RESEARCH ARTICLE

A Cognitive Digital Home Framework using Admission Control and Resource Distribution

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Abstract—The advances in radio design and wireless net- working, along with the growth of multimedia home entertainment technologies, is creating the concept of a cognitive digital home requiring spectrum coexistence of various devices and networks of networks. A framework for resource allocation in a Cognitive Digital Home (CDH) with a multiplicity of radio access technologies (RAT) such as cognitive radios and legacy radio devices supporting heterogeneous applications is developed. We consider two channel access models in the CDH for addressing spectrum coexistence of legacy devices: (i) Pessimistic Controllability (PC) Model where the Home Genie node (HG) has no influence over legacy devices, and (ii) Switched RAT (SR) Model where the HG has perfect control of legacy devices. Distributed algorithms for maximizing sum rate and maximizing service capacity are designed using partial dual decomposition techniques. A distributed power control scheme is also designed for efficient use of energy. An admission control scheme based on pricing information obtained from the distributed algorithms is used to improve system feasibility.

Index Terms—Cognitive digital home; distributed resource allocation; admission control; power control

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