Proposition de recherche doctorale

Opportunistic Data Dissemination in Ad-Hoc Cognitive Radio Networks

Mots clés :

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- **Unité de recherche** : Laboratoire d'informatique de Paris 6
- **Ecole doctorale** : École Doctorale Informatique, Télécommunications, Électronique de Paris
- **Domaine scientifique principal**: Divers

Résumé du projet de recherche (Langue 1)

Recent advances in communication technologies and the proliferation of wireless computing and communication devices make the radio spectrum overcrowded. However, experiments from the Federal Communication Commission (FCC) reveals that the spectrum utilization varies from 15% ? 85%. Consequently, Cognitive Radio Networks (CRNs) are proposed to utilize the radio spectrum opportunistically. In types of cognitive radio networks where channels for transmission are opportunistically selected – also called Cognitive Radio Ad-Hoc Networks –, reliability in data dissemination is difficult to achieve. First, in addition to the already known issues of wireless environments, the diversity in the number of channels that each cognitive node can use adds another challenge by limiting node's accessibility to its neighbors. Second, Cognitive Radio (CR) nodes have to compete with the Primary Radio (PR) nodes for the residual resources on channels and use them opportunistically. Besides, CR nodes should communicate in a way that does not disturb the reception quality of PR nodes by limiting CR-to-PR interference. Therefore, a new channel selection strategy is required which cause less harmful interference to PR nodes and try to maximize the chances that the message is delivered to the neighboring cognitive radio receivers, thus increasing the data dissemination reachability. In this thesis, we propose SURF, a distributed channel selection strategy for reliable data dissemination in multi-hop cognitive radio ad-hoc networks. SURF classifies the available channels on the basis of primary radio unoccupancy and the number of cognitive radio neighbors using the channels. Simulation results in NS-2 confirmed that SURF is effective in selecting the best channels for data dissemination, when compared to related approaches. We observe that the channel selection strategies are greatly influenced by the primary radio nodes activity. Next in this thesis, we study and analyze the impact of PR nodes activity patterns on different channel selection strategies through NS-2 based simulations. We observed that intermittent PR activity is the case where clever solutions need to operate. This is where SURF gives the best results and the target region to avail communication opportunities. Finally, in this thesis, we go one step further and check the applicability and feasibility of SURF. In this perspective, first we propose a cognitive radio based Internet access framework for disaster response networks. We discuss the architectural details and the working principle of the proposed framework. We highlight the challenges and issues related with the deployment and connectivity of the framework. Second, we discuss the applicability of SURF in the context of channel bonding and in this regard, we discuss an interference based channel bonding strategy for cognitive radio networks.