

Technical Note: WiMax Licensing Regimes
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Given the commercial success of Wi-Fi, many communications industry watchers are interested in the promise of the emerging IEEE 802.16 set of wireless data networking standards known as WiMax. WiMax is not Wi-Fi.¹ WiMax is a non-line-of-sight last mile access technology. In April of this year, Intel became the first company to sell WiMax-compliant chip sets.² Nonetheless, it is not too early to consider the implications of emerging new licensing regimes for WiMax and similar technologies. This report addresses the question whether WiMax will be licensed or unlicensed, and what alternatives exist which blend the benefits of both regimes. This is important for a variety of reasons, not the least of which the choice of licensing regimes will affect the way technologies and services develop.

Much of spectrum policy debates have focused on whether spectrum access should be granted by licenses or should be unlicensed under a common resource approach. In order to coordinate rival uses of the spectrum, the Federal Communications Commission (“FCC”) normally issues licenses granting the right to emit RF energy. These spectrum licenses, for example radio, TV, and cellular licenses, specify the frequencies, location, time, and power levels which can be used by the licensee. By contrast, unlicensed devices share the spectrum with other radio services on a sufferance basis, using low power at certain frequencies, and are subject to a few cardinal rules: unlicensed users have no vested right to continue using any frequency; must accept any interference; and may not cause harmful interference to licensed users. To guard licensed users against the possibility of harmful interference, unlicensed equipment must be authorized (certificated) to show compliance with FCC standards before marketing or importation of device.³

In practice, the architecture of licensed networks tends to follow a centralized, coordinated approach, while unlicensed networks develop in a more decentralized manner with varying standards and rules. Both approaches seem to work in creating stable systems. The value chain in licensed regime is that of a service provider market where the spectrum is an input to a final product. An unlicensed regime tends to collapse the value chain, creating a market where endusers buy equipment to provision it for their own use on a small geographic scale. Licensed regimes, in which a small number of users or single user, can impose hierarchical, sharing techniques and are not subject to the collective emissions of errant users which would degrade its communications channel, are generally able to achieve more efficient spectrum use than regimes in which competing users are not coordinated.⁴ In these cases, there is little incentive for such licensees to take on the costs associated with deploying more sophisticated, robust receivers, thus enabling other users to share the band.⁵ By contrast, unlicensed devices, without the ability to impose coordination, must employ filtering and error correction techniques to separate out the unwanted noise from the intended communication. In addition, unlicensed devices standards oftentimes require that the device time out when it hears other users so as to avoid spectrum “collisions”. The cost of interference which may be intolerable to a licensed user might be perfectly acceptable to unlicensed user

¹ Many observers conflate WiMax and Wi-Fi networking standards as being big and little brothers, or WiMax is “Wi-Fi on steroids.”

² See http://www.intel.com/pressroom/archive/releases/20050418comp_a.htm (visited May 31, 2005).

³ 47 C.F.R. §§15.1, *et seq.*

⁴ Speta, J. B. (2002), “A Vision of Internet Openness by Government Fiat”, *Northwestern University Law Review*, Vol 96, pp. 1553 at, 1572 (2002) (“Where there is a single licensee either operating its own service or acting as a bandwidth manager, that licensee can mandate the use of equipment or protocols that fully utilize the spectrum. But where each device controls itself, the best that can be done is to use protocols that permit the spectrum to be used approximately sixty percent of the time.”).

⁵ Goodman, E. P. (2004), “Spectrum Rights in the Telecosm to Come”, *San Diego Law Review*. 269-404.

who is not paying reoccurring fees.⁶ So, it remains unclear where the total social welfare is greater if under the uncoordinated system the cost of mitigating interference is slight compared to the efficiency gain of coordination.

That said, as the WiMax standards are finalized, different versions can be made to operate in licensed spectrum or as unlicensed devices. The choice of a licensing regime for WiMax is not a determination which the FCC will make directly. Rather market entrants can choose between licensing regimes depending on technology, service requirements, and their ability to obtain a license. There are proposed flavors of WiMax (802.16a, approved in January 2003) which would operate in licensed spectrum or as an unlicensed device in spectrum between 2 and 11 GHz.⁷ A licensee can deploy WiMax in place of technologies it is currently using, so long as its use and emissions, frequencies, and power are consistent with the terms of its license. WiMax can be used as an unlicensed device if the standard adheres to the technical characteristics and limitations prescribed by the Part 15 rules.

The WiMax standard follows a centralized architecture whereby base stations coordinate terminals and allocate scheduling time slots to each terminal to avoid interference. Moreover, unlike unlicensed devices, WiMax is designed to be able to use higher powers, which increases range and the likelihood of interference. Given that WiMax follows a centralized architecture and may use higher power emissions than the Part 15 rules allow, the standard may be predisposed to a licensed regime, but this result is not a forgone conclusion.

As the FCC modernizes its spectrum policy more license options become available for WiMax rather than a simple decision of either licensed or unlicensed regime. One promising option is the rules the FCC recently issued for the 3650 MHz band. In this proceeding, the FCC adopted a hybrid approach which provides for nationwide, non-exclusive licenses and requires that technologies employ contention-based protocols. Under these rules, there is no limit on the number of licenses that can be granted, and each licensee will be authorized to

operate on a shared basis with other licensees.⁸ In the future, the FCC may also consider licenses for WiMax operators similar to current Ham or CB licenses. These rules offer non-exclusive licenses to individuals who have demonstrated a minimum level of technical and legal sophistication, and the ability to follow use restrictions and coordination rules. Such a regime might be very appealing for rural wireless internet service providers who would need to deploy networks and coordinate with other networks.

Ideally, spectrum policy will provide for sufficient flexibility such that the market will decide the licensing regime for WiMax. This will help achieve some of the following policy goals: increased usage; less waste of “white space”; more competition; greater choice; and diminished need for command and control. The emergence of licensed and unlicensed versions of WiMax devices in the market place would indicate the success of the FCC’s rules at achieving these policy goals.

⁶ Carter, K. R., Lahjouji, A., and McNeil, N. (2003) “Unlicensed and Unshackled: A Joint OSP-OET White Paper on Unlicensed Devices and Their Regulatory Issues”, Federal Communications Commission OSP Working Paper Number 39, at 13-21. Available <http://www.fcc.gov/osp.workingp.html>.

⁷ Telecommunications Industry Association, 2005 *Market Review and Forecast* at 159.

⁸ *Report and Order and Memorandum Opinion and Order*, In the Matter of Wireless Operations in the 3650-3700 MHz Band, FCC 05-56, (March 10, 2005).