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 1- Introduction-sensor network architecture

1.Introduction

- Sensor networks are highly distributed networks of small, lightweight wireless node, deployed in large numbers to monitor the environment or system.

- Each node of the sensor networks consist of three subsystem:
  - Sensor subsystem: senses the environment
  - Processing subsystem: performs local computations on the sensed data
  - Communication subsystem: responsible for message exchange with neighboring sensor nodes

- The features of sensor nodes
  - Limited sensing region, processing power, energy

Contents

1. Introduction.
2. Sensor Network Architecture.
3. Data Dissemination.
4. Data Gathering.
5. MAC Protocols for Sensor Networks.
6. Location Discovery.
7. Quality of a Sensor Network.
8. Evolving Standards.
9. Other Issues.

WSN

- The advantage of sensor networks
  - Robust : a large number of sensors
  - Reliable :
  - Accurate : sensor networks covering a wider region
  - Fault-tolerant : many nodes are sensing the same event
- Two important operations in a sensor networks
  - Data dissemination : the propagation of data/queries throughout the network
  - Data gathering : the collection of observed data from the individual sensor nodes to a sink
- The different types of sensors
  - Seismic, thermal, visual, infrared

WSN

1.1 Applications of Sensor Networks

- Using in military
  - Battlefield surveillance and monitoring, guidance systems of intelligent missiles, detection of attack by weapons of mass destruction such as chemical, biological, or nuclear
- Using in nature
  - Forest fire, flood detection, habitat exploration of animals
- Using in health
  - Monitor the patient's heart rate or blood pressure, and sent regularly to alert the concerned doctor, provide patients a greater freedom of movement

WSN

- Using in home (smart home)
  - Sensor node can built into appliances at home, such as ovens, refrigerators, and vacuum cleaners, which enable them to interact with each other and be remote-controlled
- Using in office building
  - Airflow and temperature of different parts of the building can be automatically controlled
- Using in warehouse
  - Improve their inventory control system by installing sensors on the products to track their movement

WSN

1.2. Comparison with Ad Hoc Wireless Networks

- Different from Ad Hoc wireless networks
  - The number of nodes in sensor network can be several orders of magnitude large than the number of nodes in an ad hoc network.
  - Sensor nodes are more easy to failure and energy drain, and their battery sources are usually not replaceable or rechargeable.
  - Sensor nodes may not have unique global identifiers (ID), so unique addressing is not always feasible in sensor networks.
  - Sensor networks are data-centric, the queries in sensor networks are addressed to nodes which have data satisfying some conditions. Ad Hoc networks are address-centric, with queries addressed to particular nodes specified by their unique address.
  - Data fusion/aggregation: the sensor nodes aggregate the local information before relaying. The goals are reduce bandwidth consumption, media access delay, and power consumption for communication.

1.3. Issues and Challenges in Designing a Sensor Network

- Issues and Challenges
  - Sensor nodes are randomly deployed and hence do not fit into any regular topology. Once deployed, they usually do not require any human intervention. Hence, the setup and maintenance of the network should be entirely autonomous.
  - Sensor networks are infrastructure-less. Therefore, all routing and maintenance algorithms need to be distributed.
  - Energy problem
  - Hardware and software should be designed to conserve power
  - Sensor nodes should be able to synchronize with each other in a completely distributed manner, so that TDMA schedules can be imposed.
  - A sensor network should also be capable of adapting to changing connectivity due to the failure of nodes, or new nodes powering up. The routing protocols should be able to dynamically include or avoid sensor nodes in their paths.

WSN

- Real-time communication over sensor networks must be supported through provision of guarantees on maximum delay, minimum bandwidth, or other QoS parameters.

- Provision must be made for secure communication over sensor networks, especially for military applications which carry sensitive data.

Classification of sensor network protocol