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Community Fiber in Washington, D.C., Seattle, WA, and San Francisco, CA:
Developments and Lessons Learned

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By Susan Crawford, John Connolly, Melissa Nally, and
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Executive Summary

This report provides detailed accounts of planning carried out in connection with community fiber networks in Washington, D.C., San Francisco, CA, and Seattle, WA. It includes information about existing fiber assets that the cities identified, funding mechanisms that were considered, and roadblocks that were encountered. Our hope is that this report will be helpful to other cities that are considering launching fiber optic networks.

Key Findings

- The cities profiled in this report have each approached the question of community fiber differently.
- Washington, D.C. made concessions and arrangements that allowed it to build a robust public-safety-quality fiber network, but limitations on the use of that network have made it unavailable to residents and businesses. Additionally, prices charged non-profits for use of the network are currently too high to be competitive with incumbent products.
- San Francisco has been highly innovative in expanding fiber to public housing, aggressively leasing dark fiber to community anchor institutions such as libraries and schools, and ensuring free public Wi-Fi, but has not yet cracked the nut of alternative community residential or business fiber access.
- Seattle has had an extensive city fiber loop in place since 1986, but regulations limiting use of poles and approvals for cabinets have slowed the rollout of competitive last-mile service. Seattle's recent negative experience with Gigabit Squared (which was unable to execute on its last-mile promises and subsequently vanished from the scene) casts a shadow. Seattle's current mayor appears to be determined to ameliorate both the regulatory burdens and the information asymmetries that have dogged the city.

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I. Introduction and Context

Telecommunications reaches almost every aspect of our daily lives. A robust high-speed, high-capacity Internet connection is quickly becoming an essential utility for modern life. But in many communities in America, high-capacity fiber connections for homes and businesses are rare and incumbent providers are under little competitive pressure to build them. As a result, many municipalities are clearing the way for fiber networks to be built by private or public entities that use city conduit, pole access, and other assets. There are more than 400 communities across America with their own networks serving local businesses and/or residents. Many more are currently considering facilitating municipal networks of different varieties. The experiences of San Francisco, Seattle, and Washington, D.C. may be instructive. All of these cities are considering municipal fiber networks; none has cracked the nut of widespread commercial and residential deployment.

II. Washington, D.C.

Washington, D.C. has a diverse population of nearly 650,000 people and is the center of a large metropolitan area. The city spans 61 square miles and is home to over 261,000 households. Many residents are short-term workers in businesses that have something to do with the federal government, or in government jobs, but the District also has many long-term inhabitants and is increasingly home to a knowledge-based economy.¹

Washington, D.C. has a fast and reliable city-owned high-speed Internet access backbone (the DC-NET backbone), capable of speeds up to 100 Gbps.² The network is used for municipal purposes, as explained below, but many people are interested in leveraging its assets for improved residential and business connectivity. District residents, who remain mostly disconnected from this network, enjoy the highest average download speed among American states (13.8 Mbps as of the last quarter of 2013)³ but also pay more for Internet access than in any other city in the country.⁴

A. Internet Access in the District

Residential and business customers in the city access the Internet in much the same ways as do their urban peers around the nation and express similar concerns about high costs, low speeds, and a lack of reliability. The District has an overall high-speed Internet

¹ Richard Florida, *The Truth About D.C.'s Growing Knowledge-Based Economy*, THE ATLANTIC CITIES (Oct. 31, 2013), <http://www.theatlanticcities.com/jobs-and-economy/2013/10/truth-about-dcs-growing-knowledge-based-economy/7317/>.

² Aaron Wiener, *Fiber-Optical Illusion*, WASHINGTON CITY PAPER (May 1, 2013), <http://www.washingtoncitypaper.com/blogs/housingcomplex/2013/05/01/fiber-optical-illusion/>.

³ *The State of the Internet, Vol. 6, 3*, AKAMAI, http://www.akamai.com/dl/akamai/akamai-soti-q313.pdf?WT.mc_id=soti_Q313.

⁴ *White Fence Index*, <http://www.whitefenceindex.com/> (last visited May 1, 2014).

access adoption rate of 72.5%, but that average masks a deep divide in access along lines of class and race.⁵ The wealthier (and whiter) Northwest quadrant of the city has an adoption rate of nearly 100%, while poorer areas of the city have an adoption rate below 60% and the poorest below 40%.⁶

No District residents connect to the Internet through the city network's fiber. Fiber to the home provided by Verizon is recognized as the city's fastest and most reliable option for accessing the Internet, but most District residents cannot use the service because it is unavailable in their area. Just 36.7% of Washington, D.C. residents can purchase Verizon's FiOS service.⁷ Verizon's fees range from \$70 per month for 15 Mbps to \$300 per month for 500 Mbps.⁸ Eleven percent of Washington's Internet users had fiber connections in 2012.⁹ Though Verizon has stopped expanding its fiber network to new regions, the company is slowly expanding its network within Washington, D.C.

Cable high-speed Internet access passes more than 98% of city residents.¹⁰ Though Comcast is the dominant cable provider in the city, RCN has overbuilt Comcast's network in some places and provides limited competition. Cable is the most common high-speed Internet access service in the city, used by 52.4% of city residents in 2012.¹¹ A plan offering 6 Mbps service is available from Comcast for \$50 a month (exclusive of television costs).¹²

DSL is often seen as the budget option for Internet access in the District, though even a basic plan, providing phone service and 1 Mbps connectivity, can still cost \$50 a month.¹³ Verizon provides DSL over its copper network, and 98% of city residents have access to the service.¹⁴ Twenty-seven percent of Washington's Internet access subscribers had DSL connections in 2012.¹⁵

Terrestrial wireless (sometimes called WiMAX) beams access to the Internet from a tower to equipment at a customer's premises. Just 11% of District residents have access to such a service.¹⁶ DC Access, the primary provider of terrestrial wireless in the District,

⁵ *District of Columbia State Broadband Data and Development Program: Residential Wireline Broadband Adoption Rates*, OFFICE OF THE CHIEF TECHNOLOGY OFFICER (2011), <http://dc.gov/DC/OCTO/Maps+and+Apps/Online+Mapping/All+Online+Maps/DC+Broadband+Adoption+Rates>.

⁶ *Id.*

⁷ *Broadband Data: National Broadband Map Datasets*, NATIONAL TELECOMMUNICATIONS AND INFORMATION ADMINISTRATION (June 30, 2013), <http://www2.ntia.doc.gov/broadband-data>.

⁸ *The Fastest Internet Plans for You*, VERIZON FIOS INTERNET, <http://www.verizon.com/home/fios-fastest-internet/> (last visited Apr. 19, 2014).

⁹ U.S. CENSUS BUREAU 2012.

¹⁰ NATIONAL TELECOMMUNICATIONS AND INFORMATION ADMINISTRATION, *supra* note 7.

¹¹ U.S. CENSUS BUREAU 2012.

¹² *New Customer Offers in Washington, DC*, COMCAST XFINITY, <http://www.comcast.com/internet-service.html> (last visited Apr. 19, 2014).

¹³ Cecelia Kang, *Survey Maps Out Digital Divide*, WASH. POST, Feb. 18, 2011, at A16.

¹⁴ NATIONAL TELECOMMUNICATIONS AND INFORMATION ADMINISTRATION, *supra* note 7.

¹⁵ U.S. CENSUS BUREAU 2012.

¹⁶ NATIONAL TELECOMMUNICATIONS AND INFORMATION ADMINISTRATION, *supra* note 7.

centers its service around Capitol Hill and north of Dupont Circle into Adams Morgan.¹⁷ DC Access draws rave reviews from customers for its reliability and customer service.¹⁸ Its offerings start at \$35 a month for a 1.5 Mbps connection and increase to \$120 a month for 5 Mbps. The service is far less oversubscribed than other carriers' offerings (meaning fewer users are sharing each tower) so these maximum speeds are more readily achievable than with either cable or DSL.¹⁹

High cost is a major reason why high-speed Internet access adoption is low in the District's poorer neighborhoods. Of those residents without Internet access, 57% cited cost as their primary reason.²⁰ Of former Internet access subscribers who no longer had access, 33% cited cost as their primary motivation for dropping their service.²¹

Washington is home to the first 100 Gbps municipal broadband network in the United States. The current network was built on the foundation of DC-Net, the city government's public-safety-grade fiber backbone, which has been in place for over fifteen years. DC-Net was built to provide a more reliable alternative to Verizon's aged 911 system and to allow the city to save money on providing telephone services to its 30,000 employees.²² The District built DC-Net at relatively low cost using city funds and bonds.²³ But the choices the city made about DC-Net have sharply limited its usefulness to city residents and businesses.

B. Early History and Initial Challenges

Though a general requirement to build an "institutional network" for internal use by D.C. city government had been part of District cable franchise agreements since the early 1980s, nothing happened until Comcast's 1999 franchise renewal negotiations.²⁴ In exchange for continued access to D.C. residents, Comcast agreed to provide a portion of its fiber loop across the city for the District government's exclusive use.²⁵

The 1999 agreement was conditioned in important ways. First, the city agreed not to lease or sell the fiber. Second, the contract required that the city not "engage in any

¹⁷ Interview by John Connolly with Martha Huizenga, Partner, DC Access (Apr. 11, 2014).

¹⁸ *DC Access*, YELP: INTERNET SERVICE PROVIDERS, <http://www.yelp.com/biz/dc-access-washington-2> (last visited Apr. 15, 2014).

¹⁹ Huizenga, *supra* note 17.

²⁰ U.S. CENSUS BUREAU 2012.

²¹ *Id.*

²² Interview by John Connolly with Peter Roy, Former Deputy CTO, Office of the Chief Technology Officer (Apr. 15, 2014).

²³ *Id.*

²⁴ Peter R. Roy, *DC's Private Telecommunications Network*, LAW & ORDER 63 (2003).

²⁵ *Cable Franchise Agreement between the District of Columbia and Comcast Cablevision of the District, LLC*, OFFICE OF CABLE TELEVISION (Oct. 21, 2002), http://octt.dc.gov/information/legal_docs/comcast_2002_franchise_index.shtm.

activities or outcomes that would result in business competition between the District and Comcast or that may result in loss of business opportunity for Comcast.”²⁶

Comcast did not, in the end, make its fiber available. To compensate the District, the company then allowed the city to overlash fiber to its aerial network, allowing the District to run its own fiber on utility poles across the city. This turn of events was fortuitous, as the price of installing aerial fiber on existing poles is generally modest when compared to the cost of putting up new poles or running fiber underground, and the overlash opportunity made the cost even lower than that of a standard aerial build.²⁷

As a result of this agreement, the District was able to run fiber anywhere outside the city’s core. This paved the way for DC-Net’s growth. But fiber assets within the city’s core are required to be underground, and that meant dealing with the operator of the conduit, Verizon. Because Verizon sold the government telephone and data service that DC-Net was intended to replace, the company was hostile to the fledgling network and sued the city for trespass and illegal takings in 2003.²⁸

Because of two historical oddities, the city prevailed and was able to reach a settlement agreement with Verizon. First, a 1902 federal statute regulating companies operating conduits under the District’s streets mandated that “space shall be furnished to the District of Columbia as may be necessary for its fire alarm or police patrol wires or cables.”²⁹ Because DC-Net was intended for public safety, an argument could be made that it fell within the ambit of the statute. Second, between the 1890s and 1970s the District had used this underground space for thousands of miles of wire for its police and fire call boxes and private phone network, and had maintained control over these wires.³⁰ The District was able to replace the old cables with new fiber. But this city fiber remained subject to the settlement agreement with Verizon, and that agreement included a provision preventing the District from directly competing with the company in providing service to homes and businesses.³¹

C. Building the Network

The city built DC-Net in different ways in different parts of the District. Downtown, the city cut its old copper wires and then attached new fiber to one end of each cut wire, pulling it through the Verizon conduit to the next manhole.³² This simple strategy made digging up the District’s streets unnecessary and dramatically reduced the overall expense of the project. Outside downtown, the city lashed its fiber onto Comcast’s cable poles.

²⁶ Roy, *supra* note 22.

²⁷ *Id.*

²⁸ Verizon Washington, DC Inc. v. District of Columbia, 2003 WL 24270291 (D.D.C.) (Trial Pleading).

²⁹ An Act Regulating the use of telephone wires in the District of Columbia, 32 Stat. 393, ch. 1136 (1902).

³⁰ Roy, *supra* note 22.

³¹ Interview by John Connolly with Tegene Baharu, Deputy CTO of Infrastructure Services, Office of the Chief Technology Officer (April 22, 2014).

³² Roy, *supra* note 22.

Eighty percent of DC-Net was built using fiber in Verizon's conduits and overlashing Comcast's poles, while the remainder was leased on a long-term basis from Level 3 Communications.³³ Bypassing Comcast and Verizon completely, DC-Net is its own "middle mile" and peers directly with Level 3 using two OC-3 connections in the suburbs.³⁴ In other words, DC-Net bypasses the telecom companies that often dominate middle-mile (or "special access") connections and connects directly with an Internet backbone.

DC-Net's design reflects its public safety purpose. To avoid creating single points of failure, the network includes several redundant fiber rings.³⁵ The system includes redundant power backups at each site and operators have the ability to detect the precise location of any line breaks or other failures.³⁶ Though planning for DC-Net began before the September 11th attacks, the city's legacy copper public safety network failed on that day, and the city's new fiber network was meant to ensure that such a failure would not reoccur.³⁷ Indeed, DC-Net fit perfectly into the post 9/11 security paradigm, which helped the network win support.³⁸

The network was built at relatively low cost. DC-Net's total construction budget was about \$93 million, the vast majority of which was paid for by the District with appropriations and bonds.³⁹ With an expected savings of \$10 million a year on city telecommunications expenses once completed, the network was expected to pay for itself quickly.⁴⁰ Nevertheless, operating costs were a problem in the early years, as the new network required a full staff but was not yet providing service to or receiving money from most District agencies.⁴¹ DC-Net found its financial footing by 2006.⁴²

DC-Net runs across the entire city and provides speedy and reliable service. In the past, the District's Verizon 911 service was considered the worst in the nation.⁴³ DC-Net was reviewed by the National Emergency Number Association and found to be a national

³³ Joseph Carella, *Broadband Infrastructure Application: Submission to NTIA – Broadband Technology Opportunities Program*, BROADBAND USA, http://www2.ntia.doc.gov/files/grantees/dc-can_infrastructure_application_part1_redacted.pdf (last visited Apr. 16, 2014).

³⁴ *DC-Net Call Center Infrastructure*, OFFICE OF THE CHIEF TECHNOLOGY OFFICER, http://hbx.dc.gov/sites/default/files/dc/sites/Health%20Benefit%20Exchange%20Authority/page_content/attachments/DCHBX-13-0001Attachment1.pdf (last visited Apr. 19, 2014).

³⁵ Carolyn Duffy Marsan, *D.C. builds high-speed network*, NETWORK WORLD, Feb. 23, 2004, at 21.

³⁶ *Building a Better Infrastructure: District Network Supports Public Safety to Economic Development*, PUBLIC CIO, Aug. 2, 2012, at 15.

³⁷ Roy, *supra* note 22.

³⁸ *Id.*

³⁹ Chris Peabody, *DC-NET/ DC.Gov E911 Network Update*, WASHINGTON DC: INTEGRATED NETWORK TECHNOLOGY OVERVIEW, http://media.govtech.net/Events/2006Events/2006Maryland/26_145_VoiceDataVideoConvergence_PEABODY.ppt (last visited Apr. 16, 2014).

⁴⁰ Roy, *supra* note 22.

⁴¹ *Id.*

⁴² *Id.*

⁴³ Peabody, *supra* note 38.

model of a next generation network.⁴⁴ One non-profit user, commenting on DC-Net's uptime and customer service, noted that in her organization's first year on the network, service went down only once, and then only briefly.⁴⁵ Moreover, DC-Net's service team identified the problem remotely and informed the organization before it noticed the interruption itself.⁴⁶ Though initially concentrated downtown, DC-Net has in the years between 2006 and 2014 installed fiber across most of the District.

D. Trying to Bring DC-Net to the People: DC-CAN

Since 2010, District officials have tried to leverage DC-Net to serve the city's underserved communities. Expanding high-speed Internet access was one of President Obama's campaign promises, and his administration's stimulus bill included more than \$7 billion towards high-speed Internet access expansion.⁴⁷ Washington applied for a grant, setting as its goal "an increase in broadband adoption among the District's vulnerable populations and residents of its underserved community."⁴⁸ This grant envisioned using DC-Net as the base of a municipal middle mile network, called the DC Community Access Network (DC-CAN), which would lower high-speed Internet access prices and increase its adoption in low-income communities. Although the city accomplished several of these goals, D.C.'s high-speed Internet access landscape remains essentially unchanged.

The National Telecommunications and Information Administration (NTIA) awarded the District \$17.4 million to build out DC-CAN. (Though DC-CAN is not coterminous with DC-Net, the project adds fiber to the pre-existing DC-Net network and is treated as equivalent from a technological and functional perspective.).⁴⁹

The District's grant application specified two main goals for DC-CAN: first, provide community anchor institutions (CAIs) such as libraries and schools with access to affordable and reliable high-speed Internet access, currently unavailable from private providers. Second, add fiber and act as the middle mile for commercial providers in distressed parts of the city by offering points of interconnection from which these providers could sell cheaper service to consumers. In addition, the District envisioned a system of wireless hotspots providing free Internet access to a small area around each anchor institution.

The District's ambitious plans sparked excitement. Connecting 190 new institutions (in addition to the 100 already served) would mean adding 170 new miles of fiber to DC-

⁴⁴ *Id.*

⁴⁵ Interview with Jessie Posilkin, Former Information Management Specialist, Bread for the City (April 15, 2014).

⁴⁶ *Id.*

⁴⁷ *American Recovery and Reinvestment Act of 2009*, NATIONAL TELECOMMUNICATIONS AND INFORMATION ADMINISTRATION, <http://www.ntia.doc.gov/page/2011/american-recovery-and-reinvestment-act-2009.d> (last visited Apr. 14, 2014).

⁴⁸ Carella, *supra* note 32.

⁴⁹ Baharu, *supra* note 30.

Net's 300-mile network for a cost to the District of only \$7.5 million in matching funds.⁵⁰ Several last-mile providers expressed interest in providing service to District residents by tapping into DC-CAN, and non-profit groups also planned to connect directly to the service.⁵¹ Groups of citizens expressed interest in using free wireless mesh networks to expand access across the city.⁵²

E. Community Anchor Institutions and Wireless Access

The District used federal Broadband Technology Opportunity Program (BTOP) grant money to extend its public-safety-grade fiber network by 211 miles to reach 291 schools, health clinics, fire and police stations, and libraries across the city. These institutions received symmetric (equal upload and download speeds) fiber connections to their premises, and the BTOP funding covered most of their installation costs.⁵³

But the institutions themselves are made responsible under BTOP's rules for covering their operating costs, and DC-CAN is therefore charging \$470 a month for 10 Mbps and \$60 per each additional 10 Mbps. Schools and libraries in the program are permitted to use E-Rate funding to cover their monthly access costs, but other institutions find these costs prohibitive.⁵⁴

DC-CAN also provides free Wi-Fi Internet access to District residents via a network of 223 hotspots, most of which are housed at the community anchor institutions.⁵⁵ Though hosted at the institutions, these hotspots were paid for and are maintained by the District.⁵⁶ Each hotspot covers between 300 and 600 feet.⁵⁷ The hotspots are spread across the city, with a high concentration located downtown.

Although the presence of expensive monthly service for anchor institutions and the installation of wireless hotspots has not dramatically changed Internet access in Washington, D.C., it does represent an expansion of high-speed Internet access in the city.⁵⁸ More importantly, the city's fiber network has been meaningfully expanded into District neighborhoods. This will make it cheaper to move forward once new plans are adopted.⁵⁹

⁵⁰ *DC Community Access Network Fact Sheet*, BROADBANDUSA: CONNECTING AMERICA'S COMMUNITIES, <http://www.ntia.doc.gov/legacy/broadbandgrants/applications/factsheets/5116FS.pdf> (last visited Apr. 12, 2014).

⁵¹ Carella, *supra* note 32.

⁵² Andrew Zaleski, *Is Broadband for All Even Possible?*, THE ATLANTIC CITIES (Sept. 21, 2012), <http://www.theatlanticcities.com/technology/2012/09/broadband-all-even-possible/3321/>.

⁵³ Greg Bloom, *Bridging the Digital Divide with the DC Community Access Network*, BREAD FOR THE CITY (December 14, 2011), <http://www.breadforthecity.org/2011/12/bridging-the-digital-divide-with-the-dc-community-access-network/>.

⁵⁴ Roy, *supra* note 22.

⁵⁵ Carella, *supra* note 32.

⁵⁶ Posilikin, *supra* note 44.

⁵⁷ Aaron Wiener, *Fiber-Optical Illusion*, WASHINGTON CITY PAPER (May 1, 2013), <http://www.washingtoncitypaper.com/blogs/housingcomplex/2013/05/01/fiber-optical-illusion/>.

⁵⁸ *Id.*

⁵⁹ Baharu, *supra* note 30.

F. Mesh Networking

One solution to the city's digital divide contemplated by some CAIs and community groups (but ultimately rejected by the District) was mesh networking. In a wireless mesh network, groups of routers pass data to each other across an area, enveloping it with connectivity and allowing a single Internet connection to be shared over a greater distance than would be possible with a traditional hotspot.⁶⁰ The non-profit organization Bread for the City, for example, planned to develop a mesh network using its DC-CAN connection:

And our next step is to go 'the last mile' ourselves, bringing this new bandwidth directly into people's homes by launching an open community wireless network. Using special technology that allows wireless devices to talk to each other and make 'mesh' networks, we will share our surplus DC-CAN bandwidth with the neighborhood around our centers.⁶¹

Though Bread for the City employees shared their mesh network plan with District officials and received positive responses, that support was eventually withdrawn.⁶² Indeed, DC-CAN's CAI contract (for institutions rather than last-mile providers) was revised to specifically prohibit "providing Internet access to third parties through a wired or wireless connection."⁶³ Bread for the City chose not to use the contract for last-mile providers offered by DC-CAN.

When asked the reason for the change, District officials have cited general security worries, concerns that terrorists would use the network, and need to comply with the PATRIOT Act.⁶⁴ In the context of expanding its own network of hotspots, District officials have also expressed concerns about interfering with Comcast and Verizon's business, especially in light of the city's desire to have the companies expand their offerings in the city's underserved areas.⁶⁵ And these open mesh networks encourage consumers to "share" their Comcast and Verizon bandwidth over the network, which violates the companies' terms of service. It is reasonable for the city not to want to be part of an initiative that encourages violation of these contractual terms, however those terms are viewed.

G. The Last Mile

⁶⁰ Zaleski, *supra* note 51.

⁶¹ Bloom, *supra* note 52.

⁶² Wiener, *supra* note 56.

⁶³ DC-CAN Services Contract 20.

⁶⁴ Lydia DePillis, *Meet the New-ish Boss: Chief Technology Officer Rob Mancini*, WASHINGTON CITY PAPER (Jan. 11, 2012), <http://www.washingtoncitypaper.com/blogs/housingcomplex/2012/01/11/meet-the-new-ish-boss-chief-technology-officer-rob-mancini/>.

⁶⁵ *Id.*

DC-CAN's second goal was to build middle-mile infrastructure to lure private or non-profit last-mile providers to underserved areas. As of now, no last-mile wireline service is being offered that ties to DC-CAN, although several wireless companies have tested such service.⁶⁶ DC Access, a local terrestrial wireless Internet provider, explored using DC-CAN to expand its network but ultimately found the service more expensive than the middle-mile connection for which it was already paying.⁶⁷ Neither Verizon nor Comcast, the city's dominant providers, has yet partnered with DC-CAN to offer service, though both companies, along with several others, are in preliminary negotiations to provide such service.⁶⁸ DC-CAN's leaders focused intently on building basic fiber infrastructure and paid less attention to the task of developing partnerships with last-mile providers. Now that this infrastructure is complete, developing such partnerships has become central.⁶⁹

The District is unable to provide Internet access directly to consumers itself because of its franchise agreement with Comcast and its settlement agreement with Verizon.⁷⁰ Non-profit CAIs have been classified as part of the middle mile, in part to avoid running afoul of these restrictions.⁷¹ Though many would like to see the District offer high-speed Internet access directly to consumers as a public utility, these agreements, necessary to build DC-Net in the first place, make this impossible.⁷²

H. Costs

Few nongovernmental entities have taken advantage of DC-CAN. Cost is the problem.⁷³ The network's non-profit users are nearly all in the healthcare business because they benefit from DC-CAN's reliability and security and tend to have larger budgets funded by insurance, Medicare, and Medicaid.⁷⁴ DC-CAN is charging \$470/month for 10 Mbps and \$7,400 for 1 Gbps.

Why is service so costly? First, DC-CAN is a commercial-grade network with equal upload and download speeds, so its price should be compared with dedicated commercial Internet access service rather than that usually provided to homes and small businesses. At its lowest price point, DC-CAN is still more expensive but also much faster than a traditional T1 line. But many smaller non-profits do use residential-style high-speed Internet access rather than a T1 line, and DC-CAN is more than twice as expensive than such residential access.⁷⁵ DC-CAN's price is not currently competitive for small non-profits.

⁶⁶ Baharu, *supra* note 30.

⁶⁷ Huizenga, *supra* note 17.

⁶⁸ Baharu, *supra* note 30.

⁶⁹ *Id.*

⁷⁰ Wiener, *supra* note 56.

⁷¹ Posilikin, *supra* note 44.

⁷² Baharu, *supra* note 30.

⁷³ Posilikin, *supra* note 44.

⁷⁴ *Id.*

⁷⁵ VERIZON, *supra* note 8.

Second, DC-NET was built as a public safety network, and DC-CAN is therefore incomparably reliable and secure—and more expensive.⁷⁶ The network's popularity with health clinics makes sense given their need to secure patient data and have access to a reliable connection.⁷⁷ Regular non-profits and even Internet service providers do not necessarily require such a robust network connection, however, and are hesitant to pay for one.⁷⁸

Third, DC-CAN and DC-Net are run on a break-even basis.⁷⁹ District officials have cited the grant that funded DC-CAN as the reason for this requirement. DC-Net is itself run on such a model.⁸⁰

While cost is a major problem, District officials are looking for a solution. One that is currently being piloted is a shared-bandwidth asymmetrical high-speed Internet access connection that could be offered at a much lower price. This service would be more akin to that purchased by consumers and small businesses, though DC-Net would offer better speed, reliability, and customer service for the price. Preliminarily, DC-Net is exploring plans starting at \$30 a month for a shared 10 Mbps connection.⁸¹

I. Lessons Learned from the District

The District's municipal network story is far from complete, but other cities can learn lessons from its experience over the past fifteen years. Building DC-Net required creativity and adaptability. Washington likely could not have built its network (and certainly could not have kept its price below \$100 million) without using both an obscure 1902 law and miles of city-owned wire beneath the District's streets. Research, creativity, and a willingness to litigate allowed the city to prevail over incumbent efforts to kill the nascent network.⁸²

Comcast's agreement in 1999 to give Washington a fiber ring was crucial. When Comcast did not provide the promised fiber, city officials adapted—gaining much more valuable overlashing rights that were key to extending the network beyond the city core. Given the choice between leased fiber and overlashing rights, any city with an extensive aerial infrastructure should consider using the latter.

DC-Net could have remained a closed network for public safety and city government. District officials saw the opportunity presented by the BTOP stimulus funding

⁷⁶ Wiener, *supra* note 56.

⁷⁷ Posilikin, *supra* note 44.

⁷⁸ Wiener, *supra* note 56.

⁷⁹ *Id.*

⁸⁰ James Losey, *BTOP Comprehensive Community Infrastructure: Application Guide for Applying for Funding from the Broadband Technology Opportunities Program*, NEW AMERICA FOUNDATION (Feb. 25, 2010), http://newamerica.net/sites/newamerica.net/files/profiles/attachments/BTOP_CCI_Application_Guide_022510.pdf.

⁸¹ Baharu, *supra* note 30.

⁸² Roy, *supra* note 22.

and quickly converted their network into a more open municipal offering. While DC-CAN has not yet reached its full potential, it is providing many people and institutions with better Internet access. No one involved in planning the city's safety network had this mapped out from the beginning.⁸³

Finally, high monthly costs for DC-CAN service have created barriers to adoption, but District officials are in the process of testing out alternative pricing models. A willingness to experiment will serve the District well.

The circumstances under which a network is built may constrain its use. DC-Net was made possible by concessions from Comcast and a settlement agreement with Verizon, but the District's promises not to compete with these companies have constrained its ability to use the network.⁸⁴ While these restrictions were unimportant when DC-Net served only the city government, they now directly affect DC-CAN's effectiveness.

DC-Net is also uniquely configured because it was designed for public safety. Its reliability and security make it perfect for use by health clinics. These same features drive up the network's cost, however, making monthly subscriptions less attractive to smaller non-profits and Internet service providers.

DC-CAN's use of federal funding was accompanied by a requirement that the network be sustainable, which has meant that DC-CAN cannot artificially lower monthly prices to attract users in the early years. Moreover, DC-CAN is run under the aegis of DC-Net, which itself operates on a break-even model, so even absent BTOP funding the network would likely still be expected to pay its own way.

Immediate break-even pricing, whether imposed by grant, law, or practice, is a difficult financial model for underserved communities. Upfront network costs are high and underserved urban communities have fewer resources with which to purchase Internet access service. The District is fortunate to be able to spread its network costs among government agencies and non-profits across the city, but the price of access is still too high.

III. San Francisco, CA

The city of San Francisco has long been synonymous with technological innovation and the municipal government works to maintain and cultivate that reputation. Every one of San Francisco's households can receive high-speed Internet access should they desire it.⁸⁵ However, in terms of speed, San Francisco does not rank in the top 100 metropolitan

⁸³ *Id.*

⁸⁴ *Id.*

⁸⁵ Troy Wolverton, *Thousands in Bay Area Lack Broadband Access*, SAN JOSE MERCURY NEWS (Aug. 22, 2012, 7:25 AM), http://www.mercurynews.com/ci_21366045/thousands-bay-area-lack-broadband-access

areas in the country.⁸⁶ When it comes to municipal efforts, the city has had a rocky road to citywide high-speed Internet access.

A. Early History

In 2004, the city began to consider the idea of covering the city in free wireless services. The mayor at the time, Gavin Newsom, boldly declared, "We will not stop until every San Franciscan has access to free wireless Internet service."⁸⁷ Over the next few years, the city government discussed a proposal by Google and EarthLink to install citywide Wi-Fi throughout the city at no additional cost to taxpayers.⁸⁸ The Google/EarthLink venture had beat out five other contractors during bidding on a four-year contract to create the wireless network.⁸⁹ The plan was to include premium paid user tiers at speeds three to four times faster alongside limited free usage.⁹⁰ EarthLink would bear the estimated \$14 million to \$17 million cost of installing and maintaining the network. Google would sell ads to further subsidize the service.⁹¹

The Google/EarthLink bid was accepted in early 2006 but the project died before the end of the following year.⁹² The project fell apart in what has been described as "a long and drawn-out fight" over terms of the contract.⁹³ Additionally, a political tug-of-war between the Mayor and the Board of Supervisors made the project difficult to execute.⁹⁴ The relevant technology was prohibitively expensive at the time, and not advanced enough to create a ubiquitous Wi-Fi network in the city. There was a great deal of controversy over Google asking for email addresses as a condition of signing on to the free tier of Internet access.⁹⁵ Those difficulties, together with others,⁹⁶ left the project dead in the water.⁹⁶

After the EarthLink/Google project fell through, other organizations such as Meraki vied to provide citywide free Wi-Fi. (Indeed, Meraki later made a failed attempt at building mesh network service without municipal participation.)⁹⁷ But city leaders decided it was

⁸⁶ NATIONAL BROADBAND MAP, <http://www.broadbandmap.gov/rank/all/msa-metropolitan-statistical-area/percent-population/within-nation/speed-download-greater-than-3mbps-upload-greater-than-0.768mbps/ascending/> (last visited May 22, 2014).

⁸⁷ *Whatever Happened to Municipal Wi-Fi?*, THE ECONOMIST (Jul. 26, 2013, 2:05 PM), <http://www.economist.com/blogs/babbage/2013/07/wireless-networks>

⁸⁸ Aaron Pozar, *San Francisco Community Broadband Network*, <http://www.nanog.org/meetings/nanog55/presentations/Monday/Pozar.pdf>.

⁸⁹ *EarthLink Abandons San Francisco Wi-Fi Project*, N.Y. TIMES (Aug. 31, 2007) http://www.nytimes.com/2007/08/31/technology/31earthlink.html?_r=0.

⁹⁰ *Whatever Happened to Municipal Wi-Fi?*, *supra* note 86.

⁹¹ *EarthLink Abandons San Francisco Wi-Fi Project*, *supra* note 88.

⁹² *Whatever Happened to Municipal Wi-Fi?*, *supra* note 86.

⁹³ Dan Raile, *Having Been Burned Before, Google Won't Bring Fiber to San Francisco*, PANDODAILY (Feb. 25, 2014), <http://pando.com/2014/02/25/having-being-burned-once-before-google-wont-bring-fiber-to-san-francisco/>.

⁹⁴ *EarthLink Abandons San Francisco Wi-Fi Project*, *supra* note 88.

⁹⁵ Telephone Interview by Melissa Nally with Brian Roberts, Policy Analyst, San Francisco Department of Technology (April 24, 2014).

⁹⁶ *Whatever Happened to Municipal Wi-Fi?*, *supra* note 86.

⁹⁷ *Id.*

time to take matters into their own hands. In 2007, the city's Department of Technology and Information Services (DTIS) commissioned a study on developing infrastructure for a fiber network throughout the city.⁹⁸ This 2007 study found that it would be costly and risky to develop a fiber network throughout San Francisco.⁹⁹

B. Existing Fiber Projects

The city maintains an internal fiber deployment and design team that has already built municipal fiber. Part of the approximately 140 miles of "dark fiber" is currently used for municipal buildings, schools, and San Francisco's housing projects. Since 2002, 256 facilities have been connected to fiber.¹⁰⁰ The first buildings to be connected to fiber were municipal: public safety, the 911 center, police stations, fire stations, and city hall.¹⁰¹ The first major expansion was to the City College of San Francisco (CCSF), which had about eight campuses it wanted to connect to fiber. After CCSF unsuccessfully put out a RFP, they turned to the city, and the city was able to deliver.¹⁰²

The city also leases out use of its network to hospitals and clinics. As of 2013, the city's revenue from leasing out its fiber network adds up to about \$360,000 a year.¹⁰³ This strategy has enabled the Board of Supervisors to maintain a modest budget, year after year, for fiber expansion throughout San Francisco. The city's major client is the Corporation for Education Network Initiatives in California (CENIC), which has connected hospitals, clinics, and the medical school at the University of California at San Francisco to fiber. Because many clinic visitors are not native English speakers, the fiber connection allows doctors and patients to use video medical interpretation to communicate.¹⁰⁴ The city has also connected science museums such as the Exploratorium and California Academy of Science to its fiber network.

In early 2008, the city deployed fiber to low-rise public housing projects at speeds of 100 Mbps, compared to the less than six megabits per second offered by typical Internet access service in San Francisco at the time. The city partnered with local non-profit Internet Archive, which had previously connected to the city's municipal fiber network, to provide Wi-Fi throughout those buildings.¹⁰⁵ The city supplied the fiber for the network for

⁹⁸ *Fiber Optics for Government and Public Broadband: A Feasibility Study*, COMMUNICATIONS ENGINEERING & ANALYSIS FOR THE PUBLIC INTEREST (Jan. 2007), <http://www.ctcnet.us/wp-content/uploads/2014/01/SFFiberFeasibilityReport.pdf>

⁹⁹ Roberts, *supra* note 94.

¹⁰⁰ *CCSF Connectivity Fiber/Wi-Fi*, CITY & COUNTY OF SAN FRANCISCO DEPARTMENT OF TECHNOLOGY, <http://onesanfrancisco.org/wp-content/uploads/Agenda-Item-4-DT-Connectivity-Presentation-Revised.pdf>

¹⁰¹ Roberts, *supra* note 94.

¹⁰² *Id.*

¹⁰³ James Temple, *SF supe: Time to Speed Up High-Speed Internet*, SFGATE (May 7, 2013, 11:18 AM), <http://www.sfgate.com/technology/dotcommentary/article/Plan-could-open-SF-up-to-better-Internet-4494749.php>

¹⁰⁴ Roberts, *supra* note 94.

¹⁰⁵ Katie Hafner, *Low-Income Residents Get High-Speed Access*, N.Y. TIMES (Mar. 28, 2008, 1:46 PM), http://bits.blogs.nytimes.com/2008/03/28/low-income-residents-get-high-speed-access/?_php=true&_type=blogs&ref=technology&_r=0

free, paid for and installed the access points, and continues to provide maintenance for the system.¹⁰⁶ This initiative has covered over 40 housing projects in San Francisco, for a total of more than 6,000 units or 15,000 tenants.¹⁰⁷ The Internet Archive has helped the city to construct on-site computing centers and runs a project known as SFLan, which aims to partner with the municipal government and non-profits to build a fiber backbone to support citywide wireless traffic.¹⁰⁸ Last-mile connections to homes and businesses have not, however, been built by San Francisco.¹⁰⁹

The city has created an initiative within the Department of Technology called GoConnectSF, which aims to connect all the residents of San Francisco to high-speed Internet access technology. The initiative was initially funded by a Sustainable Broadband Adoption (SBA) grant through the BTOP program, and provides four programs designed to improve broadband adoption rates to target groups by promoting broadband awareness, training, and skills development. Partners include the City College of San Francisco, organizations for the elderly and adults with disabilities, and programs for disadvantaged youth.¹¹⁰

In 2011, community groups began rallying for community fiber. Dana Sniezko, creator of the now defunct site SF Fiber, noted that other cities have created open-access networks to deploy fiber. "This is really effective because it's a lot like a public utility," she explained. "The city or someone [provides] a pipe, and then anyone who wants to run information or service on that pipe can do so...It creates some good public infrastructure, and also allows for competition, and it sort of revives the local ISP."¹¹¹ As of 2014, the city had not decided in favor of community fiber.

C. Free Wi-Fi on Market Street

On December 17, 2013, San Francisco began offering free Wi-Fi along Market Street. The expiration of a vendor agreement with AT&T helped the city to pursue this project, which was completed on time and within budget.¹¹² The hardware and bandwidth for the Wi-Fi service were donated by private companies: Ruckus Wireless donated the infrastructure, and a local company called Layer42 Networks contributed a gigabit backbone to the installation.¹¹³ But the city's Department of Technology developed the system and attached the equipment to traffic lights and other city-owned property. "It was simpler, faster, better to do it on our own," said Marc Touitou, whom Mayor Edwin Lee

¹⁰⁶ Roberts, *supra* note 94.

¹⁰⁷ Pozar, *supra* note 87.

¹⁰⁸ *Community Wireless*, INTERNET ARCHIVE, <https://archive.org/web/sflan.php> (last visited May 22, 2014).

¹⁰⁹ Rebecca Bowe, *Boxed Out*, S.F. BAY GUARDIAN (May 10, 2011, 4:37 PM), <http://www.sfbg.com/2011/05/10/boxed-out?page=0,1>.

¹¹⁰ *GoConnectSF*, CITY AND COUNTY OF SAN FRANCISCO, <http://goconnectsf.org/about> (last visited May 22, 2014).

¹¹¹ Bowe, *supra* note 108.

¹¹² Colin Wood, *SF's Market Street Wi-Fi Marks Shift In City's Tech Approach*, GOVERNMENT TECHNOLOGY (Dec. 18, 2013), <http://www.govtech.com/local/SFs-Market-Street-Wi-Fi-Marks-Shift-In-Citys-Tech-Approach.html>.

¹¹³ *Id.*

appointed as Chief Information Officer and director of the Department of Technology for San Francisco in April 2013. "The quality is higher with the technical design by the Department of Technology. We wanted high capacity. We wanted it to be cool—no strings attached, no ads."¹¹⁴

The Wi-Fi network cost \$500,000 to deploy.¹¹⁵ The city mounted access points with gigabit fiber backbone connections on traffic poles to construct a network connected to fiber by Ethernet cables and occasional mesh.¹¹⁶

According to Mayor Edwin Lee, nearly a quarter million people walk down Market Street each day. From the city's perspective, providing free public Wi-Fi is the first step to a larger vision of connectivity aimed at bridging the digital divide and ensuring that everyone has equal access to innovation. "With a reliable and ubiquitous infrastructure in place, the door is wide open for a myriad of invaluable services well beyond public access," said Touitou. The installation of free Wi-Fi on Market Street is an important first step to providing free wireless throughout the city. About 250 people use the free Wi-Fi on Market Street each day, and the City hopes that number will grow with increased awareness.¹¹⁷

The city's total wireless network maintenance budget for the 2014-5 fiscal year is \$120,000.¹¹⁸ In the future, the city may solicit sponsors to lend their brand to the wireless network, in the style of "powered by" a certain entity.¹¹⁹ This free mobile Wi-Fi will eventually be extended to 31 public parks and areas, with support from Google. Spearheaded by San Francisco's Department of Technology, Google provided \$600,000 to fund installation and operation, and the project will be completed by summer 2014.¹²⁰ There will be two network names – one the same as Market Street (San Francisco Free Wi-Fi), and the other referencing Google. Twenty-five of the parks will be directly connected to fiber, while the other six will have wireless bridges to buildings served by fiber.¹²¹

D. Dig Once Legislation

Board of Supervisors President David Chiu has introduced a "Dig Once" plan. The proposed amendment to the Public Works Code would allow the city to lay fiber optic cable

¹¹⁴ John Cote, *S.F. Rolls out 3 Miles of Free Wi-Fi Along Market Street*, SFGATE (Dec. 16, 2014, 10:02 AM), <http://www.sfgate.com/bayarea/article/S-F-rolls-out-3-miles-of-free-Wi-Fi-along-Market-5067616.php>.

¹¹⁵ *San Francisco's Market Street Now Offering Free Wi-Fi*, COMMUNITY BROADBAND NETWORKS (Dec. 27, 2013), <http://www.muninetworks.org/content/san-franciscos-market-street-now-offering-free-wi-fi>

¹¹⁶ Roberts, *supra* note 94.

¹¹⁷ Jonah Owen Lamb, *Market Street Wi-Fi is Mostly a Success – If You Know About It*, THE EXAMINER (Jan. 27, 2014), <http://www.sfoxaminer.com/sanfrancisco/market-street-free-wi-fi-is-mostly-a-success-if-you-know-about-it/Content?oid=2687958>

¹¹⁸ *Id.*

¹¹⁹ Stephen Lawson, *San Francisco Gives its Market Street Free Wi-Fi, Eyes Citywide Service*, PC WORLD (Dec. 16, 2013, 11:00 AM), <http://www.pcworld.com/article/2080820/san-francisco-gives-its-main-street-free-wifi-eyes-citywide-service.html>.

¹²⁰ *Whatever Happened to Municipal Wi-Fi?*, *supra* note 86.

¹²¹ Roberts, *supra* note 94.

in connection with any infrastructure projects that require streets to be torn up. This would cut city expenses by a factor of 10 to 20 for any given fiber optic installation.¹²² “In the 21st century, cities need access to affordable, high-quality broadband to compete economically, just as access to water, electricity, roads or railways was critical in the 20th century,” Chiu said in a public statement. “We see other cities like Austin, Kansas City and Santa Clara making enormous strides. My proposal will ensure that San Francisco does better in this area.”¹²³

The legislation is currently being revised for presentation to the Board of Supervisors. However, commenters have criticized it as coming too late to capitalize on recent substantial digs, and have said the draft is more “a trial balloon than a major mobilization.”¹²⁴ Some city personnel believe that water and sewer conduits are more difficult to fit for fiber.¹²⁵

E. Looking Ahead

It remains to be seen whether private companies will overtake municipal efforts to cover San Francisco in fiber Internet access to the home. In early 2014, Sonic.net, a small, privately-held ISP, started working on a pilot project to connect homes in San Francisco to fiber. The service successfully brought gigabit fiber for \$69.95 per month to Sebastopol, a small town in Sonoma County.¹²⁶

The city has no immediate plans to pursue fiber to the home, choosing to concentrate its fiber efforts on public areas.¹²⁷ When the city took the lead in installing Market Street Wi-Fi after AT&T lagged, it decided to take Internet access seriously as a municipal service. The proposed Dig Once legislation indicates a dedication to improving fiber access and lighting up the city’s dark fiber. For the future, the city hopes to boost its dark fiber leasing program and to expand its free Wi-Fi to other parks and neighborhood commercial corridors, depending on its budget.¹²⁸ The city is also seeking funding to repair and upgrade the public housing network that was installed five years ago.¹²⁹ Touitou believes that high-speed connectivity is a necessary right of citizens, stating, “It’s a normal municipal service, as far as I’m concerned.”¹³⁰

¹²² Temple, *supra* note 102.

¹²³ Steven T. Jones, *Will SF’s New Broadband Infrastructure be Controlled by the City or Google?*, SAN FRANCISCO BAY GUARDIAN (May 8, 2013 at 1:00 PM), <http://www.sfbg.com/politics/2013/05/08/will-sfs-new-broadband-infrastructure-be-controlled-city-or-google>.

¹²⁴ Raile, *supra* note 93.

¹²⁵ Roberts, *supra* note 94.

¹²⁶ Meghan Neal, *Why It’s So Hard to Bring Gigabit Internet to the US*, MOTHERBOARD (Apr. 7, 2014, 5:25 PM), <http://motherboard.vice.com/read/why-its-so-hard-to-bring-gigabit-internet-to-the-us>.

¹²⁷ Roberts, *supra* note 94.

¹²⁸ *Id.*

¹²⁹ *Id.*

¹³⁰ Lawson, *supra* note 118.

IV. Seattle, WA

A. Current Providers

The city of Seattle, home to thousands of employees of Amazon and Microsoft, lacks the high-speed Internet access that one would associate with a high-tech center. The majority of the city has access to some form of Internet access from the three major providers: CenturyLink (DSL), Comcast (cable modem), and Wave (cable modem). Of the 275,000 households in Seattle, Comcast provides Internet access to 160,000 and Wave reaches 11,000.¹³¹ However, prices are high for access, with Comcast charging \$77/month for 50 Mbps and CenturyLink charging \$70 for 40 Mbps service. The average speeds for Internet access in Seattle available from CenturyLink, Comcast, and Wave are 10.6 Mbps, 27.1 Mbps, and 30.7 Mbps respectively.¹³²

Service from one cable modem Internet access provider, Broadstripe, was so poor that it prompted the formation of Upping Technology for Underserved Neighborhoods (UPTUN).¹³³ Broadstripe served the Beacon Hill and Central District areas, both of which are home to lower-income residents and thus could not attract service from the major providers such as Comcast. (CenturyLink does provide service there, but its DSL product available in the area is low-quality—capable of just 1.5 Mbps down in places.)¹³⁴ The service from Broadstripe proved erratic, with service often failing if the weather was too cold, hot, or windy. UPTUN began collecting horror stories from Broadstripe users to demonstrate to the city the extent of the problem with Broadstripe's service.¹³⁵ Although Wave's acquisition of Broadstripe in late 2011 has improved the situation, because Wave has upgraded the speed of the product to up to 50 Mbps down and has improved its reliability, high-speed access is still not easily or cheaply available to many residents in the Beacon Hill or Central District areas.

Seattle has had its own city fiber network since 1986. It started when a few public schools in the city became interested in creating a network to connect their buildings. This sparked collaboration between the city of Seattle, King County, the University of Washington, Seattle City Light, and other entities. Collectively, they created a mechanism for cost-sharing depending on the number of strands that a particular entity planned to use.¹³⁶ The fiber network has grown to encompass a loop through the city, covering over 500 linear miles.

¹³¹ Telephone Interview by Melissa Nally with Tony Perez, Director, Seattle Office of Cable Communications (May 14, 2014).

¹³² Net Index from Ookla, *Download Speed in Seattle, Washington*, OOKLA, <http://www.netindex.com/download/4,302/Seattle,-WA/>

¹³³ Matthew Halverson, *Beacon Hill Unplugged*, SEATTLEMET (Apr. 28, 2011, 5:00 AM), <http://www.seattlemet.com/real-estate/articles/beacon-hill-internet-service-may-2011/>.

¹³⁴ Perez, *supra* note 150.

¹³⁵ Robert Kangas, *Share Your Broadband Stories*, UPTUN (Feb. 23, 2011), <http://www.uptun.org/2011/02/23/share-your-broadstripe-stories/>.

¹³⁶ Perez, *supra* note 150.

The city's fiber network provides high-speed Internet access to public schools, fire departments, police stations, and city offices in Seattle. The city refrained from leasing it to any private entity until 1996. (These were self-imposed restrictions stemming from city negotiations with cable and phone companies.)¹³⁷ Even after 1996, the city remained reluctant to open its fiber network, and waited until 2012 to open it to private use.¹³⁸ Comcast has leased fiber from the city, using it for a project in Pioneer Square.

B. Regulatory Burdens

After Broadstripe entered bankruptcy in 2009, CenturyLink became interested in upgrading its DSL infrastructure in the Beacon Hill and Central District areas. However, it ran into several regulatory hurdles.

First, the Seattle Department of Transportation (SDOT)'s Director's Rule 2-2009 places requirements on any provider who wishes to install an above-ground telecommunications cabinet in a public right of way in residential areas.¹³⁹ The rule stemmed from complaints by property owners about ugly cabinets being installed without notice. The provider must first attempt to find two private easements before it is allowed to apply for a hardship waiver for a public right of way easement. The provider must then send the owner of the abutting property and all property owners within 100 feet of the proposed cabinet site a letter describing the proposed cabinet and an aerial view of the proposed location. Next, the provider must have 60% of the property owners approve the cabinet. If a property owner does not return the letter either granting approval or denying approval, the owner is counted as denying permission. This rule makes it extremely time-consuming and expensive for any provider to install a new cabinet in the city.

Qwest has estimated it spent \$2,500 on each proposed site merely attempting to contact the owners.¹⁴⁰ This amount is in addition to the roughly \$3,500 in application and permit fees for each cabinet. Qwest succeeded in persuading SDOT to reduce the notification requirement from 300 feet to 100 feet, but the burden of this rule remains heavy.

Second, Seattle has a pole attachment rule (as does every phone company or electric utility in the country) that requires providers to pay Seattle City Light to survey pole

¹³⁷ *Id.*

¹³⁸ Seattle, WA., Ordinance 123931 (July 30, 2012) available at <http://clerk.seattle.gov/~scripts/nph-brs.exe?d=ORDF&s1=117487.cbn.&Sect6=HITOFF&l=20&p=1&u=/~public/cbory.htm&r=1&f=G>; See also Taylor Soper, *City of Seattle Looks to Expand Fiber Leasing Plan*, GEEKWIRE (Oct. 1, 2012 3:00 PM), <http://www.geekwire.com/2012/city-seattle-expand-fiber-leasing-plan/>

¹³⁹ SEATTLE DEP'T OF TRANSP., SDOT DIRECTOR'S RULE 2-2009: TELECOMMUNICATION FACILITIES IN THE PUBLIC RIGHT OF WAY, EXCLUDING UTILITIES POLES AND ATTACHMENT SPECIFICATIONS AND PROCEDURES (2009).

¹⁴⁰ Letter from Kirk R. Nelson, President of Qwest, to Grace Crunican, Director of SDOT (Mar. 13, 2009), available at http://www.uptun.org/wp-content/uploads/2013/09/03132009_qwest.pdf

routes, cut vegetation, and test poles to make sure they have not rotted from the inside. If a pole is found to have rotted, the provider must pay City Light to replace the poles.

These two regulatory burdens make it difficult for providers accurately to estimate either how much it will cost to improve service or how long the process will take. (They should not be getting in the way of builds by CenturyLink, however—that company owns many of the poles.)

Mayor Ed Murray, who took office in 2014, has said he will change these rules to make sure that Seattle's providers are able to expand their networks.¹⁴¹ Seattle's Office of Cable Communications is currently working with the city's Department of Transportation to change the Director's Rule to make it easier for companies such as CenturyLink to deploy the additional boxes they need to increase capacity. The Office of Cable Communications will send the proposed legislation to the City Council in June 2014.¹⁴²

Seattle also has an innovative ordinance that requires telecom companies to make their poles compatible with overlashing, lowering barriers to competitive entry. Overlashing enables a network provider to attach to utility poles without using extra space, eliminating make-ready costs and reducing construction costs to approximately \$13,000 to \$20,000 per mile.¹⁴³ The process allows utility pole attachments to be loaded with multiple fiber cables.¹⁴⁴ Companies are usually required to have a messenger wire that can support three different sets of wires.¹⁴⁵

C. History of Attempted Access Improvements in Seattle

In 2004, Philadelphia announced that it would provide free Wi-Fi across the city as part of a plan to rebrand Philadelphia as a technology center.¹⁴⁶ In an effort not to be left behind, the city of Seattle convened a futures panel to examine issues related to high-speed Internet access infrastructure,¹⁴⁷ and the city council created the Seattle Task Force on Telecommunications Innovation to examine a variety of different high-speed Internet access options: Wi-Fi, broadband over power lines, DSL, FTTH, and other access

¹⁴¹ Press Release, Ed Murray, *Seattle Must be a National Leader in Identifying Innovative Ways to Make High Speed Internet Available and Affordable to Anyone* (Apr. 9, 2014) available at <http://murray.seattle.gov/murray-seattle-must-be-a-national-leader-in-identifying-innovative-ways-to-make-high-speed-internet-available-and-affordable-to-anyone/>.

¹⁴² Perez, *supra* note 150.

¹⁴³ *Comments of the National Association of Telecommunications Officers and Advisors*, NATOA (October 28, 2009) <https://www.natoa.org/documents/NATOA%20Comments%20on%20NBP%20Public%20Notice%20%23%2012.pdf>.

¹⁴⁴ *Id.*

¹⁴⁵ *Id.*

¹⁴⁶ Bob Tedeschi, *Big Wi-Fi Project for Philadelphia*, N.Y. TIMES (Sept. 27, 2004), http://www.nytimes.com/2004/09/27/technology/27ecom.html?_r=0.

¹⁴⁷ Perez, *supra* note 150.

technologies.¹⁴⁸ The taskforce found that while Wi-Fi and wireless Internet access were useful, they were not a substitute for a fiber to the home network. This was a controversial opinion at the time, because fiber was also the most expensive option. “It turns out that they were right. Wi-Fi is great for portability, for offloading cell minutes, for mobility, other things like that. But it’s always going to be a complement to a robust fiber network that can provide a real, immersive experience of connectivity,” said Tony Perez, Director of the Seattle Office of Cable Communications.¹⁴⁹

Since the taskforce report was issued, Seattle's goal has been to have such a FTTH network by 2015.¹⁵⁰ The city developed requests for proposals seeking private partners to leverage the physical assets and staff expertise of the city to build a FTTH network, and received 28 responses (and interviewed ten companies).¹⁵¹ One of the key lessons the city learned from this process is that mere availability of a fiber ring does not provide enough incentive to bring last-mile fiber to the home providers to Seattle. The potential partners wanted the city to assume greater financial risk than the city was prepared to take on.¹⁵²

The city carried out additional studies to see how the business case for last-mile providers could be bolstered without forcing providers to cover their build-out costs across the city through initial subscriber revenues. The city also wanted to make the eventual network as useful and affordable as possible. According to one study, signing up every household in the city for FTTH (100% penetration) would cost \$700-800 million.¹⁵³ Perez believes the up-front cost for fiber in Seattle will be closer to \$200 million, based on “the holy grail” of 40% penetration.¹⁵⁴

On a separate front, while the logic behind investing in a free public Wi-Fi network was never fully explained, the city launched a test Wi-Fi program in a few chosen locations.¹⁵⁵ It quickly became apparent that the community Wi-Fi model would not solve the city’s problems, as usage tended to be dominated by people using the network for heavy-bandwidth applications that congested the available Wi-Fi spectrum.¹⁵⁶ Although the network served about 20,000 users at its peak, the city made the decision to not invest \$100,000 in upgrading the network and shelved it in early 2012.

The city has tried various public-private partnerships to lower the price and improve the quality of its Internet access. Seattle tried to persuade Google to bring fiber to

¹⁴⁸ *Id.*

¹⁴⁹ *Id.*

¹⁵⁰ *Id.*

¹⁵¹ *Id.*

¹⁵² *Id.*

¹⁵³ *Benefits Beyond the Balance Sheet: Quantifying the Business Case for Fiber-to-the-Premises in Seattle*, COLUMBIA TELECOMMUNICATIONS CORPORATION (Sept. 2009).

¹⁵⁴ Perez, *supra* note 150.

¹⁵⁵ Brier Dudley, *Seattle Pulls Plug on Its Broadband Network*, SEATTLE TIMES (May 6, 2012, 8:00 PM), http://seattletimes.com/html/business/technology/2018149915_brier07.html.

¹⁵⁶ Brian Heaton, *Free Community Wi-Fi Coming to an End in Seattle*, GOVERNMENT TECHNOLOGY (Apr. 27, 2012), <http://www.govtech.com/wireless/Free-Community-Wi-Fi-Coming-End-Seattle.html>.

the city, and made it onto Google's shortlist. But Seattle was not chosen. While Google has never disclosed why it did not choose Seattle, Seattle's former Chief Technology Officer Bill Schrier wrote a lengthy article describing Seattle's political roadblocks and regulatory burdens.¹⁵⁷ These problems included the previously mentioned Director's Rule and pole attachment requirements.

In December 2012, Seattle announced a partnership with Gigabit Squared to allow fundraising to bring a fiber network to Seattle that would be based on the city's existing fiber assets.¹⁵⁸ Gigabit Squared initially announced that it would begin service in 12 test neighborhoods by the end of 2013, but later scaled back to two test neighborhoods in 2014. The announced prices were competitive, ranging from a \$350 one-time fee for 5 Mbps for life to \$80 a month for symmetrical 1 Gbps—squarely in competition with Comcast's \$77 monthly fee for 50 Mbps.¹⁵⁹ However, Gigabit Squared was unable to find funding to support its operations and withdrew from the project, leaving an unpaid bill of over \$50,000.¹⁶⁰ The collapse also raised questions about why Seattle chose to partner with an unproven company that had never built a municipal network, especially one on the scale of Seattle's proposed network. The collapse also revealed problems on the government side, as the city was reportedly unable to provide timely accurate information about its fiber assets. To take accurate stock of its fiber assets, the city would have had to determine who owned which strands and how many strands were available, which would have been administratively burdensome.¹⁶¹ Many circumstances, importantly including Gigabit Squared's lack of capacity to execute projects or present a viable business plan, hampered Gigabit Squared's ability to raise money.¹⁶²

D. Municipal Fiber Network

Seattle has long been interested in creating its own municipal fiber network, stemming from the report the city commissioned in 2004. Several studies commissioned at the same time the Wi-Fi experiment was carried out supported the idea of a municipal network. One study that attempted to quantify the positive externalities of a fiber network found that the city would receive over \$1 billion in spillover benefits annually from such a network.¹⁶³

¹⁵⁷ Bill Schrier, *Four Reasons why Google Fiber will Never Come To Seattle*, GEEKWIRE (Mar. 4, 2014 1:49 PM), <http://www.geekwire.com/2014/commentary-four-reasons-google-fiber-will-never-come-seattle/>.

¹⁵⁸ Taylor Soper, *Mayor Mike McGinn Announces Plan to Develop "Ultra-fast Broadband Network,"* GEEKWIRE (Dec. 13, 2012 10:09 AM), <http://www.geekwire.com/2012/live-mayor-mike-mcginn-announces-plan-develop-ultrafast-broadband-network/>.

¹⁵⁹ Taylor Soper, *Blazing Fast Broadband on the Cheap: Pricing Unveiled for Seattle's Gigabit Internet*, GEEKWIRE (June 24, 2013 6:00 AM), <http://www.geekwire.com/2013/gigabit-squared-announces-pricing/>.

¹⁶⁰ Jon Brodtkin, *Gigabit Project in Seattle Reportedly Dead, Leaves Trail of Unpaid Bills*, ARS TECHNICA (Jan. 8, 2014 11:34 AM), <http://arstechnica.com/business/2014/01/gigabit-project-in-seattle-reportedly-dead-leaves-trail-of-unpaid-bills/>.

¹⁶¹ Perez, *supra* note 150.

¹⁶² Robert Kangas, *Clear the Air about Gigabit Broadband in Seattle*, UPTUN (Feb. 22, 2014), <http://www.uptun.org/2014/02/22/clear-the-air-about-gigabit-broadband-in-seattle/>

¹⁶³ COLUMBIA TELECOMMUNICATIONS CORPORATION, *supra* note 152.

Seattle is in an unusual position compared to most cities that investigate municipal networks as a solution to their access problems. Seattle has service that is good enough for many residents and has three major providers, although they generally do not compete in the same territories and the DSL entrant's ability to compete head-to-head with cable is constrained by the inherent transport capacity limitations of twisted-pair copper wires. Historically, this access picture has made galvanizing public support for municipal fiber difficult.

Former Mayor Mike McGinn made better Internet access an issue in his successful 2009 election campaign, but he was unable to deliver a solution. Councilman Bruce Harrell has also long cared about the issue of Internet access, including making a detailed version of possible municipal network solutions available on his website.¹⁶⁴ In early 2014, current mayor Ed Murray announced that he would support all options to improve Internet access in Seattle, including a municipal network. Mayor Murray has been working with city government to lower the barriers to deployment, including the cost of building a network and the time it would take to deploy it. "There are some things that we can do and some things we can't, but at least we want to get at what are these potential barriers, and whether these barriers are policy driven, operational, legal, financial, or other," said Perez.¹⁶⁵

As technology changes and everything moves towards over the top delivery, the demand for faster connectivity is growing. Whether a municipal network will become a reality in Seattle remains to be seen. Taxpayers may be unwilling to pay for increased service, or municipal fiber may remain prohibitively expensive. Leasing city dark fiber to competitive providers of high-speed Internet access appears to be the most practical solution for Seattle at the moment, although there has not yet been a great deal of demand to lease city fiber. As of mid-2014, wireless carriers and businesses looking to connect different buildings within the city are the main entities leasing fiber from Seattle.¹⁶⁶ Should the city be able to eliminate some of the regulatory burdens that make it difficult for a private company to build networks, it may be that the major providers in Seattle will be more interested in leasing Seattle's excess fiber.

Seattle is currently undergoing a political transformation. City council members used to be elected at large, which meant that their accountability to particular neighborhoods was limited. Beginning this year, seven of the nine city council members will be elected by particular districts.¹⁶⁷ This change may increase public ability to pressure city council members to care about improving high-speed Internet access in Seattle.

¹⁶⁴ Bruce Harrell, *Building "Next Generation" Broadband for Seattle: Why? How Much?*, (Mar. 29, 2010, 9:57 PM), www.bruceharrell.org/2010/03/building-next-generation-broadband-for-seattle/

¹⁶⁵ Perez, *supra* note 150.

¹⁶⁶ *Id.*

¹⁶⁷ Lynn Thompson, *Elections by District Mean Big Change for Seattle Council Members*, SEATTLE TIMES (Nov. 6, 2013 8:25 PM), http://seattletimes.com/html/localnews/2022206750_districtcouncilracesxml.html.