SNS COLLEGE OF TECHNOLOGY

Coimbatore-35

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DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

19ECE402- WIRELESS ADHOC AND SENSOR NETWORKS

IV ECE / VII SEMESTER

UNIT 4 WIRELESS SENSOR NETWORKS

Topic 5- self organizing MAC for sensor network

MAC Protocols for Sensor Networks

- The challenges posed by sensor network MAC protocol
  - No single controlling authority, so global synchronization is difficult
  - Power efficiency issue
  - Frequent topology changes due to mobility and failure

- There are three kinds of MAC protocols used in sensor network:
  - Fixed-allocation
  - Demand-based
  - Contention-based

MAC Protocols for Sensor Networks

- Fixed-allocation MAC protocol
  - Share the common medium through a predetermined assignment.
  - It is suitable for sensor network that continuously monitor and generate deterministic data traffic
  - Provide a bounded delay for each node
  - However, in the case of bursty traffic, where the channel requirements of each node may vary over time, it may lead to inefficient usage of the channel.

MAC Protocols for Sensor Networks

- Demand-based MAC protocol
  - Used in such cases, where the channel is allocated according to the demand of the node
  - Variable rate traffic can be efficiently transmitted
  - Require the additional overhead of a reservation process
- Contention-based MAC protocol
  - Random-access-based contention for the channel when packets need to be transmitted
  - Suitable for bursty traffic
  - Collisions and no delay guarantees, are not suitable for delay-sensitive or real-time traffic

Self-Organizing MAC for Sensor Networks (SMACS) Eavesdrop and Register

- Self-Organizing MAC for sensor (SMACS) networks and eavesdrop and register (EAR) are two protocols which handle network initialization and mobility support, respectively.
- In SMACS
  - neighbor discovery and channel assignment take place simultaneously in a completely distributed manner.
  - A communication link between two nodes consists of a pair of time slots, at fixed frequency.
  - This scheme requires synchronization only between communicating neighbors, in order to define the slots to be used for their communication.
  - Power is conserved by turning off the transceiver during idle slots.

Self-Organizing MAC for Sensor Networks a... Eavesdrop and Register

- In EAR protocol
  - Enable seamless connection of nodes under mobile and stationary conditions.
  - This protocol make use of certain mobile nodes, besides the existing stationary sensor nodes, to offer service to maintain connections.
  - Mobile nodes eavesdrop on the control signals and maintain neighbor information.

Hybrid TDMA/FDMA

- A pure TDMA scheme minimize the time for which a node has to be kept on, but the associated time synchronization cost are very high.
- A pure FDMA scheme allots the minimum required bandwidth for each connection
- If the transmitter consumes more power, a TDMA scheme is favored, since it can be switch off in idle slots to save power.
- If the receiver consumes greater power, a FDMA scheme is favored, because the receiver need not expend power for time synchronization.

CSMA-Base MAC Protocols

- CSMA-based schemes are suitable for point-to-point randomly distributed traffic flows.
- The sensing periods of CSMA are constant for energy efficiency, while the back-off is random to avoid repeated collisions.
- Binary exponential back-off is used to maintain fairness in the network.
- Use an adaptive transmission rate control (ARC) to balance originating traffic and route-through traffic in nodes. This ensures that nodes closer to the BS are not favored over farther nodes.
- CSMA-based MAC protocol are contention-based and are designed mainly to increase energy efficiency and maintain fairness.