

**Before the  
INFOCOMM DEVELOPMENT AUTHORITY  
Singapore**

*In the Matter of*

*Consultation on the Deployment of  
Wireless Broadband Technologies  
In Singapore*

**COMMENTS OF MICROSOFT**

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Microsoft welcomes the Infocomm Development Authority’s (“iDA”) public consultation (“consultation”) on the deployment of wireless broadband technologies and is pleased to offer its comments. As a developer of software, applications, and Internet technologies, Microsoft supports iDA’s initiative to promote wireless broadband usage throughout the island. Microsoft believes that iDA’s decision to allocate the 2.3 and 2.5 GHz bands to use by wireless broadband technologies will stimulate the continued development of these technologies, promote innovation in the services offered to consumers, and encourage broadband deployment.

Microsoft also encourages iDA to consider additional actions, beyond the development of the 2.3 and 2.5 GHz bands, to further stimulate wireless broadband deployment. In particular, iDA should make additional spectrum available for broadband service in both licensed and license-exempt bands, and it should do so in harmony with

decisions on spectrum usage being made around the world. Most importantly, iDA should implement the 2003 World Radio Conference's decision to dedicate spectrum at 5 GHz to use by license-exempt networks. Secondly, iDA should exercise restraint in its regulation of the spectrum, maintaining technological neutrality and allowing market forces to guide the highest valued use of the spectrum.

**I. WIRELESS TECHNOLOGIES UNIQUELY EXTEND THE REACH AND UTILITY OF BROADBAND SERVICES**

Robust, ubiquitous, and reasonably priced broadband service is essential to fuel the development of new applications and services that improve productivity, enrich lives, and benefit every sector of society and the economy. Microsoft believes that wireless technologies – operating in both licensed and license-exempt bands – will be instrumental to bringing broadband to those who do not yet have it, and, perhaps more importantly for Singapore, to increasing its utility to those who do.

New wireless technologies have unleashed the beginning of a revolution in broadband networking. Singapore quickly recognized the potential of wireless, as reflected in iDA's innovative "Wired With Wireless" program. But the consultation notes that "there are uncertainties with regard to the development of the wireless

broadband market,”<sup>1</sup> and seeks comment on the potential of and benefits arising from deployment of wireless broadband technologies.

While agreeing that there are “uncertainties,” Microsoft sees great potential for the future development of the wireless broadband market. Today wireless broadband devices are used primarily to create wireless local area networks (“WLANs”) *within* homes, offices, universities campuses and public hotspots – that is, they create a wireless link to a wired broadband connection. In Singapore, in particular, hotspot deployment has boomed. Indeed, there are about 600 hotspots island-wide (the equivalent of one WLAN hotspot per square kilometer).

It is remarkable that the global growth of WLANs over the last three years has occurred during a period when the global telecommunications market has otherwise been quite depressed. Notably, this is at least partially because the economics of deploying a wireless network are consumer-friendly. Wireless broadband has the advantage of being both less expensive and less capital intensive at the start. Moreover, the standardized, low power wireless equipment is easy to buy and easy to use.

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<sup>1</sup> Consultation Paper ¶ 1.3. The iDA has also recently declared that it is “Singapore’s goal to become Asia’s living lab for wireless innovation.” Singapore Gears Up for Wireless Broadband Innovation, News Release, Feb. 23, 2004, available at [www.ida.gov.sg/idaweb/wireless/infopage](http://www.ida.gov.sg/idaweb/wireless/infopage)

In addition to providing standard connectivity via Wi-Fi<sup>2</sup> – whether linking devices in a residential or business network, or providing connectivity at a public hot spot – wireless networks operating in the license-exempt bands offer fundamentally different kinds of connectivity than wired networks: they can be portable, mobile, and even temporary. Utility is limited only by the imagination. Already in Singapore there are both public (free) and commercial access points in airports, convention centers, hotels, libraries and restaurants. McDonalds alone provides 140 public access points in Singapore. In the United States, there are more than 28,000 Wi-Fi public access points,<sup>3</sup> a figure estimated to reach 200,000 in a mere four years.<sup>4</sup> There is little doubt that as wireless technologies evolve, new services and applications will be developed that will further increase economic productivity and social welfare.<sup>5</sup>

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<sup>2</sup> “Wi-fi” is the common term for low-power, license-exempt devices that operate at 2.4 and 5 GHz and are built to the “802.xx” standard of the Institute of Electrical and Electronic Engineers (“IEEE”).

<sup>3</sup> See Ed Sutherland, *What Is the Future For Hotspots?*, Wi-Fi Planet, July 15, 2003, at <http://www.80211-planet.com/news/article.php/2235511>; Mark Berniker, *Wi-Fi Hot Spot Market Picking Up*, July 10, 2003, at <http://www.80211-planet.com/news/article.php/2233721>.

<sup>4</sup> See Mark Berniker, *Wi-Fi Hot Spot Market Picking Up*, Wi-Fi Planet, July 10, 2003, at <http://www.80211-planet.com/news/article.php/2233721>.

<sup>5</sup> Analysts predict that direct Wi-Fi access revenues in the United states could reach \$1.5 billion by 2008. *Report: WiFi to Surpass 3G*, April 13, 2004, available at [www.unstrung.com/document.asp?doc\\_id+50864&print+true](http://www.unstrung.com/document.asp?doc_id+50864&print+true).

## **II. WIRELESS TECHNOLOGIES CAN ALSO SUPPORT A VARIETY OF NETWORK ARCHITECTURES**

As exciting and positive as the development of WLANs and public hotspots has been, it would be a mistake to make regulatory decisions assuming these are the only – or even the primary – uses to which wireless broadband technology will be put. With the right regulatory environment, these radio technologies are also ideally suited for the creation of broadband networks (using licensed as well as license-exempt spectrum) that can both compete with existing wired networks and complement them by providing connectivity even they do not provide.<sup>6</sup>

Although wireless technologies have not yet been widely deployed as a last-mile broadband solution or for the creation of networks covering entire communities, with improvements in technology, and increased access to spectrum, this may be beginning to change. Moreover, even as government and industry increasingly recognize the importance of broadband connectivity, the way in which we use broadband is changing. Those changes are particularly well suited to wireless solutions. For example, we are moving from a world of discrete Internet “transactions” – in which an individual accesses a website or sends an e-mail through centralized nodes and servers – to a world in which

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<sup>6</sup> So far, Wi-Fi and similar devices have been deployed in what are usually called the “license-exempt” or “unlicensed” spectrum bands, meaning that by government rule these bands are available for anyone to use – rather than being licensed for the exclusive use of one party. There is no reason these devices cannot also be used in a spectrum band licensed to one party.

millions of computing devices, such as smart phones and PDAs, will be simultaneously and constantly exchanging needed information directly with one another on the edge of the network. In other words, the Internet is becoming an environment in which devices and services will communicate constantly, and will do so in a seamless, unfettered way. This means that both consumers and businesses will need affordable, reliable, and “always on” broadband networks, and they will need that access regardless of whether they are at home or the workplace, or even visiting a regulatory agency.<sup>7</sup>

Another potential development may make the future of wireless broadband even more exciting. Mesh networks – a peer-to-peer architecture for unmanaged, license-exempt wireless networks – reduce the need for network backhaul capacity by allowing data to flow directly from one user to another, eliminating the need to travel through centralized nodes and servers. Each end point in the network becomes another router, so that cell phones and laptops can send and receive signals from each other, rather than via an access point or cell tower.

Mesh networks thus minimize “line-of-sight” problems associated with more centralized, managed, wireless networks, because receivers only need to “see” one of many other receivers, instead of being dependant upon unfettered access to a single

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<sup>7</sup> Last year the Federal Communications Commission in the United States established a Wi-Fi network to provide free, public access to the Internet to all visitors to its headquarters in Washington, DC.

antenna.<sup>8</sup> Mesh networks can be more robust than managed networks, because “[n]etwork traffic will no longer be dependent on a system with a single point of failure.”<sup>9</sup> License-exempt mesh networks are not yet widely deployed, but initial reports are promising.<sup>10</sup>

### **III. iDA SHOULD MAKE LICENSE-EXEMPT, AS WELL AS LICENSED, SPECTRUM AVAILABLE FOR WIRELESS BROADBAND DEVELOPMENT**

With this potential in mind, Microsoft applauds iDA’s decision to dedicate the 2.3 and 2.5 GHz bands to wireless broadband. It is an important step that will render concrete benefits for the public. But Microsoft also encourages iDA to consider this allocation decision as just one piece of its larger wireless broadband strategy.

As a regulator, the most important thing iDA can do is to make sufficient spectrum available for wireless broadband, and to do so in a manner that is harmonized with usage elsewhere around the world. Spectrum is the cornerstone of development, and without it manufacturers simply cannot pursue the uses outlined above.

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<sup>8</sup> See Kevin Werbach, *Monster Mesh: Decentralized Wireless Broadband*, available at <http://www.edventure.com/conversation/articleprint.cfm?Counter=9708404>.

<sup>9</sup> Mark Jones, *Above the Noise: Wireless Meshes With Its Future*, InfoWorld, March 23, 2003.

<sup>10</sup> See, e.g., Carolina Braunschweig, *Venture Capitalists Get Caught Up in a Big Mesh of Technology*, Venture Capital Journal, Apr. 1, 2003 (describing deployment of mesh networks in Zamora, Spain); Martin Veitch and Martin Courtney, *Network Week – Wireless LANs Analysis – Intel Tunes Into Mesh Radio*, IT Week, Mar. 31, 2003 (describing Intel’s involvement with mesh networks).



An appropriate place to start would be with the implementation of the 2003 World Radio Conference's ("WRC-03") decision to allocate spectrum at 5 GHz to license-exempt networks, including radio local area networks ("RLANs"). That decision reflected near universal agreement that additional spectrum at 5Gz – *beyond that already available in the 2 GHz band* – is necessary if wireless broadband technologies are to approach their potential. Many countries have begun to implement this decision,<sup>11</sup> and by aligning its use of the 5 GHz band, Singapore can access economies of scale for equipment and facilitate a declining cost structure for its consumers.

Prompt action is warranted because the technology is already on the market, and license-exempt RLAN devices are operating in Japan, Europe, Canada and the United States. The decision to allow use of RLAN devices and creation of RLAN networks without a requirement for individual licenses has been essential to their success. License-exempt bands generally have been recognized as "hotbed[s] of growth and innovation,"<sup>12</sup> and it was largely the phenomenal success of the license-exempt technologies at 2.4 GHz in the United States that pushed regulators there to search for additional license-exempt spectrum in both higher and lower bands. Where there is no

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<sup>11</sup> The United States has already implemented the decision and nearly doubled the amount of spectrum available to license-exempt networks at 5 GHz, to a total of 555 MHz. *See* Revision of Parts 2 and 15 of the Commission's Rules to Permit License-exempt National Information Infrastructure (U-NII) Devices in the 5 GHz Band, *Report and Order*, 18 FCC Rcd. 24484 (2003).

<sup>12</sup> Statement of Chairman Michael K. Powell, Federal Communications Commission, Nov. 18, 2003.

need for spectrum exclusivity, a license-exempt regime promotes the broadest access and can dramatically decrease costs.

#### **IV. ELEMENTS OF A SUCCESSFUL WIRELESS BROADBAND REGULATORY POLICY**

In addition to allocating spectrum for wireless broadband uses, iDA should consider how its regulatory decisions will affect the utility of that spectrum. iDA has rightly recognized the importance of technological neutrality.<sup>13</sup> Microsoft agrees that this approach – which focuses on encouraging spectrum sharing rather than defining appropriate uses – is a precondition to innovation. Thus, in *any* band, iDA should consider the use of smart technologies like transmit power control and dynamic

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<sup>13</sup> Consultation at 3.2.

frequency selection and other spectrum etiquettes to control interference. A regulatory framework that supports efficient and intensive use of the spectrum will, Microsoft believes, enable new wireless technologies to meet the public's demand for broadband while we continue to find new and valuable uses for our increasing connectivity.

Respectfully submitted,

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