Quality of Service for Ad Hoc and Sensor Networks

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What is QoS?

- Ability to provide "better than best effort" service
- Performance parameters
  - Ad hoc networks: multimedia communication
    - Latency
    - Jitter
    - Packet delivery ratio
  - Sensor networks: data gathering
    - Signal-to-noise ratio
    - Coverage
    - Missed detection / false alarm probabilities

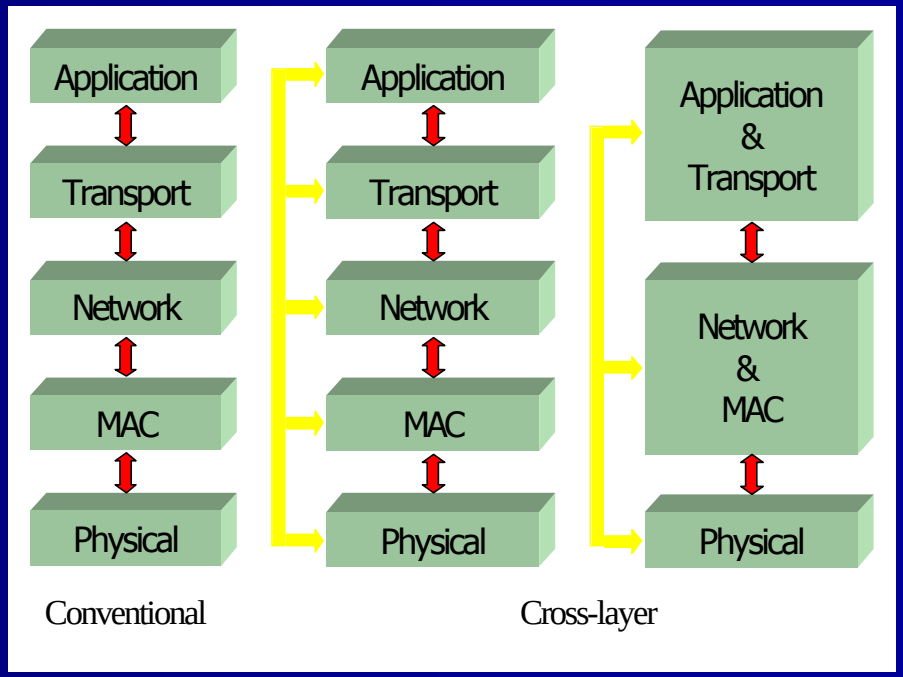
Why is QoS hard for ad hoc and sensor networks?

- Resource limitations
  - Bandwidth
  - Node energy
- Contention for bandwidth
- No centralized control/infrastructure
- Time-varying links
- Enormous amounts of data

→ Need to involve all levels of protocol stack

Cross-layer Architectures

- Tailor protocol stack to take into account QoS requirements of application
- Two architectures
  - Expose information across protocol boundaries
  - Integrate protocols



Challenges

- Appropriate QoS model
  - Per-flow vs. aggregate flows
  - Granularity of QoS support
- How much integration of layers?
- General vs. application-specific
  - How much to tailor protocols to particular application space?
  - Trade-off generality for functionality
- Support for heterogeneous nodes and applications

Challenges (cont.)

- Protocols for resource-impoverished nodes
- Providing assurances despite link failures
  - Node mobility
  - Channel fading
  - Contention
- Integration with other networks
  - Cellular
  - IP
  - WLAN

Example: Video Tele-conferencing

QoS architecture

Non-QoS architecture

Example: Sensor Coverage

- Trade-off in QoS and energy efficiency
- Operate at required QoS
  - Allow sensors to sleep
  - Maximize network lifetime