

The Need for Well-Defined Yet Non-Exclusive Radio Operating Rights

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Introduction

As mobile computing becomes ubiquitous, the resulting exponential growth in demand for wireless data transport will bend current spectrum allocation and commercial business models to the breaking point. Silos of exclusively-licensed and lightly-used spectrum will no longer be tolerable. The imperative of increasingly efficient use of spectrum on both an exclusive and shared basis suggests that we need to redefine access rights to spectrum capacity over the next decade to be:

- **More definite:** Rights to transmit *and* levels of protection from third-parties (both co-channel and adjacent channel) should be made *explicit* conditions of new and renewed licenses, and subject to secondary-market transactions.
- **More transparent:** The definition of these access rights and the operating parameters of all deployments on a licensed band should be registered in a publicly-accessible and useable database that can be used to facilitate decentralized coordination and negotiation, as well as opportunistic access to unused spectrum capacity.
- **More intensive:** Since both shared access to underutilized bands *and* an exponential increase in spectrum re-use will be needed to meet expected consumer data demand, a licensee's affirmative rights must not preclude the use of any remaining capacity by third parties on a non-interfering basis. Radio rights should conform to a 'use it or share it' ethos.

In short, the FCC needs to return to the unfinished challenge defined by its own 2002 Spectrum Policy Task Force (SPTF): To quantify permissible levels of interference on a service-by-band basis. Although Commission staff decided that the "interference temperature" measurements suggested by the SPTF were unworkable, the concept of quantifying the explicit transmit rights and reception protection that a licensee can count on – on a probabilistic and not absolute basis – would better permit private parties to self-manage issues of interference and shared band access. In contrast, the continued resort to a case-by-case, *ex post* adjudication of interference claims will increasingly cause uncertainty, delay and under-investment.

Outdated Assumptions of Command & Control Interference Protection

Today's spectrum allocations and radio operating rights continue to reflect a dichotomy between the relative availability of spectrum and technology that existed during the first half-century or more of spectrum licensing – but which has nearly reversed itself today. When government licensed broadcast radio in the 1920s and broadcast TV in the 1940s and 1950s, spectrum was plentiful but technology was primitive. Both assignments and rights reflected an industrial policy goal to stimulate the mass-market penetration of very low-cost reception devices (radios, TVs – and later analog cell phones) in a context of relative spectrum abundance. Since there was spectrum enough to allocate guard bands several times larger than the actual channels in use, the cost of receivers could be minimized – and a precedent set that receivers would not be expected to tolerate any degree of interference from other uses.

The policy of protecting receivers from "harmful interference" became simultaneously absolute (rather than probabilistic or contingent) and vague (since it was defined service-by-service, and only *ex post* in

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reaction to complaints). Moreover, the concept of licensing *exclusive* access to a channel or band presumed that (a) technology and governance rules could not support the shared use of underutilized capacity, except perhaps where there was no protection from interference at all (viz., on designated unlicensed bands); and (b) there were still sufficient allocations and assignments available to meet the public's need for new services and overall communications capacity.

All of these precepts continue to underlie the licensing of radio operating rights – whether to commercial users by the FCC, or to federal users by NTIA – and all are outdated obstacles to an exponential increase in mobile communications capacity.

An Updated Radio Rights Regime

An updated conception of radio operating rights should be based on policy goals that promote pervasive connectivity. It will be far more important to put rules in place that spur innovation and maximize communications capacity than it is to minimize interference per se. Indeed, one of the most oft-quoted passages from Ronald Coase's 1959 article *The Federal Communications Commission* made this point:

It is sometimes implied that the aim of regulation in the radio industry should be to minimize interference. But this would be wrong. The aim should be to maximize output.²

Meeting society's demand for mobile communications capacity will require a concept of radio operating rights and governance that may seem contradictory by today's standards. We need to simultaneously make spectrum rights more like property (more explicit and certain for the period granted) while also making the overall communications capacity of the spectrum less like property (non-exclusive and open for shared access). That is, we need to provide licensees certainty and flexibility concerning their operating rights – thereby facilitating private negotiations and transactions – while also reserving any unused spectrum capacity to the public itself. Since the public interest in government excluding others from a band (i.e., licensing) lies entirely in the use of the spectrum to communicate, it is the licensee's service – viz., its actual use of the band's capacity – that deserves protection, not its non-use.³

In practice, I believe this can be achieved by a combination of definitional *and* governance changes:

1. Define explicit transmit rights and permissible interference on a band-by-service basis.

For new and renewed licenses, the Commission should make the complete set of transmission rights (e.g., transmit power, out-of-band emissions) explicit. The Commission should also define the level of protection the licensee can expect for its own operations, although this should be defined in probabilistic rather than absolute terms. These rights, when first defined, would need to be defined service-by-band and as consistent as possible with neighboring adjacent- and co-channel licensees.

2. Combine these rights and the actual deployment parameters of licensees in a public database.

If key policy goals are to maximize useable spectrum capacity and facilitate innovation, then we should want complete transparency into both what licensees have a right to do and *what they actually are*

² Ronald H. Coase, *The Federal Communications Commission*, 2 *Journal of Law & Economics* 1 (1959), at 27.

³ Of course, this follows from both the statutory definition of the FCC's licensing authority, as well as the Commission's fairly recent and explicit rejection of the argument that it does not have the legal right to authorize users of Ultra Wideband devices to emit energy in licensed PCS bands. Rejecting Sprint's claim that its license rights presume exclusive rights to emit on the band, the Commission firmly stated that "spectrum is not, and has never been, exclusive to Sprint or to any other licensee or user." First Report and Order, In Re Revision of Part 15 of the Commission's Rules Regarding Ultra-Wideband Transmission Systems, F.C.C. R. 10505 (2002), at ¶ 271.

doing. This enables other licensees to design their systems, to change the use of a band, or to attempt to coordinate and/or negotiate with other users. It also enables other potential users to employ dynamic spectrum access technologies or protocols to make use of *unused capacity* without causing harmful interference. Depending on the band, this dynamic access could be based on secondary market transactions, or it could be opportunistic and/or unlicensed. Access to any band with a primary user must be conditional; but a centralized, online information registry “enables secondary users to execute more aggressive spectrum access algorithms at acceptably low risk.”⁴

The current opaque and uncertain definition of rights for incumbents and potential entrants alike deters both innovation and more intensive and efficient use of the public’s spectrum resource. A more definite, transparent and explicitly non-exclusive definition of spectrum use rights on a band-by-band basis will be critical to supplying the capacity for pervasive connectivity.

⁴ John M. Chapin and William H. Lehr, “The Path to Market Success for Dynamic Spectrum Access Technology,” *IEEE Communications Magazine*, May 2007. Australia established a centralized online device database along these lines as part of its 1997 adoption of Space-Centric Management as a tool to define a complete set of explicit transmit rights for all new licenses to encourage certainty and industry self-regulation. See Michael Whittaker, “Authorising Dynamic Spectrum Access Under Space-Centric Management, Futurespace, February 2009.