




Office of the City Manager

INFORMATION CALENDAR

July 25, 2006

To: Honorable Mayor and  
Members of the City Council

From:  Phil Kamlarz, City Manager

Submitted by: Chris Mead, Director, Information Technology

Subject: Wireless Internet for the City of Berkeley

INTRODUCTION

On November 15, 2005, Councilmembers Capitelli, Moore, Anderson, and Maio submitted a Council Action Item entitled “Wireless Internet for the City of Berkeley” that asked the City Manager to report on the possibilities and requirements for a Berkeley citywide wireless (“WiFi”) Internet system.

Initially, the response was scheduled for March of this year, but it was postponed so that it can be published after the report from Dr. Linda Rudolph, the City’s Health Officer, on the alleged health hazards of radio frequency radiation.

CURRENT SITUATION AND ITS EFFECTS

**What is WiFi?**

The term WiFi has become synonymous with low-cost, easily accessible wireless Internet connections. In fact, WiFi is a trademark name that covers products built to a technical specification for wireless computer networks. (The official name of the specification is 802.11, of which there are various subsets: 802.11a, 802.11b, 802.11g etc.)

Unlike cellular phones or broadcast television and radio, WiFi uses unregulated bands of the electromagnetic spectrum. That is to say, anyone can set up and deploy a WiFi network without regulatory permission. (However, to minimize interference, the Federal Communications Commission has limited the maximum power output of a WiFi device to four watts.)

A WiFi-enabled device such as a laptop computer is able to connect to a network and thus to the Internet when they are near a WiFi access point (WAP). A typical WAP has a range of about 300 feet outdoors and half that distance indoors. The area served by a WAP is often referred to as a Hotspot. Multiple Hotspots can be arranged to provide coverage for a large area, known as a WiFi cloud. In theory, at least, WiFi clouds can be of almost any size – certainly, city-size clouds are achievable.

In addition to its being unregulated, WiFi has several other attractions:

- WiFi can be configured to allow enabled devices to join a network and/or access the Internet in an easy, ad-hoc manner, requiring little more than the click of a mouse button. As a consequence,

WiFi has become popular in commercial gathering places such as cafes, airports, sports stadiums, etc.

- WiFi products from different manufacturers are interoperable, and vendor competition and economies of scale have driven down prices. For example, a WAP for use in a home can be purchased for under \$50. Further, many portable devices such as laptop computers come with WiFi connectivity built-in.
- Cabling is usually the most expensive component of building a computer network. Therefore a wireless system such as WiFi that does not need physical connections can be very cost effective.

### **Municipal Networks**

The low cost and ease of deployment of WiFi has made it technically and economically feasible to build a citywide wireless computer network. Further, by ownership of the rights-of-way, which are excellent locations for WAPs, cities are well positioned either to build their own wireless networks, or to broker favorable agreements with private companies. There are several reasons why a municipality may find such a citywide network attractive:

- To narrow the “digital divide” for low-income residents by providing free or very inexpensive Internet access
- To promote economic development and enhance the city’s image
- To enhance municipal communications with residents
- To simply provide a utility-like service to residents
- To support mobile city staff

However, because municipal WiFi networks are so new, there is virtually no hard data on whether the benefits listed above are realistic.

### **Current Activities in Berkeley**

Presently, the only large-scale WiFi infrastructure in Berkeley is the AirBears network operated by the University of California. AirBears offers a unified wireless local area network for use by students and faculty in most of the major buildings on campus.

Numerous cafes in Berkeley offer their own access points. Some charge for the service, others offer it for free as a means of attracting customers. Many of Berkeley’s hotels also offer their guests WiFi services.

All the major cellular telephone companies offer high-speed data networking services in Berkeley and throughout the Bay Area. However, these are not WiFi networks, but are based on other technologies that can operate over the cell phone infrastructure. These services are expensive, typically \$60 to \$100 per month, but they do have the advantage of being both very secure and available in major metropolitan areas throughout the country.

### **Current Activities in Other Cities**

While there is a great deal of buzz around municipal WiFi networks, with many cities announcing ambitious plans for deployment, the work that has actually been accomplished is relatively modest. For example, it was only this year that St. Cloud, FL, became the first city in the nation to complete the rollout of a free WiFi network covering the entire municipality. Most of the existing deployments have covered just a downtown or commercial corridor.

Here is a short list of some of the more interesting work in progress:

#### Philadelphia

The country's fifth largest city recently awarded a contract to EarthLink to build a 135 square mile network, the largest in the U.S. EarthLink will finance, build, and manage the wireless network, and share revenue with the Wireless Philadelphia, the non-profit created by the city of Philadelphia to manage the project. The estimated cost the infrastructure is \$10 million. The target date for completion is the end of 2006.

EarthLink will sell bandwidth on the WiFi network to other Internet service providers (ISPs), and Philadelphia residents will be able to choose EarthLink or other ISPs for their WiFi services. Service will not be free, but EarthLink claims the cost will be "very reasonable" – a price of \$20 of month has been floated, with a special discount for low-income residents.

The Philadelphia plan met considerable opposition from the local phone company, Verizon, and there is now a state law on the books that effectively gives Verizon veto power over similar projects in other Pennsylvania cities.

#### San Francisco

San Francisco's WiFi plans received nationwide attention when, in response to a Request for Information (RFI), Google Inc. offered to build the network at no cost to the City. In April, Google, and their partner EarthLink, were officially awarded the contract. Google has stated that it will offer San Francisco residents 300Kbps WiFi for free. It is believed that it will support the service with advertising. Faster speed option will be available for a monthly fee.

#### Silicon Valley

Several Silicon Valley cities including Sunnyvale, Santa Clara, and Mountain View have announced plans to deploy citywide WiFi services. All these municipalities have signed agreements with MetroFi Inc. Each city has started with a series of localized hotspots, with plans to deploy citywide. MetroFi will offer both a free service and a premium service for about \$20 a month.

In addition to these local efforts, the Wireless Silicon Valley Task Force was formed in November 2005 with the goal of bringing WiFi to the entire region – a technically unprecedented feat. So far, 38 South Bay municipalities have signed on for the project, and an RFP, developed by Intel Corp., was issued in April of this year.

### West Hollywood

The City of West Hollywood provides its own free municipal WiFi service to the downtown area. Advertising revenues were expected to provide operating funds, but have fallen short. Hence, the City uses approximately \$50,000 per year in general funds to subsidize the running of the service.

### **Economic Considerations**

Many cities first envisaged paying for WiFi networks out of public funds, possibly through the issuance of bonds. However, the cost of \$200,000 to \$500,000 per square mile proved a major deterrent. Further, these proposals often ran into vehement opposition from established Internet Service Providers (ISPs), who complained about government-subsidized competition. Indeed, some states such as Texas have gone as far as passing legislation prohibiting WiFi deployment by municipalities, and similar legislation has been introduced in Congress (H.R. 2726).

Another economic issue is that no one really knows how much it will cost to administrate a large-scale WiFi network.

While the costs to maintain the equipment for a WiFi network are fairly well understood, providing support to users may be far more challenging than is currently anticipated, especially if the goal is to reach that part of the community that is new to Internet access. Collecting the money in a for-fee model and maintaining customer accounts would be an additional burden.

These administrative, legal, and financial disincentives have turned cities away from self-financed, self-run networks and towards partnerships with established wireless service providers. Typically, cities negotiate an agreement giving the provider access to their rights of way and the use of city streetlamp poles and other structures for the attachment of the antennae. The company gains revenue either from advertising, such as a banner at the top of each web page, or from charging users a fee, typically \$10 to \$20 a month. The for-fee services usually offer faster download rates and some form of user support.

A successful economic model for running municipal WiFi networks has yet to emerge. Recently, there has been interest in moving away from a paid service towards a free service supported by advertising. The reason for the change is that subscription services have succeeded in attracting only a small section of the population, whereas a free service would have deeper penetration rates, thus making it more attractive to advertisers. Further, the administrative overhead for a free service is much lower. However, as the West Hollywood experience shows, advertising revenue cannot be taken for granted.

### **Health Concerns**

Concerns regarding any potential health issues associated with radio frequency (RF) radiation were addressed in the informational item from the City of Berkeley's Health Officer, which was given to Council on July 11, 2006.

In addition, at the November 15, 2005 meeting the Council asked the City Attorney for a list all of the cases decided under the provision of the Telecommunications Act of 1996 that preempts local regulation of wireless telecommunication facilities on the basis of health or environmental effects of radio frequency emissions. As part of her July 11, 2006 report to Council, the Health Officer attached the memorandum from the City Attorney providing a discussion of those cases.

### **Technical Issues**

Basic WiFi technology is now very well established. For example, the majority of laptop computers now sold have WiFi built-in. Operating systems such as Windows XP automatically notify the user of any WiFi network in the vicinity, making connection very easy. Moreover, the equipment for creating a simple WiFi network is now so inexpensive that a large number of public hotspots have sprung up in every city. It has become virtually standard in the Bay Area for cafes to offer WiFi service.

Hotspots are easy to deploy, but a citywide system presents a more daunting technical challenge. One issue is the need to connect WAP's back to the network via a number of radio relay antennas (known as an RF mesh network). Another challenge is providing adequate penetration into buildings. Some WiFi companies address this issue by selling booster antennae for desktop computers to be used in offices or homes.

The precise number of WAPs required to blanket a municipality depends on the area's topography and density. Berkeley would probably require 12 to 20 antennae per square mile.

### **Comparison With Established Internet Services**

Municipal WiFi has several advantages over traditional service providers:

- It is free, or relatively low cost
- It is available, in theory at least, citywide
- It is "untethered", that is to say, can be accessed outside the home or business.

There are also some disadvantages:

- Service is slower than broadband alternatives such as cable or DSL. Throughput for most WiFi systems is between 300kps to 1000kps, compared to speeds up to 6000kps for domestic wired services.
- The free service usually comes with unavoidable advertisements
- There will inevitably be some "dead spots" where service is unavailable
- There is little or no customer support for the free service
- Service may be unavailable inside the home or office, unless a separate booster antenna is purchased

As a consequence of these pluses and minuses, WiFi companies often offer themselves as a complementary service to established providers, rather than a replacement.

### **Legislative Developments**

Presently, if a company wishes to deploy its telecommunications infrastructure in Berkeley's rights-of-way, it must negotiate a franchise with the City. Thus, for example, the City of Berkeley has a cable television franchise agreement with Comcast Inc. The only exception to this rule is infrastructure for telephone services provided by companies that have been certified by the State of California.

However, the nation's telephone companies are now planning to enter the cable TV market, and as a consequence, they are sponsoring legislation at both the State and the Federal level to replace municipal

franchises with a single statewide franchise. Further, a series of recent court decisions has narrowed municipalities' scope for regulating the placement of antennae.

These two developments could result in a virtual free-for-all in cities rights-of-way. Should such a thing happen, there would be less incentive for a WiFi company to negotiate a deal with Berkeley, although the use of the City's lamp poles is still an attraction. None of this means that municipal WiFi networks would no longer be built, but the cities would lose control of the deployment.

Finally, as has been noted, federal legislation could kill municipal WiFi altogether. However, other bills before Congress (S. 1294) seek to protect cities right to build networks.

#### POSSIBLE FUTURE ACTION

There are several options open to the City of Berkeley:

Wait out the market. It may be that municipal WiFi is a passing fad that will be left behind by economic reality and new technology. This was the fate of Metricom, a proprietary municipal wireless network founded in the mid 1990s.

Build a City-owned network. This is by far the most expensive option, costing in the region of \$2 million to \$5 million, plus the cost of keeping the network running, but it would give the City total control of the service.

Partner with the private sector. This option has been widely adopted by local government. With this approach, the private company takes all or most of the financial risk. However, this leaves the municipality with less control over the network. Earthlink and MetroFi have emerged as the two commercial frontrunners, although other companies offer similar deals. (Google, which is a software company rather than a network provider, partnered with Earthlink for the San Francisco contract.)

Partner with the public sector. The University of California at Berkeley has expressed some interest in extending their campus wireless network into the City. Alternatively, it might be possible to broker a deal with the school district.

If Council wishes to explore the option of a citywide WiFi network, an RFI or RFP could be issued. On the other hand, the City could simply sign up with a company that is offering to install a network at no cost, such as MetroFi or Earthlink.

Council may also wish to receive more public input before moving ahead.

#### FISCAL IMPACTS OF POSSIBLE FUTURE ACTION

The fiscal impact will depend on the options chosen by Council:

Wait out the market. This option would have no effect on the City budget.

Build a City-owned network. This option would cost an estimated \$2 million to \$5 million.

Partner with the private sector. There would be no direct cost for this option, but it would take an estimated \$40,000 in staff time to prepare an RFP and evaluate the responses, plus another estimated

\$20,000 to develop a contract and/or franchise. Prospective vendors may offer the City a modest fee for the use of street lamps to mount antennae.

Partner with public sector. Investigating options and entering into negotiations with a prospective public sector partner would cost an estimated \$30,000 in staff time. Further costs would be dependent upon the nature of any agreement.

CONTACT PERSON

Chris Mead, Director, Information Technology, (510) 981-6510