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1. WiFi Industry Perspectives and Business Models

Municipalities have discovered that encouraging a provider to deploy a City-wide WiFi network is not as simple as contacting Google or EarthLink. These providers and others launch municipal WiFi systems only when projected operating margins show a sufficient rate-of-return on the investment – often enabled by guaranteed payments to the WiFi provider from an Anchor Tenant, the municipality.

The projected rate-of-return for a City-wide WiFi network is different for every market. The many factors that influence the rate-of-return include coverage requirements, cost to deploy the WiFi network, projected equipment life, potential market size and demand, and operational costs such as pole attachments, marketing, and maintenance.

In most communities, the projected operating margins for City-wide WiFi networks are relatively low. As a result, private providers seek to maximize the use of existing City assets to significantly reduce both the initial and the reoccurring operating costs of a WiFi network. These City assets include any available community resource that increases operating margins by:

1. Reducing operating costs such as pole attachment fees, energy fees, customer acquisition, and maintenance.
2. Reducing the required investment to deploy the WiFi network.
3. Increasing the number of anticipated consumers without lowering per customer margins.
4. Increasing the provider's net cash flow by obtaining anchor tenancy commitments from the City.

An anchor tenant commitment is the most common approach currently used by municipalities to encourage a provider to build and provide a municipal WiFi network. The anchor tenant commitment provides substantial guaranteed cash-flow to a private provider in exchange for municipal use of the network. This increases the ability of the private provider to obtain required capital to deploy a WiFi network in the community, and increases the projected operating revenues of the business. Often, in conjunction with anchor tenancy, the municipality adds digital inclusion requirements.

In developing a provider attraction strategy the following considerations are important:

1. Available City assets that the City and provider can leverage. The breadth of assets include; mounting facilities such as lamp posts and traffic lights, support from economic development, promotion of services to local residences or businesses, and others assets that improve the profitability of the WiFi business.
    - Leverage of the City asset reduces operating costs and the required investment for a City-wide deployment.
    - Leverage of the City brand name reduces customer acquisition costs.

2. The level of control or influence the City requires. Attributes to identify include: availability of service (percent of all households, percent of outdoor, etc), price and service levels, requirements for installation at consumers, and other factors that influence the consumer experience.
   - Private investors tend to pursue the "easy to reach consumers first, a City-sponsored deployment needs to ensure all citizens have an opportunity to acquire service.
   - The market for WiFi is for a high-speed low-cost (under $25 per month) alternative to dial-up.

3. The level of political risk the City is willing to absorb.
   - Municipal WiFi is in an early development status and most business models are untested. A City-wide deployment faces many challenges – both technologically and financially.

4. The roles the City supports in promoting the WiFi network including assistance with sales and marketing support of advertising in existing publications, and seeking anchor tenant commitments from area businesses.
   - Leverage of existing communication channels reduces costs to obtain customers and increase awareness of the WiFi offering.
   - The success of the WiFi business hinges on the market share gained.

5. The digital inclusion goals and objectives, including coordination with other agencies in the community.
   - Digital inclusion is more than a simple equation of access and affordability. Digital inclusion efforts require attention to other components such as user training, hardware access, and other elements.

Pricing plays a key role in the development of a venture into broadband Internet service provision. The success of a WiFi business hinges on the percentage of market share gained. We foresee little problem encouraging residential high-speed subscribers to switch to this service; they will essentially receive the same (or better) service at a lower price.

The key factor is the participation of dial-up users, because they are less likely to be concerned with speed of access. Their service provider decisions are largely based on price, and their perception of ease of use. To successfully attract participants from this group; the provider may need to employ a cost leadership position strategy. This involves slightly undercutting the monthly prices of national dial-up providers and marketing the product as a lower cost and better quality service. Survey results and market experience indicate that the ideal WiFi price point is between $20 and $25 per month.

Low-end pricing of this service is so critical. The WiFi provider must be conscious of attempting to “do too much.” The revenue per customer is such that there is little room for large expenses. The provision of unnecessary or extravagant services quickly erodes

net income and cash flow. The market positioning of this service is designed to provide essential high-speed Internet to residential and small business users.

While negotiating with a potential provider, it is important to understand that the private and public sectors have conflicting objectives. The private sector's objectives are to maximize revenues. They seek to keep capital investment to a minimum, steer clear of serving hard-to-reach consumers, shift expenses to consumers, deploy a lower density of wireless access points, and charge consumers for installations. The public sector objective is to maximize participation by ensuring all households have an opportunity to participate in an affordable and equitable manner.

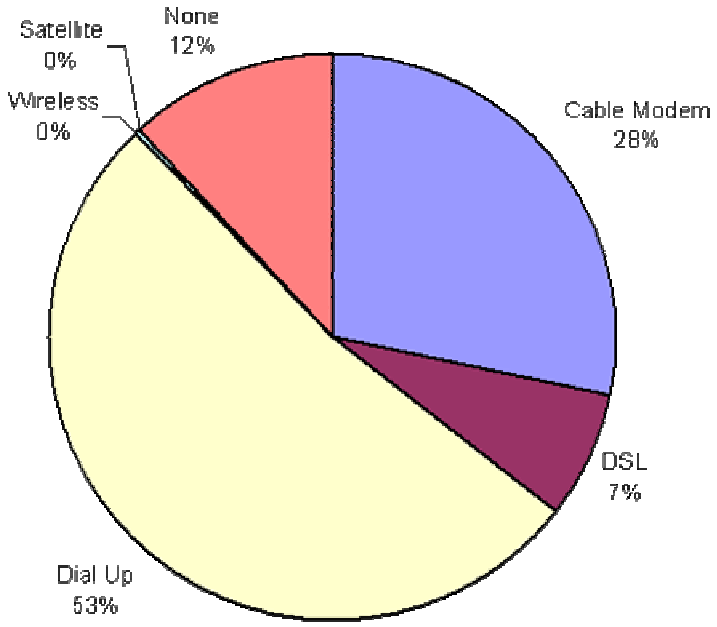
1.1 WiFi Internet Users

Understanding the dial-up and non-Internet market today is critical for a City-wide WiFi project. Figure 1[1] shows that the majority of households subscribing to WiFi – previously had dial-up or no Internet access.

These results illustrate that the most attractive market for a WiFi provider are communities that have a low penetration of cable modem and DSL.

[1] Based upon results reported in Moorhead, Minnesota. Results from other communities are similar with the download speeds of WiFi compared to obsolete modem service. Dial-up users on the other hand are ecstatic with the performance.

Figure 1: Internet Connection Before Switching to WiFi



1.1.1 Consumer Expectations

For residential consumers, we observe significant differences between importance and satisfaction for price of their Internet service and their connection speed. When this is a factor it often indicates a market opportunity for a low-cost, high-speed service. It is however important to recognize that perceptions of connection speed vary from consumer-to-consumer. As indicated, experience shows that consumers that switch from dial-up to a 1 Mbps WiFi service are ecstatic about the performance, while previous cable modem users are generally dissatisfied with the download speeds. Using data obtained from the Ames 2007 Citizens Satisfaction Survey we estimate that approximately 73[2] percent of Ames residents have high-speed Internet today. Therefore offering a higher tier connection speed (2.5 Mbps or greater) is important.

The gaps between importance and satisfaction are often greater for business users. We typically observe significant gaps for speed, price, reliability, and security. In addition to

[2] 84 percent of Internet users with high-speed and 87 percent of residents with Internet which nets 73 percent of all residents with high-speed

the speed perception indicated above, marketing efforts for business users need to specifically address reliability and security attributes of WiFi.

1.1.2 DSL Availability

The report from the Pew Internet and American Life Project[3] indicates that DSL overtook cable modem service as the most widely used residential high-speed access in 2006. The Pew Report indicated that DSL accounted 50 percent of the residential high-speed market, while cable modem accounted for 41 percent. The Pew Report indicated that substantial prices cuts accounted for the gains seen by the DSL providers. The Pew Report is not without controversy. Another research firm, Leichtman Research Group Inc., disputes the data. The latest findings from Leichtman Research Group claim that cable modem use still leads high-speed with a 52 percent share, compared with DSL's 46 percent.

Regardless of which survey provides the most accurate snapshot, the gains made by DSL providers are impressive. As indicated in the Pew Report, the gains have been initiated by aggressive pricing and tiered service offerings which give consumers more choices. However, The Pew Report appears not to consider another key factor – whether DSL is available at a given consumer location. Our survey findings and competitive analysis in other communities have shown that where DSL market share is low, DSL availability is limited or has spotty coverage. DSL availability varies widely from community-to-community. Since it appears that the surveys did not take DSL availability into consideration the differences in the survey results is expected In other words if the two surveys did not factor in the variations in DSL availability, differences in the survey findings are expected.

1.1.3 Factors Impacting Residential Internet Use

Our survey results in other communities identify key factors impacting computer ownership and acquisition of high-speed Internet service.

1. Income: We often observe a 2 to 1 difference in having high-speed Internet at home between low-income and high-income households. Computer access has a similar pattern, but a reduced ratio (70 percent vs. 100 percent).

2. Age of the person responsible for paying household bills: Households having a computer at home dropped considerably for respondents over 65. Having high-speed Internet at home declined as age increased.

[3] May 28, 2006, http://www.pewinternet.org/PPF/r/184/report_display.asp

3. School aged children at home: We observed a slight increase of computer ownership and having high-speed Internet access for households with school age children as compared to households without school age children.

1.2 Business Model Considerations

This section summarizes key elements of potential business models for a City-wide WiFi network and provides a comparison of municipal WiFi projects.

This section examines several elements that are used to develop a municipal–specific unique business model. The elements described are applicable for either a City-owned, or a private investor network.

1.2.1 Summary of Potential Business Model Elements

Municipal WiFi business models are based upon community objectives, legislative considerations, mitigation of risk, financial objectives and other considerations. A successful model examines a community's unique goals and objectives and bases the approach on a consensus of needs for both the community and potential partners.

The first decision point in development of the business model is determination of the network ownership. After this determination is made the rest of the business model elements can be decided upon.

As discussed previously, in most cases in order to obtain a City-wide WiFi network a substantial financial commitment is made by the municipality - either as an anchor tenant or in network ownership. The exception to this was San Francisco in which EarthLink and Google offered to deploy a WiFi network at no cost to the City without any anchor tenant commitments. EarthLink's offer however was not pursued by San Francisco.

The following paragraphs detail elements that are commonly used to develop a particular WiFi business model (anchor tenant, community branding, community operations, digital inclusion, economic development, ISP competition, open access, private enterprise, public-private partnerships, and universal access). The elements are not mutually exclusive, and in practice, the actual business models use a combination of these elements.

Anchor Tenant: The City encourages a private entity to build, operate and maintain the network by agreeing to purchase capacity for public service and some public safety applications. This is the key element of the model used by Minneapolis, Minnesota and Philadelphia, Pennsylvania.

- Principles: The City fulfills internal needs using a WiFi network but does not want to own or operate the network. In addition, the City may also desire that

residences and businesses have an alternative low-cost high-speed Internet access option.

- Financing: The Anchor Tenant element uses general operating budget funds to meet the city's obligations. Grants may cover some of the public safety functions costs.
- Primary Objective: To assist the provider with financing by guaranteeing an investment in the system and providing a fixed-source revenue stream. Given the magnitude of the financial commitment, the municipality is allowed to influence some aspects of the network such as capacity, coverage, and performance.

Community Branding: For new market entrants, one of the highest expenditures a company expects to make is creation of name recognition and branding. In this element, the City allows a private WiFi provider to use the City name to market the service. The consumer perception of the credibility of the service is often increased with us of the City name. Both the City of Aurora, Illinois and the St. Louis Park, Minnesota projects use community branding in their business model.

- Principles: Obtaining market share is very expensive for new market entrants, and becomes a barrier to market entry for companies offering low-margin services, such as WiFi. Community branding may increase market share, reduce initial marketing expenses, raise the projected rate-of-return and lower the market entry barrier for new provider entrants into the market.
- Financing: This element often does not require municipal resources over and beyond allocating space in routine municipal publications and communications. Issuing targeted or specialized communication requires covering incremental costs with existing or expanded operating budgets.
- Primary Objective: Provide familiarity and credibility with the service provider to raise the consumers' comfort–level with contracting for the service. With municipal support, the provider can reduce marketing expenses and increase net contribution margins. Ensuring that the City's brand image is maintained is critical if this element is used in the business model.

Community Operations: The municipality builds the network to increase or expand upon services and programs. The network provides voice and data service to municipal employees for use during the work day. Although the network is not marketed to residents, the spare capacity can be allocated for residential access. Oklahoma City, Oklahoma uses their network for community operations.

- Principles: The City implements a WiFi network to provide cost-effective communications support for city operations. Remote access to files, report writing programs and GIS applications increases efficiency. The City is able to improve upon and/or expand services by permitting employees in the field access to City databases.

- Funding: Funding for this initiative is generally allocated from general operating budgets.
- Primary Objective: To maximize efficiency, reduce the need to re-enter handwritten field reports into the computer, permit field personnel access to GIS information and municipal databases, and to reduce overall staffing costs. The municipality is also able to expand upon services and programs that rely on in-the-field digital access (building permit approvals, occupancy permit processing, Fire Department inspection, social service files, etc).

Digital Inclusion: The municipality provides access in a City-wide or selected geographic area to assist in closing the Digital Divide by providing universal, affordable access to the community. This element also requires attention to the other components of the Digital Divide including education, training, and equipment. Many agencies (schools, job training agencies, etc.) provide computer training. To reduce duplication of efforts, coordination between other community agencies is important. The Philadelphia and Minneapolis models contain digital inclusion elements.

- Principles: Affordable high-speed access is an essential service to citizens. Those with high-speed access can participate in online services and programs; those without high-speed access are left behind.
- Financing: Digital inclusion programs are funded through traditional revenue sources as well as through grants and Community Development Block Grant (CDBG) funds.
- Primary Objective: To provide a means to ensure equal access to the electronic world. Equipment costs have decreased and educational initiatives that provide computer training are on the increase. The Divide is increasingly seen as resulting from the consumer's inability or reluctance to pay monthly access fees; therefore, newer digital divide initiatives focus on reducing or eliminating monthly access fees.

Economic Development: An investment in the future is the focus of this model element. The municipality builds the network to provide affordable access for residents and businesses. The difference between this attribute and the Universal Access attribute is the inclusion of the small business sector and an emphasis on job creation and economic growth. This is a secondary attribute of the St. Cloud, Florida model.

- Principles: The City seeks to encourage both businesses and residents to relocate to the community by providing an essential service at an affordable cost. Upgrading the community's communication infrastructure is important to component of attracting "cutting edge" or "high tech" businesses to the area.
- Financing: Revenue sources are similar to Universal Access including assessment funding, general obligation bonds, user-based fees or allocations from the general

fund. In addition, depending on the project, special assessments in the form of an incrementally-based payoff period are a potential financing source.

- Primary Objective: The project promotes community growth and development of both traditional and new businesses. A projected increase in tax revenues offsets the initial network investment and on-going day-to-day operational costs.

ISP Competition Model: The municipality builds the wireless network and markets the service. They act as a utility provider and increase staffing levels to cover technical, sales, operational, and maintenance functions. In order to insure sufficient market share is obtained to reach a break-even cash flow, marketing the service is critical. Network performance, supplemental services and degree of technical support are established and clearly defined. Residents will judge the system by the degree of network reliability and customer service support.

- Principle: Since existing high-speed and broadband options are not meeting the needs of all residents and businesses in the community, the City steps in to provide a cost-effective service.
- Financing: The City makes an initial investment to build the system and market the services. The revenue stream from customers of the service pays for the maintenance and further system enhancements. Financing the network deployment is likely to require use of secure bonds – such as general obligation bonds.
- Objectives: To bring universal high-speed access to the community and promote competition in the marketplace. The City realizes at least a breakeven cash flow sufficient to support continued operation and development of the system. Customers are satisfied with the service – its reliability and speed. More residents and businesses switch to high-speed and prices for access decline.

Open Access: The municipality deploys a ubiquitous broadband network to connect residences and businesses. The municipality then leases the network to multiple private sector service providers that in turn deliver retail services to the residences and businesses. The City of Boston's recently announced plans may evolve to contain open access elements. The City of Seattle is attempting to spur development of an open access Fiber-to-the-Premises (FTTP) network

- Principles: To entice businesses to invest in the community the barriers to entry must be minimized. Retail providers are constrained by the high initial investment needed to build a broadband network. A municipal network shifts the private provider's focus to a retail service model by removing issues associated with network investment and operation.
- Financing: The Open Access Model can consider use of: special assessments, revenue bonds, general obligation bonds or general operating funds. Financing payments are offset by lease fees charged to the retail providers.

- Primary Objective: Provide competitive choice in high-speed service for all residents and businesses by removing a formidable barrier to entry. New retail providers enter the marketplace, offering greater customer choices.

Private Enterprise: Broadband accessibility is determined by private companies responding to their perceptions of the market. Municipalities adopt a "laissez faire" approach and rely on private companies to build and operate networks and provide services.

- Principles: Public entities should not compete with private companies for the provision of goods and services.
- Primary Objective: Let the market determine the availability of goods and services in a community.

Public/Private Partnership: A public entity collaborates with one or more private companies to build the network and/or provide services. The partner either supports components of the ISP or acts as a network leasing agent. Examples of this element used in business models are Moorhead Public Service, Moorhead, Minnesota and the City of St. Louis Park, Minnesota

- Principles: A public/private partnership makes sense when both sides of the partnership have significant items to contribute to the project. This element leverages to core competencies of each party. Municipalities tend to deal with infrastructure effectively whereas Internet Service Providers are versed in the delivery and support of retail services.
- Financing: The financing for this model depends upon the contributions of the municipality. For instance, access to poles, conduit and facilities are invaluable municipal assets that can be contributed at little to no municipal cost. The municipality could build the network and contract with a private company to operate and maintain the network in exchange for a portion of the revenues. In this case, funding the network infrastructure is from general obligation or revenue bonds.
- Primary Objective: To provide a universal access network by capitalizing on the assets each partner brings to the project. It relies on the strengths of each partner to integrate operations.

Universal Access: This element provides free ubiquitous wireless access to residents. A subset of universal access is deployment of WiFi in targeted (hot-spots) in outdoor or indoor public areas. The hot-spot approach is the lowest cost and the most popular approach by municipalities' to-date. The City of St. Cloud, Florida used Universal Access as the foundation for their City-wide wireless project.

- Principles: The general public is beginning to view universal high-speed access as an essential service. In the past, local government took a role in bringing essential services such as roads, water, and sewer to the community. Pooling or aggregating resources from citizens to provide essential services takes advantage of economies of scale and reduces costs paid by citizens for connectivity access. This business model element assumes that these citizens will use savings to acquire other goods and services which in turn stimulates the local economy.
- Financing: Revenue sources include assessment funding, general obligation bonds, user-based fees or allocations from the general fund.
- Primary Objective: To provide the residents of the community with free access to high-speed access so that they can take advantage of online resources, pursue opportunities in education, commerce, etc. The project facilitates citizen's future success in the "new digital economy."
- Secondary Objective: Provide access to area visitors so that the city is a more attractive destination for those needing online access. The local economy is rewarded when visitors purchase goods and services in the area.

The elements above are not mutually-exclusive. Multiple elements will need to be applied to develop a unique model which matches the City of Ames's unique goals and objectives.

1.3 Comparison of WiFi Projects

Municipal WiFi projects have common elements; however, specific components of the projects need to consider individual community needs. This section provides a brief comparison of five communities that have or are in the process of a WiFi implementation.[4] We examine projects in the following five communities:

- Chaska, Minnesota
- Minneapolis, Minnesota
- Philadelphia, Pennsylvania
- St. Cloud, Florida
- St. Louis Park, Minnesota

Please note that this section is not structured to provide a recommendation of one approach over another. When comparing the projects, it is important to review them in context of community goals and objectives. Each community has gone through a due diligence process and made educated choices based upon specific needs. By reviewing the approach in this context, you can better understand what elements of the model might apply to your situation. The drivers of the business model, technology, and other

[4] Information for this article is based upon our experience, discussions with vendors and municipal representatives, attendance at various seminars and conferences, and day-to-day review of various articles published in newsletters and the web.

attributes are unique community goals and objectives. Comments regarding the attributes of a given approach are intended to help the reader understand some of the nuances and trade-offs that are required in developing a strategy.

1.3.1 Primary Drivers

Table 1 shows the primary drivers (let's say the "meat" or "turkey") and secondary benefits (let's call it "gravy") for each community. Minneapolis MN is driven by public safety communication; St. Louis Park, MN and Chaska, MN are driven by retail services; Philadelphia, PA by digital inclusion and retail services; and St. Cloud, FL by economic development and retail services.

Table 1: Turkey or Gravy

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

1.3.2 Public Safety and Internal Communications Uses

Each of the approaches serves public safety, internal communications, and retail services differently. Table 2 and Table 3 address of public safety and internal communications applications.

Chaska, MN, Philadelphia, PA, and St. Louis Park, MN are leveraging the ubiquitous availability of the standards based on 2.4 GHz licensed frequency for internal communication uses (inspectors and other mobile workforce). Use of the unlicensed standards-based approach, although it is secure as cable modem or dial-up, may not be appropriate for some first responder (public safety) applications.

Minneapolis' use of a licensed frequency with a proprietary interface offers the greatest security for sensitive data transfers. However, it reduces the possibility of obtaining ubiquitous coverage in Minneapolis/St. Paul metropolitan area by using the proprietary 4.9 GHz approach. Minneapolis will likely need to continue to use EVDO or other technology for ubiquitous coverage for mobile applications.

St. Cloud's use of the network for internal communications needs 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 of the city boundaries are required to use a supplemental connectivity technology.

Table 2: Public Safety Communication Support

	Chaska MN	Minneapolis MN	Philadelphia PA	St. Cloud FL	St. Louis Park MN
Attributes	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 Communication Support

	Chaska MN	Minneapolis MN	Philadelphia PA	St. Cloud FL	St. Louis Park MN
Attributes	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

1.3.3 Reliability, Availability, and Expandability

Another key difference between systems is network availability during power outages. In Chaska, Minneapolis, Philadelphia, and St. Cloud, portions of the WiFi network are not operational during power outages. This is due to the fact that not all of the WiFi radios are equipped with back-up power. In St. Louis Park, radio nodes are solar powered with battery backup allowing network communications during both brief and extended power outages.

Another difference between the networks is the use of fiber backhaul. Philadelphia, Minneapolis and St. Cloud are using radio backhaul for the WiFi radios; St. Louis Park and Chaska use a combination of wireless and fiber backhaul. The addition of radio and fiber backhaul positions the community to expand institutional connectivity options and expand available retail service either by third parties or the community. For example:

- Each of the networks use a point-to-multipoint radio network layer in their deployment that may be used to serve higher-end business customers or as an alternative for leased T1 lines
- Chaska and St. Louis Park have deployed a fiber backbone to support WiFi deployment. The fiber backbone is also used to support education and

community needs as well as a potential to offer 100 Mbps or greater connectivity services to select users

1.3.4 Retail Services and Digital Inclusion

Table 4 presents the models for retail services and digital inclusion. Chaska, Philadelphia, and St. Louis Park appear to be pursuing networks allowing the opportunity for nearly all households to have the ability to participate. To maximize participation, mechanisms are in place to guide the subscriber with a connection. The Minneapolis model provides lower coverage area and the retail provider is not planning on high customer interaction. The system either works or it does not. This "hands off" approach is designed to maximize provider revenues. The St. Cloud model provides a large-coverage footprint; however, it does not offer traditional help-desk support. St. Cloud provides consumer workshops and has arranged for retail outlets to sell appropriate required Customer Premises Equipment (CPE) and installation support.

Each model, with the exception of St. Cloud, has the basic price level for an always-on 1 Mbps connection in the $20 range. In addition to the monthly fee, in each of the models the consumer must either lease or purchase a CPE to access the network. Although it appears some of the models down-play the CPE requirements, field results from operational WiFi networks do indicate that the majority of households will require high-power CPE to access the network while indoors. Further, experiences in Chaska and St. Louis Park indicate that the largest use of municipal WiFi is from previous dial-up users seeking a low-cost high-speed alternative in their household. Use of municipal WiFi for portability has been minimal by consumers.

The approaches to support digital inclusion are in various stages of policy and procedure development. Philadelphia has chosen and published eligibility requirements for the digital inclusion program (details are available on their web site, http://www.wirelessphiladelphia.org). Chaska and St. Cloud do not appear to have a specific digital inclusion strategy. However, since St. Cloud's service is free it provides a foundation for other agencies or organizations to easily leverage.

Minneapolis and Philadelphia each have a $10 per month service available based upon a pre-determined needs test. St. Louis Park does not require the ISP to provide a low cost service, but is considering a voucher approach for low-income households. Minneapolis, Philadelphia, and St. Louis Park are aspiring to leverage net revenues from the offering to assist education, training, and equipment digital inclusion efforts.

Table 4: Retail Service and Digital Inclusion

	Chaska MN	Minneapolis MN	Philadelphia PA	St. Cloud FL	St. Louis Park MN
Retail Service	98% Coverage	90% Coverage	95%+ Coverage	95%+ Coverage	98% Coverage
	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.

1.3.5 Business Model Attributes

The business model, financing, partners/contractors and deployment status are shown in Table 5.

Another key factor to consider is population and governance structure of the community. Both Philadelphia and Chaska started their planning within a year of each other. Chaska is approaching the third year of operation while Philadelphia just began deployment last fall. Chaska was able to move quickly because of its size and the role of the municipal electric. As a utility, Chaska has financial resources and assets not available to Philadelphia and can make decisions in context of the electrical utility, not a political body.

Table 5: Business Model Attributes

	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

The choice of the business model affects the cash outlay and risk for each city.

- There are no public details regarding Chaska's current investment, operating costs, and business relationship with Siemens. Chaska has reported they are maintaining cash flow and have begun to pay debt service, including principal.
- Minneapolis does not make an investment for construction; however, they provide guaranteed payments to US Internet. The estimated payments are $2.4 million upon contract signing and $1.3 million each year for 10 years. In return, they receive access to the network for public safety and public service use. These payments do not include the cost for development of the plan and required radio hardware (vendor proprietary 4.9 GHz wireless cards).
- Like Minneapolis, Philadelphia does not have a direct investment in the network; however, they assisted in funding of the business plan and other planning activities. In addition, Philadelphia has agreed to be an anchor tenant, acquiring approximately $3.8 million[5] in services over the first five years of operation.
- St. Cloud has spent approximately $2.4 million to deploy the network. This investment is in addition to the annual fees paid to Hewlett Packard to operate and maintain the network. The City feels citizens will spend their connectivity fee savings locally, thus increasing taxes and other city revenues. St. Cloud feels that the increased revenues offset their investment and operating costs.
- St. Louis Park has an initial investment (capital and operating expenses) of $3.3 million and $400,000 annual operating and interest expenses in year two,

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

declining to $300,000 in year five (decline due to interest expense), for a total commitment of $5.3 million during a five-year period. In return for use of the network, St. Louis Park receives $14 per month per subscriber from Unplugged Cities. Unplugged Cities also has responsibility for operating and maintaining the network.

Another factor to consider when examining business models is population density. Minneapolis' and Philadelphia's population density is considerably higher than the other communities. This condition makes these communities more attractive for private investment. The market potential based on a geographic density is nearly seven times larger in Philadelphia than in Chaska.

1.3.6 Models Do Not Necessarily Apply to Other Communities

At the beginning of this summary, we indicated it is important to look at the models in context of community objectives. For example, let's compare Minneapolis and St. Louis Park.[6] Minneapolis is entering into an arrangement that they feel is equitable and meets their objectives. What happens if we apply the model to St. Louis Park?

Basing the payments on the ratio of geographic size between Minneapolis and St. Louis Park (ratio of five, 55 square miles vs. 11 square miles), St. 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 (56 percent of the commitment required for the network ownership).

In return, St. Louis Park would obtain access to the network for public safety and public service uses. Anticipated coverage is 50 percent to 60 percent of the community and St. Louis Park needs to acquire new cards for each device desiring access. This coverage requirement does not meet St. Louis Park's needs because they intend to require public safety communication access throughout the City and in surrounding communities.

The proposed network also does not provide for deployment of additional fiber in support of advanced services and planned applications.

In return, US Internet would provide service to residents, including a subsidized service to low-income neighborhoods. The planned coverage (90 percent) falls short of St. Louis Park's 100 percent goal. The limited customer support offered by US Internet also does not meet St. Louis Park's expectations to have the opportunity for all residents to participate.

[6] Based upon a detailed analysis conducted by the author on behalf of St. Louis Park, MN during their planning process.

Applying the Minneapolis model to St. Louis Park does not meet stated goals and objectives. The reverse is also true. Applying the St. Louis Park model to Minneapolis does not meet Minneapolis' objectives. A successful project examines the community's goals, objectives and unique conditions and designs a tailor-made solution. It is, therefore, critical to choose the path based upon unique community conditions – not because another community has chosen a given path.