Wireless Networks

Channelization constraints specify possible channels to allocate

- Different ways to select channel

Categorization

Channelization - Single Radio

- Environment – Single Radio with 802.11 Phy
- Channels – TDMA slots
- Emphasis on multicast traffic in MANETs
- Hyperarcs

- Network Coding
  - Network Capacity

- Channel Access for Network Coding
  - Contention Based – 802.11
  - Scheduling Based
    - Centralized - TDMA
    - Distributed – NAMA, LAMA, PAMA, HAMA

- Contention Based Channel Access
  - Low network throughput in the presence of high load
  - High control overhead

- Drawbacks of channelization
  - Two Hop Information Required

- Channel Allocation Scheme
  - Forward propagation of used channel information
  - Reverse propagation of used channel information with Channel Allocation

- Channel Allocation Conflict at multicast points
  - Nodes downstream from a multicast point allow it to allocate channel

- Channelization constraints specify possible channels to allocate
  - Different ways to select channel

- Environment – Multi-radio, Multi-hop
- Wireless Cellular Network
- Relay networks are dynamically formed.
- Each relay network can be operating in different frequency.
- Relay network formation algorithm provides a simple and distributed frequency assignment scheme.
- It also provide an enhancement to improve network throughput of resulting relay networks.

- Frequency/Channel Assignment Scheme
  - While returning the RREP, the GW and intermediate nodes on the reverse path are responsible for assigning a non-interfering frequency to links on the path.
  - UFI, (Used Frequency Information) : The set of frequencies used in all incident links of node i
  - AF, (Available Frequency) : The set of available frequencies of node i
  - When node i receives UFI, from the NADV generated by node j, it re-calculates.
  - When node i receives a RREP from node i-1, it further re-calculates.
  - It then assigns a frequency to its next-hop-link by choosing from the resultant AF’.

- Local Optimization Scheme
  - Interference from remote nodes causes a drop in received SNIR at the interfered node so that it experiences a higher bit error rate.
  - 2-phase algorithm
    - Each node measures received SNIR of all its incident links periodically
    - It reassigns a new frequency to the interfered link if SNIR of the link has fallen off markedly.

- Performance Evaluation
  - Simulation using OPNET v.11.5

- Throughput gain of multi-hop cellular network
- Overall network throughput
- Improvement of node’s SNIR

This research is supported in part by NSF grant CNS-0508114 and DARPA grant BAA 05-42