Wireless Sensor Network

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Outline

• What is wireless sensor network

• Peculiarities of WSN

• Device in Sensor Network

• Application of Wireless Sensor Network

What's Wireless Sensor Network

- A network that is formed when a set of small sensor devices that are deployed in an ad hoc fashion cooperate for sensing a physical phenomenon

- What's the difference with conventional sensor

   Not just sensors, but sensors with tiny brains.

Sensor with Brain

Advantage of having brain

- Improves the quality of readings obtained
  - False reading due to malfunctioning sensors are discarded
  - Sensor can calibrate themselves
  - Shorter response time
- Allows nodes to function autonomously
  - How to route data when a certain node fails or moves out of range.
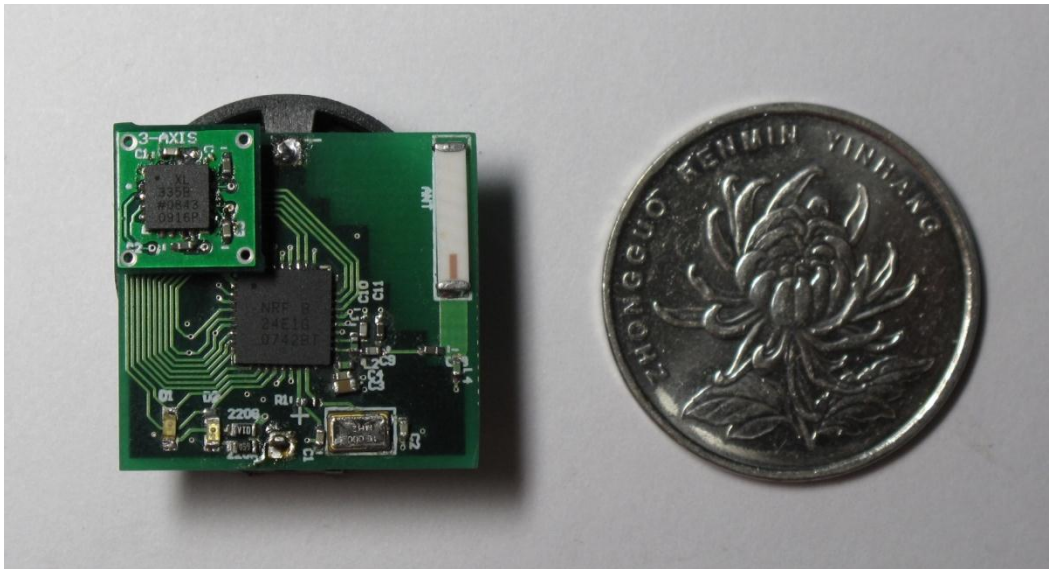- New functionalities
  - Localization

What's Wireless Sensor Network

- Distribute large amount of sensor nodes in sensor field, which are able to setup multi-hop wireless ad-hoc networks automatically
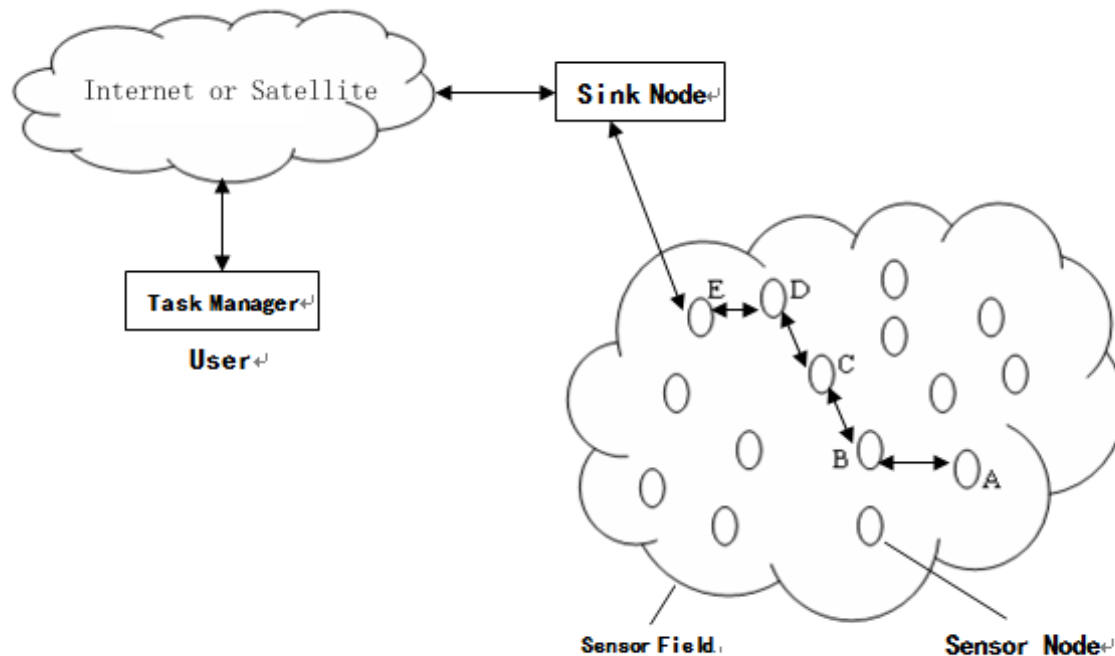
WSN Peculiarities

- **Large amount of sensors with small size:** Typically a sensor network may contain thousand of nodes, which are cheap and small size sensors.

WSN Peculiarities

- **Low energy use:** In many applications, the sensor nodes will be deployed in remote area, in which case recharging is not feasible.
  - High mountain area
  - Satellite in outerspace
- **Efficient use of the small memory**: When building sensor networks, issues such as routing-tables, data replication, security and such should be considered to fit the small size of memory in the sensor nodes.

- **Network self-organization:** It is essential that the network can self-organize itself, considering the large amount of nodes and the potential placement in hostile location.

Sensor Network Devices

- An important aspect of sensor networks is that devices themselves are meant to eventually disappeared-either from out consciousness or even visibly or physically.

- As the technologies develop, the sensor node devices are becoming smaller and smaller.
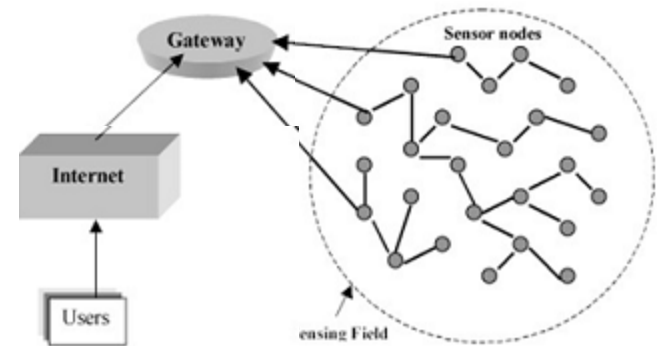
Applications of WSNs

- Ecological monitoring
  - Great Duck Island project-sensors have been put in fixed locations on a remote island to try and better understand the behavior of leach's petrel (a pelagic seabird)
  - Reading such as humidity, rainfall and temperature on a constant basis to understand the movement of the petrel.

Application of WSNs

- Great Duck Island project is the most common use of the wireless sensor network.
- First, data is collected by sensor on the ground.
- Then, data is passed using multi-hop routes between sensors until they reached the network gateway or sink.
- This then allowed access to the data from the conventional internet. In the Great Duck Island project a laptop with a satellite link was used as the sink.

Application of WSNs

- Checking & Tracing
  - Allows tracking and monitoring of assets in whole logistic chain
    - From manufacturing, packaging, transporting, shop
- Examples
  - Express post, containers, flowers

Challenges faced in WSNs

- Limited energy resources
  - Maximize network lifetime
    - Minimize usage of transceiver
    - Minimize usage of sensors(e.g. temperature, humidity, etc.)

- Limited Bandwidth
  - Minimize the amount of data that needs to transmit

- Small memory and low computing capability
  - Collect the simplest parameters
  - Avoid data processing in sensor nodes

Reference

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- [3]杨洋.低功耗无线传感器网络节点的设计与实现：[学位论文].北京：北京邮电大学电子工程学院， 2009.

Thanks for listening.

Questions?