E-Business Strategies, Inc.

June 2002

RESEARCH INSIGHT

Boingo Wireless:

802.11b Wi-Fi Aggregator Business Model Analysis

Imagine this: you plop down at a table in your favorite coffee shop, flip the power switch on your laptop computer, a click here, a click there, and you're communicating with others or surfing the Web - without any wires. This is not a scenario from the future; it's Wireless Fidelity – a phenomenon commonly known as Wi-Fi.

Wi-Fi aggregators represent a new breed of companies. This case study lays out the different facets of a Wi-Fi aggregator's business model. In particular, we examine a leading aggregator called Boingo Wireless. At the end, we challenge the reader to think of what they would do if they were running this company and how they would position it for success.

Case Highlights:

- Wi-Fi or Guerilla Networks is one of the hottest phenomena in mobile technology today. As mobile operators around the world struggle with making the transition from 2G to 3G or "third generation" technology, this wireless technology is quickly filling the customer need for mobile access to the Internet.

- Boingo Wireless is a provider of Wi-Fi services, enabling access to the Internet via wireless Local Area Networks (wLANs) located in various "hotspots" across the country, such as airport lounges and cafes. We believe on-the-move users, especially traveling businessmen, will embrace Wi-Fi services for high-speed wireless data services.

- Boingo is an early market leader in the emerging Wi-Fi data services market. Boingo's founder, Sky Dayton, founder and current chairman of Earthlink, and board members, which include John Sigdmore, CEO of MCI-WorldCom, are seasoned entrepreneurs with an unparalleled experience in the telecommunications space.

- We believe Boingo's Wi-Fi aggregation business model, with low cost and high value proposition, uniquely positions the company to benefit from the growth of the Wi-Fi market. Boingo does not own a single wLAN network. Instead, it aggregates these networks provided by various "micro-carriers" by providing a single point of access to them.

- With a sound business model, Boingo should make a perfect acquisition target for mobile carriers in the next 2 years. This should be the case particularly if 3G does not happen on time, and Wi-Fi continues to fill in the mobile corporate users' wireless data services needs. Sprint PCS is already an investor in Boingo, making it a likely interested party. Earthlink is another interested party.

Who is Boingo Wireless?

Located in San Monica, CA, Boingo is a wireless broadband Internet Service Provider aggregating wLANs or Wi-Fi networks run by other firms. Using 802.11b or Wi-Fi, a popular standard for wireless networks, Boingo provides high-speed wireless Internet access from more than 500 “hotspots” - airports, hotels, cafes, restaurants, convention centers and many other public places - for mobile users or "Road Warriors".

Boingo was founded in February 2001 by Sky Dayton, founder of Earthlink. Earthlink is second largest Internet Service Provider (ISP) after America Online. Boingo was quietly built for nearly a year, operating under the stealth name "Project Mammoth.” Boingo launched its public service in January 2002.

Boingo is backed by about $15 million in venture funding from New Enterprise Associates (NEA), Sprint PCS and Evercore Ventures in its Series A round.

802.11b

802.11b is a technical specification issued by the Institute of Electrical and Electronic Engineers (IEEE) that defines the operation of 2.4 GHz, 11 Mbps, Direct Sequence Spread Spectrum Wireless Local Area Networks (wLANs).

Boingo Wireless’ Business Model

Figure 1 shows the different facets of Boingo’s business model. This case specifically is organized around the following key questions:

- What is the business opportunity that Boingo is going after?
- How is it creating value?
- What is its market positioning strategy?
- Who are Boingo’s competitors?
- How is it monetizing the opportunity?

Emerging Market Overview – Wi-Fi

Wi-Fi or Guerilla Networks is one of the hottest phenomena in mobile technology today. Wi-Fi technology is cheap, fast and works today. Wi-Fi uses unlicensed radio spectrum to enable computers within few meters of a small base-station to share an Internet connection. Base-stations are popping up in homes, offices, airports, libraries and cafés, and Wi-Fi capability is fast becoming a standard feature of laptops.

Wi-Fi networks have another built-in advantage: They're cheaper. A wireless system can cost one-tenth to one-hundredth as much as a wired system. All a user needs is one access point to receive the signal from laptops; there's no need to rip out walls, pay for massive amounts of wires, pay for expensive spectrum or go into sewer systems. It's so cost-effective that it is changing the way people think about connectivity. But there are downsides: a small number of access points and security.

Wi-Fi network costs one-millionth of a 3G or “third generation” network. As mobile operators around the world struggle with making the expensive technological transition from 2G to 3G technology, Wi-Fi technology is quickly filling the customer need for cordless mobile access to the Internet.

Large corporations are already using Wi-Fi at offices, warehouses and factories. Corporate IT departments are showing an increasing interest in using broadband wireless for remote and mobile access as soon as coverage is adequate.

In the United States, the technology has inspired a mania unseen since the early days of the Internet boom. Attempts to build Wi-Fi networks so far fall into three camps, illustrated in Figure 2.

Figure 1: Business Model Focus Elements

Wi-Fi

Wi-Fi is the trademarked name used to signify wLAN product interoperability. The name stands for "wireless fidelity." wLAN products that meet the interoperability standards set by Wireless Ethernet Compatibility Alliance (WECA) are awarded the Wi-Fi logo.

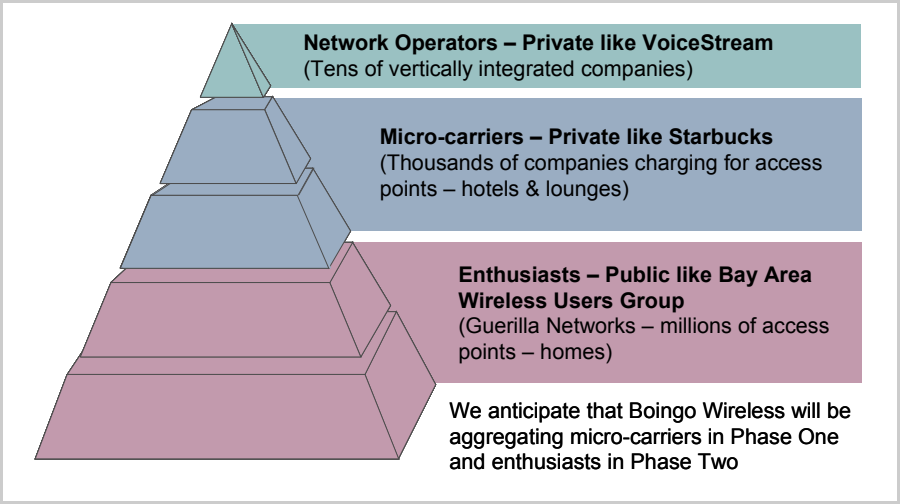

Figure 2: Wi-Fi Access Market Segmentation

These camps are:

1. **Top-down networks**, built in the traditional way by vertically aggregated network operators like VoiceStream, who then charge fees for access.

2. **Metropolitan networks**, built by wireless network companies called "micro-carriers" who charge for localized access.

3. **Bottom-up**, Guerilla or ad hoc community cells of 802.11 access points, built by loose federations of enthusiasts who offer free public access to all locally.

Business Opportunity – Hot Spots Aggregation

Public and private Wi-Fi hotspots offered by micro-carriers are growing in number. Micro-carriers are actively building fixed-point Wi-Fi access points in various public spaces such as hotels, airports, conference centers, and retail establishments like Starbucks.

The problem with current Wi-Fi access is a difficult, if not downright unpleasant, customer experience. It involves clumsy set ups with different PC cards or software that has to be used at different access points. Customer service among the hundreds of micro-carriers is virtually non-existent.

Because the coverage area of any one micro-carrier is limited, this causes "additional pain" to mobile users. Limited coverage means that mobile users will need to sign up for different micro-carriers depending on where they are. That means travelers must have multiple Wi-Fi access accounts. More importantly, this requires them to be "aware" of the micro-carriers active in their areas of movement.

Boingo sensed an opportunity in solving mobile users' pain by becoming a micro-carrier aggregator. It stitched together a heterogeneous amalgamation or patchwork of networks into a single, seamless experience for the end user. Boingo targeted the opportunity for providing mobile users with unified access to the wireless micro-carriers' hot spots from wherever they are. Essentially, Boingo is playing the mid-market aggregator role in Figure 2.

The Boingo Service - How Does It Work?

Step 1: Buying the Hardware – Users have to go to the store and buy a credit card-size Wi-Fi receiver (802.11b card from Cisco, Agere or Nokia) that slips into the PC-card slot of the laptop.

Step 2: Downloading the Software – Users download "sniffer" software for free from Boingo's Web site onto their laptops. Currently, support extends to laptops with Windows 98, ME, 2000 or XP and a Wi-Fi-compatible 802.11b cards.

Wi-Fi at Starbucks!

As part of its customer-centric strategy, Seattle-based Starbucks Corp plans to put Wi-Fi systems in nearly 75 percent of its coffeehouses. Starbucks offers the service through VoiceStream Wireless, where users must pay a subscription fee to VoiceStream to access the system.

Micro-carrier Footprint

The range or radius of coverage for typical micro-carrier network varies up to 500 feet (164 meters) depending on the number and types of obstacles encountered.

Coverage can be extended, and freedom of true mobility and roaming can be provided for a greater area through the use of multiple access points.

However, coverage of micro-carriers is limited by the underlying economics. The cost of installing gear every 500 feet everywhere is substantial.

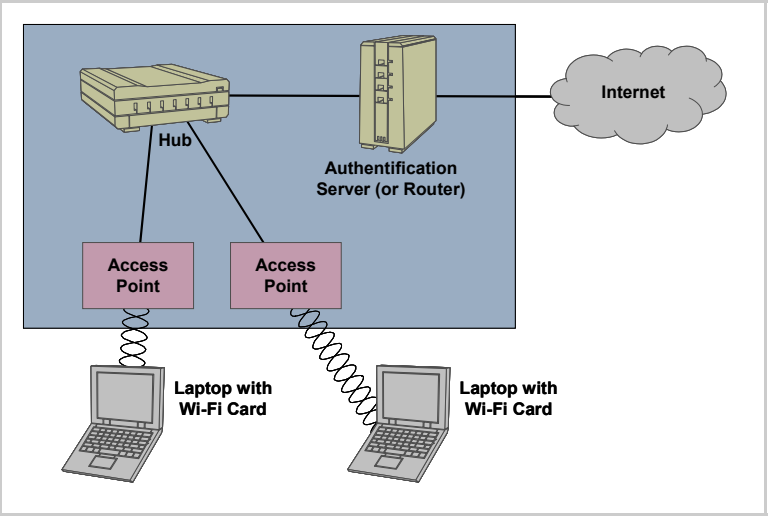

Figure 3: Wi-Fi Architecture

Step 3: Subscribing to the Service – Users then call a customer-service rep and subscribe to a provider, such as Boingo, for a monthly or daily fee. In Boingo's case, the monthly fee is $75. The user gets a user name and password that allow him or her to tap into 500+ public access points across the country.

Step 4: Accessing the Service – Once installed, the high-speed service is click-and-go. When users click the Boingo icon on their laptops, the "sniffer" software then checks the air for wireless signals, and a message pops up: **"The Boingo Wireless signal is available. Would you like to connect?"** A click on the YES and you're online. The service is 100-200 times faster than dial-up service, capable of hitting 11 megabits per second.

Value Proposition – How Does it Create Value for Users?

Boingo is aiming to provide low-cost, high performance and easy-to-use services for mobile customers to connect to the Internet. The value proposition to customers is clearly convenience. They would otherwise have to sign up for multiple micro-carriers depending on where they are and also be aware of who is servicing which areas.

To provide this value, Boingo is relying on partnerships with micro-carriers. Its ecosystem of micro-carrier partners currently includes: Wayport, Surf and Sip, Nomadix, RoomLinx, Air2Lan, Pacific Direct Connect, HereUAre and AirPath. It has a revenue sharing arrangement with the network operators. We expect the partner's share of the revenue to range from 30-50%.

To track usage, Boingo uses a billing system from Portal Software called Infranet software platform. Infranet provides flexibility in the tracking and billing of multiple services, pricing plans and customer usage -- important components to support Boingo's business model. Users receive a single aggregated bill from Boingo even though they may use services of a number of operators.

Boingo is partnering with as many micro-carriers as possible to minimize its build out risk (it appears to have learned a lesson from previously failed companies Metricom and MobileStar who tried to go-it-alone and spent billions on hot-spot infrastructure). With these partnerships, Boingo's network spans over 500+ hot-spot locations. The Boingo network today includes full coverage in major airports, such as Dallas/Fort Worth, Austin-Bergstrom, San Jose, and Seattle-Tacoma, and access in the lobbies of hundreds of Four Seasons, Hilton, Marriott and Wyndham hotels, among others.

To complete its value proposition, Boingo has plans to bring hundreds of additional locations online. This includes more hotels and select coverage at airports such as Atlanta-Hartsfield, Chicago-Midway, Philadelphia, Baltimore-Washington, Washington-Dulles and Boston Logan; plus more cafes and dozens of free community hot spots which users will be able to access at no charge.

The Basic Wi-Fi Elements

Wi-Fi cards work in a laptop and receive and transmit digital information over a radio frequency of 2.4 GHz. The card converts the radio signal into digital data (actually small packets of information) the PC can understand and process.

Access points receive and transmit information similar to the Wi-Fi card. The access point connects via a RJ-45 wire to the Ethernet and acts as the gateway (or on-ramp) for wireless users to access a wired LAN.

The access points connect into a hub, switch, or router - but can be connected to a server directly with a cable adapter.

Positioning – Where is it Located In the Value Chain?

Boingo is positioning itself as a value-added intermediary between end mobile users and the Wi-Fi network operators. Instead of deploying its own network infrastructure and incurring the build out costs that have crippled players like MobileStar in the past, Boingo purchases from micro-carriers on a wholesale basis, integrates these networks together and sells a single service to its customers. Thus, for end-users, it offers an integrated access to multiple hot spots, and for operators, it provides greater demand while at the same time reducing acquisition costs.

Boingo is more than a deal-maker, however. Key to its strategy is its laptop software that sniffs out available wireless LAN signals and then handles logon and authentication processes so that the complexity of bouncing from one wireless connection to another is invisible to roaming users. The software also includes a Virtual Private Network (VPN) client and authenticated Simple Mail Transfer Protocol (SMTP) service for outbound e-mail.

Competition – Who Else Is Offering Wi-Fi Wireless?

Boingo faces stiff competition already. Currently, its competition includes Joltage, HereUAre, iPass, Wi-Fi Metro, Wayport, T-Mobile. Many of the competitors (ex. HereUAre) are startups themselves. The startup field in Wi-Fi is large and growing, but it remains to be seen who will survive. T-Mobile is the result of acquisition of MobileStar's assets by VoiceStream following MobileStar's bankruptcy in 2001.

Waiting in the wings, though, are the big mobile-phone companies. We expect to see mobile carriers jump in also as customer adoption grows. The reason for this is the limited barriers to entry. Currently, there are very few barriers to entry in the Wi-Fi based Internet Service Provider market – Wi-Fi technology is cheap and non-proprietary. We expect what happened in the wired ISP market - proliferation of competition, price erosion, and consolidation - to repeat in the Wireless ISP market.

Long-term competition from hybrid models - Wi-Fi service offering high speeds at low or no cost over very small areas and the 2.5 or 3G service covering wide areas at lower speeds and relatively high cost - is worth watching. The telcos have been pushing 3G wireless-data services. Such services already are popular in Europe and Japan. We expect customers to select a hybrid of Wi-Fi and 2.5G or 3G. Hardware is catching up to this hybrid model; Nokia recently announced a PC card offering both Wi-Fi and cellular connectivity.

Revenue Model - How Does it Make Money?

Boingo is monetizing value through three service plans:

- **Boingo Pro.** For $24.95 a month, users get 10 Connect Days. A Connect Day includes unlimited access in a Boingo location for up to 24-hours. Users can disconnect and reconnect within each 24-hour period from the same location at no additional charge. Each additional Connect Day is just $4.95.
- **Boingo Unlimited.** With this plan, users get unlimited monthly usage for $74.95.
- **Boingo As-You-Go.** At $7.95 per Connect Day, this plan is for users who are not sure how much they will use the service. Customers only pay for what they use with no monthly fees. The plan allows new users to try the entire Boingo network without committing to a flat rate plan.

The implication of the revenue model and the potential number of customers is that Boingo would need additional funding to the tune of $27M to survive till 2004. To see this, let's assume that an average user spends $35/month on Boingo's service. If Boingo is able to get 25,000 subscribers in 2002, then it will generate $6.3M in revenue (Boingo's partners receive $4.2M with 40% share). Let's assume that the company's burn-rate is $1M per month (100 employees at a carrying cost of $10K/employee/month). Factoring in marketing and advertising costs of $5M for the year and other SG&A costs of $5M, the total spend in 2002 is $22M. Therefore, the net

Who Is Who in the Wi-Fi Value Chain?

Wi-Fi Laptop Cards:
3Com, Intel, Cisco, Agere, Lucent

Wi-Fi Access Points:
3Com, Avaya, Cisco, Compaq, Enterasys, Ericsson, IBM, Intel, Lucent, Marconi, Microwave Data Systems, Moseley Associates, Nokia, Nu-Metrics, OTC Wireless, Proxim, Symbol, WaveRider, YDI

Wireless Networking Chips:
Agere, Bandspeed, Bermai, Broadcom, Embedded Wireless Devices, Envara, IceFyre, Intersil, LinCom Wireless, Magis Networks, Mobilian, NewLogic, RF Solutions, Systemonic, Woodside Networks

Wi-Fi Security:

Authentication and Privacy: Agere, Cisco, Funk Software, Symbol

Monitoring Wi-Fi Traffic: Sniffer Technologies, WildPackets

Other Add-Ons: BlueSocket, NetMotion, ReefEdge, Vernier Net-

Competitor Revenue Models

Joltage: Buy up to 60 hours of access for $25. Or pay a straight $2/hr.

Sputnik: Affiliate users agree to share bandwidth for free access. You pay for hardware.

loss in 2002 is roughly $15.7M.

As competition increases, prices are bound to fall. That is, the average revenue per subscriber (ARPS) is bound to drop. Assuming that the ARPS drops to $30/month while the subscriber base grows to 100,000 in 2003, Boingo will generate $21.6M in total revenue (Boingo's partners receive $14.4M with 40% share). Assuming a conservative total burn-rate of $4M/month in 2003, Boingo's net loss will be $26M in 2003.

To survive till 2004, Boingo would need $25-27M in additional funding. If the customer adoption is slower or marketing costs are higher than our projections here, Boingo will need more financing.

Favoring Social, Economic and Technology Trends

Users are getting increasingly untethered. Supporting this social trend is technology. Wi-Fi technology is becoming cost-effective, robust and widely adopted.

Other trends that are going to drive adoption include:

- **Standardization**. Wi-Fi cards are becoming standard in laptops and notebooks, and eventually they are going to become "free" to the buyer, just as we do not perceive the modem or Ethernet port having a specific cost. Gartner predicts that by 2003 more than 5.4 million people worldwide will use the technology regularly.

- **Vendor Support and Marketing.** Support from major vendors is strong and growing. Microsoft is fueling the movement by weaving Wi-Fi software into its operating systems that alerts users when they come in range of Wi-Fi network. Wireless equipment vendors Cisco and Agere have made Wi-Fi innovation a top priority. And computer makers such as Apple, Dell, and Compaq are building Wi-Fi radios into notebook and handheld PCs. By 2004, more than 45 million business laptops – two-thirds of total in use – will be Wi-Fi enabled.

- **Grassroots Movement and Public Awareness.** Wi-Fi devices are mushrooming and the technology is rapidly available in business and private homes, with public spaces like airports and conference centers eyeing it as well. Meanwhile, next-generation networks are rolling out slowly, with few devices available. Wi-Fi networks are cheaper to deploy and the devices are already here, in the form of laptops and notebooks, with handhelds on the horizon. The number of public networks available to users is expected to top 15,000 by end of 2003, up from 1,100 last year.

Wi-Fi is the strongest bet among the alternative wireless networks, which makes Boingo a good acquisition target for telecom companies. Not only is Wi-Fi standards-based and creeping quickly into devices and corporate IT portfolios, but there's the strong chance of carriers like Verizon and British Telecom using Wi-Fi to round out their product lineups. As a result, we expect Boingo to be a good acquisition candidate for a telecom company when the market recovers.

Business Risk Factors

There are several risk factors facing Boingo. They include:

- **Nascent Market Risk.** The market for Wi-Fi services is in its nascent stages. Although we believe there is tremendous potential for Wi-Fi data services as enterprises look to enhance productivity, it is still very early in the game. Many hurdles have to be overcome.

- **Technology Risk.** Security is a major concern. It's radio signals easily penetrate the walls of homes and businesses where the networks reside. As a result, adoption by corporate users could be slower than expected.

- **Partnership Risk.** Potential for conflicts among Boingo's micro-carrier partners

due to limited bandwidth exists. Only three channels are available in any location. If too many networks are set up too close together, they can knock each other off the air. Since the 2.4 GHz spectrum they use is unregulated, there is no good way to resolve conflicts. As a result, Boingo needs to move fast and establish relationships with key players before the competition does. Furthermore, Boingo's business model has its partners assuming a lot of the risk because they are taking on the expense of building out their networks. If all the risk falls on Boingo's partners and they fail, then Boingo does not have service. With 21 ISPs failing in 2001, there are doubts about the longevity of all wireless LAN providers.

- **Adoption Risk.** Wi-Fi allows only limited mobility. Unlike cellular networks, Wi-Fi does not provide seamless transfer from one base station to another as you move. Furthermore, availability will probably always be limited to hot spots rather than the wide areas covered by the data services of wireless-phone carriers. As a result, if 3G happens sooner than later, Boingo and other Wi-Fi have a limited window of opportunity.

- **Regulatory Risk.** Wi-Fi faces an uncertain regulatory environment. Most Wi-Fi systems operate in unregulated portion of frequency used by cordless phones, baby monitors, and microwave ovens. Recently, Sirius Satellite Radio and XM Satellite Radio Holdings, who are satellite radio providers, have asked the FCC to regulate Wi-Fi technology, claiming that Wi-Fi signals interfere with their broadcasts. As a result, in a scenario of unfavorable regulation, Boingo could be in trouble.

- **Strategy-to-Execution Risk.** Boingo is in the very early stages of its business plan, and has yet to develop substantial revenues. Though we expect revenue to ramp significantly toward the end of 2002 and into 2003, there is clearly execution risk in terms of Boingo's ability to monetize its strategy.

The Bottom Line

Boingo's first mover advantage should make it a dominant Wi-Fi services provider. In the current economic environment, Boingo faces limited threat from the larger players like AOL, Verizon, etc. who have other problems to deal with, such as falling stock prices.

Boingo needs to move quickly and partner with businesses (not just micro-carriers) that cater to the mobile customer and sell aggressively to their customer base. For instance, Boingo could partner with Delta Airlines and create a program to get Delta's Frequent Flier members to sign-on.

Building a large customer base quickly is central to the success of Boingo's business model. Sky Dayton has done this once with EarthLink. Boingo is basically a next-generation wireless spin on EarthLink's business model: create a consistent network from a chaotic array of wireless hot spots by providing common front-end services, access technology and customer care.

The EarthLink business model was a huge success. The question is: Can he pull it off again?

Questions to Ponder

1. Is Boingo solving a real pain? That is, is it a "need to have" solution for a mobile user or a "nice to have" offering?
2. Is there clear differentiation from competition?
3. How many users are likely to pay for the service?
4. What is the target market? Consumers? Corporate? Both?
5. What changes in users' behavior will be necessary?
6. What partnerships and alliances will be required for growth?
7. Is it a viable long-term play?

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