

**REMARKS OF
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THE PROMISE OF UNLICENSED COGNITIVE NETWORKS

Good morning! Thank you, Ambassador Gross, for your kind introduction. I also thank Sylviane Toporkoff for inviting me to participate today. It is a pleasure to be here among this distinguished group of leaders.

The Internet has had a powerful effect on the world economy and has helped improve the human condition across the globe. We have witnessed the fruits of increased innovation, entrepreneurship and competition that this technology has helped deliver. Combining the power of the Internet with the freedom that comes from wireless mobility has created new economic and political opportunities that were unimaginable just five years ago when I was first appointed to the FCC. The power of competition, private sector leadership and regulatory liberalization has wrought a wonderful explosion of entrepreneurial brilliance, economic growth and political change.

For instance, shortly after the WTO accord of 1997, the world's telecom market stood at U.S. \$602 billion. The Telecommunications Industry Association projects \$4.3 trillion in global telecom spending this year. TIA expects that figure to climb to \$5.31 trillion in 2014. At the same time, worldwide Internet usage grew from a mere 400 million users in 2000 to over 2.1 billion today. Similarly, world-wide mobile phone subscriptions rose from 700 million in 2000 to over 5.7 billion as of this summer.

Indeed, we cannot ignore the unfolding revolution in how we connect to the Internet for information, products and services. In the United States, a large percentage of younger and minority citizens increasingly access the Internet through mobile devices. According to the Pew Research Center's July 2011 report on smartphone use in the U.S., smartphone owners under the age of 30, that are non-white, low-income and less-educated state that "they mostly go online using their phones." A full 87 percent "sometimes" use their mobile devices to browse the web. And, 38 percent use their handsets as their primary means to access the Internet. In addition, the Institute for Communication Technology Management at University of Southern California reports that more than 60 percent of Latino, black and young smartphone users "often" or "always" use smartphones for their Internet connections.

As this data demonstrate, clearly, the future of the Internet is mobile. And the future is now. Consumers increasingly demand mobile devices that deliver myriad applications for browsing, information and entertainment. With this in mind, during my time at the Federal Communications Commission, I have consistently supported efforts to identify and put into the marketplace more spectrum. At the same time, I have worked to remove regulatory barriers, preserve flexibility for entrepreneurs, and promote additional innovation and investment in communications services. I have also called for greater adoption of techniques to maximize spectral efficiency and employ dynamic uses of spectrum.

U.S. policymakers are finding the task of identifying 500 megahertz of quality spectrum to reallocate challenging, at best. Even if we could meet that challenge today, almost ten years would pass by before the FCC could write proposed auction rules and

band plans, analyze public comment, adopt rules, hold an auction, collect the proceeds, clear the bands, and watch carriers build out and turn on the networks for their customers. In the meantime, therefore, helping innovators create and deploy new technologies to enhance more efficient use of the airwaves should be a top priority for all regulators. Consumers reap the greatest benefits when public policy aims to bring more spectrum to market while also promoting spectral efficiency. We should work together to encourage wireless providers to deploy enhanced antenna systems more aggressively and provide targeted consumer education on the benefits of using femto cells, both of which are ready off-the-shelf.

In light of consumer demand on today's wireless service providers, learning more about unlicensed cognitive networks, also known as "smart" or "intelligent" networks, is important and timely. A cognitive network is one that uses computer-enhanced facilities *and* devices, the combination of which are referred to as a "network." Cognitive networks will enhance efficiency, first, by incorporating technology that may query geo-location databases, sense the "noise" environment, or other means, and; second, by relying on unlicensed shared spectrum.

Last year, the FCC adopted an order finalizing rules to make the unused spectrum between television channels available for unlicensed broadband wireless devices by using a geo-location database. We call this spectrum, located within the 700 MHz Band, the "TV white spaces." Although highly technical in nature, the effect will be simple for consumers. In fact, they may not notice anything different, except that they will experience – and no doubt appreciate – higher speeds and expanded coverage when

connecting to the Internet. This new and robust connectivity will spark the creation of as-yet unimagined applications for both personal and business uses.

The FCC's rules provide that mobile devices operating in the unlicensed TV white spaces would query a database over the air to learn which channels in the area are currently available for use, along with any other relevant operating parameters. Thus, these devices are a component of cognitive radio networking. Initiated in 2002, the effort to make use of the white spaces spectrum is and has always been bipartisan. Moreover, the FCC undertook this proceeding with an eye toward replicating the successful history of innovation that resulted from unlicensed operations in the 2.4 GHz band. Relinquished by the federal government and commonly known as a "junk band," the FCC allocated the 2.4 GHz band for unlicensed use in 1995. Among other ubiquitous devices such as digital cordless telephones, utility metering devices, fire and security alarm systems, wireless bar code readers, wireless local area networks and baby monitors, entrepreneurs deployed "wireless fidelity" or "Wi-Fi" in the 2.4 GHz band. Perhaps you've heard of it.

Today, Wi-Fi adds many billions of dollars to the U.S. economy and is an essential component of the mobile broadband marketplace. For instance, a 2009 Microsoft report measured a small subsection of unlicensed spectrum use, namely Wi-Fi in homes, health records technologies, and radio frequency identification (RFID) tags in the clothing retail sector. Microsoft found that just these three unlicensed wireless applications will generate \$16 to \$37 billion per year in economic value for the U.S. economy over the next 15 years.

Some refer to the TV white spaces as a "Super Wi-Fi" because the band is located much lower in the spectrum than its older sibling, Wi-Fi (700 MHz versus 2.4 GHz). Due

to their spectral properties, signals from the TV white spaces will easily travel through walls and will require fewer base stations, and therefore less money, to be carried.

Let me emphasize that this form of cognitive radio is “unlicensed.” The U.S. has long-standing experience with unlicensed radio –going back to the 1930s. I understand that for many global regulators, the term “unlicensed” may raise concerns. Let me assure you, however, “unlicensed” does *not* mean completely “unregulated.” Rather, unlicensed means that the user of the spectrum does not need an individual FCC-issued license in order to use the spectrum or operate the device. And, all manufacturers of devices for this band must comply with technical parameters established by the FCC and obtain the requisite certifications.

Permitting use of the TV white spaces on an unlicensed basis maximizes the efficiency of these smaller scraps of spectrum, which would be difficult, if not impossible to auction. Why? Because the rights to these small patches are not clearly defined, exclusive or easily transferable. Given these parameters, potential bidders would lack the incentive to spend the money necessary to invest in a license and construct a network, comply with FCC regulations, or offer commercial service.

Unlicensed use provides today’s entrepreneurs with a means to develop new and exciting products without the high barrier to entry posed by licensed spectrum use. In addition, *unlicensed* Wi-Fi has become an important tool for *licensed* carriers. Cisco recently reported that IP traffic carried over Wi-Fi alone is expected to surpass the amount of traffic carried over wired networks by 2015. A 2011 Juniper Research report states that, by 2015, 63 percent of traffic generated by mobile devices will transfer onto the fixed

network via unlicensed Wi-Fi and femtocell technologies. Furthermore, unlicensed networks will pick up 90 percent of this offloaded data at some point in transit.

You may know that the U.S. Congress is currently debating the merits of further consolidating the television channels in order to identify additional spectrum for auction. As part of this discussion, some have suggested that Congress or the FCC should set aside a large contiguous swath of spectrum within the 700 MHz Band for exclusive unlicensed use. I respectfully disagree with this approach. As a preliminary matter, such action would be premature. As I mentioned earlier, unlicensed spectrum, no matter where it exists, plays a critical role in the context of mobile broadband services. Nonetheless, the timeline for identifying, auctioning and ultimately clearing additional licensed spectrum in the 700 MHz Band is murky at best, let alone that for setting aside and reserving a given amount of channels for unlicensed use. At this early stage, it is not apparent that we should stop the progress well underway in the white spaces arena to create a solution for a problem -- an alleged shortage of unlicensed spectrum in the 700 MHz Band -- that may never exist.

More importantly, such action would go directly against the FCC's goal in the TV white spaces effort -- to maximize efficiency and gain consumer benefits from an undefined and under-used resource. Put another way, a contiguous swath of spectrum *would* be clearly defined, exclusive and easily transferable -- everything the white spaces are not. Given today's unprecedented budget deficits, I question whether the U.S. can afford *not* to auction any and all spectrum recovered in this band.

Finally, such designation may jeopardize U.S. efforts to harmonize this band internationally and to reap the associated beneficial economies of scale. I hope that we

would all agree on the desirability of creating a more efficient and less costly path for network and device manufacturers.

Next, let me update you on U.S. developments in the area of white spaces technology. We've already had a number of trials demonstrating the power of this "Super Wi-Fi," from "smart grid" and "smart city" networks, to rural healthcare and rural education. In late 2009, the U.S.'s first white space-based wireless broadband network was established in Claudville, Virginia, in the Blue Ridge Mountains of my home state. There, a private company established a central white space link that transmits a signal to Wi-Fi routers at a local school and cafe, bringing broadband to a previously unserved population.

In 2010, in the Midwest, a group of entrepreneurs deployed the first white space broadband network for healthcare providers in Logan, Ohio. That network enables and supports healthcare providers' ability to use affordable broadband, while also providing data transmission for telemedicine applications.

Also last year, in the Sierra Nevada mountain range (in the western portion of the U.S.), private companies deployed the first smart grid using TV white space. There, on behalf of the Plumas-Sierra electric utility, entrepreneurs built a network that automated the utility's substations allowing it to initiate smart meter reading. And, along the Atlantic Coast, Wilmington, North Carolina established a "smart city" white space network to support municipal applications including wetlands water quality monitoring, vehicular traffic monitoring and lighting management. The city also established a "middle mile" wireless network that connects its fiber network with Wi-Fi public access points in city parks and housing projects.

The U.S. is not alone in examining ways to achieve greater spectral efficiency through cognitive radio networking. In fact, in September, Ofcom announced plans to introduce white spaces technology in the U.K. Also, I understand that various members and study groups connected with the World Radiocommunication Conference are examining ways to facilitate cognitive radio systems. I look forward to learning more about these developments.

Conclusion

In this era of economic turmoil, use of white space technology will help create jobs. This year, McKinsey reported that, while the Internet has disrupted some businesses, for every job lost due to its deployment, an average 2.6 new jobs have been created. For instance, today, over 2,500 wireless Internet service providers use Wi-Fi to deliver service to over two million users in the U.S., many in rural communities.

Furthermore, unlicensed spectrum serves as an incubator for wireless innovation. Over 20,000 wireless devices have been certified for use in the old 2.4 GHz “junk band” – more than any other band. More than 760 million Wi-Fi products were shipped last year alone – including SmartPhones, laptops, media players and tablets. For 2014, experts project shipment of more than 1.5 billion such devices.

As a correlation, TV white spaces, with its use of a geo-location database, serves as a test bed for innovation in cognitive radio. To the extent the world will need to explore cognitive radio to meet future spectrum demands, Super Wi-Fi must be given room to blossom. Opening this band to unlicensed use is an important component of the long-term spectrum planning currently underway in the U.S., and around the world.

Finally, the competitive opportunities presented by developing the unlicensed TV white spaces will broaden the ability for new entities to enter the wireless marketplace, including small businesses, rural telephone companies, and businesses owned by members of minority groups and women.

I've learned that it's foolish to predict the effects and consequences of regulatory decisions. If past is prologue, however, this powerful new form of advanced cognitive wireless communications will have even greater economic effect than Wi-Fi. For these reasons, I urge that we work together to take action to further the development of cognitive radio technologies. I propose that, together, we take advantage of the emerging reality brought about by technological progress, business innovation and the dynamic mobile marketplace. Unlicensed cognitive networks are poised to play a prominent role in our future.

Thank you. I look forward to continuing this discussion with my fellow panelists and to answering any questions.