Dynamically Managing the Real-time Fabric of a Wireless Sensor-Actuator Network

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- **Objective:** develop algorithms for wireless sensor-actuator networks (WSAN) supporting control applications that with hard/firm real-time quality-of-service (QoS) constraints.

- **Approach:** To meet real-time constraints required in networked control applications, one must manage the communication network's "real-time fabric" to enable reliable prediction of end-to-end delays. This will be done by stabilizing the network's interference environment through adaptive power/channel control, by managing data dropouts through rate control, and the use of anytime controllers. This approach balances the relationship between application (physical) performance and a network's (cyber) end-to-end QoS. This requires a scalable integration of methods used in control, wireless networking, and real-time systems.

- **Progress to Date:**
  - Reducing jitter in real-time control tasks (RTSS09, ECRTS10)
  - Bounded Burst QoS constraints on dropouts (ACC 10, TAC 2010)
  - Adaptive bandwidth reservation schemes in wireless networks (TMC 2010)
  - Distributed Algorithms for Network Optimization (Ph.D. Dissertation 2010)