The Three Ps: A resulting energy approach to radio operating rights

Position paper[1] for the conference on "The Unfinished Radio Revolution: New Approaches to Handling Wireless Interference," Washington DC, 12 November 2010

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The radio revolution is incomplete. The shift from "command and control" radio licensing to a more hands-off regime of flexible-use auctioned licenses and unlicensed operation is well under way, but the vital question of how radio operating rights should be defined, assigned and enforced in order to resolve interference disputes and obtain the maximum benefit from wireless operations remains largely unanswered.

The ambiguous definition of rights is a long-standing problem. For example, the FCC's 2002 Spectrum Policy Task Force noted a widespread sentiment that "the Commission's most difficult, controversial, and unsatisfactorily resolved cases have resulted from situations in which the extent of an incumbent's spectrum rights and interference rights, and its limitation on impacting other bands or users, were not clearly understood by the incumbent, by a new service provider, and even by this Commission."

A review of U.S. interference conflicts stemming from unclear cross-channel rights reveals instances where: two (or more) licensees are both operating within their licenses but unable to operate concurrently (800 MHz); the FCC changes the license rights after auction but before renewal (WCS/SDARS); lack of clarity concerning cross-channel protections leads to protracted proceedings (AWS-3); and a new entrant discovers an unforeseen need to remedy harm to adjacent channel incumbents (AWS-1/BAS). Inter-operator conflict is greatest across boundaries between different service types. The increasing diversity of radio uses and users, as well as the need to pack operations ever closer together, will only serve to amplify the problem.

Current radio operating rights are uncertain due to: the use of the harmful interference criterion; technical parameters that do not define the bounds of allowed operation objectively; the regulator's willingness to alter operating rights at any time during the term of the license; and ineffective delegation to operators of the means and incentives to negotiate bilateral resolutions. This has led to protracted conflicts and unexpected costs, which in turn inhibit innovation and investment.

Our approach is based on three principles: (1) aim regulation at maximizing concurrent operation, not minimizing harmful interference; (2) delegate management of interference to operators; and (3) define, assign and enforce entitlements in a way that facilitates transactions.

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[1] This is a précis; for the full paper, including references and acknowledgments, see http://ssrn.com/abstract=1704194

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We propose that operating rights should be articulated using probabilistic transmission permissions and reception protections (the Three Ps). Since the RF propagation environment changes constantly, parameter values should be defined probabilistically as a percentage of times and locations. Transmission permissions should be based on resulting field strength over a range of locations and frequencies, rather than the radiated power at a transmitter. Reception protections should state the maximum outside electromagnetic energy an operator can expect over a location/frequency profile; protection levels are an undertaking by the regulator to implement these ceilings when making other allocations, but importantly do not form an entitlement against other, existing operators. This formulation of operating rights does not require a definition of harmful interference. Quantifying and addressing harmful interference remains a very important topic, but is delegated to operators and, should negotiation fail, adjudicators.

Since the initial entitlement point is unlikely to be optimal, or remain optimal for very long, the regulator should do all it can to facilitate adjustment of rights after the fact. In this process, the number of parties to a negotiation should be limited, both through rights assignments that minimize the number of recipients as much as possible, and by the regulator enabling direct bargaining between the parties. The regulator should stipulate the remedies that attach to an entitlement (i.e. injunctions or damages) when it is issued, and not decide such things *post hoc* in its capacity as an adjudicator. The regulator should clearly separate rulemaking, where it plays an essential role in defining entitlements, from the enforcement/remedy phase where its role, if a court is not available, should be limited to adjudication on the basis of existing rules. Notably, the regulator should refrain, to the extent possible, from rulemaking when acting as an adjudicator.

The full and complete description of every entitlement – including owner, Three P operating parameters, fixed station locations if applicable, and waivers if any – should be recorded in a public registry. And finally, the regulator should refrain from changing the rules, or adding new ones, in the middle of the game. After defining operating rights, parameters, and remedies in a license, the regulator should leave those unchanged until renewal. However, those same rights, parameters and remedies should be allowed to adjust though negotiation between operators.

The fruits of the radio regulation revolution can thus be gained by an objective articulation of the rights in an operating license, and the effective delegation of negotiation and dispute resolution to operators.