleWork Consortium and several pilot programs that exploit Big Broadband and stress telepresence.

One of the pilot projects was at Loudoun Magazine, an up-scale quarterly that had already bought into the idea when their lease was up and they faced moving to a new office. They decided to go "cold turkey" and publish their next issue entirely through telework, with employees spread across Virginia and tied together with video conferencing, white boarding, instant messaging and other enabling software. Cable and DSL proved to be too slow for video conferencing, so for workers without access to fiber connections, they installed fixed wireless. With at least 512 Kbps in each direction they could see the expressions of coworkers and get a real feeling of being there. TelePresence.

[1] Assumes an average $60K/yr salary plus burden, 45-minute commute each way, and 5-minute savings if 10% of the population telecommutes.

Loudoun Magazine Art Director confers with the CEO, Deputy Editor and Managing Editor while debating pros and cons of a candidate magazine cover. Participants could page through to discuss candidate covers.
(mock-up screen shot)

High-quality video conferencing also benefits telemedicine and will help us manage our rising healthcare costs, which will increase more when baby boomers reach retirement age. A Florida project serving kids with diabetes, for example, eliminated 80% of the hospital visits and saved each family thousands of dollars.

There's almost no end to the benefits of Big Broadband and high-quality video conferencing. It enables signing for the deaf, remote surveillance, distance learning programs, and even collaborative performance. Distance Learning is especially important for employees who need ways to update their skills without taking time off from work since fewer employers invest in employee development than they did in years past when it was common to work for one company for a lifetime.

Last month the University of Texas hosted the Internet2 Conference with demonstrations of various applications that exploit Big Broadband. One was an online concert by the Miro String Quartet. The audience was divided in two, with half seeing a live performance and the others seeing a high quality broadcast. Then the two groups switched for a repeat performance and compared notes. The sound quality was said to be indistinguishable, but even with gigabit networks, the video quality suffered due to limitations of HDTV. Other demonstrations featured UHDTV (ultra-high-definition TV), which required several gigabits per second and filled a wall size display with the same HDTV quality you'd expect from a 42" display.

SPEED: and Application Requirements

Application requirements are like a hierarchy, where fast networks that support the most demanding apps can also support the simplest ones. This point becomes important with digital convergence, where all apps are a series of bits running over one network, and where pricing shifts from a per-minute or per-byte model to a flat-rate model. Big Broadband changes the economic value by carrying ALL apps and not distinguishing between the values of a sensor alert that only needs to send 10 bytes of data versus a movie that needs several gigabytes to download.

APPLICATION	REQUIREMENT
Text	300 bps
Telephone	8-64 Kbps
Color Image	25-2,500 Kbps
Digital Photos	1,000-10,000 Kbps
Digital Music	128-700 Kbps
Video Conferencing	**512-2,000 Kbps**
MPEG-4 VoD (Internet)	250-750 Kbps
MPEG-2 (DVD, Satellite)	4,000-6,000 Kbps
HDTV (1080i MPEG-2)	20,000 Kbps

The speed of dialup Internet access (28-56 Kbps) is fast enough for email and Web browsing with simple graphics, but it's painfully slow when receiving high-resolution images and photos.

Most cable and DSL services have download speeds of 1-3 Mbps (little broadband) and can handle the photos and even digital music but still have a difficult time with video, except in the case of highly compressed MPEG-4 video.

Experts point to 100 Mbps as what is required to receive several simultaneous DVD-quality MPEG-2 video streams or several HDTV streams in real-time. Other experts argue that 100 Mbps is too slow because consumers will want information faster than real-time. "Faster than real-time?" Why?

Mobility and the desire to download content onto handheld devices will drive demand for networks that support speeds faster than real-time. That's because we're impatient and don't want to wait for downloads to finish before getting on the road again.

Consider the time it takes to download a DVD movie in standard-definition format.

Downloading *The Matrix* (7.8 GB)

Delivery Method	Days	Hours	Minutes
Dial-up (56 Kbps)	**13**		
Pony Express	**11**[a]		
Wireless (512 Kbps)	**1.5**[b]		
DSL (640 Kbps)	**1**		
Cable (1.5 Mbps)		**11.5**	
T1 (1.54 Mbps)		**11**	
FedEx		**10**[c]	
Ethernet (10 Mbps)		**2**	
Fast Ethernet (100 Mbps)			**10.5**
Gigabit Ethernet (1000 Mbps)			**1**

[a] New York to California: extrapolated from record delivery time of 7 days 17 hours, traveling approximately 2,000 miles (from St. Joseph, Missouri to Sacramento, CA)

[b] Maximum 150 users per node

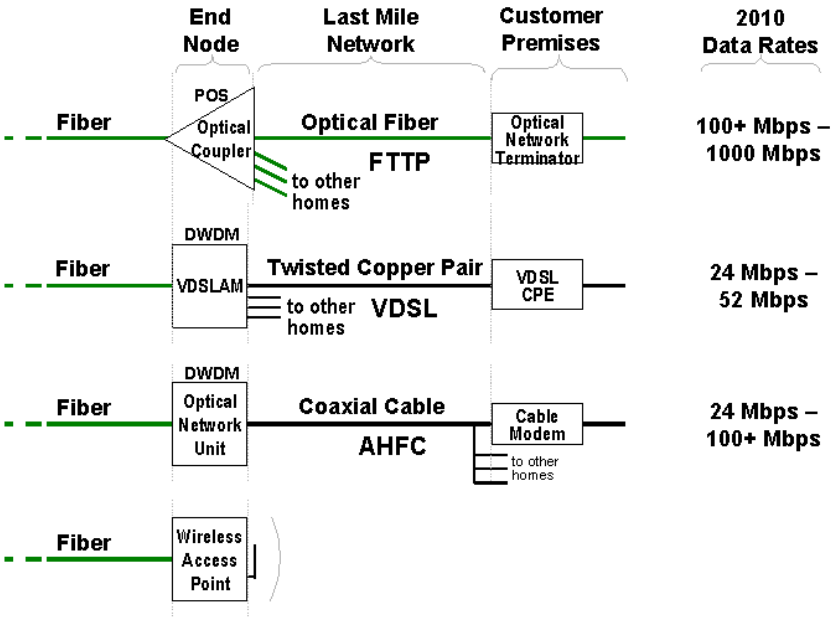
[c] Express delivery from New York, NY 10005 to Beverly Hills, CA 90210

Forget dialup; it would be faster for Pony Express to ride across the country. And it would still take hours to download with Cable, DSL or T1 lines, so the movie could get there faster with FedEx. Now with Big Broadband, you can have the movie in just a few minutes.

SPEED: and Deep Fiber

We keep hearing that incumbent ISPs will offer a triple play of bundled services (voice, data and video), or a grand slam (add wireless hotspots and cellular phones), but today that means a mix of networks such as DSL + satellite + wireless, and that's inefficient. So let's explore alterative ways to get Big Broadband performance.

FTTP – The fastest networks come from taking optical fiber all the way to the premises and inside too, and that's easiest to do in new neighborhoods with no existing infrastructure (a.k.a. green field). One example is Landowne, a planned community in Loudoun, VA that installed FTTH and offers 100 Mbps Internet access for about $60/month (or $140/mo for voice, data and television). When needed, they can simply "flip a switch" to enable 1Gbps performance – for Bigger Broadband!



FTTH is not the only solution, however. As fiber extends closer to the user's device, the legacy wiring gets shorter and therefore faster. But as we get closer, we face more problems with rights-of-way, such as digging up Suzie's garden. That's why incumbent ISPs keep trying to utilize their existing infrastructure.

DSL – It uses existing telephone twisted pair wiring for the last mile or so, and by moving the DSLAM end node closer, ADSL speeds move to VDSL with higher data rates approaching 24-52 Mbps in five years or so. That's fast enough for one HDTV program using MPEG-2 compression or several using MPEG-4, but there's no two-way 100+ Mbps roadmap.

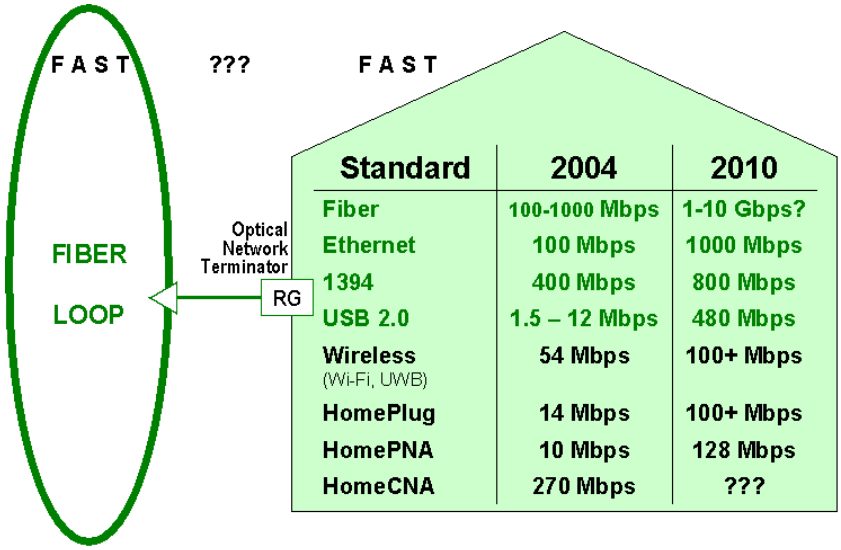
Cable – Advanced Hybrid-Fiber Coax systems based on the DOCSIS 2.0 standard use coax cabling for the last mile, with fiber extending to the curb instead of to the neighborhood and with speeds approaching the 100 Mbps target. DOCSIS theoretically can support 800 Mbps (53 channels * 30 Mbps each), but cable is a shared resource, so individual homes won't get that much. An argument for using cable (or copper) for the last mile is that installers need less skill and only simple tools to do the job, which also weighs in if the cable is accidentally cut.

Wireless – There's a lot happening in wireless municipal area networks (WMANs) with technologies such as WiMAX, which does not need line-of-sight, reportedly can reach distances up to 30 miles in open space, and can support data rates of up to 280 Mbps (but not that speed over that distance). Even newer millimeter wave technologies that do require line-of-sight access, will soon exceed 1 Gbps, so it's becoming easier to deliver Big Broadband to rural areas.

Powerline – The FCC recently defined rules for sending broadband over the power grid, so another last-mile option is emerging, but I see the preferred choices as FTTP and wireless.

SPEED: and Home Networking

All of the home networking standards shown here are headed toward speeds of over 100 Mbps, so the home networks are relatively fast, and the fiber loop and fiber backhaul network are very fast, but as long as the last mile connecting them is slow, there's imbalance.



Standard	2004	2010
Fiber	100-1000 Mbps	1-10 Gbps?
Ethernet	100 Mbps	1000 Mbps
1394	400 Mbps	800 Mbps
USB 2.0	1.5 – 12 Mbps	480 Mbps
Wireless (Wi-Fi, UWB)	54 Mbps	100+ Mbps
HomePlug	14 Mbps	100+ Mbps
HomePNA	10 Mbps	128 Mbps
HomeCNA	270 Mbps	???

Once the digital broadband network actually reaches the home, it needs a way to connect to the phones, stereos, TVs, PCs and other devices inside. That's the realm of the Residential Gateway (RG) and the Home Network. Fiber is sometimes found in high-end new home construction, but it's not practical to retrofit in existing homes, and the same goes for Ethernet cabling. So, the most common home networks are wireless or technologies based on existing power lines, phone lines, or coax cabling.

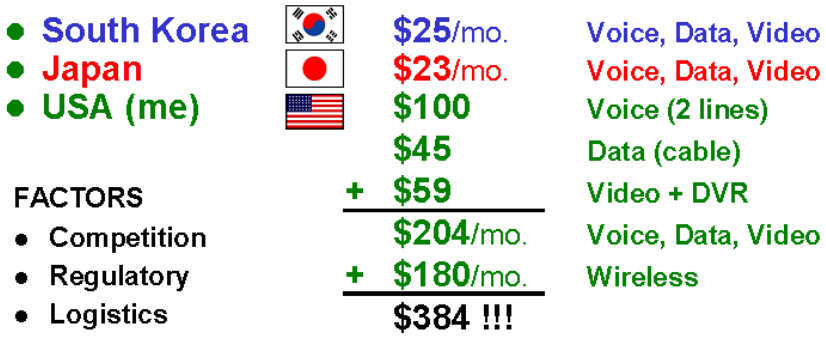
AFFORDABILITY: and the Broadband Take Rate

While politicians can boast that over 80% of the U.S. have access to broadband; only about 20% subscribe since it's too expensive, too slow, and lacks compelling benefit. At the root of this problem is a lack of real competition to drive down prices, improve performance, and encourage development of new applications. And contributing to the problem is the high cost of infrastructure investments with long payback periods.

Vision – I often describe my personal vision as including *"Consumers with EASY access to services and Service Providers with EQUAL access to consumers, all without worry about incumbents that control network access."*

For television programming that vision means having the ability to watch any show ever recorded or any sporting event broadcasting live or archived for access later. You shouldn't be limited to only the content that your cable or satellite broadcaster offers for your market. And from the service provider point of view, it means having equal access to all potential customers without being locked out by competitors.

I don't see that vision coming from phone or cable companies or any other company that has built its own network since they have no reason to share and every incentive to block competitors. But the many municipalities that are installing Public and Public/Private networks and managing them as public infrastructure are encouraging. Even countries like Japan and South Korea have aggressive government policies and incentives that encourage competition, and the results have been impressive.



South Korea leads the world with over 80% of households subscribing to broadband with speeds that are 10-times faster than here for just $25/mo; and another $8/mo adds Wi-Fi hotspot access. Broadband is a strategic industry that the government is investing in with financial incentives and regulatory policies designed to foster competition. Their goal is ubiquitous access to 155 Mbps to 5 Gbps by year-end 2005, and they have some logistical advantages that help. Most of the population lives in high-rise apartments, where it's easier to run fiber-optic cables, and that density contributes to a high fashion uptake of cool new technologies.

Japan's broadband market is following a similar path, and already you can get 1 Gbps Internet access for $38/mo that includes voice, data and television.

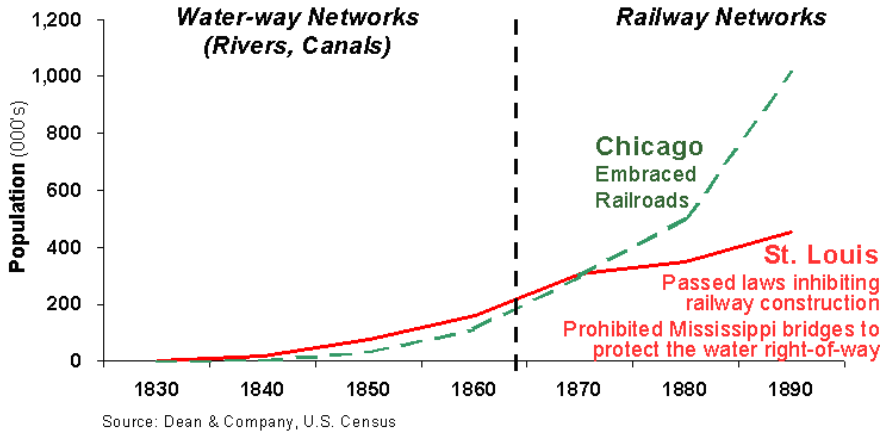
USA is a comparative disappointment, and I use my own payments as an example. I've been paying over $200 per month for local phone service, Internet cable modem service, digital cable and DVR rental. I recently cut back to one local line and am using the cell phone for all long distance calls, but my total bill is still over $300/mo, and I'm envious of people who get much better service at much less cost – so much so that moving out of Austin is a serious option.

Since other consumers and small and medium businesses are faced with similar decisions, it's no wonder that cities are starting to get aggressive to be sure they have access to Big Broadband.

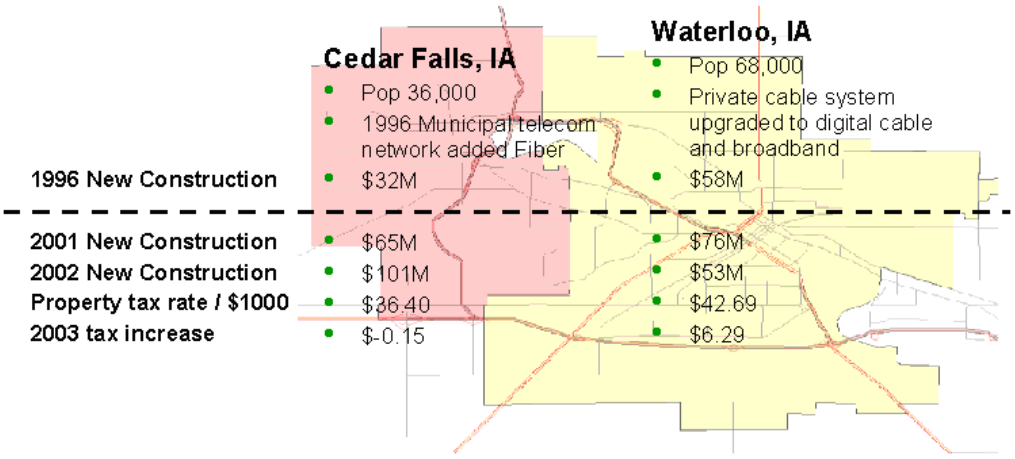
ACCESS: Community adoption of New Technologies

I've already suggested that access to Big Broadband drives economic development; so let's look at two examples of public infrastructure decision. One is old, and one is new.

The first example contrasts the growth of two large cities during the emergence of railroads. Up until about 1870, the main means of transportation was through rivers and canals, and that drove the economies of Chicago (on Lake Michigan) and St. Louis (on the Mississippi River). While St. Louis passed laws prohibiting railroad bridges over the river to protect precious waterways, Chicago embraced the railroads, and that made all the difference.



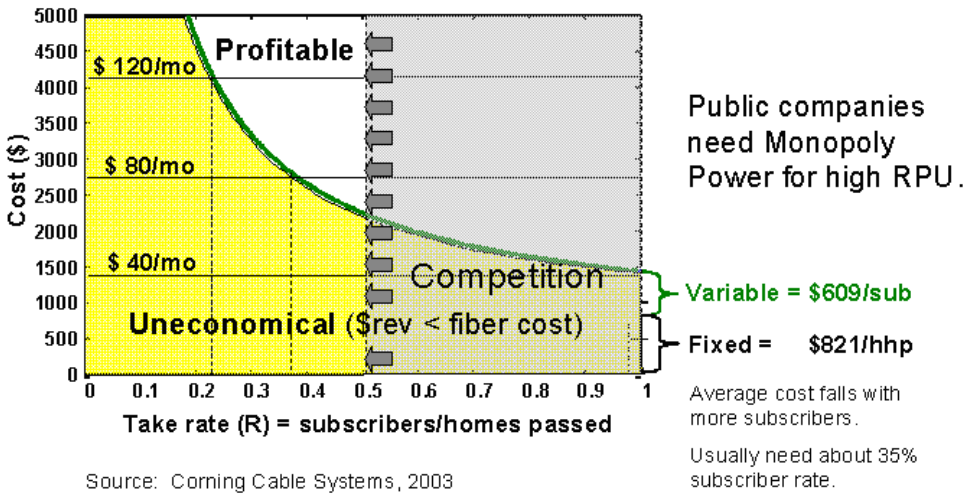
A more modern comparison is between sister cities in Iowa – one that installed optical fiber and one that upgraded their cable system instead. Cedar Falls was the smaller of the two, with a population of just 36,000, but it's the one that chose fiber. Waterloo was nearly twice as large, with population of 68,000. After Cedar Falls installed fiber, new construction outpaced that of Waterloo and needed fewer taxes to fund that growth.



Waterloo mayor John Roof is now a convert, saying *"Fiber optics is the key to Waterloo's future growth … I believe it has hurt us economically not to be able to provide fiber optics to businesses locating in our city."*

LOGISTICS: Fiber Cost vs. Take Rate

It has been difficult for phone companies to justify installing their own FTTH networks, but new FCC rules eliminate the requirement to share access with competitors, and this essentially gives them monopoly power if they can survive a long payback period. Let's consider the economics.



According to Corning Cable Systems, the fixed cost of adding FTTH in existing neighborhoods is about $821 per household passed, although the cost in new neighborhoods is about the same as other media. When you add the variable costs of premise equipment for each subscriber (about $600 each), you get a curve representing the total cost per subscriber that is lower and easier to justify with more subscribers and only profitable with high monthly Revenue Per User (RPU). It can take several years to reach 35% penetration, but stockholders often aren't patient.

In theory, the more services that are bundled together, the higher the RPU (and profit potential), but competition makes it more difficult to add services and also limits the take rate of a single provider. New innovative services that exploit Big Broadband would help increase RPU, but many of them have not been developed yet and are waiting for more subscribers to faster networks – the chicken vs. egg dilemma. So, what remains when several competitors fight for the same customers with their own network is a small opportunity for profit (in white).

Bell South, SBC and Verizon have all announced plans to install new FTTH networks, emboldened by new FCC regulations that eliminate the requirement to share access to those networks. In the process, they will standardize on FTTH technologies to drive down prices, but because of the pressures on profit potential, you can expect telcos to cherry-pick the most profitable opportunities and only install FTTH in new neighborhoods. This will leave older neighborhoods, urban housing, and rural environments without access to Big Broadband, and that leaves policy makers with a need for alternative ways to ensure that their cities don't suffer from aging infrastructure. The answer is Public Broadband.

Let's compare two different business models:

1. **Monopoly Model** – A telephone or cable company installs its own network and then offers new services outside of its core competency as part of a service bundle. This is like UPS building its own highways to deliver packages and then trying to offer taxi and bus service and charging tolls to private cars as long as they don't compete.

   If FedEx and every other shipping company was forced to also build roads for its service, wouldn't that a wasteful duplication of effort? Since the cost of building private highways is high, that would likely not happen, and the result would be little or no competition, little or no choice, and little or no market pressures on price and capabilities. In the monopoly model, change to an open market is unlikely if it requires expensive political battles, since that favors incumbent monopolies with deep pockets and powerful lobbyists.

2. **Public Model** – Cities have always been in the infrastructure business, building streets, bridges, airports, water works, and electric power systems. Airports are analogous to public broadband since airlines can't justify building their own airports and cities don't try to operate the airlines, gift

shops and restaurants. Instead, they raise development funds with taxes or long-term municipal bonds and endure long-term payback as the bonds get paid off with access fees. A benefit of the public model is more choice.

- Voice service can come from an incumbent phone company (e.g. SBC), a mobile phone company (Sprint), a cable company (RoadRunner), or through VoIP (CallVantage, Net2Phone, Vonage, Skype).
- Music service can come from any service across the Internet (iRadio, iTunes, Napster2, Rhapsody, Wal-Mart).
- TV service can come from a broadcaster (terrestrial, cable, satellite) or on-demand across the Internet (CinemaNow, Intertainer, MovieLink, NetFlix, Starz).

POLITICS: Who else is doing Fiber?

Over 200 cities across the country have figured out ways to fund public broadband networks that serve residents and businesses. Their objectives include encouraging economic development and ensuring universal access to high-speed Internet services regardless of location or income. In many cases, they had to fight strong political obstacles posed by incumbent service providers that feel threatened.

Examples include:

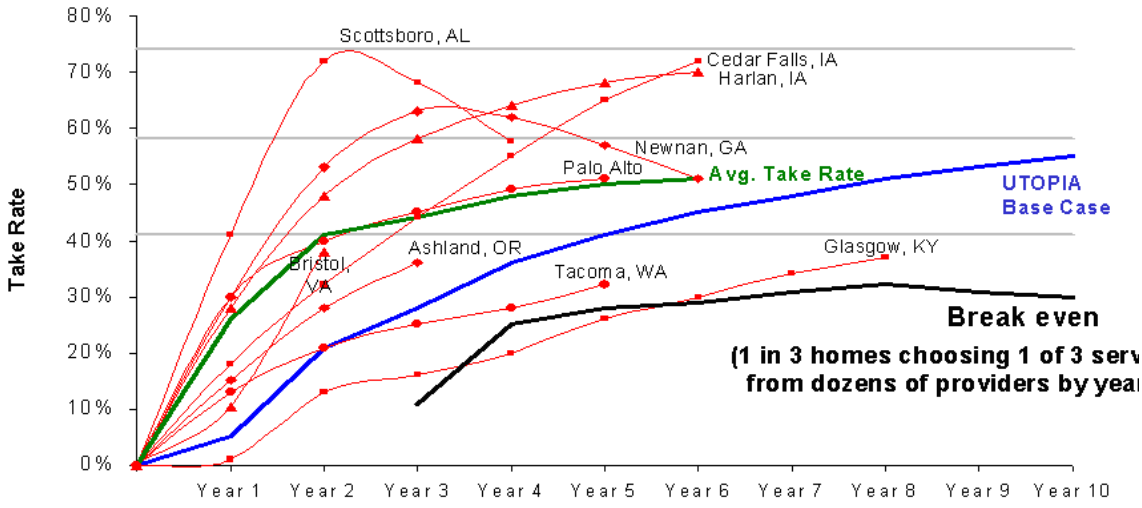
- Bristol, VA
- Cedar Falls, IA
- Jacksonville, FL
- Nashville, TN
- Palo Alto, CA
- Pittsburg, PA
- Tacoma, WA
- Loudoun County, VA – As a suburb of Washington, D.C. and the fastest growing community in the country, Loudoun can't build roads fast enough to keep up with the daily commute, so they emphasize TeleWork as a way to relieve traffic congestion and have focused on FTTH to drive economic development.

POLITICS: Utah Telecommunications OPen Infrastructure Agency (UTOPIA)

UTOPIA is a public/private consortium of 18 Utah cities that makes up a third of Utah's population. Its experience makes for an especially interesting example for other cities facing similar policy choices. They initially faced strong opposition from Quest Communications but are now working with Quest as a partner to install and manage fiber networks that are treated as public infrastructure and managed like airports.

Proceeds from the sale of bonds pay for network construction to connect the cities and extend optical fiber to each residence and business. The bonds are satisfied with revenues from ISPs that pay network access fees to serve their customers. Private contractors are building the network and employing hundreds of citizens during the estimated 3-year construction period.

The UTOPIA project required several studies of previous public broadband projects and consultant reviews of the plans and feasibility. They projected a breakeven point that could take seven years if one third of homes subscribe to at least one service from the dozens that would be available to them, and this was compared to a conservative estimate of the take rate (base case) as well as the take rates of dozens of similar networks.



Break even = meet debt service, cover operating expenses and fund technology upgrades
Source: Dean & Company, SRI Survey

The actual take rate in the UTOPIA project varies by city but has been far faster than the base estimate or the experience from similar networks, largely because they were able to learn valuable lessons from others. Going forward, other cities that choose to adopt a public broadband approach can expect even greater success since there's now even more experience to call upon.

POLITICS: in the Market

In this last section I'll share personal opinions of Big Broadband and politics that seem to be focused less on the public good and more on partisanship and profits. I'll also include suggestions for policy makers and citizens and a collection of references for additional reading.

Technically, the Internet is complex, fluid and designed to route around problems such as network failures. Economically, it is an ecosystem that creates new forms of competition, valuable new services for end users, and many still unforeseen benefits for society. As such, the Internet may respond in unexpected ways to pressures placed on it, and this uncertainty may be troubling to governments that value stability; but this is its strength, not a weakness.

I have three suggestions:

1. Policy makers need to be more visionary, recognizing that the Internet will continue to evolve, and avoiding the limitations of traditional telecom regulations;

2. They should embrace Big Broadband and the Internet for its potential to achieve public policy objectives; and

3. They should create a climate that maximizes social welfare by promoting the Network as public infrastructure, as opposed to protecting individual networks, companies or industries.

That's easier said than done, and balancing public good against the needs of industry can be a challenge when policy makers hear more often from powerful lobbyists than from citizens. That's why it's important that we all exert our civic duty by understanding the issues, communicating them when we have a chance, and voting our conscience and not our partisanship.

Let's start with an understanding of the stakeholders and their fears.

- **Telephone Companies** – Telcos have been a powerful force in the legislature. They built private networks to deliver voice communications and now feel a need to protect these networks in the

courts while adding additional services since digital convergence and the Internet have commoditized basic phone service. The FCC made it easier to justify new fiber networks since they no longer must share them with competitors, but telcos will likely limit fiber to new neighborhoods even as they try to prevent municipalities from extending fiber to existing homes and businesses, and you won't see SBC and Verizon in the same markets since they can't both capture needed subscribers. With an open mind and by embracing public broadband, however, telcos could eliminate most of their expensive capital investments and focus instead on improving personal communications, which is after all their core competency.

- **Cable MSOs** – By upgrading their cable networks with two-way capabilities, cable companies were able to use Internet access as a competitive advantage over satellite broadcasters, who posed the biggest threat, but the Internet speeds are too limiting for advanced applications. Since cable companies now also feel threatened by telcos that plan to offer triple play service bundles, they have started offering VoIP phone services. The FCC made it easier for customers to move phone service and keep the same number, and new rules prevent states from taxing VoIP to support universal access and e-911. This puts even more pressure on telcos to do unnatural things like offer television over IP. It's a wasteful and vicious cycle where each industry builds private networks.

- **Film Studios** – Hollywood worries that Big Broadband will make it easier to steal movies, as was done with music. To feel comfortable, they need to focus on DRM (digital rights management) and new business models (like Apple's iTunes did for music). Once these two issues resolved, the studios have lots to gain from Big Broadband since they can sell on-demand access to any movie or video program ever recorded.

- **Landlords and Cities** – The older office buildings in downtown cities that lack raised floors for easy wiring may find that their obsolete network infrastructure drives tenants to newer buildings, and cities may worry about an exodus to the suburbs since that's where the new buildings are. It's all about location, location, location, and affordable access to Big Broadband is a major decision criterion when deciding on a new location.

- **Universities & Professors** – Brick & mortar universities are seeing new competition from the University of Phoenix Online and similar institutions that don't have capital tied up in buildings and can easily take classes to students or have students come to them through the Internet. Likewise, some professors worry about putting their precious course materials online for fear that they could be accessed without payment. With a change in mindset, however, this can be an opportunity instead of a threat.

- **Oil Companies and Car Manufacturers** – They fear telework and see Big Broadband as a threat if it means fewer cars on the road.

SUMMARY

I look at public broadband by asking, "Who installs, maintains, protects, controls and owns the network versus who benefits?" Businesses and their employees, schools and their teachers and students, healthcare providers and their patients, and governments and their citizens – they all benefit from Big Broadband, so it's an important public policy issue and best viewed as public infrastructure.

REFERENCES

What follows is a collection of useful resources that expand on this topic.

BIG BROADBAND:

Reviving the FORGOTTEN Information Superhighway, paper by Wayne Caswell, CAZITech (PDF)

Expanding the Digital Divide & Falling Behind on Broadband, by the Consumers Union (PDF)

Reforming Telecom Policy for the Big Broadband Era, by Reed Hunt, former FCC chairman (PDF w/add'l.refs)

Digital Tornado: The Internet and Telecommunications Policy, early FCC paper about the role of government (PDF)

Digital Agenda: BROADBAND, by C|Net (2MB PDF, requires registration)

One Page Briefs on Broadband , 23 organizations weigh in with advice to Congress

Understanding Broadband Demand, 2002 review of critical issues by US Commerce Dept (PDF)

The Economic and Social Benefits of Broadband Deployment, by Telephone Industry Assn (PDF)

High Tech Broadband Coalition

Broadband Research Center, online resource by Network World

ACCESS: Wisdom of the East, paper describing BB in Japan & N. Korea by David Deans

FIBER OPTICS:

FTTH Council

Fiber 101, tutorial by Corning

FOCUS, Fiber Optic Communities of the United States

UTOPIA, Utah Telecommunications Open Infrastructure Agency

Why we don't have Fiber to the Home, essay about politics & business models

WIRELESS NETWORKS:

Wi-Fi Alliance, covering the 802.11 WLAN standard

WiMAX Forum, covering the 802.16 WMAN standard

Wireless LAN Buyer's Guide, by Wayne Caswell, CAZITech

TELEWORK:

Telework Consortium

International Telework Association & Council

Telework Association, European organization

Telework and Telecommuting Resources

Telework Beat, NetworkWorld column by Toni Kistner

US Government Interagency Telework Site

City of Austin Telework Program