All WiFi Projects are Not the Same: a comparison of major community wireless plans

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We are witness to the birth of a new movement in communications: community development of broadband networks that, unlike private sector networks, are dedicated to maximizing access and meeting the needs of communities and citizens. Over the past two years, hundreds of community WiFi projects have been initiated and many have received considerable attention.

But it is important to note that this movement is in its infancy—and that most of the high profile projects are in the planning phase—they are years away from being fully operational. This uncertainty is not evident if one reads press releases and mass-media articles -- in fact, the hype around muni WiFi might lead one to reasonably conclude that a community can get ubiquitous, free broadband simply by calling Google or EarthLink. The reality is that each of the municipal Wi-Fi projects has required a detailed planning effort and in most cases has required a significant financial commitment.

Just as significantly, each municipal effort is unique and, ideally, is tailored to its community's specific needs. This article provides a brief comparison of the broad parameters for five WiFi projects that are either underway or in operation. These projects are the fruit of efforts by communities in Chaska, MN; Minneapolis, MN; Philadelphia, PA; Saint Cloud, Florida; and Saint Louis Park, MN.[1]

This comparison is intended to illustrate how each project is customized to meet local needs and values—not to recommend one approach over another. On the contrary, just because an approach is pursued by one community, does not mean it is appropriate for another. It is important to understand each project in the context of the community's goals and objectives.

By reviewing the models in this context, you can better understand what elements of the model might apply to your community. Your business and technology models must turn on *your* community's goals and objectives – not Philadelphia's or San Francisco's. This analysis aims to illustrate how the five different projects juggle the nuances and trade-offs required--and to encourage you to undertake a significant due diligence process to develop your own, customized strategy.

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[1] The author's analysis of these community's projects is based on personal experience with respect to some of them, and on review of contracts, media coverage, and other publicly-available data with respect to others. The author's comparative analysis of project drivers and motivating factors is based on his own analysis and opinion of the key documentation—and is not meant to suggest that the cities mentioned have explicitly cited these factors as drivers.

Identifying Your Meat and Your Gravy

That due diligence process would involve a number of key questions. First, what is the primary broadband need for your community? Why are you interested in public broadband? This is your key driver—let's call it the **meat** of the matter. Then, what are some of the other benefits you might get from broadband?—the ones that are nice but not essential and not motivating drivers. Let's call these the **gravy**.

Table 1 shows the primary drivers (the meat) and secondary benefits (the gravy) for each of the sample communities. A review of each project suggests the meat in Minneapolis is public safety communications needs; Saint Louis Park and Chaska are driven by a need for public, retail broadband services; Philadelphia's drivers are digital inclusion and public-facing, retail services; and Saint Cloud is primarily motivated by economic development and the need for retail services to the public. The other benefits are pure gravy.

Table 1: Meat or Gravy

	Chaska MN	Minneapolis MN	Philadelphia PA	St. Cloud FL	St. Louis Park MN
Digital Inclusion	Gravy	Gravy	Meat	Gravy	Gravy
Economic Development	Gravy	Gravy	Gravy	Meat	Gravy
Public Safety Communications	Gravy	Meat	Gravy	Gravy	Gravy
Internal City Communications	Gravy	Meat	Gravy	Gravy	Gravy
Retail Service	Meat	Gravy	Meat	Meat	Meat

Evaluating Public Safety and Other Government Applications

Another area of inquiry concerns whether to engineer the network to serve government needs as well as public needs. Each community chooses to prioritize public safety, internal city communications, and public broadband services differently. For example, Chaska, Philadelphia, and Saint Louis Park are leveraging WiFi for internal government communications requiring mobility (such as field inspectors). They are not focused on public safety applications, likely because the WiFi (2.4 GHz unlicensed spectrum) technology may not be secure or reliable enough for first responder (public safety) needs.

In contrast, Minneapolis' planned network uses a licensed frequency and a proprietary interface–resulting in a high level of security for sensitive, public safety, data transfers—clearly, this is the meat of Minneapolis' program. However, because of the nature of the proprietary 4.9 GHz approach, it is likely the solution will not result in *ubiquitous* coverage. Minneapolis will likely need to continue to use EvDO or another carrier technology to fill in the coverage gaps of the new 4.9 GHz network.[2]

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[2] The technology may not provide ubiquitous coverage in Minneapolis. This is not to say it cannot--coverage is a function of the number of radios deployed, the height of the radio mounting, the type of antennas used, and other factors. Minneapolis plans on 90 percent coverage for retail services using the 2.4 GHz band, and it appears the 4.9 GHz public safety radios will be co-located with the 2.4 GHz retail service radios. From an engineering standpoint, 2.4 GHz generally covers a greater area than 4.9 GHz; as a result, when radios for the two networks are collocated, there can be 4.9 GHz coverage gaps (see Figure 1).

Saint Cloud's use of the network for internal city communications is not defined, but the deployment appears well suited to support inspectors and other mobile workforce needs. As in the case of the other communities, mobile workers traveling outside city boundaries will need to use a supplemental wireless technology.

Tables 2 and 3 categorize and compare the public safety and internal government communications factors.

Table 2: Public Safety Communications Support

	Chaska MN	Minneapolis MN	Philadelphia PA	St. Cloud FL	St. Louis Park MN
Public Safety Communications	VPN over unlicensed 2.4 GHz WiFi	Licensed 4.9 GHz WiFi	VPN over unlicensed 2.4 GHz WiFi	VPN over unlicensed 2.4 GHz WiFi	VPN over unlicensed 2.4 GHz WiFi with possible upgrade to licensed 4.9 GHz WiMax
	Standard based CPE	Proprietary CPE	Standard based CPE	Standard based CPE	Standard based CPE
	Coverage ubiquitous in majority of Chaska	Coverage may not ubiquitous in Minneapolis	Desires ubiquitous coverage in Philadelphia	Coverage ubiquitous in majority of St. Cloud	Ubiquitous coverage planned in majority of St. Louis Park
	Coverage not ubiquitous in Minneapolis/St. Paul Metropolitan Area	Coverage not ubiquitous in Minneapolis/St. Paul Metropolitan Area	Coverage not ubiquitous in Philadelphia Metropolitan Area	Coverage not ubiquitous in Orlando Metropolitan Area	Desires coverage in surrounding communities.
	Supplement with EvDO or other technology?	Supplement with EvDO or other technology?	Supplement with EvDO or other technology?	Supplement with EvDO or other technology?	EvDO used today

Table 3: Internal City Communications

	Chaska MN	Minneapolis MN	Philadelphia PA	St. Cloud FL	St. Louis Park MN
Internal City Communications	VPN over unlicensed 2.4 GHz WiFi	VPN over unlicensed 2.4 GHz WiFi	VPN over unlicensed 2.4 GHz WiFi	VPN over unlicensed 2.4 GHz WiFi	VPN over unlicensed 2.4 GHz WiFi
	Standard based CPE	Standard based CPE	Standard based CPE	Standard based CPE	Standard based CPE
	Coverage ubiquitous in majority of Chaska	Desires ubiquitous coverage in Minneapolis	Desires ubiquitous coverage in Philadelphia	Coverage ubiquitous in majority of St. Cloud	Ubiquitous coverage planned in majority of St. Louis Park
	Coverage not ubiquitous in Minneapolis/St. Paul Metropolitan Area	Coverage not ubiquitous in Minneapolis/St. Paul Metropolitan Area	Coverage not ubiquitous in Philadelphia Metropolitan Area	Coverage not ubiquitous in Orlando Metropolitan Area	Coverage not ubiquitous in Minneapolis/St. Paul Metropolitan Area

Balancing Criteria that Enhance the Network—But May be Costly

Part of planning a wireless broadband project is determining how robust and reliable it needs to be. Most community WiFi networks are unlikely to be as reliable as carrier networks unless they are engineered—at some cost—to achieve that reliability. For example, each community must determine whether it is important that the network be widely available during power outages—a function that requires backup powering of every radio in the network. In the case of Chaska, Minneapolis, Philadelphia, and Saint Cloud, portions of their WiFi networks are not operational during power outages because not all the WiFi radios are equipped with back-up power. In the case of Saint Louis Park,

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Given the 90 percent planned coverage of Minneapolis' 2.4 GHz radios and the propagation differences, the coverage for the 4.9 GHz public safety network may have a smaller footprint.

all radio nodes are solar-powered with battery backup, enabling continued operation during brief and extended power outages (up to five days).

Another key – and costly -- design choice that the planning community must make is whether to build fiber optics for backhaul. Fiber or partial-fiber backhaul boosts the capacity of a network and allows greater speeds and more use. But the tradeoff is that building fiber can be very costly. Each community makes the decision about that high expense to suit its own requirements. Philadelphia, Minneapolis, and Saint Cloud use wireless backhaul only; Saint Louis Park and Chaska use a combination of wireless and fiber backhaul. The fiber enables higher speed government services (for such city entities as schools or libraries) and enhanced commercial products (such as 100Mbps or greater speed to selected users).

Determining What Kind of Retail Offering a Community Needs

The parameters and reach of the public-facing broadband service is another key question communities must determine in the early planning phase. Chaska, Philadelphia, and Saint Louis Park all appear to prioritize creating opportunity for nearly all households to be able to participate. To facilitate participation, these projects put in place mechanisms to guide subscribers in acquiring service and to assist them with making complex hardware (particularly consumer premises equipment, or "CPE") function to activate their connection. This strategy comes at a cost, but it also facilitates the goal of maximizing participation.

The Minneapolis model (which, as discussed above, prioritizes public safety over the public offering) provides a lower coverage area, and the retail provider is not planning on high customer interaction. In other words, if the service does not easily work for a given customer, there is likely to be limited support from the provider—an approach designed to maximize provider revenues. The Saint Cloud model, while providing a large-coverage footprint, does not offer traditional help-desk support. Rather, Saint Cloud offers workshops to educate the consumer, and has arranged for retail outlets to sell the CPE required for activation and installation support.

Each model, with the exception of Saint Cloud, prices the basic level (for an always-on one Mbps connection) in the $20 range. In addition to the monthly service fee, each of the models will likely require the consumer to lease or purchase CPE to access the network indoors.

Determining How to Address Digital Inclusion

Some but not all community broadband projects are motivated by digital inclusion considerations, and the multiple approaches to this issue are evolving. From the first, the Philadelphia planners cited digital inclusion as their motivator and Philadelphia has selected and published eligibility requirements for reduced cost service for certain residents (the criteria are listed at www.wirelessphiladelphia.org). Minneapolis also has criteria for low-cost service. Chaska does not have an explicit digital inclusion strategy,

while Saint Cloud offers a free service that appears to be focused on affordability and accessibility for all citizens. In a completely different approach, Saint Louis Park does not require a low cost service, but is considering a voucher or other programs for low income households. Minneapolis, Philadelphia, and Saint Louis Park are all evaluating using network revenues to assist education, training, and equipment digital inclusion efforts.

Table 4 summarizes the retail offerings and digital inclusion components.

Table 4: Retail Offerings and Digital Inclusion Programs

	Chaska MN	Minneapolis MN	Philadelphia PA	St. Cloud FL	St. Louis Park MN
	98% Coverage	90% Coverage	95%+ Coverage	95%+ Coverage	98% Coverage
Retail Service	Experienced nearly 100% of subscribers require a high power CPE	Anticipates that approximately 10% of subscribers require a high power CPE	Anticipates that 90%+ of subscribers require a high power CPE. Supply of CPE determined by the ISP.	Customer responsible for supplying a high power CPE.	Anticipates that close to 100% of subscribers require a high power CPE.
	Experienced a substantial percentage of customers require an external antenna (actual percentage not provided).	Does not anticipate external antenna installations.	ISP responsible for determining if external antenna is required.	Customer responsible for determining if external antenna is required.	Anticipates that up to 10% of customers require an external antenna.
	Served over 2,500 paying subscribers with a city-wide WiFi network for almost 3 years	Served 5 non-paying subscribers in the initial pilot.	A pilot is in process. Selected subscribers in a pilot covering a 14 sq mile area.	Have over 8,400 registered users. It appears that a household can have multiple registered users.	Served 300 paying subscribers during a 6 month WiFi network pilot.
	Set Price	Price Influence	Price determined by ISP	Free Service	Price Approval
	Chaska Provided	Provider Branded	Provider Branded	St. Cloud Branded	St. Louis Park Branded
	5 year business model	10 year business model	5 year business model	5 year business model	5 year business model
	Designed to supply a low-cost high-speed alternative that all households have the opportunity to subscribe to. 1 Mbps service at $16 per month.	As a basic tier, offer a 1 Mbps $20 per month service to residents. Price fixed for a 10 year period.	As a basic tier, offer a 1 Mbps $23 per month service to residents.	Designed to supply a free high-speed alternative that the majority of households have the opportunity to subscribe to.	Designed to supply a low-cost high-speed alternative that all households have the opportunity to subscribe to. 1 Mbps service price at $20 per month.
Digital Inclusion	Uncertain on approach or considerations.	$10 per month 128 kbps service to identified low-income neighborhoods. A "walled-garden" free access is also available.	$10 per month high-speed service to eligible households. Free cash flow used to address training and hardware availability. In addition, each district will have a designated zone for free access.	Free Service	Focus on education and provision of refurbished PC's donated by the city, schools, and private sector. Future considerations include use of excess cash flows to address training, hardware availability and issuance of vouchers for low-income households.

Evaluating Business Models and Ownership Structures

Perhaps the most crucial decision for any broadband project is that of the business model because the choice of whether to own the network affects the cash outlay and risk for each city. Mass media coverage of these projects seldom recognizes that each community develops its own, particularized model to meet its own needs—and that neither the models nor the desired outcome are the same with respect to each project.

Minneapolis, for example, has a payment rather than investment model for its network. The city has guaranteed payments to the network owner/operator, US Internet. The estimated payments are $2.4 million upon contract signing, and $1.3 million each year for 10 years. In return, the city receives access to the network for public safety and internal government communications.

Like Minneapolis, Philadelphia does not have a direct investment in the network. Rather, the network will be owned by EarthLink. The city did assist in funding of the business plan and other planning activities. In addition Philadelphia has agreed to be an anchor tenant, purchasing approximately $3.8 million[3] in services over the first five years of operation.

In contrast, Saint Cloud invested approximately $2.4 million to deploy a city-owned network. In addition, the city pays annual fees to HP to operate and maintain the network. The city believes residents will spend locally the money they save on communications services, increasing taxes and other city revenues. Saint Cloud feels that these increased revenues will offset the city's investment and operating costs.

Saint Louis Park's business model is also for city ownership. The city has an initial investment (capital and operating expenses) of $3.3 million. Year two will entail $400,000 annual operating and interest expenses and that amount will decline to $300,000 in year five (decline due to interest expense), for a total commitment of $5.3 million over a five-year period. In return for use of the network, Saint Louis Park receives $14 per month per subscriber from the network operator, Unplugged Cities. The city believes that the revenues from Unplugged Cities will pay back the city's investment. Unplugged Cities also has responsibility for operating and maintaining the network.

Table 5 summarizes business models, financing mechanisms, partners/contractors and deployment status.

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[3] Estimated from the Wireless Philadelphia Business Plan, February 9, 2005.

Table 5: Business Model & Status

	Chaska MN	Minneapolis MN	Philadelphia PA	St. Cloud FL	St. Louis Park MN
Business Model	Retail Service	Anchor Tenant - Discounts when other communities join program	Non-Profit Ownership, with City as an Anchor Tenant	Economic Development	Private-Public Partnership
Financing	Municipal Bonds, debt service covered with revenues from Internet service.	US Internet is seeking financing (may be a combination of debt and equity).	Grants, donations, and loans. Debt service covered with lease fees paid by the ISP.	Estimated that a portion of the household savings will be spent in local economy, thus increasing tax and other revenues to the City. It is estimated that the revenues from the "dollar churn" will offset the implementation and operational costs of the net	Municipal Bonds, debt service covered with lease fees paid by the ISP
Wireless Network Ownership	Chaska	US Internet	Wireless Philadelphia/EarthLink	St. Cloud	St. Louis Park
WiFi Vendor	Tropos	BelAir	Tropos	Tropos	Proxim
Partners or Key Contractor	Siemens	US Internet	EarthLink	HP	Unplugged Cities
Status	Operational	Implementation	Pilot	Operational	Implementation
Activation	4Q 2004	3Q 2007	3Q 2007	1Q 2006	2Q 2007
Population (2005 US Census Estimate)	22,820	372,811	1,463,281	22,508	43,296
Area (square miles)	14.3	58.4	135.1	9.2	10.9
Population Density (per square mile)	1,596	6,384	10,831	2,447	3,972

This article began with the plea that each community evaluate press-releases, case-studies, anecdotes, and other media coverage in context of their own situation and objectives—rather than assuming as workable for them models that were developed for other communities. To illustrate why this is important, let's take Minneapolis and Saint Louis Park, two communities in the same metropolitan area that have selected dramatically different models. Clearly, Minneapolis has planned and negotiated an arrangement it feels is equitable and meets its objectives. What happens if we apply the model to Saint Louis Park?[4]

Basing the payments Minneapolis makes under its agreement with the network owner/operator (US Internet) on the ratio of geographic size between Minneapolis and Saint Louis Park (ratio of five, 55 versus 11 square miles), Saint Louis Park would pay US Internet $480,000 up front and $260,000 per year for the next 10 years, or a total commitment of over $3 million. This is 56 percent of the commitment required for Saint Louis Park to own its own network under its model.

Applying the Minneapolis model once again, Saint Louis Park would obtain access to the network for public safety and internal government uses. Anticipated coverage is 50 percent to 60 percent of the community and Saint Louis Park would need to acquire new cards for each device needing access. This coverage level does not meet Saint Louis Park's needs for public safety wireless throughout the City and in surrounding communities. In addition, the plan does not provide for fiber that would enable advanced services and very high speed applications—these are key goals of Saint Louis Park.

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[4] Disclosure: the author serves as business and technical consultant to Saint Louis Park on its public broadband project. This analysis of the city's purposes is based on data he collected and analysis he conducted during the course of that work.

Under the model, US Internet would provide service to residents, including a subsidized service to low-income neighborhoods, but the planned public coverage of 90 percent does not meet Saint Louis Park's 100 percent goal. In addition, the model for customer service interaction in the Minneapolis agreement (low levels of support to make the service functional for individual users) does not meet Saint Louis Park's goal to enable all residents to participate.

Clearly, applying the Minneapolis model to Saint Louis Park does not meet Saint Louis Park's goals and needs. The reverse is also true. The clear lesson is that a successful project examines that community's goals, objectives, and unique conditions and designs a tailor-made solution. Choose your path based upon the unique conditions of your community – not based on the attention given someone else's strategy.