Optimized Link Adaptations and Protocol Design for Improved MANET Performance

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Motivation

- Despite extensive research, the spatial throughput of a MANET is still unsatisfactory
  - Sub-optimal routing and MAC designs (mostly heuristics based)
  - Lack of coordination between layers (example?)
  - Focus only on a subset of the control parameters (e.g., power)
  - Mainly aimed at simple hardware (e.g., omni-directional antenna)

- New opportunities
  - Advanced physical-layer capabilities
  - Analytical tools for optimized protocol design
    - Game theory
    - Recent decomposability results and feasibility of convex optimization
    - Geometric programming techniques

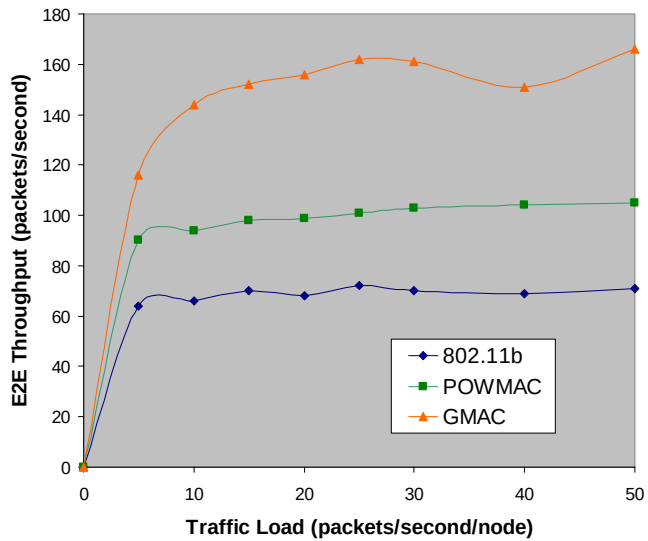
Research Goals

- Design a new generation of MAC and routing protocols that are:
  - Adaptive to channel and network dynamics (both load and mobility)
  - Controllable w.r.t. link parameters (power, rate, modulation, clustering)
  - Inspired by theoretical optimizations
  - Extendable to MIMO and smart-antenna technologies
  - Designed with layer awareness (example?)

- Demonstrate experimentally the effectiveness of such protocols
  - Interested in teaming opportunities

Examples of Ongoing Research

1. GMAC (game-theory-inspired power-controlled MAC)
   - Enables concurrent transmissions in a receiver's neighborhood
   - Transmission powers within some locality are computed distributedly to achieve Nash equilibrium



2. LCAP (load-based concurrent access protocol for MANETs with directional antennas)
   - Power control for data and control packets
   - Load control ≡ interference margin
   - Ameliorates channel access problems