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Beachfront commons

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ABSTRACT

Technology competition between wireless communication technologies can lead to new, more or less disruptive services. A potentially disruptive technology would be to have unlicensed transmission in the lower UHF bands at power levels up to, e.g. 2 W EIRP. This would give citizens a share of the best spectrum for free use. Tools against congestion could be based on mandatory stochastic channel back-off or, if multiple users are present, on adaptive power and bandwidth control. Compared to the FCC TV white space regulation, no back link would be needed as the spectrum would be used exclusively by wireless devices. In an environment of shrinking interest in terrestrial TV broadcasting, such a regulation is expected to create a new market for high-range consumer devices, competing with licensed communication, while also being suitable for offloading traffic from licensed operations. Furthermore, the approach will allow for efficient digitization of equipment for Programme Making and Special Events (PMSE), but could also be made compatible with novel disaster relief services. To enable accurate interference prediction, it is proposed that, instead of only providing transmitter regulation, receivers should also be regulated, such as be required to adhere to a certain minimum selectivity. The proposal should be taken up in the WRC process.

1. Introduction

During the last 80 years, large and more-or-less disruptive innovations have resulted in big changes in spectrum use and have had a great impact on profits, wages, and lifestyle. Examples of such innovations are TV broadcasting, licensed cellular voice communications, the mobile Internet, and unlicensed communications such as WiFi, some of which have definitely been disruptive. The mobile Internet has been disruptive to SMS revenue (Weber, Haas, & Scuka, 2011), and WiFi has turned out to be disruptive to 3G in the sense that more bits are transmitted via WiFi than with licensed cellular wireless communications (estimate according to Rethink Wireless, 2013). Furthermore, the Internet has the potential to disrupt terrestrial TV broadcasting. The trend towards abolishing the latter could be pushed in even more powerful ways than is currently the case, so this disruption is yet to come. Disruptive innovations such as the mobile Internet or WiFi took place while technologies were in competition, such as SMS vs. email and W-CDMA vs. WiFi. This demonstrates that technology competition can be very useful in reducing costs or promoting new services.

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In this paper, it is proposed for the spectrum freed by receding terrestrial broadcasting to be used for a new type of wireless commons, allowing long-range wireless applications that are not feasible given today's regulation of spectrum.

Currently there is a debate over how to use 200–300 MHz of UHF in the future. There is a clear trend towards cable and satellite broadcasting and towards Internet-based TV. The use of terrestrial broadcasting is declining in industrialized countries. In Germany, for example, there is discussion of replacing DVB-T by a tower overlay of 16 MHz via LTE, such as for sports broadcasting (Kürner et al., 2013). Private TV stations have lost interest in terrestrial TV transmission (Mediengruppe RTL Deutschland, 2013).

There have also been efforts to use the white space of the TV spectrum, in particular in the U.S. (see Digital Trends, 2012; Forge, Horvitz, & Blackman, 2012; PCAST, 2012; TV Technology, 2012). Due to the large cell size of terrestrial TV broadcasting, there are white spaces in the spectrum that can be exploited on a listen-before-talk basis. The approach followed by the FCC allows a high power device to be employed only if it accesses a geolocation database, creating the necessity of a link. The regulation has not, however, led to the creation of many new products, mainly due to its technological complexity. Because of the fear of interference, many bands cannot be used in many areas, employed only in some of the “holes of a Swiss Cheese” (Forde & Doyle, 2013). There is also the risk that the operator of the database will remain in control of the white space, such as if an incumbent uses it for providing Internet access (as proposed by Fitch, Nekovee, Kawade, Briggs, & MacKenzie, 2011). Finally, providing licenses to users might lock that spectrum for many years to come, even if those TV stations were to stop operating.

It has been proposed previously that there be more commons on lower bands, such as by Lehr (2005); see also Benkler (2012). The UHF bands have very good propagation characteristics, that is, their electromagnetic waves pass through walls with low attenuation but do not travel beyond the radio horizon. However, it has typically been argued that this would either lead to congestion or not be economic.

This paper is structured as follows: First, there is a review of the workings and benefits of disruptions. Second, the crippling of commons by regulation and its justification in current economic thinking are discussed. Third, a concrete proposal for having commons on UHF bands is made, with tools against congestion, creating the potential for unprecedented low-cost communications. If desired, such an unlicensed use of UHF bands could become a secondary use of spectrum with, for example, Programme Making and Special Events equipment (PMSE) or disaster relief services being the primary users.

2. A review of disruptions

It is widely believed that the iPhone created a major disruption in mobile communications. However, most of its initial services, including the flat rate going with it, had been invented in Japan earlier, between 1999 and 2004 (Weber & Wingert, 2006; Weber et al., 2011). Examples of novel services were mobile email, mobile browsing, mobile applications, mobile music, and the inclusion of digital still and video cameras. In the Japan, these innovations were marketed in fierce competition between various groups of operators, each specifying their radio interface, their services, and their handsets. Each operator tried to benefit from its chosen radio technology as long as possible. As a result, the competition for instance between PDC and PHS and between cdmaOne and W-CDMA became very important. Operators felt uncertainty and learned to specify networks, services, and handsets. For example, PHS operators were able to undercut prices and reduce the weight and size of handsets, while PDC operators were able to offer handover (which PHS initially was not capable of), browsers, and video cameras (a surprise on 2G). Furthermore, it was relatively cheap to provide music downloads by updating cdmaOne, while this was a challenge for W-CDMA. Technological competition thus led to the discovery of the mobile Internet, multifunctional handsets, and flat rates. Email turned out to be disruptive to earlier messaging services; flat rates were disruptive to earlier pricing models, etc. In 2007, Apple “only” needed to polish the user interface and distribute these innovations worldwide, causing problems for old businesses based on pricing data as if it were water in the desert, as was common with SMS and data tariffs in, e.g., Europe (Sutherland, 2005).

Another example of disruption can be seen in the repercussions that WLAN has had on W-CDMA. Wi-Fi has contributed to a reduction in average revenue per user although operators of the Universal Mobile Telecommunications System had originally hoped that it would be used almost exclusively – universally – by businessmen, who, however, in many cases preferred to search for a hotspot instead. The competition posed by Wi-Fi led to a large upturn in the number of Wi-Fi-enabled devices, and unlicensed communication even overtook licensed communication in terms of the volume of bits transmitted (Rethink Wireless, 2013). In the end, unlicensed was even used to offload traffic from licensed operations. These disruptions led to the creation of new and profitable business, and to the related destruction of incumbent business.

Hence the challenge: Are more disruptions possible in the future which would contribute to a further reduction in the cost of communications or to the development of new devices and markets?

To study the issues, the authors did desk research, conducted expert interviews, and organized a workshop (Weber & Scuka, 2011).

3. A critique of the crippling of commons

Common knowledge, according to scholars such as Cave, Doyle, and William (2007), suggests that spectrum commons can be used where congestion is unlikely to occur, as in short-range communications (p. 211). These authors also argue that