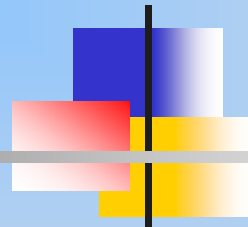


CSE498: Wireless Sensor Network Design



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Outline

- Course introduction
- Introduction to wireless sensor networks
- Summary and homework



Course Objectives

- Be able to
 - list various applications of wireless sensor networks
 - describe the concepts, protocols, and differences underlying the design, implementation, and use of wireless sensor networks
 - propose, implement, and evaluate new ideas for solving wireless sensor network design issues
- Ph.D. research oriented training
 - Present and discuss ideas and results
 - Teamwork
 - Broaden technical background



Textbook

- No textbook
 - Papers and materials will be handed out or available at the Blackboard System.
- Prerequisites
 - CSE404 (Computer Networks) or Instructor's permission.



Tentative Course Schedule

- www.cse.lehigh.edu/~cheng/Teaching/CSE498-06/schedule.html



Grading

- Homework: 10%
 - Due Monday 11:55 PM. No late hand-in homework will be accepted.
 - Submit your work through the Blackboard course website to "Digital Drop Box".
- Individual project (30%)
 - Presentation: 10%
 - A survey paper: 20%
- Take-home exam (20%)
- Group Project (30%)
 - Presentation: 10%
 - Demo: 10%
 - Report: 20%
- Academic integrity
 - All graded work, except the group project, should be your own!



Basic Course Information

- Course website
 - <http://www.cse.lehigh.edu/~cheng>
- Office hours
 - Tuesdays from 4 PM to 6 PM and Thursdays from 5 PM to 6 PM, and by appointment
 - Packard Lab 326
 - Email: cheng@cse.lehigh.edu

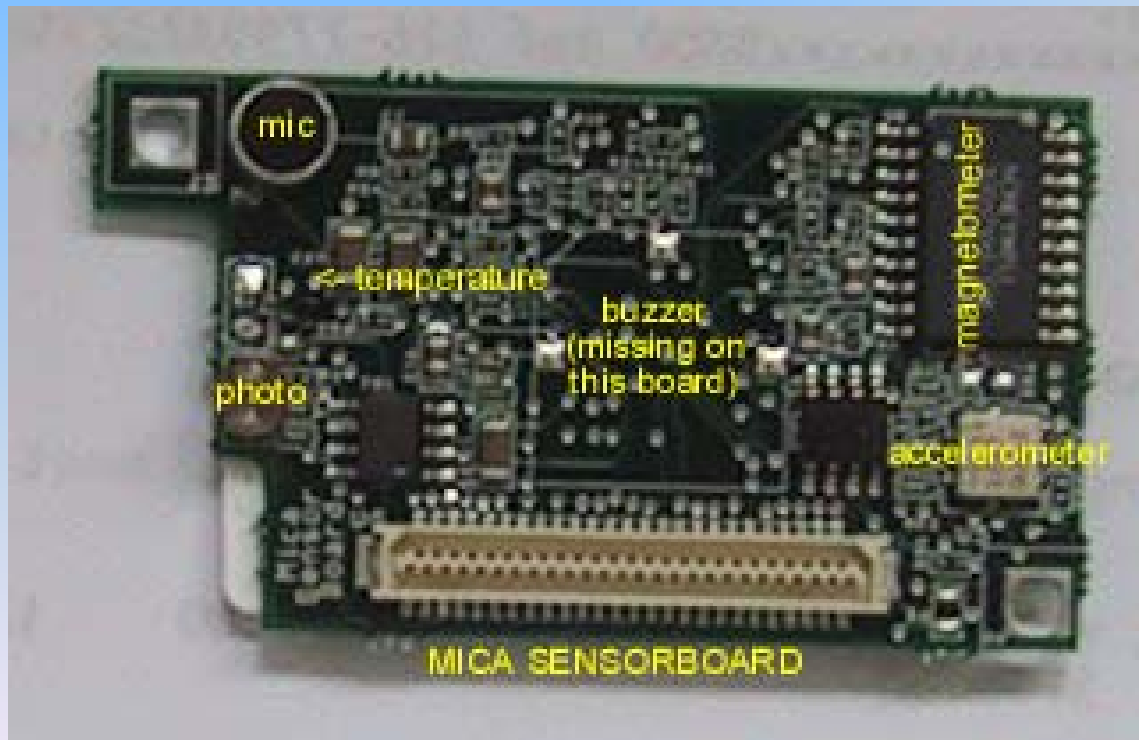


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Wireless Sensors

- Sensing, computing, communication



Wireless Sensor Networks (WSN)

■ Improvement over traditional sensors

■ Traditional

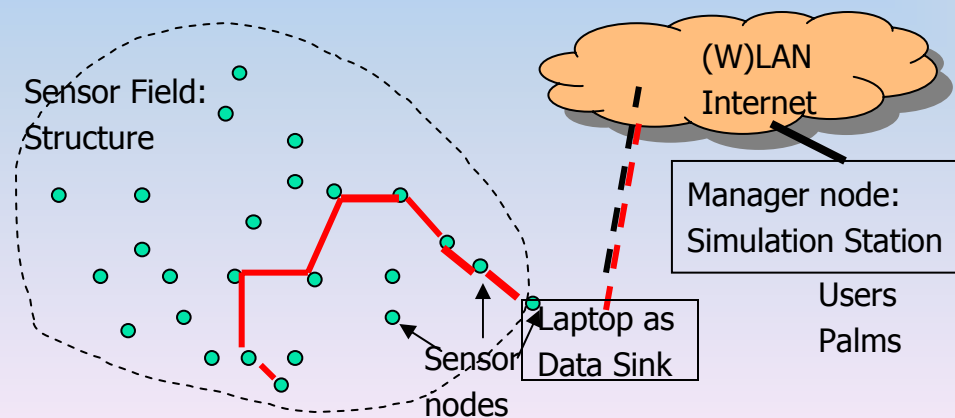
Far from phenomena
or several sensor positioned

Engineered positions

WSN

densely deployed inside or
close to phenomena

Randomly deployed





Wireless Sensor Networks

- Applications

- Geophysical/structural/habitat monitoring
- Security surveillance, disaster area or battlefield information collection
- Health, home and other commercial areas



Uniqueness of WSN

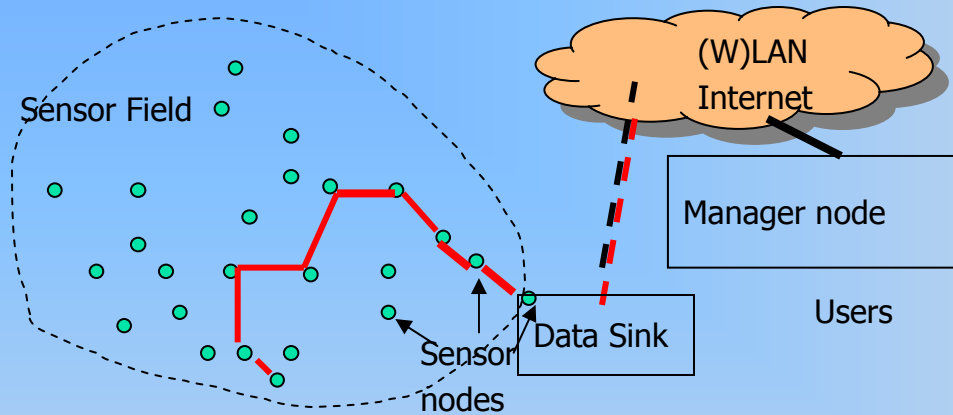
- Different from wireless ad hoc networking



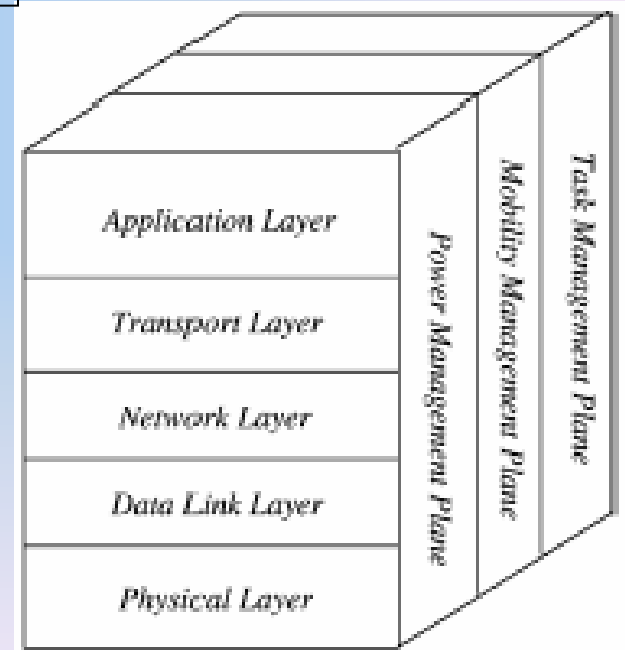
An Important Design Constraint/Goal

- Energy constraint vs. long network lifetime
 - Prolonging network lifetime at the cost of lower throughput or higher transmission delay

WSN Communication Architecture



- Not all of the layers are available in a WSN





Application Layer

- Sensor management protocol
 - Software to perform administrative tasks
 - Rules related to data aggregation and clustering
 - Time synchronization
 - Topology management
 - Moving sensor nodes, turning off sensor nodes
 - Key distribution
 - Sensor network reprogramming



Transport Layer

- Challenges

- TCP in wireless environment => TCP splitting
- Attribute-based naming



Network Layer Schemes

- SMECN
 - Creates a subgraph of the sensor network that contains the ME path
- Flooding
 - Broadcasts data to all neighbor nodes regardless if they receive it or not
- Gossiping
 - Sends data to one randomly selected neighbor
- SPIN
 - Sends data to sensor nodes only if they are interested (ADV, REQ, DATA)
- SAR
 - Creates multiple trees where the root of each tree is one hop neighbor from the sink; select a tree for data to be routed back to the sink
- LEACH
 - Forms clusters to minimize energy dissipation
- Directed diffusion
 - Sets up gradients for data to flow from source to sink during interest dissemination
- ...



Data Link Layer

Category	Resource sharing mode	Application domain	Disadvantages
Dedicated assignment or fixed allocation	Pre-determined fixed allocation	Appropriate for continuous traffic and provides bounded delay	Inefficient for bursty traffic
Demand based	According to demand or user request	Useful for variable rate and multimedia traffic	Additional overhead and delay due to reservation process
Random access or contention based	Channel contention when transmission packets are available	Suitable for bursty traffic	Inefficient for delay-sensitive traffic

- Examples in each category



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 - **Refer to Blackboard**