

Alternative Municipal Wireless Network Models

Examination of Grassroots and Ad-based Initiatives

Paul Andor Farkas, M.Sc.

CEIT Alanova GmbH

Schwechat, Austria

a.farkas@ceit.at

Abstract—This research explores the various solutions currently available for sharing Wi-Fi connections and seek to identify whether there are potential applications and business models that could be used to make such grass root and advertising-based deployments a viable alternative to the capital intensive wireless infrastructures offered by the dominant network integration players (e.g., Cisco, HP, IBM, Motorola, etc.) in the wireless community market.

Municipal wireless; Wi-Fi; location-based services; community networks

I. INTRODUCTION

Just as the Open Source movement took on the “big players” in the software business a decade ago, a number of start-ups sharing the same Open Source philosophy are aiming to challenge the incumbents operating in the rapidly expanding municipal wireless market. Simultaneously, other players in the wireless market have used advertising-based business models to finance municipal wireless deployments. This research aims at exploring innovative user driven solutions, advertising-based business models and potential revenue-generating applications that can serve as alternative means of establishing citywide wireless infrastructures. Through a combination of software and hardware solutions, a number of firms help users obtain Internet connectivity over Wi-Fi on their phones and laptops regardless of whether they are in their own backyard or a town halfway across the globe.

II. ASSESSMENT OF DEMAND

Cities have generally been at the forefront of the adoption of new technologies that transform society, whether railroads in the nineteenth century or automobiles in the twentieth century. [1] With more than 400 wireless projects in various stages of preparation in the U.S. alone [2] and a similar number of initiatives in various cities across the globe, it appears that the current drive by many cities to establish municipal wireless networks represents part of the global evolution towards ubiquitous Internet and the Information Society.

In today’s global economy, competition does not occur between countries, but between cities. This stems from the fact that competitiveness is driven by innovation and cities tend to be the centers of such innovation. Investment in new infrastructures such as wireless technologies is essential for cities to remain competitive and retain or attract new increasingly mobile workers and businesses. The establishment

of a digital community is an investment by a city in its citizens and businesses so that they can continue to compete in the global economy and the information society. Wireless infrastructures not only help in breaking down the Digital Divide among citizens, but also promote efficiency in the public and private sector. Finally, such infrastructures are crucial to developing new innovative services for improving citizen satisfaction and also fostering growth. Some of the reasons cities cite for setting up their wireless infrastructures include:[3]

- Economic development
- Social betterment
- Government efficiency
- Tourism and marketing

According to a recent report from market analysts Datamonitor, the market for municipal wireless networks and related applications is “positioned to explode” in the UK and the U.S. over the next five years, growing from \$900 million this year to \$6.4 billion by 2012 as local governments and internet service providers recognize the economic and community benefits these networks offer.[4] In the area of wireless deployments, continental Europe lags behind North America and the UK by about 1-2 years, however, the much vaunted eEurope program and increased European efforts to improve the competitive environment in the telecom sector promise to foster a similar level of growth here as well.

To date, many of the municipal wireless projects have been financed through public-private partnerships involving cities and private companies - ranging from equipment vendors to network operators to ISPs - contracted for the deployments. In the U.S., these business models often focused on using ISP revenues as a means of generating return on investment. However, the recent pullout of Earthlink from several high-profile, large-scale U.S. projects and similar scale-backs and withdrawals from the market by other companies has raised questions as to whether such PPP models without anchor tenant commitments for wireless services from cities remain viable. More successful PPP projects have been those that include long-term anchor tenant contracts with the cities hosting the deployments. The anchor tenant applications tend to be related to Public Safety, Public Transportation, Government efficiency and Utility Management. Ad supported deployments were discussed early on in the municipal wireless boom, then later

fell out of favor as the former two approaches took hold. Examples of publicly funded deployments are limited in number, but have been growing since the afore-mentioned problems with PPP models have emerged.

Although numerous cities remain interested in the possibilities of ubiquitous Internet access, some - including even wealthier communities - balk at the costs associated with such deployments. Moreover, unfortunately, the private sector (telecoms) have not shown significant interest in financing such deployments (especially those focused on competing, potentially disruptive technologies such as Wi-Fi and WiMax), being content with the status quo and concentrating efforts on recouping the costs from their investments in 3G infrastructure.

In consideration of the interest that remains on the part of cities for such deployments and the simultaneous prohibitive costs associated with them, the following sections will explore alternative, low-cost means of obtaining ubiquitous internet access as well as alternative financing models (e.g. ad-based financing) for such deployments.

III. GRASSROOTS SERVICE PROVIDERS

There are a number of firms that have arisen whose main focus is on the sharing of Wi-Fi connections and the development of Grassroot wireless initiatives.

A. FON

FON was founded by Argentine entrepreneur and philanthropist Martin Varsavsky. The vision of the company, which calls itself “the largest Wi-Fi community in the world,” is to establish Wi-Fi everywhere, which it hopes to achieve through its members – the Foneros. The solution is based on a community Wi-Fi router, La Fonera which the company sells. Users – Foneros – purchase and install the router and thereby share some of their home Internet connection with other Foneros who may happen by. In return, they can surf free of charge using the Community’s FON Spots worldwide. FON is also working with a number of telecoms to distribute their routers to customers who sign up for DSL connections. For those, who choose not to share their connection or have not yet bought FON routers, the company sells inexpensive access to its Community network. Services include FON Maps, software tools and downloadable POI files for portable navigation devices depicting FON hotspots.

In addition to being a “Movimiento of people” whose aim is to build a free, global Wi-Fi Community, FON also works with municipalities, cities, and communities to create citizen-generated Wi-Fi communities. Cities where such grass roots FON initiatives are underway include: Geneva, Oslo, Tokyo, New York, San Francisco and Munich.

FON, however, is not just a socialist movement seeking to transform the way the world accesses the Internet, it also works through so-called “Bills”. Bills are business owners (restaurants, hotels, stores, etc.) who invest in FON routers in the interest of selling access to the connection. There are even Super Bills who are entrepreneurs who want to invest in routers and place them in public places and then share their revenue with FON and the owners of these public places so that the latter don't have to buy routers themselves.

FON is supported by well-known Open Source players including Skype and Google and has entered into partnership with numerous other Media and Internet companies. [5]

B. WeFi

WeFi is an Israeli firm that offers a software-based solution that allows users to find the best available Wi-Fi connection in their vicinity. The WeFi software works by reporting connectivity data to its back-end servers, where a global, ever-growing database and map of available Wi-Fi resources is updated. This information is automatically shared with all the WeFi users. The company's service claims to be able to identify all available Wi-Fi resources wherever the WeFi software runs and to manage the network with zero spending on physical assets.

In addition to allowing users to share Internet connections and find the best available Wi-Fi connections, with WeFi users can:

- Find Wi-Fi access spots on the map
- Add their own Wi-Fi spots
- See where friends are, whether connected close by or worldwide
- See local reviews, events, and other users’ experience of the Wi-Fi and spots around them

In addition, every Wi-Fi spot that has been mapped by a WeFi user has its own Spotpage. The spot will show as mapped by the member who first mapped it, and should be registered to the owner of that wireless access spot. Users who own a Wi-Fi spot, will soon be able to customize their Spotpage. WeFi’s backers include Yossi Vardi, an instant-messaging pioneer whose company sold ICQ to AOL.

C. Whisher

Whisher is a Spanish company’s version of WeFi. The software-based solution allows users to share their Wi-Fi connections with others and get free access wherever they find other Whisher members. Whisher also aspires to create through this collaboration the world's biggest free Wi-Fi network. Users can turn the service on and off at will and receive alerts when people access their Wi-Fi. Like WeFi, Whisher is a software application that works irrespective of the hardware in place and is compatible with any Wi-Fi access point or router.

Users who share their Wi-Fi with others get, in return, free Wi-Fi everywhere (other members make their connections available). Whisher also has a map of currently registered Wi-Fis and these additional features:

- Wi-Fi connectivity and sharing
- Communication across all services
- Group chat
- Geolocation
- File transfer
- Automatic access to other networks

- Local chat

D. CuWin

CuWiN (the Champaign-Urbana Community Wireless Network) is a coalition of wireless developers and community volunteers committed to providing low-cost, do-it-yourself, community-controlled alternatives to contemporary broadband models.

CuWiN's mission is to develop decentralized, community-owned networks that foster democratic cultures and local content. The organization supports organic networks that grow to meet the needs of their community's through advocacy and a commitment to open source technology.

To achieve its mission, CuWiN relies on international and domestic partnerships with dozens of research institutions, not-for-profit organizations, community groups, businesses, universities, and government institutions. Solutions of CuWiN include a free open source, open architecture software for mesh wireless networking.

E. NetEquality

NetEquality aims to support Wi-Fi mesh networks for community wireless, education, and the developing world. It is a non-profit organization dedicated to providing free internet access for low-income communities. The organization provides planning, deployment resources and Internet mesh products worldwide

NetEquality networks create a wireless "mesh" to spread a DSL connection across entire apartment complexes, neighborhoods or other housing communities. Each wireless access point can talk to its neighbors and repeat the signal back to the DSL.

Of the service providers described above, FON and WeFi have the largest number of users. However, despite significant investment from industry leaders such as Google and BT (who have pumped \$55.2 million into FON), these companies still lack a crucial ingredient for success: scale. FON has just 830000 registered Foneros around the world of which only 340000 actively share their routers.[6] FON has begun working with communities to establish grassroots networks – it remains to be seen if the grassroots community Wi-Fi strategy will give the company the necessary scale to move forward.

IV. AD-SUPPORTED WI-FI

With the dawn of an era of ubiquitous Internet access becoming ever more likely as a result of solutions offered by firms such as those highlighted above, the question arises as to how businesses and communities can capitalize on such efforts and make them grow. One need look little further than firms like Microsoft or search giant Google to get a glimpse at their plans for a future with ubiquitous Internet. In the recent past, Microsoft unveiled its MSN Sideguide as a means of providing location-based advertising to MSN users using their XP and Vista platforms. This sidebar displays content from MSN channels and enables easy Live Search. MSN Sideguide was also used to fund the deployment of free Wi-Fi networks.[7] MSN Sideguide was a key element of the now defunct

MetroFi's municipal wireless deployments in Concord, California and Portland, Oregon. According to MetroFi: "The pairing of MSN SideGuide with MetroFi-Free on MetroFi's municipal wireless broadband networks will enhance the browsing experience of users by conveniently centralizing search and advertising, while adding access to interesting content all in one location." Essentially, service providers such as MetroFi would rely on the ad-serving capabilities of MSN SideGuide to "enhance the monetization of Wi-Fi networks. [8] Although it remains unclear what aspect of their business model failed, like many of their peers, MetroFi also recently pulled out of the municipal wireless business leaving a number of projects - in: California (Concord, Cupertino, Foster City, downtown San Jose, Santa Clara, and Sunnyvale); Illinois (Aurora and Naperville); and Oregon (Portland) - in search of new investors.

The launch of Google Maps is a key example of how Google aims to provide targeted advertising to Internet users based on their location. In New York City, Google users accessing the Internet via their cell phone are provided location-based advertising based on their position which is determined via the triangulation of cell towers. A number of firms (e.g., the Finnish firm Ekehau, and U.S.-based Skyhook Technologies) provide Wi-Fi Positioning Services (WPS) that use Wi-Fi signals to offer much more accurate positioning information than available through cellular networks.

Other advertising models have also arisen that are based on the spread of Wi-Fi. Firms such as AnchorFree and JiWire are optimizing Web-based advertising to Wi-Fi hotspots. In essence, hotspots are aggregated into a network that national advertisers can use to deliver targeted advertising to those consumers most likely to pay attention to it. Wi-Fi-centric advertisers can target users based on their location. For example, using such a system, advertising for high-end goods can be delivered to consumers who are located in places frequented by people with more purchasing power. Ads can appear "at any point in the connection process: before connection on the login splash screen, during the authentication process, and throughout the browsing experience." [9]

With this model, free advertising-supported Wi-Fi can be made available to customers of a wide range of businesses ranging from the large bookstore chain to corner restaurants. People who are shopping or eating in such a location will see banner ads on their screens or short video spots or both before entering their browsing session. Using this approach, businesses that traditionally offer Wi-Fi to customers – such as hotels – can sign up with the Wi-Fi service provider and collect a share of the advertising revenue generated by the free hotspot(s). In the interest of generating advertising revenue, some firms even supply these businesses with the necessary hardware and/or software for free. Service providers currently offer retailers and advertisers several options. With an open network option, retailers agree to run any ad from the service provider's rotation; in a closed network option, a company with multiple locations (like a bookstore chain or hotel) can run its own advertising or other messages within that network.[10]

Even some telecoms have embraced the advertising potential of Wi-Fi. FON partner BT is examining offering free Wi-Fi as a means of creating a new revenue stream for its

business customers. BT Business Total Broadband allows businesses using BT Business Hubs into a BT Openzone wireless hotspot at no cost. “This will allow anyone visiting their premises, be it an office, shop, restaurant or depot, to log on to a separate secure [internet](#) channel to check e-mail, surf the web, use internet-enabled applications and make Voice over Internet Protocol (VoIP) calls. BT Business Total Broadband customers currently receive an inclusive number of BT Openzone wireless minutes, ranging from 50 to 500 a month depending on the option and contract. These can be used at more than 2,500 BT Openzone Premier hotspots at locations such as hotels, airports and railway stations, the 12 UK wireless city centers.” [11]

V. APPLICATION OF AD-SUPPORTED NETWORK APPROACH TO MUNICIPAL WI-FI

The question of the viability of ad-supported municipal Wi-Fi hinges on whether geo-areas can be hand-selected and advertising performance forecast in a predictable and repeatable manner. In the end, it’s a fairly simple exercise in supply-and-demand. Do advertisers want to reach the audience associated with the areas that are consuming infrastructure costs? If so, at what advertising rate, and does that revenue offset the costs of managing the network?[11] As mentioned earlier, Microsoft recently teamed with Metrofi to use their new Sideguide for MSN as a means of financing the deployment of wireless networks in Oregon and California. These deployments represented the first large-scale ad-supported municipal wireless projects.

Mobile Advertising Spending Worldwide, by Format, 2007-2012 (millions)

	2007	2008	2009	2010	2011	2012
Mobile message advertising*	\$2,560	\$4,200	\$6,440	\$9,260	\$11,960	\$14,173
Mobile display advertising**	\$52	\$142	\$338	\$629	\$945	\$1,203
Mobile search advertising***	\$83	\$244	\$597	\$1,290	\$2,345	\$3,773
Total	\$2,695	\$4,586	\$7,375	\$11,179	\$15,250	\$19,149

*Note: numbers may not add up to total due to rounding; *spending on placement in text messages, includes direct spending on message campaigns as well as spending on promotional coverage of end-user messaging costs; **spending on display banners, links or icons placed on WAP, mobile HTML sites or embedded in mobile applications such as maps or entertainment services (eg games or video); ***spending on sponsored display ads and text links that appear alongside mobile search results, as well as spending on audio ads played to mobile phone callers making a directory inquiry*
 Source: eMarketer, March 2008

092628 www.eMarketer.com

[12]

Although MetroFi’s deployments ultimately failed, smaller-scale deployments from the likes of FON have succeeded. The advertising model for Wi-Fi networks has been applied at airports as well. There are already several examples of successful ad-supported Wi-Fi networks at airports including Denver International Airport and the International Airport in Las Vegas. For example, when Denver International switched to a free Wi-Fi offering supported by advertising in November 2007, within a week Wi-Fi use grew tenfold even though the change was never announced publicly.

Solutions offered by a number of companies including JiWire, 1020 Inc., Anchorfree Inc., Front Porch Inc., LastMile

Communications and Nebuad make it easier for municipalities to pursue such ad-based models by providing turnkey advertising solutions for the wireless networks. In turn, citywide wireless projects offer advertisers cutting-edge marketing opportunities. Moreover, such models allow Wi-Fi network operators a wider range of service options including “allowing casual users free access in return for viewing ads, while supplying monthly subscribers with ad-free connections.” Ad revenues associated with programs such as JiWire’s Ads for Access can offer wireless cities or their service providers as much as fifty cents per user, per session, for laptop users in total revenues. The pending surge in mobile Wi-Fi devices and users accessing the network will go hand-in-hand with significant increases in revenue opportunities as well. In April 2007, FON also began exploring an Ad-based model for providing free Wi-Fi. According to the initial concept, non-Fonero users would obtain a certain amount of time of free access “in reward” for viewing a short ad. Watching subsequent ads would give them more time. Alternatively, businesses that set up FON spots could choose to sell or give away access cards (FON offers such cards for 3 USD/EUR/day and 2 USD/EUR for each additional day) that will allow users to access FON spots either in locally or wherever their ultimate destination may be.

To date, probably the main factor standing in the way of widespread or ubiquitous Wi-Fi deployment has been the lack of mobile devices with browsing capabilities to justify them. The launch of the iPhone, the introduction of Google’s new Android platform, and the rush by other players in the mobile phone market to introduce similar devices promises to change this.

VI. OTHER (LOCATION-BASED) SERVICES

The industry’s introduction of such so-called “super devices” brings all the capabilities required for taking advantage of location-based services into the palm of one’s hand. Using such devices, a number of possible services can be initiated.

Through location-based services, people can interact with their communities. Users can access the special offers of stores, restaurants and other businesses in their vicinity or along their intended route, filtered and customized to their characteristics or needs (e.g. language, age group, etc.). The service can include private citizens to evolve into a virtual garage sale; even real estate can be offered to potential buyers based on their current position. Eyesores (graffiti, abandoned vehicles, dead animals, litter) or public nuisances (potholes, loose manholes, broken infrastructure) can be reported to the responsible authorities with the click of a button and even accompanied by a digital image created by the handheld device.

Tourism can also get a boost from such applications as users use them to easily access the historical background or significance of cultural or natural amenities that they encounter and be guided to other similar points of interest in the vicinity. Users can also obtain information or leave their comments on a range of establishments including museums, hotels, restaurants and shops.

Through location-based services authorized users can locate friends, children, people with special needs (such as dementia) via their mobile devices, even pets can be tracked with the help of RFID microwave technology. Such tracking possibilities also opens up a range of applications related to sports and recreation such as the planning of jogging or biking routes, calculation of average speeds or calories burned, etc.

Low bandwidth business applications include the possibility of GeoFencing. Businesses can build a virtual fence around their client's locations and determine exactly when their personnel entered that area and when they left. Such information may be of critical importance in the operations planning for a large field services company.

VII. LOCATION-BASED START-UPS

A number of start-ups have been founded that take advantage of the new trend towards location-based service offerings.

A. AdMob

Founded in 2006, AdMob runs a mobile advertising marketplace serving over 1.5 billion targeted ads per month. The company recently launched a new product called AdMonitor that presents live data on who is viewing mobile ads around the world, including which phones and which network operators they are using. In November, AdMob released an application that allows third-party developers to embed mobile advertising into the popular social networking site Facebook.

B. Zyb

This company wants to shape the future of mobile social networking by acting as the missing link between online social networks and the mobile phone. The company's solution enables users to store their mobile-phone contacts, calendar, and pictures online. When using Zyb, the user gets an online interface and the ability to subscribe to auto-updates from friends and import public calendars into the phone. Zyb feels its service will resonate with consumers well because it allows them to store and categorize their network of family members and close friends under mobile numbers. To date, Zyb has signed deals with operators in five countries, and the service is available in five languages. Its primary focus is now on Europe, but it later plans to expand into Asia and the U.S.

C. Refresh Mobile

This company's *Mippin* service aims to deliver the latest news, blogs, and other Web content in the perfect format to your phone, giving mobile-phone users the ability to discover and share what they want. Its competitors include PluMo, Winksite, FeedM8, and Mofuse. The company plans to target the U.S., Britain, South Africa, and India over the next 15 months.

D. Qype

Qype is a local search service that allows people to share views on everything from the most reliable plumber to the best restaurant. The site has more than 45,000 registered users in Germany and is now expanding across Europe. French and British sites will be launched in December, with Spain and Italy to follow in 2008. Plans are to add event reviews and access from mobile phones. Competitors include townster.de, trustedplaces.co.uk, and welovelocal.com.

VIII. CONCLUSION

In the not so distant future, when everyone has an iPod touch and when all digital cameras and Gameboys are Wi-Fi enabled and there are a variety of location-based services to choose from, the whole municipal wireless landscape will change and it is likely that the ad-based Wi-Fi model will become economical. Targeted ads can be used to drive ROI and thereby justify large-scale deployments. During the interim period, it remains to be seen whether the Grassroots wireless efforts will be able to fill in the gaps where large-scale municipal wireless deployments are not yet economically feasible. Clearly Grassroots deployments will face QoS issues and cannot be used to support certain types of bandwidth-intensive applications or those that require roaming or additional layers of security. However, for general Web surfing, checking Emails, chatting and similar activities they can offer a good, cost-effective alternative to capital intensive municipal wireless deployments.

REFERENCES

- [1] The Wireless Philadelphia Executive Committee (2005) Wireless Philadelphia Business Plan: Wireless Broadband as the Foundation for a Digital City, February 9, 2005.
- [2] Muniwireless.com (2006) 29 December 2006 list of US cities and regions, 2006..
- [3] Neff, Dianah. Civitium (2006) Wireless Cities Conference, Cannes, France, November 30, 2006.
- [4] Govtech.com (2007) U.S. and U.K. Municipal Wireless Spend to Reach \$6.4 Billion by 2012.
- [5] Fon.com (2007).
- [6] John Markoff (2008) "Worldwide Dreams For a Wireless Web", The New York Times
- [7] Muniwireless.com (2007) MetroFi will use MSN SideGuide to deliver ads in citywide networks.
- [8] Metrofi.com (2008) Press Release (www.metrofi.com/press_releases-38.html)
- [9] Muniwireless.com (2008) MuniWireless 101: Applications: Advertising.
- [10] Muniwireless.com (2007) Interview: AnchorFree's Mark Smith on the Wi-Fi ad model.
- [11] Webwire.com (2008) BT opens up wireless internet access for UK businesses (<http://www.webwire.com/ViewPressRel.asp?ald=63782>)
- [12] Ibid
- [13] marketingcharts.com (2008) Mobile Advertising Spending to Surpass \$6.5 billion in 2012

