Saint Paul: America's Most Connected City

The Broadband Advisory Committee Report on the Future of Broadband in Saint Paul

September 26, 2007

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I. Executive Summary

Broadband

For cities to successfully compete in the global economy they must be connected to the world. From harbors to railroads, from highways to airports, infrastructure has historically enabled the exchange of commerce, information, and people. For cities to remain economically competitive in the 21st century, they must be connected to a new infrastructure – affordable, high-capacity broadband (broadband) telecommunications.

Broadband, viewed ever increasingly as a utility, provides this new portal connection to employment, educational opportunities, accessible healthcare, public safety, retail, commerce, and the world's information to residents, businesses, government, educational institutions, and non-profit organizations. Furthermore, the availability of affordable, high-capacity broadband is becoming an important factor in where businesses and people choose to locate. And, with the increasing demand for new applications, consumers and businesses are consuming bandwidth at an ever increasing rate.

Broadband can be provided through a variety of wired and wireless technologies. However, careful review of current technologies indicates that the best, long-term broadband solution is a network comprised of fiber optic cables. Wireless technologies and copper-based technologies will not be able to sufficiently support the long-term bandwidth needs of the Saint Paul community.

The nation that once led the Internet revolution is now falling further and further behind in terms of broadband speed, penetration rates, cost, and innovation. The U.S. has fallen to 15th place among industrialized nations for broadband penetration and U.S. consumers pay more for slower bandwidth speeds than many other nations.

Lack of federal and state broadband policy initiatives and guidance has placed the burden of broadband leadership on local governments. Today, Saint Paul has an opportunity to secure its economic future with the strongest democratizing force in the world today – high capacity connections to the world.

Saint Paul, The Most Connected City

In 2006, the City of Saint Paul in Minnesota created the Broadband Advisory Committee (BAC) to provide broadband recommendations to City leadership. Twenty representatives from the community, government, labor unions, non-profits, education, and business associations were appointed to the BAC.[1] This report summarizes their recommendations.

The Broadband Advisory Committee (BAC) believes that affordable, ubiquitous broadband is critical for securing Saint Paul's economic future and will serve as a differentiator from other cities. The critical nature of this infrastructure dictates that **the City must control its own digital destiny through public control, by establishing an open, ubiquitous foundation for connectivity and collaboration. By doing so, it is the vision of the BAC that Saint Paul will become America's most connected city.**

As America's most connected City, Saint Paul residents, businesses, and institutions will experience quality of life services such as:

- Fire detection wired directly to neighborhood Fire Station

- Neighborhood networks that communicate local information within their own community neighborhood area, in the neighborhood's language(s)

- Doctors and nurses who can check on ill and elderly clients

- Monitoring vacant properties from a remote central location

- Paramedics and firefighters who arrive with your medical history and floor plan in hand

- Instant-response online service delivery from government

- Community technology centers that train and equip residents with the tools necessary to access these services

- New, incubator and home-based businesses

Closed Versus Open Access Networks

Key to the BAC's recommendation is the concept of an open access network. Most consumer broadband telecommunications services offered in the United States are provided through a closed access network wherein the company that owns the infrastructure also provides the services for it, thereby limiting choice and competition. The BAC believes that a network where the network owner does not provide user services and instead leases out the network to multiple service providers will allow for greater competition, increased choices for consumers, and spur innovation in services.

Open access networks have become increasingly popular throughout Europe and are gaining momentum in the United States.

Community Fiber Network

The BAC recommends an incremental, phased-approach to creating a publicly controlled network that uses both short- and long-term solutions. This approach would allow City and community leaders to evaluate and make decisions at key points throughout the process.

The network would begin by creating a partnership with key Saint Paul public institutions to address their own broadband infrastructure needs. This partnership would participate in the development of a collaborative and cooperatively managed fiber network that would serve the immediate- and long-term telecommunications needs of the partners. The cooperative venture would be leveraged through the efficient maximization of the partners' pooled resources. The network would be held and managed by a non-profit or a public corporation. The network has been coined the Community Fiber Network (CFN). Possible initial partners include: City of Saint Paul, Ramsey County, Saint Paul Public Schools, and State of Minnesota.

The BAC envisions that the CFN would have the ability to grow organically, developing in stages as new partners are added, with the possible long term goal of the CFN providing the momentum to build a city-wide fiber system to serve the entire Saint Paul community.

The CFN would also provide a benefit to private service providers by allowing them access to a wider range of customers.

Wireless System

While wireless networks provide some unique features that would be beneficial to Saint Paul, the BAC recommends that a wireless system be provided by a private entity and that the City does not subsidize this type of effort. Any wireless system built should complement the fiber network. Wireless networks are dependent on fiber infrastructure. The fiber in the CFN system could be leased out to a private provider to support a wireless network.

Summary of the Report's Recommendation

1. Create a partnership of public institutions and build the core of the Community Fiber Network.

2. Leverage the Community Fiber Network to facilitate construction of an open access fiber network throughout Saint Paul.

3. Ownership of the open access fiber network would either be a non-profit or a public corporation.

4. Any wireless system would be provided by a private service provider, would augment the fiber network, and be reliant on its infrastructure.

5. Establish City policies that advance broadband service in Saint Paul.

Next Steps

1. The BAC requests that City leadership authorize continued exploration of the CFN by empowering staff to approach possible CFN partners to explore mutual interest, with the understanding that moving forward will require the hiring of additional expertise in network modeling, financing and organizational development.

2. The BAC also recommends that the City establish policies and practices within the City to ensure the advancement and coordination of broadband services and activities.

3. The BAC recommends that the City continue the BAC to ensure the community is represented in broadband activities.

Conclusion

The BAC does not believe that Saint Paul needs to be a "technology pioneer", but instead position itself as a "fast follower" by using proven technologies and moving forward in a thoughtful, well-planned, incremental and fiscally responsible approach. By doing so, Saint Paul residents, businesses and institutions will be able obtain a variety of affordable high capacity broadband services, anytime, anywhere in Saint Paul, making it America's "most connected city."

II. Background & History

Since 2005, the City of Saint Paul (the City) has actively pursued and examined broadband issues. At the request of the Saint Paul City Council (the City Council) the City's Office of Technology published the *Saint Paul Wireless Technology Study* in April 2005. The study provided a review of current wireless technology, national wireless municipal activity, potential roles for the City, and options and direction for the City.

As a follow-up to the *Saint Paul Wireless Technology Study* the City engaged Springsted, Inc.*,* in the fall of 2005, to examine in depth the City's broadband technology needs in four key areas: resident disparity issues (Digital Divide), economic development, education and City operations. This resulted in the *Broadband Technology Needs Assessment and Economic Development Impact Study (BITS)* report, which was presented to the City Council on May 24, 2006.

Among the numerous findings in the report, the study: 1) Identified three technological options for the City to consider based on current broadband infrastructure available; 2) Provided three ownership options for the City to consider; and 3) Recommended the formation of a broadband strategy advisory committee to develop strategies to achieve the City's broadband goals.

In response to the report's findings and recommendations, Mayor Christopher Coleman and the City Council created the Broadband Advisory Committee (BAC) in July 2006. The BAC was tasked with the following charge:

> **1.** The Office of Technology and Communications will develop for public solicitation by August 15, 2006, a Request for Information that will solicit recommendations on ownership and technology strategies to provide broadband access city-wide including addressing digital divide issues, economic development and City of Saint Paul operations.
>
> **2.** The Saint Paul City Council will hereby appoint a legislative advisory committee, as per Section 3.01.8 of the City Charter, and to be charged with the duties to 1) create criteria on which to judge the RFI submittals, 2) evaluate the RFI submittals on behalf of the City of Saint

> Paul and to make recommendations for the City to consider, 3) examine, in conjunction with the RFI process, broadband ownership options including municipal ownership and a private/public partnership and to recommend to the City which option to select.
>
> Saint Paul City Council Resolution 06-525, June 2006 [2]

As recommended in the *BITS* report, the BAC's membership included representatives from the community, government, labor unions, non-profits, education, and business associations. Some of the representatives on the BAC were also experts in the field of broadband and wireless technology. Per City legislation, all of the BAC member terms were set to expire a year from the BAC's inception.

Prior to the BAC's first meeting in August 2006, the City's Office of Contract and Analysis Services (CAS) advised the City to pursue a Request for Proposal (RFP) rather than a Request for Information (RFI). Based on past experience, an RFP would provide the City with more meaningful and useful responses. Additionally, CAS advised the BAC to develop a recommendation on an ownership model prior to soliciting for proposals.

With the advice from CAS, the BAC began to research and discuss criteria for the RFP. The BAC quickly realized that if an RFP was issued without the BAC first understanding the long-term needs of the City and thoroughly examining broadband technologies (wired and wireless), digital inclusion issues, City operation needs, and best practice business models, then the City might be locked in a path of action that could undermine addressing the long term needs of the City. As a result, the BAC informed the Mayor's Office of its intent to examine those issues and to present their findings and preliminary recommendations to the City by January 2007. Thus the BAC created three working subcommittees: Business, Residential, and City Operations.

On January 9, 2007, the BAC presented their findings to the Mayor, members of the Council, and City staff. The BAC recommended that on a long-term basis, an open access Fiber-to-the-Premise (FTTP) system would best handle the bandwidth needs of the future and provide a platform for true competition, innovation and economic development. The BAC also recommended that WiFi deployment should only be considered as a complement to a fiber system and not an end goal. At the time of this presentation, the BAC did not recommend an ownership model.[3] As a result of this presentation, the

Mayor requested that the BAC develop recommendations on an ownership model for the FTTP recommendation.

Since then, the BAC has researched FTTP ownership options and this report is its final result. This report presents the BAC's five recommendations and action steps on ownership and technology strategies to ensure the City's long-term broadband needs are met. The recommendations address local digital divide issues, economic development, wireless technology, and the needs of the City and of other Saint Paul public institutional operations. It is important to note that while the BAC's work has deviated from its original task of issuing an RFI, the BAC believes it has fulfilled the intent of the Council resolution. Through the research and expertise provided by its members, the BAC has developed recommendations that continue to move the City forward without the issuance of a RFI.

III. Broadband – New Port of Entry to the Global Economy

Historically, the foundation for an area's economic and social development has been its ability to be connected. Port cities such as Boston, New York, and Charleston served as the first ports of entry to the new world and coastal port towns became the hubs for the transport of the nation's commerce and people.

In 1803, President Thomas Jefferson's vision to build a system of trade that connected people throughout the country drove Lewis and Clark to discover a route across the nation. Through their quest, Lewis and Clark discovered that there was no clear route to cross the nation. As a result, a series of canals, rivers, and dirt roads were constructed to provide a patchwork of networks to connect people and commerce. And it was near these connectivity points that towns grew and evolved to connect to other towns. It was during this same time period that Pig's Eye Landing (Saint Paul's former name) became accessible by steamboat and became a port city.

With the completion of the first continental railroad in 1869, new social, political, and economic ties spread across thousands of miles and new "port" cities such as Kansas City, Denver, and San Francisco were established. Almost a century later in 1956, President Dwight D. Eisenhower signed into law the Federal Aid-Highway Act that created a network of roads that would come to link every major town in the nation and give rise to the trucking/cargo industry, and the evolution of suburbs, shopping centers, and strip malls. With each new layer and means of connection available, hubs of commerce and population growth prospered. Cities and towns bypassed by these new connections struggled.

Saint Paul and Minneapolis have a surprisingly strong economy – due in no small part because they are the home to the 15th busiest international airport in the world and have access to the international economy.

Today, the Internet provides a similar network of connectivity for social and economic development opportunities. The Internet has transformed economic and social development paradigms across the globe, not just within our nation. Connection to this network provides the same opportunities for economic and social growth as in the past,

only now on a global scale. Similarly, communities that are not strongly tied to the Internet's fiber infrastructure face the same fate as the towns that suffered when their dependency on former transport connections were bypassed by newer means.

> A dollar spent on telecom infrastructure produces an outsize impact on the U.S. economy as a whole. Indeed, a growing body of research has found that telecom investment plays a vital role in stimulating economic growth and productivity – more so than money spent on roads, electricity, or even education.
>
> Spencer E. Ante, "Telecom: Back From The Dead*"*
> BusinessWeek, 25 June 2007

IV. What is Broadband?

Broadband is traditionally defined as a type of transmission media that can simultaneously carry multiple channels of data, video, and/or voice in a "high-speed" capacity. However, definitions vary depending on the source. Here are some examples:

- *Federal Communications Commission (FCC)* – Defines high-speed as more than 200 Kbps (kilo bite per second) in each direction. This definition has not been updated since 1998.

- *International Telecommunications Union Standardized Sector* - Defines broadband as greater than 1.5 Mbps (mega bites per second – mega equals 100 kilo bites).

- *National Academy of Sciences* – Defines broadband not as a particular speed, but as a service with sufficient capacity to use existing applications and to encourage the development of new ones.

The BAC prefers the use of the National Academy of Sciences' definition. It is important to stress that broadband should be seen as a frame of reference that will continue to expand to meet the demands of its users. Furthermore, for simplicity, the term broadband will be used interchangeably with specific technologies (i.e. DSL, Co-axial cable, fiber optics, etc.) and high-speed Internet.

To help understand the difference in bandwidth speeds:

- Kilobits is one-thousand bits per second (Kbps)
- Megabits is one-million bits per second (Mbps)
- Gigabits is one-billion bits per second (Gbps)
- The original "dial–up" phone modem speed is 56K (Kbps)
- A current typical DSL line from the phone company is advertised at approximate speeds of 1.5 to 7 Mbps download and less than 1 Mbps upload (asymmetrical)
- Cable broadband service speeds typically are advertised between 4 – 8 Mbps in download capacity and less than 1 Mbps in upload (asymmetrical)
- A typical WiFi speed is 1 - 3 Mbps (symmetrical)

V. Current State of Broadband

Capacity Demand Increasing

> Speed defines what is possible on the Internet. It determines whether we will have the 21st century networks we need to grow jobs and our economy, and whether we will be able to support innovations in telemedicine, education, public safety, and public services to improve our lives and communities. Most U.S. Internet connections today are not fast enough to permit interactive home-based medical monitoring, multi-media distance learning, or to send and receive data to run a home-based business.
>
> Speed Matters: A Report on Internet Speeds in All 50 States
> Communications Workers of America, July 2007 [4]

Recent changes in technology now means that video (cable television), data (Internet access) and phone (VoIP - Voice over Internet Protocol) can all be delivered over the same network using the same Internet protocol technology. This allows consumers and businesses to "experience" an expansion of the applications that are now, and will be, transmitted over the Internet. Therefore, the need to increase the speed or the size of the bandwidth "pipe" will continue to increase based on the applications consumers use and require to be able to run simultaneously audio, video and text data services, including high-definition service(s).
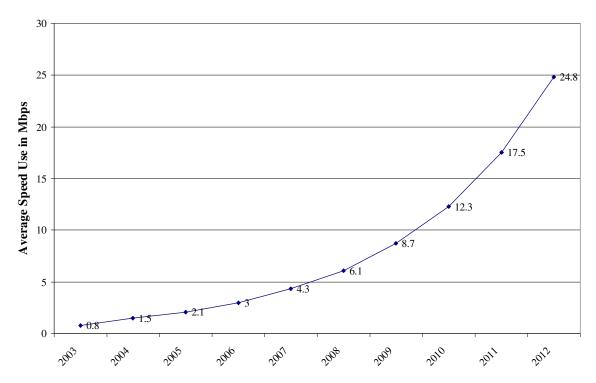
Residential broadband growth predictions over the next ten years reflect a significant change in how much data, video and voice are transmitted. The Budde chart on the following page demonstrates this trend.

Time Frame (Year)	User Development	Broadband (BB) Speeds	Key Reasons for Use
2003 - 2005	Early adopter	300-500 Kb/s	Always-on Internet
2005 - 2007	Seasoned user	2 Mb/s	Internet plus photos
2007 - 2009	BB part of life	6-10 Mb/s	Triple-play/video entertainment
2010 - 2015	Fully-integrated	BB 25-45 Mb/s	Telework, education, healthcare, hobby, entertainment

Source: 2007 Global Broadband - Broadband is Essential Infrastructure
BuddeComm based on industry data, June 2007 [5]

Research information by Corning Cable Systems LLC, a firm that specializes in fiber-optics technologies, closely parallels the Budde chart. Corning's information is graphed below.

Estimated Speed Requirements for Average Internet Users

Source: Corning Cable Systems LLC, 2007 [6]

Though both the chart and the graph above focus primarily on the average broadband user, Corning goes on to note that the "power user", with numerous HDTVs and Ultra High Def TV sets and PCs in the home, are predicted to be using up to 80 Mbps by 2012!

Corning research also predicts that within five years, demand for transmission speed will multiply six-fold as the average consumer continues to move from primarily using the Internet for email and research to using the web for more bandwidth-intensive activities such as: watching television shows and movies; downloading and listening to music; sending or posting pictures and home videos; teleconferencing; and interactive gaming and telecommuting. The YouTube phenomenon is a good example of consumer desire for higher-bandwidth applications. The following table illustrates the approximate speeds necessary for the download of an electronic course/instructional video (8 GB).

Connection Speeds for an 8 Gigabit File

Delivery Method	Days	Hours	Minutes
Dial-up (56 Kbps)	13		
Pony Express	11 (a)		
Wireless (1 Mbps)		18 (b)	
DSL (1.5 Mbps)		12	
T1 (1.54 Mbps)		11.5	
FedEx		10 (c)	
DSL (3 Mbps)		6	
Cable (6 Mbps)		3	
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), with Lincoln's Inaugural Address in 1861. (b) Maximum 100 users per node. (c) Express delivery from New York, NY to Beverly Hills, CA

Source: Data speeds calculated by PacketFront, Inc.

With online gaming and movie downloading becoming more prevalent, some Internet service providers resort to disconnecting service to users who exceed the company's "limit" for using the provider's Internet service.[7]

Presently, the only broadband option with the capacity to meet ongoing rise in bandwidth needs is fiber optic cable, which is the only option that would allow for the viewing of a movie in real time. Fiber optic cable is considered to have virtually limitless bandwidth capacity. In comparison, alternative options such as wireless, hybrid fiber-coaxial cable (HFC) and copper are relatively restricted in their bandwidth capability. Fiber optic cable is also a stable infrastructure with the ability to last 20-30 years. Moreover, the innovation in data delivery of fiber optic cable is in the electronics that send the signals down the fiber. These electronics can be changed as technology improves.

Most Internet traffic moves over fiber at some point. Fiber speeds get compromised when the signal needs to travel over copper wire. The only way to maintain fiber speeds is to extend fiber networks to the final destination. This is called Fiber to the Premise (FTTP).

The availability of networks that can deliver the expected speeds and services that consumers and businesses want, will become an increasingly important factor in where consumers choose to live and where businesses choose to locate.

United States Falling Behind in Broadband Service Availability

An increasing number of reports and articles have expressed concern over the status of broadband access in the United States and its impact on the nation's economy. The nation that led the Internet revolution is now falling further and further behind in terms of speed, penetration rates, cost, and innovation. These factors have an impact on the U.S. ability to compete in a global economy.

Speed

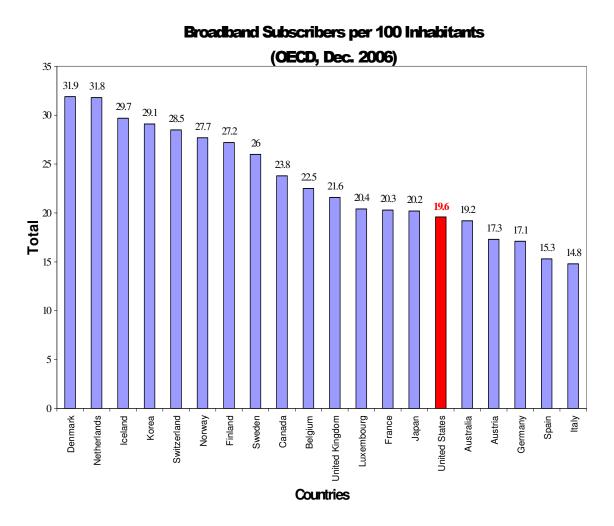A report[8] issued in July 2007 by the Communications Workers of America (CWA), found that the U.S. median national download speed was 1.9 Mbps. This is 4 times slower than Canada's and 60 times slower than Japan's.

The lack of speed available in the U.S. is partially due to outdated infrastructure that is used to deliver broadband to most U.S. households. DSL service uses primarily copper twisted pair, parts of

which are over 100 years old. Cable uses a shared, hybrid-fiber coax cable for the "last mile" of its system. Fiber optic cabling offers far superior speeds. While other countries have invested in more fiber optic systems and thus have better speeds, many of the cable and telecom operators in the U.S. have elected to upgrade existing infrastructures without investing in total fiber deployment. One major exception is Verizon, which is deploying fiber-to-the-premise (FTTP).

Penetration Rate

The U.S. has the world's highest number of broadband users, with over 58 million subscribers of broadband services. However, when factoring in the actual number of homes that have the ability to subscribe to broadband in the U.S. versus those that actually do (broadband penetration rate), the percentage rate of broadband subscribers tumbles dramatically. The United States global ranking in broadband penetration has continued to decline over the past five years and now ranks, depending on which source is cited, any where from 13th to 20th in the world.

Broadband Subscribers per 100 Inhabitants (OECD, Dec. 2006)

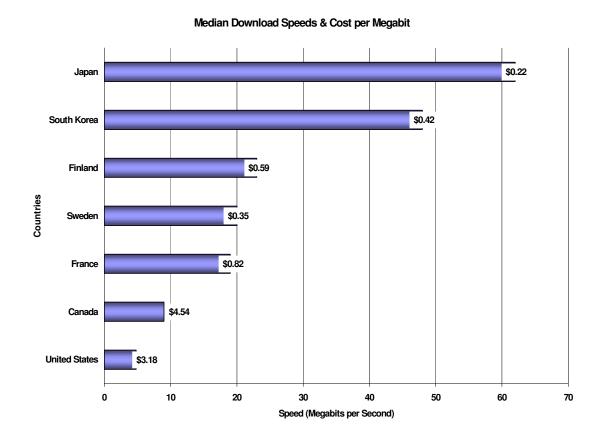| Country	Value
Denmark	31.9
Netherlands	31.8
Iceland	29.7
Korea	29.1
Switzerland	28.5
Norway	27.7
Finland	27.2
Sweden	26
Canada	23.8
Belgium	22.5
United Kingdom	21.6
Luxembourg	20.4
France	20.3
Japan	20.2
United States	19.6
Australia	19.2
Austria	17.3
Germany	17.1
Spain	15.3
Italy	14.8

Source: Organization for Economic Co-Operation and Development [9]

A nation's population density does not appear to be a factor in the penetration rates. Of the top ten countries, five of them, including Iceland and Canada, have very low population densities and yet have high penetration rates.

Cost

Even though the U.S. has more broadband subscribers then any other nation, the lack of choice and competition leaves the U.S. with higher costs for less bandwidth than most other developed nations.

Median Download Speeds & Cost per Megabit

Speed information: Information Technology and Innovation Foundation, *Assessing Broadband in America, OECD and ITIF Broadband Rankings,* April 2007

Megabit Cost information: OECD Communications Outlook 2007, Figure 7.17, *Range of Broadband Prices per Mbits, Oct. 2006, Pg. 223,* July – 2007. (Note: The cost per megabit represents the least expensive amount per megabit indicated in the report. For the complete range please refer to the report.)

National and State Broadband Policies

On April 26, 2004, while attending the American Association of Community Colleges Annual Convention at the Minneapolis Convention Center, President George W. Bush made the following remark on broadband technology:

> [we need] to make sure that we have access to the information that is transforming our economy through broadband technology. ... I'm talking about broadband technology to every corner of our country by the year 2007.

Yet, despite the pleas from just about every corner of the technology sector, the United States is without a national policy to promote high-speed broadband.

Similarly, there has yet to be a significant effort from the State of Minnesota to coordinate and establish a specific and measurable set of broadband goals.

The lack of commitment and consistent leadership from the federal- and state-level governments has created an opportunity and perhaps, an obligation for cities to take the lead in broadband access.

VI. Municipal Broadband Activity

With the Internet becoming the 21st century's new port-of-entry to the world, many municipalities across the country are taking the initiative to avoid being left behind.

> In countries where the national telco is lagging behind, we are seeing that local governments have no choice other than to take a leadership role – just as they have done with similar infrastructure over the last 100 years.
>
> 2007 Global Broadband - Broadband is Essential Infrastructure
> Paul Budde et al., June 2007

From coast to coast, communities are studying broadband. Common issues explored are the continued need for increased capacity and speed on broadband networks, the availability of choice, and the affordability of broadband for consumers. Nationwide and locally, communities like Saint Paul, have implemented, are implementing, or are considering the implementation of fiber and/or wireless networks. Below are some recent examples:

Minnesota Broadband Initiatives

- Chaska (WiFi - Implemented)
- Moorhead (WiFi - Implemented)
- St. Louis Park (WiFi -Implementing)
- Minneapolis (WiFi - Implementing)
- Monticello (Fiber Network - Implementing)
- Windom (Fiber Network - Implemented)
- North St. Paul (Fiber Network - Planning)
- Iron Range – 10 Communities (Fiber Network - Planning)
- Winona (Fiber Network – Implemented)
- Eagan (Fiber/Wireless Network – Studying)
- Burnsville (Fiber Network – Studying) (WiFi – Implementing)
- North Suburban Communications Commission – 10 Cities from the Twin Cities' northern suburbs (Studying)

National Municipal Broadband Initiatives

- There are 92 city/region-wide wireless networks operating, mostly on smaller scales.[10]

- There are 215 planned wireless deployments by cities/counties.[11]

- Several large metro communities are planning for, or are currently operating, Fiber-to-the Premise (FTTP) networks, including:

  - UTOPIA – 14 city consortium in Utah that is an open access network
  - San Francisco (Planning)
  - Seattle (Planning)
  - Lafayette, LA (Implementing)

VII. Saint Paul's Key Broadband Issues

Failures on the part of the state and federal governments to create broadband policies that promote and encourage broadband investment have put cities at a disadvantage in the global economy. However, it has opened an opportunity for Saint Paul to lead and create an economic advantage for itself.

Having carefully studied the role of broadband and the significance of it as the next "port of entry" for the Saint Paul community, the BAC and City staff recommend that the City focus on two broadband related issues: 1) Impact of Broadband on Economic Development and 2) Affordable Access to Broadband.

Impact of Broadband on Economic Development

> Broadband access *does* enhance economic growth and performance …. communities in which mass-market broadband was available ... experienced more rapid growth in 1) employment, 2) the number of businesses overall, and 3) business in the IT-intensive sector.
>
> *Measuring Broadband's Economic Impact*
> Massachusetts Institute of Technology Study, January, 17 2006

That same MIT Study found that:

- Broadband increased employment by approximately **1%** above rates of control communities.

- In a Florida case study, among ten counties, retail sales per capita grew at almost **twice** the rate of the control group after the investment in municipal broadband.

- Property values: over **6%** rise in broadband communities.

A Tale of Two Cities

As the "port of entry" history lesson demonstrated, being connected is key to development in any community. Today, that has evolved to include connection through networks that are transglobal, and the communities with access to these networks are better able to compete successfully. The following case study clearly illustrates this point. It involves two neighboring cities in Iowa, Cedar Falls and Waterloo. [12]

A Tale of Two (Adjacent) Iowa Cities – Cedar Falls & Waterloo

Cedar Falls	Waterloo
Population: 36,000	Population: 68,000
Began construction of municipal telecom fiber network in 1996	Private cable system upgraded to provide digital cable and broadband
Pre-Infrastructure Data: Economic Advantage to Waterloo	
1996 New Construction Revenue - $32 M	1996 New Construction Revenue - **$58 M**
2001 New Construction Revenue - $65 M	2001 New Construction Revenue - **$76 M**
Post-Infrastructure Data: Economic Advantage to Cedar Falls	
2002 New Construction Revenue - **$101 M**	2002 New Construction Revenue - $53 M
Cost Per Industrial Acre **$35K-$50**	Cost Per Industrial Acre $25K-$30K
Property Tax Per $1000 - **$36.40**	Property Tax Per $1000 - $42.69
2003 Tax *Decrease* per $1000 of property value - $-0.15	2003 Tax *Increase* per $1000 of property value - $6.29

Source: A Study of the Economic and Community Benefits of Cedar Falls, Iowa's Municipal Telecommunications Network, October 2003

This case study discovered that from 1996 through 2003, eleven companies relocated from Waterloo to Cedar Falls and during that same time frame, Cedar Falls did not lose any businesses to relocation. Furthermore, in 2001, after recognizing the benefits the

fiber network brought to its neighboring city, Waterloo Mayor John Rooff stated:

> Fiber optics is the key to Waterloo's future growth…In order for Waterloo with its businesses to move into the 21st century, we need fiber optic capability … I believe it has hurt us economically not to be able to provide fiber optics to businesses locating in our city.
>
> A Study of the Economic and Community Benefits of Cedar Falls, Iowa's Municipal Telecommunications Network, October 2003

This study clearly illustrates that businesses of any size can be expected to make decisions on business location based on the availability of fiber. Cities that actively develop broadband capacity will positively impact their local economy.

Looking at the larger picture, as the physical location of connectivity becomes less important, the world has become smaller, in many respects, due to broadband connectivity. Therefore, businesses can now compete nationally and globally from anywhere.

> As the world approaches 'digital convergence,' how connected Saint Paul homes and businesses are to Shanghai, Bhopal, and Santiago will be as important as how connected they are to our regional economic partners such as Minneapolis and the metro area suburbs.
>
> Tom Welna, BAC Committee Member
> BAC Presentation, January 2007

BITS Report – Business Survey

To determine the state of broadband services for Saint Paul's small- and medium-sized businesses, Springsted, Inc. conducted a telephone survey of 375 small and medium-sized businesses in the spring of 2006. The results of this survey are in the BITS report and reflected the following findings:

- By almost a 5 to 1 margin, Saint Paul small- and medium-sized businesses believe that high-speed Internet access is, or soon will be, an essential utility (*39% strongly agreed, 8% strongly disagreed*).

- A similar 5 to 1 margin believed that Internet access is essential to remain competitive (*48% very important, 11% unimportant*).

- Having high-speed Internet access was important to 56% of the respondents in achieving their businesses strategic goals.

- 30% strongly agreed that businesses are more likely to locate in a community where competitive high-speed Internet access is available.

- Over 60% use the Internet to receive or send large data files.

- Over half of the respondents said that the City should play a role in Saint Paul's broadband future (*36% encourage competition, 16% City build their own network*).

> Regions that do not have the infrastructure and the locally trained talent to support the needs of prospective private-sector entrants are left out of the short list of potential business destinations. Economic advantage and competitiveness will rest heavily on our ability to equip the 21st century workforce with competitive digital literacy skills.
>
> Digital Inclusion Imperatives Offer Municipalities New Social and Economic Opportunities, June/July 2007 [13]

Large Corporations Focus Group

The BAC held a small focus group with the Chief Information Officers (CIOs) from three Saint Paul-based corporations: Bremer, Ecolab and Gander Mountain. As large corporations, they all stated that their respective companies already have the fiber infrastructure and resources in place to address their current needs. However, they noted the need to increase the availability and affordability of broadband to residents in order to:

- Support their workforce's ability to telecommute. Telecommuting allows employees to be productive in the event of a pandemic disaster or bad weather. Telecommuting is also a benefit companies can offer employees to mitigate long commutes and maintain work-life balance.

- Increase their ability to deliver services directly to their customers.

As noted, large businesses can take the initiative to address their broadband needs by leasing or buying their own broadband fiber pipes. Small- and medium-sized businesses; however, are reliant on fiber service providers to meet their needs. This is analogous to a corporation building their own railroad link directly to their building (e.g. the Saint Paul Ford plant), whereas small businesses would not be able to afford to do the same. Furthermore, without a shared, local network, small- and medium-sized businesses miss out on the opportunity to locally connect with large corporations.

Non-Profits Focus Group

The BAC also met with representatives from five Saint Paul non-profits to discuss the services they provide and how broadband services affect their businesses and clients. They expressed the following thoughts:

- Reasonably priced, dependable network services make non-profits and small businesses financially healthy and competitive (locally and globally).

- There is limited coordination or cohesion of technology–literacy training opportunities between Community Technology Centers (computer labs), non-profits, and etc.

- There is a clear benefit to non-profits and small businesses in using the Internet to work with their constituents and customers.

- Non-profits need training & resources on how to create online neighborhood networks.

- Many non-profits and small businesses do not have staff, training, and resources to adequately manage their broadband connectivity.

The studies and research performed by the BAC reinforced the committee's assessment that broadband services play an integral role in Saint Paul's economy. Just as significant is the importance of affordable broadband access for Saint Paul's residential population.

Affordable Access to Broadband

> Access to computers, broadband services, web-based applications and the Internet are all ultimately about access to opportunity ... the ability [for people] to tap their capabilities can vastly expand an individual's ability to access a fuller range of life opportunities by gaining entry to new job options and higher wages...
>
> Digital Justice: Progress Towards Digital Inclusion in Minnesota
> Dec. 2006 [14]

The Internet has changed how society expects individuals to interact with the community and the world:

- Job seekers are now expected to search for jobs on the Internet and to submit their applications online. Websites such as Monster.com and CareerBuilders.com have reduced the Sunday classified sections substantially in the past five years.

- The Saint Paul Public Schools Parent Portal offers students and their families the ability to access and track student assignments, grades, and progress in school. It is also expected that students will use the Internet for homework assignments.

- Most government offices provide their services online and assume that residents will use them (e.g. Medicare, filing taxes, and INS online applications).

- The ability to shop, bank, and exchange e-mails have become an every day occurrence to those who have Internet in their homes.

- More companies now allow, and in some cases, encourage employees to telecommute from home. With increased travel time and expenses, occasional telecommuting is becoming the norm.

- As access becomes increasingly important to middle-class lifestyle, choice and availability of access will become a more significant factor when choosing where to live.

Based on these changes in social interaction dynamics, having affordable access, a computer, and the basic knowledge of Internet

usage equals being connected to the community and the economy. Having the Internet available for everyone is commonly referred to as "Digital Inclusion".

Digital Divide

According to the April 26, 2007 *Pew Internet and American Life Project,* 70% of Americans use the Internet. While Pew provides a national demographic perspective on who is using the Internet, if one looks closer at their national numbers, and apply the percentages to Saint Paul, the BAC is able to paint a general conceptual picture of how Saint Paul's Internet use is spread unevenly:

- Nationally, 49% of households with incomes less that $30,000 use the Internet. In Saint Paul, this means that fewer than 17,000 Saint Paul households in this income level use the Internet, while almost 25,000 Saint Paul households with income levels above $75,000 presumably use the Internet (Nationally 93% use the Internet with incomes above this level).

- Across the nation, only 56% of all Hispanic households use the Internet, while Black households use it just slightly more at 58%. This translates to 7,000 Hispanic and 7,800 Black Saint Paul households who use the Internet.

- Nationally, Pew finds that only one-third of the 65 years and older population uses the Internet. Presumably then, only 10,000 of Saint Paul's 30,000 senior population uses the Internet.

- Yet, of those in Saint Paul between the ages of 18 and 49, 82% use the Internet.

Key Aspects of Digital Inclusion

There are four key aspects to digital inclusion: 1) Internet Access, 2) Relevant Content, 3) Education, and 4) Equipment.

1. Internet Access

A computer without access to the Internet is like a car without gas. They both may be valuable tools, but neither gets you anywhere without the means. However, a computer with high-speed access to the Internet opens up a world of opportunity.

Cost can be a barrier to high-speed Internet access. A person earning minimum wage would necessitate putting aside a significantly higher percentage of their wages to pay for broadband services as compared to middle and upper incomes wage earners. For example, a $5 an hour wage earner requires one full day of work to pay for broadband at $40 a month.[15] Furthermore, the ongoing cost of broadband access is also a barrier. A family may be able to pool resources to purchase a $400 computer or get a donated computer, but the ongoing monthly expense of broadband access is difficult.

2. Relevant Content

Content and services that are relevant to the end user is critical for Internet use. Language can be a barrier when accessing the Internet. Since English is the primary language used in the U.S. for Internet sites, this becomes a barrier for individuals whose primary language is not English. Communities also have different needs for different types of services and information. Having information and services that benefit underserved communities gives a greater incentive to learn how to use computers and the Internet.

3. Education

People need to be taught how to use a computer and how the Internet works. Lack of knowledge and a fear of new technology is a real barrier to closing the digital divide. The depth of information needed to understand how to use a computer indicates a need for ongoing educational opportunities that are easy to access.

4. Equipment

Equipment is the final digital inclusion ingredient. Obviously, without equipment none of the other items matter. In some ways this is the

easiest aspect of digital inclusion to address. There are programs centered on giving away computer equipments, such as the Saint Paul Public Schools (SPPS) Dell TechKnow program. Since 2005, 380 SPPS students have participated in the 40-hour after-school program that provides middle school students an opportunity to earn a refurbished home computer and to learn technology skills.

Community Technology Centers

Community Technology Centers (CTCs) provided by schools, non-profits, recreation centers, and libraries have been a cornerstone of digital inclusion programs to provide training, equipment and access. However, there are still obstacles such as transportation, usage constraints, and time commitment issues. For example, a single mother, who after getting home from working a full-day, must still feed the family, bundle up the children, and then take the City bus to the nearest library where she has to wait at least a minimum of 45-minutes for an available computer and all just for the allowable half-hour of Internet use.

Personal computer proficiency is usually only obtained by using a computer on a frequent basis. Although CTCs provide an important component of digital inclusion, access to equipment and the Internet in the home should be the end goal.

Based on extrapolated Saint Paul data from the Pew Internet Study, there is a substantial number of Saint Paul residents and households who do not use the Internet. This means that a significant percentage of Saint Paul families and individuals are excluded from digital opportunities and cannot compete as well in the job market, keep up with their children's education process, and/or stay engaged in civic events, activities, and community information.

> Technology is so pervasive in the U.S. culture today that all students and adult citizens require such access to fully participate in the state's economy. When all underserved populations are able to use technology at a price they can afford, digital justice will have been served.
>
> Digital Justice – Progress Towards Digital Inclusion in Minnesota
> Dec. 2006

VIII. Saint Paul's Current Broadband Status

The following section is a snapshot of Saint Paul's current broadband status.

Wired Services

- Saint Paul is served by two major broadband service providers, Comcast and Qwest.

- One-third of Saint Paul has only one broadband option. Comcast offers service to approximately 98% of all residences in Saint Paul. Qwest's DSL service is only available to approximately two-thirds of Saint Paul residences.[16]

- Download speeds vary from 1.5 Mbps to 8 Mbps, depending on technology and tier of service.

- Comcast subscription fees: Residential non-bundled services vary from $19.99 for 6Mbps download/795Kbps upload (6-month new customer guarantee) to $52.95 for 8Mbps download/795Kbps upload.

- Qwest subscription fees: Residential non-bundled services vary from $31.99 1.5Mbps download/896 Kbps upload to $41.99 7Mbps download/896Kbps upload with a one-year new customer contract.

- Smaller businesses have less affordable access to Comcast services, due to Comcast's infrastructure configuration and costs to connect to the Comcast network. Comcast's "workplace" Internet services of speeds up to 8 Mbps vary from $95 to $160 per month depending on the package selected.

- Qwest provides small business DSL services with a price range between $30 to $81, depending on variations in length and terms of contract, and with speed variations from 1.5 Mbps to 7 Mbps.

- Traditional T-1 phone lines, typically used for business and institutional operations (including Saint Paul Public Schools), with speeds equivalent to 1.544 Mbps, cost approximately $200-500 per month in the Twin Cities area.

- Both Comcast and Qwest operate closed service networks that provide only the services determined by the respective company.

- Qwest does allow the resale of their DSL accounts, Comcast does not.

Wireless

- Cellular providers do offer varying wireless data services in Saint Paul. The speeds are generally under 1 Mbps, but are increasing.

- Sprint has indicated the launch of WiMax services in Saint Paul by summer of 2008. Speeds for WiMax are promoted as 8Mbps.

- There are currently approximately 90 WiFi hotspots in Saint Paul, though mostly available in restaurants, coffee shops, and hospitality locations.[17]

IX. Saint Paul, the "Capital City"

As Minnesota's "Capital City," Saint Paul is unique because it serves as the hub for three levels of government: City of Saint Paul, Ramsey County, and the State of Minnesota. Each of these government entities rely on network(s) to provide connectivity to their numerous buildings and sites throughout Saint Paul and beyond Saint Paul's borders. Each does so by using a variety of public and private networks, service providers, and technologies.

Just as Saint Paul is the center for government operations in Minnesota, it is also home to over 1,200 non-profit organizations, trade and business associations, and other quasi-government service organizations. Many of these organizations reside here as a direct result of Saint Paul being the "Capital City." Like the governmental entities, these numerous associations also need connectivity.

Finally, Saint Paul is also home to a wide variety of educational institutions, ranging from the Saint Paul Public Schools, with its 85 site locations, to the eleven higher educational institutions, all of which require internal and external connectivity.

In general, public or semi-public, institutions operate as individual silos, addressing their own network needs. As described below, the four largest public entities in Saint Paul are currently addressing their connectivity needs in the following ways.

City of Saint Paul

The City of Saint Paul relies primarily on the Institutional Network (I-Net) provided by Comcast as part of a negotiated franchise contract, to connect over 120 City, County, and State sites in Saint Paul. The I-Net is comprised of both fiber and hybrid-fiber coaxial (HFC) that stretches over 200 miles. Access to the I-Net saves the City approximately $350,000 - $400,000 in telecommunications connection fees and expenses each year. If the I-Net was to cease to function or become obsolete, the City would need to purchase access from a vendor.

While the I-Net currently adequately serves the City, there are several factors that may affect its long-term service to the City:

- The HFC (hybrid fiber-coaxial) portion of the I-Net connects 98 city locations and comprises approximately 80 percent of the I-Net infrastructure.

- A large percentage of the HFC network was built in the late 1980's and early 1990's. This infrastructure is aging and may require replacement by the time the current franchise expires in 2013.

- Current franchise language does not require upgrades of the system, only maintenance.

- The HFC network has bandwidth capacity limitations, because it uses coaxial cable for the carrier of data for the "last mile." The City's need for bandwidth continues to grow and surpass the capacity of the HFC.

- Even though the City's franchise has strong language indicating that as long as the cable company (Comcast) is doing business in Saint Paul, the I-Net will be provided, current state and federal actions may significantly alter the terms under which the I-Net is provided.

Ramsey County

Ramsey County provides a broad range of services including Public Safety, Health and Human Services, Parks and Recreation, Property Records and Revenue, and Public Works. Eighteen of the county's offices are located in the City of Saint Paul with the remaining offices located in the northern cities.

Ramsey County has one data center providing centralized network services to over 3,700 full time employees at 31 office sites throughout the county. Seven locations, including six in downtown Saint Paul and one in Arden Hills, have a fiber connection to the data center. The remaining offices are connected through single or multiple T1 lines for broadband connectivity. The majority of the fiber connections are leased from the City, District Energy, North Suburban Cable Commission, and the State of Minnesota. The County contracts with Qwest for T1 connections.

As the County becomes more reliant on the use of web-enabled applications to promote efficiency and mobility/remote access, the County has become increasingly dependent on meeting the demand for cost-effective bandwidth to support these applications.

Saint Paul Public School District

The Saint Paul Public School District's wide and local area networks connect approximately 17,000 computers, printers, and other computer-related resources throughout the district. The district's wide area network links four hub sites, with at least one of these hub sites connecting over 100 of the district's local area networks. Qwest provides commercially contracted services for T1 connections to the schools, offices, etc., which are eligible for federal e-rate funding, as well as a 100 MB connection to the wide area network.

The networks are critical for conducting operational and instructional functions, and the district's network dependency continues to grow on reliable network connections and bandwidth availability. As more teachers make use of digital content in their instruction, including video and audio programs, the district's bandwidth requirements will increase exponentially.

State of Minnesota

The State of Minnesota's Office of Enterprise Technology (OET) operates Minnesota's Network for Enterprise Telecommunications (MNET), a public-private partnership. Over 50 private sector providers furnish leased line circuits to approximately 1,000 locations in nearly 300 cities statewide. These leased line circuits deliver integrated data, voice, and video media service statewide to education, local governments, and state agencies.

OET partners with cities, counties, and school districts to leverage investments in telecommunication infrastructure to provide high-performance interconnections among the partners, state systems and services, service provider networks, and to the Internet.

In Saint Paul, OET supports wide area network services including Internet, Internet2, and MNET connections to the City of Saint Paul,

Ramsey County, Saint Paul Public Libraries, the Metropolitan Council, Twin Cities Public Television, Hamline University, Saint Paul Colleges, Metropolitan State University, and the University of Minnesota-Saint Paul campus, in addition to all state government locations within Minnesota cities.
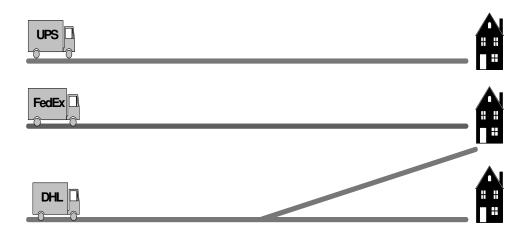
X. Closed Versus Open Access Broadband Models

Another factor to understanding broadband services in the U.S. is to look at the ownership models of existing broadband networks.

Closed Access Systems

The typical current broadband ownership model has the provider owning the "pipe" (whether copper, coaxial, or fiber) and providing the service (video, voice, and/or data).

To better illustrate this, pretend the "pipe" is a road and the service provider is a package delivery service (e.g. FedEx, UPS, or DHL). Each of these delivery services owns its own roads. The roads run parallel to each other, but each service does not go to all houses. In fact, some houses may be skipped altogether and a customer can only use the service of the company that goes directly to their home.
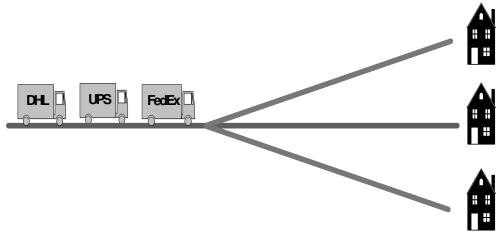

Closed Access System

So if there is only one delivery service that has built a road to that customer's home and the customer is dissatisfied with the service, their only choice is to live without the service or to keep it even though they are not happy with it

In this system, the barrier to competition is very high and only those who can afford to build their own roads can enter the competition.

Open Access System

An alternative broadband business model option is to build one road similar to real roads. The roads are open to all delivery services and go to all houses. The roads may be paid through a combination of financing from property taxes to service fees (licenses). In comparison to a closed access system, an open access system allows many different providers the ability to use the same infrastructure and the barrier to competition is very low, which allows residents many choices.

Open Access System

Open access systems are more common outside of the U.S., but are gaining some momentum here. The Utopia model currently being built in Utah is an open access system and some large cities like Portland have RFPs issued for open access fiber systems.

> The main driver for the development of … open access networks … is the fundamental belief in the importance of ubiquitous and affordable broadband access to the economic and social development of the community.
>
> The World Bank [18]

XI. BAC Vision and Mission

The "Information Superhighway" (a.k.a. the Internet) and its reliance on the pipes (roads) for the transport of data is analogous to the development of an actual freeway system. Both "highways" have and will change our economic and social structures. Thus, the BAC views the Internet and the information technologies and tools associated with it to be just as important to the City's economic future as the development of a country's waterways, railroads, and highways. Furthermore, the BAC believes that broadband deployment through a fiber infrastructure will soon give Saint Paul a significant economic advantage and will become an essential utility, much like the telephone. In that spirit the BAC offers the following:

Vision

The City of Saint Paul will be "the most connected city" in
the United States.

Mission

The City is to control its own digital destiny through public
control, by establishing an open, ubiquitous foundation for
connectivity and collaboration.

Saint Paul – A Fast Follower

To accomplish the BAC's vision and mission, the BAC does not believe that Saint Paul needs to be a "technology pioneer", but instead position itself as a "fast follower" by using proven technologies and moving forward in a thoughtful, well-planned, incremental approach.

Goals & Aspirations

- Provide an open access network infrastructure, whereby multiple vendors (including current providers) can purchase bandwidth and provide their services.

- Maintain public control of infrastructure.

- Deliver a versatile network that is expandable and supports a wide range of delivery options, including wireless.

- Support wireless services as an extension of a fiber based system.

- Explore wireless and FTTP pilot and demonstration projects where and when feasible.

- Make essential investments where and when the City and community believe they are needed.

- Avoid reliance on closed network carriers and infrastructure owners.

- Ensure a free, or low cost, base service level available to all.

- Accommodate a network foundation base for community organizations.

- Support a network that supports the needs of businesses and teleworkers.

- Sustain a platform that meets the City of Saint Paul's needs in a cost effective manner.

- Ensure the local infrastructure is able to provide for community-driven content development.

- Look beyond borders for possible collaborative broadband partnership opportunities.

- Coordinate an approach to digital divide/inclusion issues.

The infrastructure envisioned above makes many things possible. Among the services made possible by a public open access network are:

- Fire detection wired directly to neighborhood Fire Station eliminating the delay of dispatch.

- Block nurses who can check in on videophones with elderly clients.

- Monitoring vacant properties from a remote central location.

- Crime watch block clubs that can monitor alleys and other common properties.

- Paramedics who arrive with your medical history in hand.

- Firefighters who arrive with your floor plan in hand.

- Instant-response online service delivery from local government.

- Checkout a DVD from the Saint Paul Library without leaving home.

- Neighborhood networks that provide the ability to communicate and receive local information just within your own community neighborhood area, in the neighborhood's language(s).

XII. BAC Recommendations

> **Saint Paul needs to control its own digital destiny through planning, developing, and implementing the construction of a Saint Paul Community Fiber Network. In completing the network, the City will create a significant advantage for city-based businesses and residents who must compete in a global economy.**

The BAC's vision for Saint Paul to become America's "most connected" city would be a vital contributor to Mayor Christopher Coleman's vision that Saint Paul be the "most livable city." The vision also guides the BAC's recommendations. To address the two key Saint Paul broadband issues, *Impact of Broadband on Economic Development* and *Affordable Access to Broadband*, the BAC recommends an incremental, phased-approach that uses both short- and long-term solutions. The incremental approach allows City leaders to evaluate and make decisions for each phase, only moving ahead with the next step if it makes sense.

Recommendation 1 – Build Core Network

The four main government/public entities (City of Saint Paul, Ramsey County, State of MN, and Saint Paul Public School District) that operate in Saint Paul do not, for the most part, have control and ownership of their external network infrastructure nor is the technology currently sufficient for some of the networks. Discussions were held with representatives from each of the potential collaborative partners to examine how the City and other Saint Paul public entities could participate in the development of a collaborative, shared fiber optic network. This shared fiber network could be leveraged in a number of different ways to benefit the Saint Paul community as a whole. This network will be referred to as the Saint Paul Community Fiber Network (CFN).

The Saint Paul Community Fiber Network (CFN) would be a cooperatively managed network built through a collaborative effort of public/governmental entities. The CFN initially would serve the immediate- and long-term telecommunication needs of the initial CFN partners.

To date, while only in the initial stages of discussion at staff levels, with no official agreements discussed, the following entities have expressed an interest in exploring the concept of building the CFN with the City of Saint Paul:

- Ramsey County
- Saint Paul Public School District
- State of Minnesota

The BAC envisions that the CFN will have the ability to grow organically and to develop in stages as new partners are added, with the possible long-term goal the CFN would provide the momentum to build a city wide fiber system to serve the entire Saint Paul community.

The CFN has the potential to provide the following benefits:

Public Benefits

- Efficient and responsible use of taxpayer dollars by pooling resources to create a shared network.

- Captures and returns investment to the community.

- Improve and coordinate public safety efforts (e.g. traffic monitoring, crime surveillance, etc.).

- Share construction, design and management expenses.

- Reduce disruption to rights-of-way.

- Address digital inclusion and economic development opportunities.

- Create the foundation for an open access network.

An Incremental Approach

An investment of this scope must be implemented in prioritized phases. These phases may include:

- Develop a comprehensive network to initially address the telecommunications needs of the partners.

- Allow for accommodation of both initial CFN partners and additional community partner connectivity.

- Provide the foundation for future policy decisions on network expansion and applications as warranted through a well-planned and thoughtful approach to growth.

- Possible future expansion of the CFN's fiber backbone for wireless network(s), FTTP, etc.

- Provide an opportunity to manage a large scale network before expanding to a possible FTTP.

- Provide the opportunity to continue to assess the advantages/disadvantages of an open access FTTP network while meeting more immediate connectivity needs.

Maximize Use of Public Rights-of-Way

- Reduce the disruption to rights-of-ways through a systematic and coordinated approach by all partners.

- Explore alternative fiber resource options, either by private fiber providers and/or public entities, to possibly connect CFN segments.

- Create new opportunities to use existing private fiber routes.

- Encourage communications with fiber providers/owners.

Community Collaborative Partnership(s)

- Establish a non-profit or a public structure to manage and oversee the CFN.

- Create new collaborations that would not otherwise exist.

- Leverage potential foundation support.

- Manage the CFN for the direct benefit of the Saint Paul partners.

Recommendation 2 – Expand Fiber to the Community

The CFN would initially be built to serve the needs of the CFN partners. However, the BAC envisions that with the CFN fiber backbone in place, it could be leveraged to facilitate the deployment of a fiber optic, open access network that would be available to homes and businesses in Saint Paul. This would provide choices, reduce costs, and increase broadband opportunities for Saint Paul as a whole.

With the proper governance structure and mission, the CFN could provide the following benefits to the community:

Create an Open Access Network

- Increase competition and reduce rates.

- Provide the opportunity for numerous data, video and phone providers to compete, including wireless.

- Allow the incumbent providers to use the network to provide services.

- Develop in a planned, incremental approach allowing for growth as desired and as deemed practical, including wireless.

- Prohibit the network owner (CFN) to compete for and/or offer, retail/finished service to the end customers.

- Allow local businesses to compete as service providers.

- Avoid being reliant on private carriers and their infrastructures for growth and services.

- Develop a platform for the advancement of new, creative applications, and services.

- Encourage collaborative partnership opportunities for Saint Paul associations, organizations, businesses and public groups.

Address Digital Inclusion

- Serve the entire Saint Paul residential and business communities.

- Ensure that a free or low-cost affordable broadband base service is available to all residents and businesses.

- Provide sustainable resources to address digital inclusion issues.

- Research and implement digital inclusion "best practice" policies, such as those developed for Minneapolis and Chicago.

- Connect the community of Saint Paul and allow for the establishment and local control of "community networks" in the various Saint Paul neighborhood districts.

- Coordinate groups and individuals to work on Digital Inclusion efforts in Saint Paul.

Assume Local Control over Saint Paul's Digital Destiny

- Growth and expansion of the CFN occur as needs and financial models dictate.

- Reinvest the fees paid by the service providers back into the locally-owned network.

- Maintain local control by those who use it.

- Encourage foundations' support of Saint Paul digital inclusion initiatives.

The development of the CFN in a planned, incremental approach provides ample time for decision-makers to assess if an FTTP system should be the end result of the CFN.

Recommendation 3 – Ownership Model(s)

The formation of an entity to operate and govern the CFN is an essential first step. This entity would be organized around the following Mission and reflect the following characteristics:

Mission

- Ensure that Saint Paul is positioned to compete in the global information economy.

- Ensure that residents, businesses and organizations within Saint Paul have the benefits that come with competition and choice of independent network service providers.

- Ensure that residents and organizations within Saint Paul have affordable rates for connectivity.

- Continually assess the connectivity needs of the community and if there is unfulfilled needs, leverage the assets of the organization to meet the connectivity needs.

- Use the assets of the organization to address Digital Divide issues.

Characteristics

- A legal entity that provides an open access infrastructure, providing only wholesale services.

- A legal entity that allows the CFN to buy/sell/lease services and assets to private organizations.

- A legal entity that can partner with government for funding options.

- Possess a mechanism that allows input from the community of Saint Paul.

- Allows CFN member organizations to participate in the decision making process.

Public Network Business Models

The BAC has reviewed a variety of private, private/public, and public network ownership models. Based on the review of these models, combined with the mission and characteristics that BAC recommends the entity should possess, the BAC endorses the concept of a public ownership model. Under the public ownership model, there are four business model options to consider. The matrix on the next page provides an overview of these four options based on how they would be governed and financed.

	City Department	Public Utility	Non-Profit	Public Corporation
Saint Paul (example)	*Public Works Department*	*Saint Paul Regional Water Services*	*District Energy*	*Metropolitan Airports Commission*
Governance	*Managed by City department; City liable for financing; operations, services; No separate board*	*Municipal utility governed by appointed board*	*Private, non-profit corporation*	*Public corporation that provides infrastructure; Board appointed by elected officials*
Finance	*Paid with assessments and fees*	*Revenue source through users; State law - rates to cover all costs & bond retirement*	*Established with financial support from the City & also is U. S. Government Foundation supported*	*Own source of revenues; authority to levy taxes*
Comparable Broadband Model	Cyber Spot (St. Cloud FL)	WindomNet (Windom MN)	OneCommunity (Cleveland OH)	UTOPIA (14 cities, UT)
Features	Free citywide wireless mesh, public & City network	FTTP - Retail service provider of Video, data & phone services	Multiple fiber loops to consortium of non-profit & public agency partners, WiFi hot spots	FTTP - Open access, with wholesale video, data & phone services
Governance	Municipally-owned, privately-operated	Municipal utility	Public/non-profit board of directors	14 member city-joint powers agreement & board
Finance	Enterprise & general obligation bonds	Revenue bonds	Tax-deductible donation of dark fiber, foundation & corporate support, agency operating expenditures	Revenue bonds, backed with sales tax levy, if necessary

The BAC prefers a model that provides an arms-length distance from direct government oversight and of these four options, the non-profit or public corporation models provide this flexibility, including the ability to combine partners, seek a variety of funding methods, and represent the widest community interests.

Recommendation 4 – Focused Wireless Efforts

As previously stated in the background section of this report, the BAC has concluded that the use of wireless technology (WiFi) for Saint Paul would best be served if WiFi was provided to augment or supplement a broadband fiber deployment.

The report, *Next Generation Network – A Strategic Technology Plan,* echoes the findings of the BAC in regard to community-wide WiFi deployment. This study was commissioned by the North Suburban Cable Commission (NSCC), which is comprised of ten northern Twin Cities suburbs, including Roseville. The purpose of the report was to provide recommendations for the future of the NSCC institutional network. The report concludes, "We advise a conservative and cautious approach toward untested city-wide municipal WiFi models and vendors." [19]

Similar to the BAC's recommendations, the NSCC report recommended that the deployment of WiFi services in the ten-member cities would best be accomplished through use of a fiber backbone network which should be built first.

Some cities, including Minneapolis, have chosen to pursue wireless initiatives. The BAC understands each community must choose the option that is best for their particular situation. The BAC believes that the best decision for Saint Paul is to focus first on the construction of the CFN.

The BAC's rationale is based on the following reasons:

- Concerns that the deployment of a city-wide WiFi project would divert the community's energy and effort away from the long-term need for fiber.

- Embracing a "big-picture" approach while concentrating on well-planned incremental builds which will ensure that taxpayer dollars are wisely invested.

- A municipal community-wide wireless system would best be built using the CFN infrastructure.

- As business models for community wireless initiatives are still under development, it is the sensible approach to wait and see which models are viable.

- City-wide wireless systems are more difficult to engineer and more expensive to build than originally thought. Learning from large-scale deployments will ensure a successful deployment in Saint Paul.

Therefore, the BAC recommends the following actions in regard to WiFi services in Saint Paul:

- Explore possible WiFi pilots, demonstration projects, including downtown and Invest Saint Paul neighborhood project areas.

- Generate pilot projects through local community organizations to focus on digital inclusion efforts to ensure that WiFi pilots meet community needs.

- Consider the deployment of WiFi/wireless services through the use of the CFN fiber.

- Support community-wide WiFi/wireless services as long as it is not funded through a City/public financial subsidy nor diverts the City's efforts and resources from the CFN/long-term broadband strategy goals.

- Act on opportunities for the interaction between wireless and fiber activities and plans.

Recommendation 5 –
Establish City Policies that Advance Broadband Services

The BAC recommends that the City of Saint Paul establish policies and practices within the City to ensure the advancement and coordination of broadband services and activities in Saint Paul.

The City should:

- Leverage and coordinate current and future City investment in fiber by incorporating existing City-owned fiber into the CFN Core Network.

- Review the current Public Works Rights-of-Ways (ROW) ordinances and policies regarding the governance of fiber and other telecommunications activities in the Saint Paul ROW, including a policy to ensure that conduit is considered for burial with all projects that use the ROW.

- Direct the Department of Planning, Economic and Development to create policies for the inclusion of multiple conduits in all publicly funded projects, as well as review potential opportunities to improve collaborative efforts between the City and developers in providing/dedicating fiber as part of their projects.

- Address digital inclusion issues as part of the City's Invest Saint Paul initiative.

XIII. Into Action – The Next Steps

The BAC recommends the City of Saint Paul undertake the following action steps:

Action Step 1 –
Move forward with the development of the CFN partnership

The BAC recommends that the City of Saint Paul take a leadership role in the development of the CFN by:

- Determining initial members of the CFN partnership.

- Determining roles and responsibilities of each potential CFN member.

- Working with CFN partners to create a process to create the CFN organizational, technological and financial model.

City Resources needed:
The Office of Technology and Communications can lead this step with current City staff.

Action Step 2 – CFN Creation

Creation of the CFN will require the CFN partners to create and agree upon many business, governance, and technical details. The BAC recommends that the City of Saint Paul, in its leadership role, retain a consultant experienced with conducting similar efforts, to assist the Office of Technology and Communications with this process.

The consultant would guide the CFN partners through the feasibility, benefits, and drawbacks of various options and create an implementation plan for the core network with anticipation of possible growth of the system. The planning would encompass the following areas:

- Technical – Define requirements & design system

- Business Model – Analyze options and finalize business model

- Business Plan – Develop business plan

- Financial – Create detailed financial model

The finalized models and implementation plan would then be presented to decision makers for approval and authority to implement the plan.

City Resources needed:
The Office of Technology and Communications would continue to lead and coordinate the effort of engaging a consultant and representing the City's interests. Engaging consulting help for the creation of the CFN is anticipated to cost $100,000 – $150,000.

Additional City resources needed would include help from the following departments:

- Planning and Economic Development
- Office of Financial Services
- Council Research
- Public Works

Action Step 3 –
Continue the Broadband Advisory Committee

Per the resolution that created the BAC, the term of all BAC members expires after one year. To continue, the BAC would need to be created as a Mayoral Advisory Committee.

The BAC recommends that the committee continues with the following charge:

- Continue to serve as the broadband advisory body to the City of Saint Paul by monitoring broadband developments until such time that the CFN has a governing board.

- Ensure that the community's broadband needs are included in the development of the CFN.

After the launch of the CFN, the necessity of the BAC should be evaluated.

XIV. Conclusion

Each evolutionary stage of the world's economic and social development has been defined by the ability to be connected to the transport network of goods, commerce, information and people. And at each of these stages, government has had an important role in shaping the infrastructure to ensure the connections happen.

Recognizing that there is no clear national or state broadband policy, the Saint Paul Broadband Advisory Committee deems that the City and its public partners must take an active role in helping shape its own digital destiny. The BAC advocates using proven technologies and moving forward in a thoughtful, well-planned, incremental approach that will connect all of Saint Paul to the world. This report provides an outline of five recommendations and three action steps the City of Saint Paul needs to consider to ensure that Saint Paul does indeed become America's most connected city.

1 See Appendix A for a complete list of BAC membership.

2 Saint Paul City Council Resolution 06-525. 28 June 2006. See Appendix B.

3 Broadband Advisory Committee. BAC presentation to the Mayor and the City Council. 2007 January 9.

4 Speed Matters: A Report on Internet Speeds in All 50 States. (Washington D.C.: Communications Workers of America, July 2007) Page 2.

5 Paul Budde et al. 2007 Global Broadband - Broadband is Essential Infrastructure. (Paul Budde Communication Pty Ltd, June 2007). http://www.budde.com.au/publications/annual/global-market/broadband-is-essential-infrastructure-summary.html

6 Line graph created using data taken from the Corning Cable Systems presentation designed for the Evolant® Solutions for FTTH Emerging Technologies Seminar.

7 Van Der Meer, Ben. "Comcast Says Man Using Too Much Bandwidth." The Modesto Bee, 17 July 2007, http://www.modbee.com/business/story/11356.html

8 Speed Matters: A Report on Internet Speeds in All 50 States. (Washington D.C.: Communications Workers of America, July 2007)

9 Graph chart created using data from the Organization for Economic Co-operation and Development (OECD) broadband statistics to December 2006. http://www.oecd.org/sti/ict/broadband

10 Vos, Esme. "Initiatives." MuniWireless, 1 August 2007, http://www.muniwireless.com/article/articleview/6279/1/23/

11 Vos, Esme. "Initiatives." MuniWireless, 1 August 2007, http://www.muniwireless.com/article/articleview/6279/1/23/

12 Kelley, Doris J. A Study of the Economic and Community Benefits of Cedar Falls, Iowa's Municipal Telecommunications Network. 2 October 2003.

13 Cooper, Lane F. and Maria W. Wynne. Power Up: The Campaign for Digital Inclusion. "Digital Inclusion Imperatives Offer Municipalities New Social and Economic Opportunities." June/July 2007. Page 4. Sponsored by Microsoft Corporation.

14 Institute on Race & Poverty. Digital Justice: Progress Towards Digital Inclusion in Minnesota (Minneapolis: University of MN Law School, December 2006. Page 2).

15 While there are special, introductory rates offered by Comcast and Qwest in the $20 range, regular rates for DSL and broadband service in Saint Paul are typically in the upper $30s to mid $40s range.

16 The May 2006 BITS report presented to the City Council by Springsted Inc., reported that approximately two-thirds of the City's residents are able to receive Qwest's DSL service. The figure was obtained by analyzing actual placement of DSL equipment and extrapolating service areas based on DSL distance limitations. (Note: Qwest disputes this figure and asserts the rate is 90%.)

17 CNET. Hotspot Zone. August 2007. http://cnet.jiwire.com/

18 InfoDev. Study on Local Open Access Networks for Communities and Municipalities (Washington D.C.: World Bank, 2006. Page 15). http://www.infodev.org/en/publication.130.html

19 *Next Generation Network – A Strategic Technology Plan.* Prepared for the North Suburban Communications Commission by Columbia Telecommunications Corporation. May 2007.

APPENDIX A

Broadband Advisory Committee

Andrea Casselton, BAC Chair
Director
City of Saint Paul Office of Technology & Communications

Steven Buettner
Manager of Technical Services
Saint Paul Public Schools

Milda Hedblom
Dain International Services

Lee Helgen
Saint Paul City Councilmember, Ward 5

Chris Hertel
Saint Paul Resident

Jon Kerr
Resident
Saint Paul small business owner

Virtis Lanier
Teacher
Saint Paul Public Schools

Sam J. Levy
Vice President & CIO
University of Saint Thomas

Margaret Lovejoy
Director
The Family Place

Mary Mahoney
Chief Information Officer
Ramsey County

APPENDIX A – cont.

Sean McVay
Vice President
Communications Workers of America

Trudy Moloney
Director
Saint Paul City Council Operations

Mike O'Connor
Resident
Owner of Saint Paul Business

Terri Thao
Payne-Lake Community Partners

Becca Vargo-Daggett
Research Associate
Institute for Local Self-Reliance

Lowell Vogen
Minneapolis Consulting Group,
Saint Paul Chamber of Commerce Representative

Tom Welna
The High Winds Fund
Macalester College

City of Saint Paul Staff Members Actively Serving the BAC

Mike Reardon, Office of Cable Communications & Staff Support to BAC
Cindy Mullan, Information Services
Lisa Veith, City Attorneys Office
Al Carlson, Planning and Economic Development
Lucie Passus, Office of Technology & Communications

APPENDIX B

Council File #_____
Green Sheet # 3030920

RESOLUTION
CITY OF SAINT PAUL, MINNESOTA

Presented by_____

1 WHEREAS, in January 2005 the City Council adopted a resolution that requested the Administration, through the Office of
2 Technology, to work with Council Research to develop (1) an inventory of existing City telecommunications infrastructure, and
3 (2) a proposal for a study of the options for pursuing the creation of a wireless infrastructure with the capacity to serve the entire
4 city; and
5
6 WHEREAS, on April 1, 2005, the Saint Paul City Council received from the City's Office of Technology the "Saint
7 Paul Wireless Technology Study," which provided a wireless technology overview, municipal activity, potential roles for
8 the City of Saint Paul, and options and direction; and
9
10 WHEREAS, as a result of the April 1 Study, the City of Saint Paul solicited in the Fall of 2005 Request for Proposals
11 to conduct a Broadband Technology Needs Assessment and Economic Development Impact Study (BITS), wherein
12 Springsted, Inc. was retained to examine the broadband technology needs in four key areas: resident's disparity
13 issues (Digital Divide), economic development, education and City of Saint Paul operations; and
14
15 WHEREAS, Springsted's 110-page BITS Study was presented to the Saint Paul City Council on May 24, 2006, and
16 among the numerous findings: 1) identified three technological options for the City to consider based on the current
17 broadband infrastructure available to the City, 2) provided three ownership options for the City to consider; 3)
18 recommended that a broadband strategy advisory committee be formed; and
19
20 WHEREAS, the Office of Technology and Communications, based on the findings of the BITS Study report,
21 additionally recommended on May 24, 2006 that the City form the broadband strategy advisory committee and that
22 staff will develop a Request for Information (RFI) for short term wireless services and long term broadband options;
23
24 NOW, THEREFORE, BE IT RESOLVED, by the City Council of Saint Paul of the City of Saint Paul, Minnesota as
25 follows:
26
27 1.   The Office of Technology and Communications will develop for public solicitation by August 15, 2006, a

28 Request for Information that will solicit recommendations on ownership and technology strategies to provide

29 broadband access city-wide including addressing digital divide issues, economic development and City of Saint Paul

30 operations.

31

32 2.   The Saint Paul City Council will hereby appoint a legislative advisory committee, as per Section 3.01.8 of

33 the City Code, and to be charged with the duties to 1) create criteria on which to judge the RFI submittals, 2)

34 evaluate the RFI submittals on behalf of the City of Saint Paul and to make recommendations for the City to

35 consider, 3) examine, in conjunction with the RFI process, broadband ownership options including municipal

36 ownership and a private/public partnership and to recommend to the City which option to select.

37

APPENDIX B – cont.

38 3.   The Broadband Strategy Advisory Committee will be comprised of, at a minimum, representatives from

39 Saint Paul's higher educational institutions, the Saint Paul School District #625, the Saint Paul business

40 community(s), affiliated government institutions, City Council, Mayor's Office, "digital divide," and the community

41 at large, and will be comprised of approximately 18 members who are:

42

43 Darin Broton

44 Steven Buettner

45 Andrea Casselton

46 Milda Hedblom

47 Lee Helgen

48 Chris Hertel

49 Jon Kerr

50 Janice LaFloe

51 Sam Levy

52 Margaret Lovejoy

53 Mary Mahoney

54 Mike McCollor

55 Trudy Moloney

56 Mike O'Connor

57 Terri Thao

58 Becca Vargo-Daggett

59 Lowell Vogen

60 Tom Welna

61

62 4.   The Broadband Strategy Advisory Committee will be formed on or about June 15, 2006, and will exist for

63 no more than one year, but in this time, the City of Saint Paul will establish a long-term broadband advisory

64 commission that will continue to examine, review and recommend broadband policies to the City of Saint Paul.

65

66 5.   This Resolution shall be effective immediately upon passage by the city council and approval by mayor, per

67 city charter Sec. 6.07.