

Municipal Wireless Broadband: Lessons from San Francisco

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Abstract:

In December 2005, the city of San Francisco issued a request for proposal (RFP) for a community wireless broadband network. The RFP stated that the network was to be built, operated and maintained at no cost to the city, that a basic level of service should be free, and that the entire city (and county, which is contiguous with the city) should be covered.

Responses submitted included two proposals from consortia of major high tech firms (EarthLink and Google, IBM and Cisco) and four proposals from smaller firms and consortia. The EarthLink/Google proposal was selected as the winner. This initiative has achieved significant national and even international attention, largely because of San Francisco's visibility in the high tech world, and the involvement of Google.

While San Francisco's wireless broadband initiative is an innovative approach to increasing broadband access for its residents, its underlying assumptions and strategies appear somewhat flawed. This paper analyzes the assumptions, the RFP and selection process, and compares them with municipal wireless initiatives in nearby Silicon Valley communities. The paper concludes with lessons and unresolved issues from the San Francisco experience relevant for other municipal broadband projects and for broadband community access in general.

1. The Context: Broadband in the U.S.

Affordable access to services available over broadband is becoming increasingly recognized as an important contributor to social and economic development. Yet utilization of broadband in the U.S. lags many other industrialized countries. (The U.S. currently ranks 12th among industrialized countries in broadband access per 100 inhabitants according to the OECD.²) American broadband adoption is also highly dependent on socio-economic status: almost 60 percent of households with annual incomes above \$150,000 have broadband; fewer than 10 percent of households with incomes below \$25,000 have broadband.³

Broadband costs in the U.S. remain high: American consumers pay 10 to 25 times more per megabit than users in Japan. Also, average speed of broadband in the U.S. has not increased in the past five years; consumers in France and South Korea have residential broadband connections 10 to 20 times higher than

in the U.S. Further, there is little competition in most areas, with cable and DSL providers controlling over 98 percent of the market.⁴

Some U.S. cities are responding to limited availability or take-up of broadband via DSL or cable by taking the initiative to provide free or low cost broadband via wireless. In October 2005, the city of Philadelphia selected EarthLink to establish a municipal wireless network that was the largest urban network to date in the U.S., and was to include subsidized access in low income areas. In 2005, San Francisco also jumped into this fray, with a Request for Information (RFI) and later a Request for Proposal (RFP) for free wireless broadband covering the entire city.

2. The San Francisco TechConnect Initiative

2.1. From Affordable Internet to Ubiquitous Wireless Broadband

The city of San Francisco has a population of about 777,000 and area of 49 square miles, with an average population density of about 16,500 people per square mile. It is highly ethnically diverse, with a population that is 30.8 percent Asian, 14.1 percent Hispanic, and 7.8 percent African American according to the 2000 census. Median household income is about \$55,000.⁵

In mid 2005, the City of San Francisco⁶ established TechConnect, a “strategy to promote digital inclusion by ensuring affordable internet access, affordable hardware, community-sensitive training and support, and relevant content to all San Franciscans, especially low-income and disadvantaged residents.”⁷ In September 2005, TechConnect released a request for information and content (RFI/C) which stated: “Universal, affordable wireless broadband internet access is essential to connect all residents of San Francisco to the social, educational, informational, and economic opportunities they deserve.”⁸

Between the initial strategy announcement and the RFI/C release, “affordable Internet access” had become “affordable *wireless broadband* Internet access.” Yet there was little rationale for the emphasis on wireless as a city-wide solution. San Francisco has broadband available over DSL and cable (primary providers are AT&T and Comcast); fixed wireless and fiber access are available in some areas and buildings. No data were provided on where broadband is not available, nor on broadband subscribership by zip code, neighborhood, income, ethnicity, or other variables. If broadband usage is lowest among low-income and other disadvantaged residents, as appears likely, no studies were available to show whether the primary reason was pricing of broadband services, or whether other factors were also important such as lack of computers, lack of computer and Internet skills, perception that content was irrelevant or harmful, etc. TechConnect has set up a Task Force on Digital Inclusion with representatives from many community and ethnic organizations, but this was not done until April 2006, *after* the RFP was written and the winning proposal was selected.

However, following the RFI/C process, the City issued a request for proposal (RFP) with the goal of providing “*universal, affordable wireless broadband access* for all San Franciscans, especially low-income and disadvantaged residents” (italics added). The RFP listed detailed specifications including:

- The network should be built, operated and maintained at no cost to the city.
- There should be a free (basic) level of service.
- Premium services can be fee-based, but should be priced lower than existing service alternatives.
- Outdoor coverage shall be provided for a minimum of 95 percent of the city’s area.
- Indoor coverage shall be provided for ground and second floors of a minimum of 90 percent of all residential and commercial buildings in the city.
- Indoor perimeter room coverage above the second floor shall be provided for ground and second floors of a minimum of 90 percent of all residential and commercial buildings.⁹

Given San Francisco’s topography with its numerous hills, and its high urban density including many areas with multistory residential buildings and office buildings, these are very demanding specifications. Also, although “existing service alternatives” are not defined, a version of DSL is currently offered for \$13 per month and cable modem access for \$20 per month.¹⁰

2.2. The Bidders

The city received six proposals, one of which was very sketchy and is not included in this analysis. The five complete proposals were from:

- EarthLink/Google (the eventual winner)
- MetroFi¹¹
- nextWLAN¹²
- Razortooth¹³
- Seakay, with Cisco and IBM.

For a summary of key elements of their proposals, see Table 1. A few distinguishing elements included:

- RedTAP (the project submitted by Razortooth), proposed a cooperative model, community access centers, and also training and technology for residents. Their proposal noted: “Without a real strategy to provide technologically underserved residents with WiFi enabled laptops or desktops, the disadvantaged will be further left behind.”¹⁴
- Cisco and IBM partnered with Seakay, a nonprofit organization, and stated about their financing only that the project would be financed through nonprofit fundraising, with cash and in-kind donations. Yet theirs was the longest and most technically detailed proposal.

- NextWLAN proposed that the higher speed premium service would be financed by deploying about 100,000 micronode repeaters that subscribers would rent and attach to an existing estimated 40,000 DSL lines.

2.3. The Google Effect?

The proposals were evaluated by five reviewers, four of whom were city employees with various IT responsibilities. The written proposals were scored out of 80 points, 20 being for firm qualifications and 60 for degree of compliance with the city's specifications. The top three were EarthLink/Google and MetroFi, separated by only 4 points with 260 and 256 out of a possible 400 aggregated from the five reviewers, and SeaKay a distant third with 148 total points. Three of the reviewers ranked EarthLink higher on firm qualifications, while four ranked MetroFi higher on compliance with city specifications. See Table 1. The oral interviews, which covered a wide range of issues including technical solutions, costs to the city, user interfaces, digital inclusion, experience in other municipal wifi projects, etc., turned out to be critical to the outcome. Here EarthLink/Google was rated highest by the four city employees (the outside consultant gave identical ratings to both), so that EarthLink/Google received a total of 69 points of the aggregate 100, compared to only 57 total points for MetroFi. Thus EarthLink/Google won the combined review, but the aggregate scores differed by only 16 points out of a possible 500 point total.

Was this the Google effect? Since the written proposals were scored very closely and covered many of the same topics, the EarthLink/Google presentation must have been highly persuasive. Did the opportunity of having Google as a partner make the difference? The press coverage (both popular and professional) of the project since the winner was announced has overwhelmingly highlighted Google's involvement.

3. Other Bay Area Municipal Wireless Initiatives

3.1. Wireless Silicon Valley

Another major Bay Area RFP for municipal wireless was released in April 2006 by the San Mateo County Telecommunications Authority (SAMCAT), for service to some 35 communities in four counties in the area referred to as Silicon Valley. The RFP differs in several ways from that of San Francisco's TechConnect. The area and population covered are much larger; for example, the combined population of San Mateo County and Santa Clara County is about 2.4 million, and land area is about 1740 square miles. Population density is about 1400 per square mile, and about 30 percent of residents live in multi-unit dwellings.¹⁵ Only outdoor wireless coverage of the region is required; service can be either free or "low cost." Other services are "desired" but not required, including enhanced

outdoor service, indoor guaranteed service, government service, and public safety services. All of these other services may be fee-based.¹⁶

Seven proposals were received. On August 16, 2006, SAMCAT announced that it would interview three finalists:

- MetroFi
- Silicon Valley Metro Connect (Cisco Systems, IBM, Seakay, Azulstar)
- VeriLAN.

SAMCAT announced on September 5 that it had chosen the Silicon Valley Metro Connect consortium as the winner.¹⁷ This is basically the same group that ranked third in San Francisco, with the addition of Azulstar, a municipal wireless ISP. Neither written proposals nor evaluations by reviewers have been made available online.

Interestingly, EarthLink chose not to submit a proposal. Its rationale, submitted in a letter to SAMCAT, identifies some of the key issues in developing sustainable business models for municipal wireless. EarthLink states: "...we have not been able to reconcile the RFP's strong desire for a basic free layer of access throughout the coverage area." It points out the quality of service (QOS) problems that may result from low node deployment densities on some free systems: "Some of the operators ... have attempted to obscure these problems by switching to free or advertising-supported business models, hoping that because end users are no longer required to pay for the service, they would be willing to overlook the poor performance and poor coverage of the networks."¹⁸

EarthLink appears to see municipal broadband as an opportunity to compete with incumbent telco and cable companies, i.e. to provide intermodal competition: "EarthLink ... believes that municipal Wi-Fi connectivity will serve as a viable third broadband alternative to the home, at prices that will spur competition and choice in those progressive cities that elect to build."

It notes that its network design, using dense mesh of 36 Wi-Fi nodes per square mile, pushes the signal further into the consumer's home and requires higher investment. EarthLink concludes that advertising revenue alone would not cover its capital costs or provide a sufficient revenue stream. (Metro Connect apparently proposes that users can bring the outdoor signal indoors with the aid of special, signal boosting equipment that they will be able to purchase for \$80 to \$120.)¹⁹ EarthLink also notes that free or ad-supported networks typically ignore other items that "comprise a comprehensive broadband solution" such as CPE and technical support. It also foresees needs to update and upgrade the network: "We do not believe that user needs five years from now will be the same as they are today."²⁰

In Philadelphia, EarthLink plans to invest \$10 to \$15 million, with the intent to offer 1 mbps broadband Internet service for as low as \$10 per month for low income homes and \$20 for others. As in San Francisco, EarthLink appears to see this investment as an infrastructure play, a means of getting into broadband without having to lease capacity from other providers.²¹

But is this the same EarthLink that won the San Francisco competition which required free citywide service and penetration within buildings for premium service? Is EarthLink simply stating that the less rigorous SAMCAT RFP would enable bidders with cheaper designs to win, but not to be sustainable? Or/and is it saying that Google's deep pockets are the only reason it chose to partner in a bid in San Francisco? (In its presentation for San Francisco, Google noted that it had over \$6 billion in revenue in 2005, and that, as of December 2005, it had \$8 billion in cash and equivalents and no debt.)²²

3.2. Cupertino and Santa Clara

Two other Silicon Valley communities, Santa Clara and Cupertino, have contracted with MetroFi to provide wireless broadband. However, the business models vary in the two small cities, which are also geographically and demographically very different from San Francisco.

Santa Clara has about 110,000 residents, and covers 19.3 square miles. It borders San Jose, and is the location of Santa Clara University, a convention center, and numerous high tech companies including Intel.²³ Santa Clara has authorized MetroFi to install a wireless citywide network.²⁴ In January 2006, MetroFi announced that free wifi was available across the 95050 and 95051 zip codes from 180 access points. It started with coverage of half the city, and planned to cover the whole city including about 40,000 households by the end of the year. MetroFi stated: "Those with a Wi-Fi enabled device ... can now easily access the Internet or eliminate their existing service provider's charges by accessing the high-speed MetroFi network."

It appears from early press releases that MetroFi originally intended to use the same business model as adopted in Cupertino, charging \$19.95 per month. However, MetroFi now appears to have adopted an advertising-based business approach: "The MetroFi network also brings a new opportunity for local businesses to reach the community through a truly local internet advertising medium. Customers that are accessing the network will be shown a banner advertisement in the frame of the browser. Local businesses can take advantage of the local and regional nature of the network by providing links to their website, coupons or announcements to those that are guaranteed to be near their establishment."²⁵

Cupertino, also in Silicon Valley, has a population of about 52,000, of whom about 50 percent are Caucasian and 44 percent are Asian; the median income is

just over \$100,000 per household.²⁶ Cupertino is also the home of Apple Computer. The contract between MetroFi and the city is a non-exclusive installation and service agreement. The business model here is subscription-based; MetroFi acts as a no-frills provider and open access wholesaler. The basic service for \$19.95 per month includes a wireless modem, but no email or other services, so that the user can continue with existing ISP (e.g. MSN, Hotmail, Google, etc.) MetroFi also wholesales access to ISPs such as EarthLink (which offers enhanced service for \$24.95 per month).²⁷ Coverage is about 75 percent of Cupertino (about 15,000 households).

MetroFi states that the service in Santa Clara and Cupertino offers “DSL-like speeds” (about one megabit per second). The subscribers transmit data to the Internet via access points mounted on street light poles throughout the cities. The design uses 20 to 23 mesh infrastructure nodes per square mile (compared to the “dense mesh” of 36 nodes per square mile that EarthLink thought was necessary). MetroFi claims it is able to provide municipalities with “all-in” pricing of \$50,000 per square mile, inclusive of site surveys, network design, equipment, and installation. MetroFi also operates and manages the network to provide municipalities with a turn-key, open-access solution.²⁸

4. Critical Issues

4.1. A Threat to Incumbents?

The incumbent telecom industry is claiming several points of view about the growth of municipal broadband, including wireless. First, they say that municipal broadband isn't the answer to increasing broadband access. For example, some industry analysts are skeptical about whether municipal wireless is a viable means of bridging the digital divide. Pyramid Research questions “whether the dream of ‘cheap Internet for everyone everywhere’ will ever materialize as expected.” Their view is echoed by incumbents: “We expect that municipal Wi-Fi networks will not match other offerings’ unique content, security features, and reliability.”²⁹

Second, incumbents claim that public investment in communication networks crowds out private investment. They have lobbied vigorously at the state level to prohibit or severely limit municipal broadband. Baller notes that in 2004: “Not just small rural communities, but even large cities, such as Philadelphia, San Francisco and Minneapolis, had become intensely interested in developing citywide wireless projects. The incumbents saw this as a much more significant threat than the relatively small number of municipalities that were operating or pursuing wireline options.”³⁰ As of August 2006, the following states had passed legislation to prohibit or hinder municipal entry into communications: Arkansas, Colorado, Florida, Louisiana, Michigan, Missouri, Minnesota, Nebraska, Nevada, Pennsylvania, South Carolina, Tennessee, Texas, Utah, Virginia, Washington, and Wisconsin.^{31 32}

However, new entrants see municipal wireless as a means to increase competition. In Congressional testimony, EarthLink stated that municipal broadband is an antidote to facilities-based duopoly. It made the analogy to the US mobile industry before and after its expansion from a duopoly, noting that the 20 million mobile subscribers in 1994 had grown to 200 million subscribers in 2005. EarthLink also pointed out that the average price of mobile service in 1993 was 58 cents per minute; by the end of 2004, it was 9 cents per minute, an 85 percent drop.³³

A Florida study by Ford also finds no evidence to support the “crowding out” hypothesis, but strong support for a stimulation hypothesis – municipal-run networks typically provide wholesale access to key components of telecommunications infrastructure. Ford’s empirical model, using data on the number of CLECs in particular markets in Florida, indicates that municipal communications actually increase private firm entry. The inference from this research is that legislation restricting or precluding municipal provision of communication services reduces the overall level of competition.³⁴

Yet incumbents also appear to think that may need to get in the game, if only to stave off the likes of new competitors such as EarthLink if partnered with major investors such as Google or possibly Yahoo or Microsoft. One consulting firm predicts that municipal networks (not only wireless) could grab up to 35 percent of the market share for video, fixed voice and high speed Internet services, and up to 20 percent of the mobile services market. It notes that “The competitive impacts will be especially threatening to incumbents to the extent that municipal networks can be cost-justified by increasing efficiencies, cost-savings and other ‘internal’ or ‘social’ benefits captured by local governments, schools, schools and other public institutions.”³⁵ Thus “... broadband incumbents may have to deploy their own competitive Wi-Fi network offerings, and offer mobility as a differentiation tool.”³⁶

4.2. Business Models and Sustainability

Several business models have been proposed for municipal broadband. More than 2000 US communities have public power systems; many have their own optical fiber for managing their networks. Some of these municipalities have decided to provide broadband access to the public over their networks. Their typical anchor tenant is the local government; some expand to serve local businesses. If they choose to serve residential customers, they may tie into the local telephone company for long distance services, or expand their networks to homes using fiber, hybrid fiber-coax or broadband over powerline (BPL). They may become an ISP or a conduit for multiple ISPs.

For wireless, municipalities are typically contracting with the private sector to build and operate the network, which may be owned by the municipality or the

contractor (the latter investment model is known as build, own and operate or “BOO”). The revenue models are typically:

- Free service, advertising-supported;
- Subscription service, often with various tiers or options;
- Hybrid with free service in some areas or some users, and fee-based services elsewhere.

The verdict is still out on whether any of these models are sustainable. Given the insistence of many communities to include free service, advertising seems to be necessary, assuming that subscription fees would not be sufficient to cross-subsidize free service. The requirement of many municipalities to keep subscription fees low, or even to specify that they must be lower than available alternatives, limits operators’ pricing flexibility. In addition, some cities require revenue sharing, in return for providing free or discounted access to their infrastructure (such as light poles).

EarthLink raises two additional issues, namely that quality of service must be adequate if municipal wireless is to be seen as a viable alternative to DSL or cable, and that user needs, and therefore technology requirements, are likely to change over the next five years. Thus, capital and operating costs may be higher than foreseen by some community access proponents.

So why would the private sector want to get into this game? There appear to be two major drivers for the operators and content providers (as opposed to the equipment vendors, who have a clear interest in sales for this new market). First, some see it as a means to compete with incumbents without being forced to use their networks. It appears that MetroFi, which was started by former executives from Covad, and EarthLink fall into this camp. If they succeed, this might become the “third pipe” envisioned by the Hundt FCC or a form of the intermodal competition championed by the Powell FCC. Second, content and service providers are looking for new markets and testbeds. Google definitely appears to be in this category.

4.3. A Stepping Stone to 3G?

For incumbents, is municipal wireless an opportunity to try out services that could be offered over 3G? The real goal for content and application providers such as Google may also be to develop strategies and content that can be transferred to 3G networks. Of course, this scenario would also affect the business model of municipal wireless. Will 3G be the “killer response” that wipes out revenue for municipal wireless once mobile users have access to broadband on their cellphones and PDAs, or on notebook computers (as is currently being offered by Verizon and Sprint in some markets on EVDO networks)? If so, what happens to the goal of free or very cheap broadband access throughout communities?

4.4. Community Access and Demand

To achieve the goal of affordable broadband for low-income and disadvantaged populations, San Francisco and other communities opting for municipal wireless need more information on why few subscribe. For example, are there areas of the city that do not have broadband available by DSL or cable or some other means? Where service is available, what percentage of households in each neighborhood subscribe? Are the barriers to access strictly financial, or are there other barriers, such as lack of computers, lack of skills or confidence to use computers and the Internet, lack of appropriate content or applications?

Some national-level research may provide insights. For example, Flamm and Chaudhuri found that males are less likely to be Internet users, but once involved, more likely to opt for broadband. They also found that age, race and income have statistically significant impacts on propensities to use the Internet in general, but no additional impact on choice of broadband vs. dialup.³⁷ Of course, these and other findings would need to be tested at the community level.

We also know from other community access experience that many who are not connected will need training, access to computers, and an understanding of how the Internet could be useful to them and their families. Community outreach will also likely be needed. As Stover et al. note: “The formidable access issues surrounding mounting meaningful access programs, reaching populations unused to and involved with computers, and creating economic advantages for individuals and businesses require strong communities and a leadership cognizant of community dynamics.”³⁸

If a key barrier is availability or affordability of computers, San Francisco could consider initiating a computer installment purchase plan for low-income and disadvantaged residents, such as a lease-to-own scheme for a small down payment and \$20 per month. Private sector or NGO partners may be able to devise such a program.

If price of broadband service is a significant barrier (and if most unconnected households already have computers), the goal of affordable access for the low-income and disadvantaged could be achieved through a discount or voucher for those who meet low income criteria.

4.5. Pricing

San Francisco’s RFI states: “Fees for access to the Network must be priced lower than existing alternatives and must be affordable for low-income and disadvantaged residents and businesses.” These are two quite different criteria. The standard should be the second clause of this sentence, not the first. Affordability can be achieved without undercutting other broadband providers if they offer affordable service.

4.6. Is Ubiquitous Wireless the Only Solution?

The San Francisco RFP states: “Universal, affordable *wireless* broadband internet access is essential to connect all residents of San Francisco to the social, educational, informational, and economic opportunities they deserve.” This pronouncement confuses the means with the ends. The goal should be *universal (i.e. available and affordable) access to broadband*.

If the goal is universal and affordable access to broadband, should not wireless be only one solution? Wireless is very appropriate for outdoors and public spaces. It is less suitable for individual households, multiunit dwellings, high rises, office buildings, etc. Besides, many of these could already be served by commercial cable or DSL. (In fact, nextLAN proposed to provide indoor access by renting wireless micronode repeaters that subscribers would attach to existing DSL lines.)

5. Conclusions

San Francisco’s emphasis on wireless alone is misplaced; there is no evidence that the city needs *free universal wireless* broadband. The goal should be *universal (i.e. available and affordable) access to broadband*. Wireless is definitely a major part of the solution to achieve this goal, but it need not be the only solution.

The advantage of wireless for a city is that it can provide coverage for public spaces. San Francisco should be seeking wireless coverage first for outdoor public spaces and other community and public access locations such as public squares downtown and along the waterfront (some of which are already covered), parks and squares in residential areas, public areas of Chinatown and Japantown, community centers and other community meeting places.

A second priority for the City should be facilitating broadband access for low-income areas and disadvantaged populations that do have other potential options such as DSL or cable, but cannot afford them. Discounts or vouchers for broadband access could be solutions. They should apply to service from any broadband provider, including cable networks and resellers as well as DSL from the incumbent, AT&T.

A third priority should be to require that all commercial and residential buildings in San Francisco have broadband access. Again, wireless may be part of the solution, but other technologies – and providers – are likely to be more cost effective in many cases, particularly given the terrain of San Francisco and the number of multistory residences and commercial buildings.

San Francisco should also use its legal and persuasive powers to achieve these goals. For example, the city selects and approves the cable franchisee, currently Comcast. A franchise requirement should be to provide Internet-capable cable access in all buildings and a subsidy program for low-income subscribers. Permits for new commercial buildings and multi-unit residences should require broadband cabling throughout.

The San Francisco TechConnect initiative and the experience of other Bay Area communities seeking wireless broadband coverage suggest that there remain many unanswered questions about the need for ubiquitous wireless, the barriers to broadband usage, and the financial and technical sustainability of municipal wireless.

Table 1: San Francisco Wireless Broadband Proposals*

Proposal	EarthLink/Google	MetroFi	nextWLAN	RedTAP	SeaKay
Participants	EarthLink, Google Motorola, Tropos	MetroFi	nextWLAN	Razortooth Communications	SeaKay (nonprofit), Cisco, IBM
Business Model	EarthLink build, own, op free low speed service, 300/300 kbps, ad supported "T1 alternative" \$20/mo.	MetroFi build,own, op free 1mbps/300 kbps service various premium rates	free 384/384 service "zero infra, advertiser-funded" higher spd premium service financed by subs deploying ~100k micronode rptrs attached to ~40k DSL lines	wireless coop under RedTAP brand commty access centers with for-pay services free for city, state, fed \$5/mo premium srv for others	City owned, Seakay managed Cisco equip, IBM support financed thru nonprofit fundraising: cash and inkind free basic service sponsored higher speed service
City Role	leverage city assets: lights, bldgs pay city for pole access, etc. no revenue-sharing with city	no cost to city no revenue-sharing with city	no use of city assets no revenue-sharing with city	free service for city requests \$25k from city	city owned use municipal infrastructure no revenue sharing with city
Proposed Term	10 yrs with two 4-year renewals	5 years with two 5-year renewals	5 years	5 yrs with one 5-year renewal	5 to 10 years
Network Architecture	30 wifi nodes per sq mi. Motorola canopy, Tropos wifi mesh microwave links btwn towers CPE with high gain antennas	26-32 wifi nodes per sq mi 802.11a and microwave backhaul CPE with high gain antennas	~100k micronode CPE devices connected to DSL lines contract with other provider for premium portable services	citywide network Linksys routers, custom firmware	Cisco Aps plus WiMax
SF RFP Evaluation: written proposals/400 oral interviews (top 3)/100 Total Points/500	260 69 329	256 57 313	71	56	148 60 208

* A sixth proposal, from Communication Bridge Global, was incomplete.

Derived from: Civitium, "Preliminary Review of Proposals Received," February 23, 2006, and TechConnect Aggregate Evaluation and Scoring Worksheets.

NOTES

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² Source: www.oecd.org/sti/ict/broadband, data from December 2005.

³ Turner, S. Derek. "Broadband Reality Check". Free Press, August 2005.

⁴ Turner, S. Derek. "Broadband Reality Check". Free Press, August 2005.

⁵ US census data from www.sfgov.org and <http://censtats.census.gov/data/CA/05006075.pdf>.

⁶ Actually, the City and County of San Francisco; both have the same geographic boundaries and administration.

⁷ Source: www.sfgov.org/techconnect.

⁸ Source: www.sfgov.org/site/uploadedfiles/dtis/tech_connect/BroadbandFinalRFIC.doc (italics added).

⁹ See www.sfgov.org/site/uploadedfiles/dtis/tech_connect/TechConnectRFP_2005-19_12-22-05Rev1-17-06.pdf.

¹⁰ Promotions from AT&T and Comcast as of August 31, 2006. These rates increase to \$30 and \$35 per month respectively after introductory periods.

¹¹ MetroFi is privately held, and was cofounded by former Covad executives. See www.metrofi.com.

¹² NextWLAN is a privately funded wireless LAN company founded in 2003, headquartered in the Bay Area (Los Gatos). See www.nextWLAN.com.

¹³ Razortooth does business as RedTAP, a grassroots Internet company headquartered in the Mission District of San Francisco. See www.redtap.com.

¹⁴ RedTap Proposal Executive Summary.

¹⁵ Census data listed in the SAMCAT RFP. See www.jointventure.org/programs-initiatives/smartvalley/projects/wirelessv/documents.

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- ¹⁶ SAMCAT request for proposal: See www.jointventure.org/programs-initiatives/smartvalley/projects/wirelessv/documents.
- ¹⁷ Source: www.jointventure.org/inthenews/pressreleases/090506wirelessvendor.html.
- ¹⁸ Letter from Cole Reinwand, Vice President, Product Strategy and Marketing, EarthLink, to Brian Moura, Chairman, SAMCAT (San Mateo County Telecommunications Authority), June 26, 2006.
- ¹⁹ Source: www.jointventure.org/inthenews/pressreleases/090506wirelessvendor.html
- ²⁰ Letter from Cole Reinwand, June 26, 2006.
- ²¹ Verizon now offers 768 kbps for \$14.95 per month in Philadelphia.
- ²² EarthLink/Google presentation to San Francisco TechConnect, March 15, 2006.
- ²³ See www.ci.santa-clara.ca.us.
- ²⁴ Neither RFPs (if any) nor contracts between the cities and MetroFi are publicly available electronically.
- ²⁵ Source: www.metrofi.com/press/20060130b.html.
- ²⁶ Census data provided at www.cupertino.org.
- ²⁷ See www.metrofi.com and www.muniwireless.com.
- ²⁸ See www.skypilot.com/company/pr_091905a.htm.
- ²⁹ "Municipality WiFi: Despite EarthLink, Google, Viability remains Unclear." *Pyramid Research Analyst Insight*, November 28, 2005.
- ³⁰ "State Broadband Battles." *Public Power Magazine*, Sept.-Oct. 2006. Available at www.appanet.org.
- ³¹ "State Barriers to Community Broadband Services", *APPA Fact Sheet*, December 2004. Available at www.appanet.org and www.baller.com/pdfs/Barriers_End_2004.pdf.
- ³² See www.baller.com/pdfs/Baller_Proposed_State_Barriers.pdf.

³³ Testimony of Christ Putala, Executive Vice President, Public Policy, EarthLink, before the Committee of the Judiciary, US Senate, Hearing on Reconsidering our Communications Laws: Ensuring Competition and Innovation,” June 14, 2006.

³⁴ Ford, George S. “Does Municipal Supply of Communications Crowd-Out Private Communications Investment?” *Applied Economic Studies*, Feb 2005.

³⁵ “Municipal Broadband will pose growing threat to for-profit operators.” Pike and Fischer press release, available at www.pf.com.

³⁶ “Municipality WiFi: Despite EarthLink, Google, Viability remains Unclear.” *Pyramid Research Analyst Insight*, November 28, 2005.

³⁷ Flamm, Kenneth and Anindya Chaudhuri, “An Analysis of the Determinants of Broadband Access” TPRC, 2005.

³⁸ Strover, Sharon, Gary Chapman and Jody Waters. “Beyond Community Networking and CTCs: Access, Development and Public Policy.” TPRC, Sept 2003, p. 24.