



Intel® Solution Services

Wireless Silicon Valley Task Force Initiative

Wireless Business Model



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INTEL AND WIRELESS SILICON VALLEY JOINT TASK FORCE

1. Background

Wireless Silicon Valley is a project of Smart Valley, an initiative of Joint Venture: Silicon Valley Network.

Formed in 2004, the Wireless Silicon Valley Task Force consists of the Information Technology managers and economic development managers at most of the cities and counties in Silicon Valley. In 2005, the San Mateo County Telecommunications Authority joined the Task Force, bringing with it all of the cities in San Mateo County.

Wireless Silicon Valley contracted with Intel Solution Services to provide assistance with the development of a Request for Proposal (RFP) for wireless services to cover all of Silicon Valley. The consulting team conducted a survey of the participating cities and counties to gather information on their expectations and requirements. The results of the survey, summarized in this document, combined with the *Wireless Silicon Valley Vision* report, and discussions with the members of the Task Force, form the basis for the “Wireless Business Model” described in this document. The concepts and principles in the Business Model are guiding the development of the RFP.

Additional information on the program and the parties involved will be provided in the RFP when it is released at the end of April, 2006.

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The Vision paper and additional documents on Wireless Silicon Valley are available at, www.wireless silicon valley.org and www.jointventure.org

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2. Executive Overview

The purpose of this document is to provide a business model to be included in the Request for Proposal (RFP) for a ubiquitous (available everywhere) wireless network access for the entire Silicon Valley. There are many different and competing interests when designing municipal wireless networks such as Economic Development, Government Efficiency, Universal Wireless Access, Digital Inclusion, and Market Creation (instilling competition for new and exciting broadband services). In order for a digital community to thrive over the long-term, a sustainable business model is required. This document describes how a Regional Broadband Alliance (RBA) business model will best serve the residents of Silicon Valley.

The RBA model was chosen based upon the results of the Silicon Valley Wireless Joint Task Force Assessment Questionnaire and the area's past experience using a Joint Powers Authority (JPA) to procure services for the region. Once the Joint Task Force accepts the RBA model, the next step will be to start writing the RFP. In order to encourage a large number of highly quality responses to the RFP, it is important to consider a few things:

1. The business model needs to make sense, accepted by the team, and fully internalized. In situations where the business model does not make sense, or worse, when no business model is proposed, the RFP will be very confusing and will *encourage vendors to not submit responses*.
2. The RFP needs to focus on the needs of the community rather than on the details of the technology used. Technology is important for the final solution and vendors need the flexibility to propose the best technology they have. Vendors sometimes propose inferior technology that may meet unrealistic demands by the RFP issuer. For instance, a vendor may propose proprietary technology to meet a particular performance requirement when it would be better if a standardized product were proposed.
3. Vendors need to have a clear idea what the community desires and the flexibility to propose their best solution.

The purpose for creating the business model before, and separate, from the RFP is to reach internal agreement and clarify the types of services requested by the community. For many people, wireless technology is very new which leads to confusion, misinformation, and sometimes fear. The general population has valid concerns when it comes to financial viability, pricing, governmental participation, private ownership, dealing with incumbent telcos, cellular, wireless, and cable TV providers, first responder reliance on a public network resource, etc.

Defining the business model in advance of the RFP clarifies and removes internal barriers, defines a common set of terminology, and creates a positive environment for the adoption of wireless technology. The remainder of this document contains the proposed RBA business model, definitions of the terminology surrounding it, and provides a reserved area for non-business model related RFP notes.

3. The Wireless Business Model

There are many different types of business models that have been used during the last few years for municipal wireless projects. They generally fall into two generic types: public and privately owned.

Publicly owned and operated wireless networks by a city or local government have been successful where there is little public opposition to use taxpayer's monies to fund and own the network.

Although publicly owned networks can be successful, there are risks:

- √ Private enterprises lobbying State and Federal governments for passage of legislation that would prevent a municipality from providing wireless services
- √ Inability or lack of desire by a municipality to implement a city-wide wireless network
- √ Insufficient funds necessary to adequately maintain and update the network over time

Privately owned municipal networks have been successful because there is a profit motive. They are willing to make hard choices in order to secure a revenue stream.

The profit motive provides a form of discipline when it comes to coverage areas and the types of wireless service they can provide. There are a few problems with the profit based wireless model though. In many cases, service providers are not willing to provide wireless coverage in low income or sparsely populated areas. Traditional broadband providers have ignored many of these areas in the past. The only service available to these customers is slow dial-up, barely usable for modern internet applications. Cost of dial-up service is expensive while the performance is very low. Another problem with private ownership is the case where the network owner and the service provider are the same. In this situation, there is little incentive and no competition to offer new or upgraded wireless services.

In summary, there are problems with both, purely public and purely privately owned networks. Another model needs to be found that:

- √ Provides community wireless service at an affordable price
- √ Creates a profit incentive and revenue stream
- √ Provides ubiquitous wireless coverage
- √ Promotes competition between multiple service providers in order to drive down prices
- √ Creates an organization to provide network and service provider oversight that is immune from municipal ownership legislation

A Regional Broadband Alliance is the preferred model for the municipal wireless deployment. In this model, a centralized organization, the RBA, is responsible to provide management and oversight for the operations of the network. The network is privately owned and provides bandwidth to one or more service providers on a wholesale basis. In this model, a percentage of revenue, obtained through the sale of bandwidth to the service providers, is returned to the RBA to fund its operations. Depending on how the CBA is operated, there may be an opportunity for excess revenue to be returned to municipalities served or reinvested back into the network for technology upgrades.

In summary, the RBA model is ideal for the member cities that make-up the geography served by the Wireless Silicon Valley Joint Task Force. It provides a democratic method that fosters the participation and cooperation of the cities in the valley to achieve the goal of ubiquitous wireless internet, everywhere. By working together, a very large market is created that is attractive to both prospective owners of the wireless infrastructure as well as one or more service providers who are motivated through competition to offer new and exciting services.

4. Usage Model Definition

When a wireless business model is created, the next step is to define the usage model i.e. what kinds of services will be provided and how they will be delivered. There is not a “one size fits all” usage model for every community. What has worked for one community does not necessarily work for another community. Many communities are very conservative and risk adverse meaning that they wait for another community to be successful before try it. Their natural inkling is to, “just copy and do what city XYZ did” and *assume* that they will be successful.

Simply copying another municipal’s wireless and usage models may not work because:

- Each city has different needs and motivations which drives the wireless model
- There are many different potential user groups and populations that must be addressed
- Needs analysis must be performed to accurately assess wireless requirements
- Political, financial, incumbent service providers, and statutorial issues differ wildly
- Wireless Public Safety and City applications may or may not be important to the municipalities being served
- Size of the potential wireless community and market are factors that vendors consider

The aforementioned issues are just a few that may cause dramatic differences in a workable usage model for a given community. By thoroughly understanding and analyzing the needs of a given community, a single usage model will generally float to the top that makes the most sense. In the case of the Wireless Silicon Valley Joint Task Force, a survey was used as a very rapid method to gather the needs of the community from a municipality viewpoint.

After analyzing the community’s responses, the following general trends were observed, (in no particular order):

1. Universal wireless outdoor service was desired
2. Public safety applications were important to the cities
3. Indoor wireless access is desired as an alternative to existing broadband services where it exists
4. Some cities have already implemented wireless broadband or have projects underway, which will affect their participation in the project
5. Some municipalities were very interested in providing city applications and government services over a wireless network (Public Works, Parks and Rec., Field Inspectors, etc.)

By looking at the needs of the Silicon Valley community as well as looking at what other communities have done, the following service models are viable and should be included in the RFP:

1. ***Basic Outdoor Wireless***
2. ***Enhanced Outdoor Wireless***
3. ***Indoor Guaranteed Wireless***
4. ***Government Wireless***
5. ***Public Safety Wireless***

5. Usage Model Service Functions

Now that the usage model is defined, a more detailed description of its service function is presented in this section. The Municipal Wireless industry (prospective users, RFP issuers and vendor responders) have been struggling with the classification of service based upon user demands and the applications that reside on the network. The following chart displays the usage model in a matrix form along with the functions that are expected based upon service type:

Usage Model Service Type	Subscription or Fee	Speed / Performance	Advertising Allowed	QoS Priority	Fixed	Nomadic	Mobile	Advanced Security
Basic Outdoor Wireless	No	Best Effort	Yes	No	Yes	Yes	No	No
Enhanced Outdoor Wireless	Yes	High	No	No	Yes	Yes	Yes	No
Indoor Guaranteed Wireless	Yes	High	No	No	Yes	Yes	No	No
Government Wireless Services	Yes	High	No	Yes	Yes	Yes	Yes	No
Public Safety Wireless	Yes	High	No	Yes	Yes	Yes	Yes	Yes

1. **Subscription or Fee:** A basic description whether there is a charge for wireless service or not.
2. **Speed / Performance:** The description of the kind of performance a user can expect. For Basic Outdoor Wireless Service, speed will depend on distance from the access point, number of radio hops, and loading of the radio channels by other users. For the other service types, enhanced performance can be delivered through the prioritization of data.
3. **Advertising Allowed:** This is a description whether advertising is allowed in an individual service type. Advertising revenue will help attract service providers and will subsidize free access for everyone.
4. **QoS:** Quality of Service is a networking term that describes how the system decides which packet to send first. Government and Public Safety traffic should have the option of being assigned the highest priority to get the best possible performance when needed. Such a service may cost more.
5. **Fixed:** Fixed, in a mobility sense means that the device does not move during operation, for example a desktop computer. Other examples of fixed service would be automated, credit-card based parking meters, Supervisory Control and Data Acquisition (SCADA) device monitoring applications, etc.
6. **Nomadic:** Nomadic means a device that is mobile but is generally used while in a stationary position i.e. Laptop or Personal Digital Assistant (PDA). Another example of nomadic service would be a VoIP phone for field based city employees where their primary area of operation would be within the city's boundary.
7. **Mobile:** In this case, Mobile would be a laptop computer or specialized device used while in motion, on a fire engine, auto, police cruiser, train, bus, etc.
8. **Advanced Security:** The network should support Virtual Private Network (VPN) capabilities for all service types. Advanced Security means conformance with security specifications provided by the Department of Justice, including the provision of Virtual Local Area Networks (VLAN) and the use of the 4.9 GHz frequency. This level may include the physical securing of critical network equipment and protection against jamming.

6. RFP Notes and Assumptions

When defining a business and usage model it is sometimes very hard to differentiate between required features in the model vs. whether or not a feature should be open for vendors to propose in their RFP response. The following list is a placeholder for required features or open issues that need to be addressed in the RFP:

1. Individual cities and county governments are generally not interested in being the network owner or provider of wireless services in their jurisdiction.
2. Individual cities may choose not to participate in the process. They are encouraged to have their wireless service provider interoperate with the Wireless Silicon Valley service provider.
3. Each city will independently ratify the winning vendor's proposal for their geography and jurisdiction.
4. The winning vendor(s) are encouraged to cooperate with incumbent wireless service providers to provide a transparent interoperability feature to allow the entire Silicon Valley to have ubiquitous wireless service.
5. Agreements to install wireless antennas will be negotiated separately from the RFP.
6. A single sign-on, web page / portal that is localized and linked to the geography where the user first signed-on is required. Vendors are encouraged to provide transparent roaming service and interoperability agreements with incumbent wireless service providers. Vendors are encouraged to make the credential handling, security, and multi-service vendor clearing house functions occur behind the web page / portal interface away from the user.
7. Vendors should consider using existing infrastructure wherever possible (antenna mounting, use existing fiber, secure agreements with Power companies, etc.)
8. VPN pass-through is required for every service type.
9. Government and Public Safety service may take place in the 4.9GHz spectrum. Vendors are encouraged to respond with multi-band service and spectrum solutions. Support for Security, Encryption, VLAN, and enhanced VPN features will be required in this service type.
10. Vendors are encouraged to provide details on the type of advertising, the method it is delivered, and the number of "pop-ups" or "browser interruptions" to deliver advertising to the end user.
11. The Regional Broadband Alliance organization and operating structure is not fully defined yet. The RBA will have oversight powers for both the network owner and service providers. Ideally, this group will have a board of directors with membership from each participating community, the network owner, and each service provider. The board of directors will set policy for the network.
12. Vendors are not required to adopt the business model as suggested in this document. They are free to propose any business model they feel will better serve the needs of the RBA.
13. Government and Public Safety Enhanced service is composed of more than one service type. There are fixed and mobile components to this service. For Law Enforcement applications, there are additional security considerations mandated by the Department of Justice (DOJ) that are above and beyond security levels provided by standard VPN.
14. In areas where indoor wireless service is desired, the outdoor wireless signal strength may not be sufficient to penetrate into all areas of a building. Responders should specify Customer Premises Equipment (CPE) to extend the range of the service to the indoors. Indoor users will be able to choose between basic and enhanced levels of service.

7. Questionnaire Response Summarization

The following text represents a summarization of the responses the team received from the questionnaire process. The purpose for providing the summarized results in this document is to validate that the proposed business model accurately reflects the needs of the constituent organizations surveyed.

A Wireless Vision For Silicon Valley: RESULTS

Visions for a wireless network in Silicon Valley had a number of consistent and reoccurring statements. Those themes describing the promise and value of a wireless network are:

Question	Widespread Consensus
What are your expectations?	Secure 100% coverage Interoperable with existing Wi-Fi network Expandable/scaleable Multiple service levels Highly reliable
What are the major themes/usage models?	Mobile workforce (Public Safety, Public Works) Universal access, resident, visitor, business Quality-of-life benefits
How would you benefit?	Internet connectivity convenience Current (future) applications, remote/field workforce Online government Improved communications to residents
What would the network look like in 3-5 years?	Free residential service, including free VoIP Service is truly mobile, not simply nomadic Robust, reliable, high(er) network speeds 100% coverage and availability Reduced (visible) infrastructure

How would your community/organization benefit from a wireless network?

Nearly all the questions from this area were rated medium or high. Only one, *Potential Revenue Source*, was rated as low.

Six questions were rated as high. These can be grouped into three general categories; 1) Public Safety, 2) Residential user benefits, and 3) Wireless accessibility indoors

The HIGH rated questions:

1. Potential improvements in services, safety, welfare
2. Provide convenience to residents
3. Residents and visitors will be able to get free, basic access
4. Residents and businesses may be able to receive the wireless network indoors and use this as their primary access to the Internet
5. Some categories of users such as first responders will have a guaranteed level of service
6. The network will be based on open standards

How would your community/organization benefit from a wireless network?

(High = 3, Medium = 2 or Low = 1)

	Median Response
1. Potential cost savings	2
2. Potential revenue source	1
3. Potential improvements in services, safety, welfare.	3
4. Access for low income residents	2
5. Economic development	2
6. Attract tourists, visitors, business travelers	2
7. Attract business to relocate to the area	2
8. Provide convenience to residents	3
9. Residents and visitors will be able to get free, basic access	3
10. Public agencies will get free or low cost service saving taxpayer dollars	2
11. Residences and business will be able to pay for additional services such as guaranteed bandwidth and Quality of Service (QoS)	2
12. There will be a choice of service providers on the network	2
13. Residents and businesses may be able to receive the wireless network indoors and use this as their primary access to the Internet	3
14. Some categories of users such as first responders will have a guaranteed level of service	3
15. Video and VoIP (Voice over IP) will be a service on the network	2
16. The network will be based on open standards	3
17. Some elements of the network may be based on proprietary technology in order to achieve certain levels of service	2
18. There will be a “splash page” welcoming people to the community and providing information on local events, restaurants, and other resources	2
19. SCADA services will be supported for monitoring remote equipment	2

Wireless Survey Indicators

Organizations collective reactions towards wireless are very similar. Motivation to implement is relatively high but is neither economic nor social in nature. A wireless solution should be based on standard technology and be generally available at no-cost or low-cost to the public. In addition, all organizations believe themselves to be a catalyst for wireless deployment and are very open to cooperating with an external wireless organization.

Please enter a number from 1-10 that most accurately represents you/your organizations attitude concerning wireless technology

Median
Response

1. Your organization's motivation level to implement (1 Low, 10 High)	8
2. Economic motivation (1) vs. social motivation (10)	6
3. Your organization's cooperation capability with outside organizations (1 Low, 10 High)	8
4. Wireless pricing: fee based (1) vs. no-cost/free (10)	8
5. Technology preferences: standardized (1) vs. proprietary (10)	1
6. Your organization's role in deployment: catalyst (1) vs. service provider (10)	2

Identified User Applications:

Almost unanimously, wireless applications could be grouped into two categories: 1) Public Safety, and 2) Public Works. A few organizations already have deployed wireless applications. Many organizations have identified current or future applications that have been identified and are proposed as wireless candidates.

Application Areas:

Examples

Public Safety	EMS, Fire, Police, Sheriff
Public Works	Assessment, Engineering, Electric, Inspection, Parks, Sewer, Survey, Traffic, Water

Usage:

Outdoor wireless use should be free, while basic residential use should be low cost. Cost is dependent upon speed, reliability, and services available; however, competitively priced to DSL and cable.

Visitor wireless should also be free. Areas that visitors frequent should be a focus deployment area.

Question**Common Responses**

Residential:	
Do you expect basic outdoor wireless network access to be free?	Basic service free time limited, duration limited ad-based Advanced services for fee
Would you expect residential indoor users to pay a monthly fee for guaranteed wireless network access?	Minimal fee; less than current in-home services Subscription based
How much do you believe residents in your community would be willing to pay in order to get indoor residential wireless broadband network access?	Depends on speed Less than current in-home services; e.g. DSL, cable
Do you believe that multiple service providers should complete to provide wireless service?	Yes, multiple providers; single infrastructure
Please share your opinions concerning residential wireless network access.	Security Simplicity (sign-on, use) Visible infrastructure
Visitor and Tourist:	
Do you feel that basic wireless network access is a competitive advantage to attract visitors and tourists to Silicon Valley?	Yes, advantageous
In which locations do you feel that wireless network access should be provided for visitors and tourists?	Hotels Business centers Transportation corridor Tourist areas Downtown Public areas (parks)
Please share your opinions concerning wireless network access for visitors and tourists.	Security Simplicity (sign-on, use) Primary focus is residents first, visitors second

Risks:

Within all the sections, Risks provided the most and widely varied responses. Responses were consolidated into several broad categories (listed alphabetically):

- Big Brother
- Business Model (deployment, liability, coordination, fee-structure)
- Cost
- Coverage
- Customer experience
- Education
- Infrastructure aesthetics
- Interoperability
- Maturity / Refresh
- Radio Interference
- Security
- SLA (QoS, Maintenance, Upgrade, Ownership, Policy, Standards)

The top five categories account for 80% of identified risks. The top two categories account for 45%. An interesting item to note; within the top five none are issues or concerns regarding wireless technology solutions.

Top Five Risk Categories	Description
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1	Service Level Agreement	Quality of Service (QoS) Maintenance and Manageability Scalability / Expandability (upgrades) Asset Ownership and Responsibility Technology Policy and Standardization
2	Business Model	Defined Methodology, Policies, Processes, and Procedures Deployment and Implementation Schedule Financial Liability and Responsibility Communication and Coordination with City/County Governments Service Offerings and Fee-Structure
3	Radio Interference	Existing wireless infrastructures using same frequency
4	Security	Logical (communication) and physical (infrastructure)
5	Infrastructure Aesthetics	Radio Towers, Antenna
5	Interoperability	Integrate and leverage currently (or future) installed wireless network

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