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Advisory

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A Primer on Wireless Broadband Internet Access

By Russell Fox and Stefani Watterson

Until recently, high-speed Internet access could only be achieved by businesses and consumers through physical connection with a wired communications network. The most common high speed wired alternatives were cable modem service, digital subscriber lines (DSL) or high capacity telephone paths, such as T-1 lines. Wireless connectivity to the Internet was limited because the most commonly available wireless services—mobile services such as cellular and PCS—offered limited spectrum capability, making connection and download times slow.

Over the past several years, however, wireless broadband Internet access has exploded. This has come about largely because of the development of technology that operates over wider bandwidths, the availability of consumer oriented broadband devices, and the proliferation of locations where consumers can access the technology.

Wi-Fi

The wireless broadband application currently receiving the most attention is wireless fidelity, commonly known as “Wi-Fi.” Wi-Fi, technically known as the 802.11 format, allows anyone with a laptop and wireless network card to surf the Internet at home or at various “hotspots” without plugging into a modem, DSL or T-1 line. This technology, however, only provides wireless access to other, normally wireline, broadband capabilities. For example, consumers who employ wireless access at home are “accessing” a cable modem or DSL service delivered on a wireline basis to and from the home.

Between 2001 and 2003, the number of Wi-Fi hotspots is projected to have grown from 1,200 to 71,000. By the end of 2003, Wi-Fi users worldwide are projected to reach over nine million. In addition to Wi-Fi networks set up in private homes, some hotspots can be found in Starbucks, grocery stores, stadiums, hotels, and McDonald’s or other restaurants.

The traditional landline telephone companies have jumped into the business, giving it more credibility. Verizon has started offering the service in New York City through networking devices installed in payphones. SBC Communications claimed in August that it would deploy more than 20,000 public Wi-Fi hotspots over the next three years, working with Cingular Wireless and Wi-Fi service provider Wayport. Even the FCC announced in August that it had installed free Wi-Fi service in its headquarters building in Washington, D.C.

Wi-Max

Another developing wireless broadband application is called “Wi-Max” and “Wider-Fi” because it offers a transmission range of several miles, while Wi-Fi is limited to roughly 300 feet.¹ Wi-Max also allows users to wirelessly connect to the

¹ “Unlicensed and Unshackled: A Joint OSP-OET White Paper on Unlicensed Devices and their Regulatory Issues,” FCC OSP Working Paper Series #39, p. 32 (May 2003) (“Joint White Paper”). See also <http://www.wimaxforum.org>.

Internet without needing direct line of sight with the base station. In this application, wireless Internet service providers (WISPs) will provide wireless connectivity to the Internet in much the same manner as cable companies. This application is also envisioned as a method to link Wi-Fi hotspots.

Current Spectrum Allocation Issues

Wi-Fi and Wi-Max systems operate in the unlicensed bands of the electromagnetic spectrum. The spectrum bands now available for wireless Internet access are in the 2.4 GHz band and between 5.15 and 5.25 GHz. In July 2003, the World Radiocommunication Conference (WRC) allocated internationally 455 megahertz of spectrum in the 5 gigahertz band for systems using the Wi-Fi standard.

Anticipating this international action, the FCC proposed in June 2003 to amend its rules to make available for unlicensed operations an additional 255 MHz of spectrum in the 5 GHz band.² The FCC spectrum allocation proposal is similar to the Jumpstart Broadband Act previously proposed by Senators Boxer (D-Cal.) and Allen (R-Va.). Since the FCC issued its proposal, Congress has not taken further action on the Jumpstart Broadband Act.

The FCC rulemaking notice sought comment on allowing Wi-Fi and other unlicensed services to share a portion of the 5 GHz band with users from the U.S. Department of Defense. By allocating an additional 255 MHz of spectrum to unlicensed use, the FCC hopes to satisfy the need for spectrum by existing and developing unlicensed wireless services while avoiding interference problems with licensed wireless broadband systems.

Fixed Wireless

Wi-Fi systems operate in unlicensed frequency bands, but there are also wireless broadband systems that use portions of the spectrum licensed for such use. The licensed spectrum is located in the 2.1, 2.5 and 2.6

GHz spectrum bands. These systems are typically fixed wireless and can send a signal up to seven miles from a transmission point.

Advantages of the licensed wireless broadband systems are: 1) system providers have exclusive use of their specifically allocated frequencies and 2) they are protected from harmful interference from other users. Several wireless broadband systems are in operation, such as Clearwire in Jacksonville, Florida, and Roadstar Internet Services in Virginia.

3G Wireless

Another wireless broadband technology with widespread application possibilities is Third Generation Wireless or "3G." The goal of 3G systems is to provide high-speed web access, global roaming, video conferencing and TV streaming, all through a mobile phone platform. Since additional spectrum is likely necessary to provide full-blown 3G services, the FCC recently allocated to this service spectrum in the 1.7 and 2.1 GHz bands. The FCC is projected to auction this spectrum for 3G use in 2004.

Licensed vs. Unlicensed Spectrum

The most significant difference between 3G and Wi-Fi is how spectrum is allocated for each service. 3G service providers will be required to pay for and obtain from the FCC licenses to use spectrum designated for 3G services, either spectrum currently authorized to them or additional spectrum obtained when the FCC holds an auction. Wi-Fi, on the other hand, generally uses its allocated spectrum without obtaining a license from the FCC and without paying for it. The mobile phone industry, the primary providers of 3G services, is concerned that the FCC's recent focus on unlicensed wireless operations will be at the expense of licensed wireless operators.

Signal Interference Issues

Because the essential feature of unlicensed spectrum is the ability of anyone to use it

without coordination with others, the success of unlicensed operations depends on how the FCC and industry address the fundamental problem of signal interference.

In general, the FCC focuses its efforts to control signal interference on transmitter emissions, locations of transmitters and frequencies in use. In a recent Notice,³ however, the FCC sought comment on a proposal to address receiver immunity to interference. By setting *receiver* interference immunity standards, it posited, manufacturers would eliminate or greatly reduce interference levels by changing hardware design and signal processing software. The wireless industry generally agreed in comments on this FCC Notice that receiver standards must be developed by the industry and that industry compliance should be voluntary.

The Future of Wireless Broadband Depends On FCC Actions

Addressing interference concerns is but one step in the move toward increasing wireless services. The second problem in the licensed/unlicensed battle is spectrum resources. There is not enough unlicensed spectrum available to accommodate the many existing, proposed and not yet foreseen wireless services. In addition to allocating more spectrum for wireless Internet access use, the FCC's own staff in its May 2003 "Joint White Paper" suggests the FCC could create a receiver interference immunity standard that permits unlicensed devices to "underlay" the signals of existing users.

Wireless broadband services are the future of mobile connectivity to the Internet. Innovation in wireless applications and proliferation of new wireless services will depend on how the FCC addresses interference issues and how it continues to allocate spectrum for unlicensed services.

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² In the Matter of Revision of Parts 2 and 15 of the Commission's Rules to Permit Unlicensed National Information Infrastructure (U-NII) Devices in the 5Ghz Band, Notice of Proposed Rulemaking, ET Docket No. 09-122, FCC 03-110 (released June 4, 2003).

³ In the Matter of Interference Immunity Performance Specifications for Radio Receivers, Notice of Inquiry, ET Docket No. 03-65, FCC 03-54, ¶ 5 (released March 24, 2003).