

Merging Software Defined Networks and Software-Controlled Reconfigurable Antennas in Market-Mediated Resource Allocation Strategies

Gregory H. Huff*, Abhay Anand, Francisco Espinal, Rajarshi Bhattacharyya,
Vasudev Gohil, Srinivas Shakkottai, and Jean-Francois Chamberland
Texas A&M University, College Station, TX 77843

Software defined radios (SDR) and software defined networks (SDN) have become integral in the operation of cognitive radio applications and other adaptive or smart radio systems. These systems have traditionally been deployed to optimize spectral usage, mitigate interference, or the general utilization of network resources. Reconfigurable antennas have emerged recently as a major enabling technology for these systems since they provide additional physical-layer control for adaptive or smart systems. Beyond the essential function of connectivity, however, these systems that incorporate electromagnetically-tunable software-controlled hardware in the loop have been reported on in a limited number of software-enable application spaces.

In this work a software defined ecosystem (SD-X) is explored that merges the directional and polarization properties of a software-controlled 2.4 GHz ISM band in an SDN using a market-mediated approach to resource allocation. In this scenario the antennas are integrated on the clients in per-packet switching scheme for edge computing that seeks to optimize a quality of service (QOS) vector that has various user experience mapped into it using a variety of web-based applications (content streaming, communication, etc.). The antennas serve as an additional broker for spectral resources in this scheme as they can be monitored and controlled via the network to enhance or degrade a connection to impact the data rate and throttle the resources of a user to enhance the QOS of all users connected to the edge node. The network architecture will be presented along with the design and operation of the fabricated reconfigurable antenna and measurements of its reconfigured states. The software-hardware interface will be included in this as well as a number of preliminary investigations into the use of these antennas in the per-packet switching scheme.