Software Radio: Implications for Wireless Services, Industry Structure and Public Policy

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Abstract

Software radio is one of the more important emerging technologies for the future of wireless communication services. By moving radio functionality into software that has previously been implemented in hardware, software radio promises to change the economics of deploying and operating wireless network services. This paper provides an overview of the current status of software radio technology and then examines the implications of wider use of the technology on the wireless value chain. Among software radios likely implications are an increased ability to tolerate and support interoperability across heterogeneous air interface technologies (e.g., different standards for 3G, across 3G and WiFi networks, etc.); support for faster and more flexible network upgrades; the substitution of general purpose hardware for dedicated hardware that has heretofore been the basis for radio designs; and support for improved congestion management solutions. These implications suggest that software radio may be simultaneously an integrative and disruptive technology. In the short-term, incumbent wireless service providers will benefit from the lower production and deployment costs promised by software radio, while longer term, software radio creates the potential for new open interfaces that could be leveraged by new entrants to change the structure of the wireless services value chain. Software radio is a critical enabling technology with important implications for spectrum management. Software radio increases the feasibility of moving towards more flexible spectrum usage models that expand the range of options for implementing secondary markets for spectrum. The ability to modify the user's air interface in real-time to take advantage of a greater range of frequencies or multiple air interface protocols/technologies provides opportunities to improve interference management but also raises important policy challenges for radio certification and enforcement. These and other important implications for industry and public policy are explored in the paper, which draws on recent thesis work prepared by one of the co-authors.