# Opportunistic Channel Sharingin Cognitive Radio Networks

## Abstract:

Licensed white space channels can now be used opportunistically by unlicensed users, provided the channels are relinquished when needed by the primary users. In order to maximize their potential, these channels need to be assigned to the secondary users in an efficient manner. The protocols to enable such an assignment need to simultaneously aim for fairness, high throughput, low overhead, and low rate of channel reconfigurations. One way of channel assignment is to allow neighboring access points (APs) to operate on the same channel. However, if not done properly, this may increase the number of collisions resulting in lower throughput. In this paper, we present a new channel assignment algorithm that performs controlled channel sharing among neighboring APs that increases not only the fairness but also the total throughput of the APs. Controlled sharing and assignment of channels leads to a new problem that we call as the Shared Coloring Problem. We design a protocol based on a centralized algorithm, called Share, and its localized version, lShare that work together to meet the objectives. The algorithm has tight bounds on fairness and it provides high system throughput. We also show how the 802.22 MAC layer protocol for wireless regional area networks (WRANs) can be modified considering the typical case of low degree of interference resulting from the operations of Share and lShare. Results from extensive ns-3 simulations based on data traces show that our protocol increases the minimum throughput among all APs by at least 58 percent when compared to the baseline algorithms.