Resource Management of Heterogeneous Wireless Sensor Networks

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Heterogeneous Wireless Sensor Network

Data Acquisition Network
- 3d ultrasonic anemometer
- Solar radiation
- Animal Monitoring
- Precipitation
- Temperature, humidity
- Ship Monitoring

Data Distribution Network
- PDA
- Notebook
- Cellular Phone
- Mobile and Stationary Operations
- PC
- Storage
- Seismic
- Weather station
- Stationary camera
- In-flight camera

Mobile and Stationary Operations

Network

Precipitation

Solar radiation

Seismic

Weather station

Stationary camera

In-flight camera

HPWREN
**HPWREN - three tier network**

**Wireless MESH**
- QoS routing
- Fast wireless connectivity

**Sensor Cluster Heads**
- Key issue:
  - Delivering good QoS
  - With long battery lifetime
- Use faster radio to support QoS requirements

**Sensor Network**
- QoS
  - not considered in traditional sensor net research
- Battery lifetime
Contention and Interference

- Many packet collisions
- A lot of time spend in packet retransmissions
- Interference from neighboring cells
- Throughput falls
Solution: Scheduling

**Throughput**
Improvement up to 10%

**Power**
Improvement up to 85%

Throughput (Mbps)

- **No scheduling**
- **Node-level scheduling**

Number of contending nodes

Throughput measurement graph showing the comparison between no scheduling and node-level scheduling.
Routing

Router resources shared equally by all sources
Quality of Service: guaranteeing router resources to a data flow in accordance with its priority.
QoS Guarantees

- Router Configuration for QoS
- Successful configuration and experimentation with Cisco 3560 for QoS

http://hpwren.ucsd.edu/QoS/20070715.html
Conclusion

- Heterogeneous wireless sensor networks
  - Low power operation at lower layers
  - Require good QoS for some applications
  - Best effort traffic for the rest of the data

- Our solution:
  - Distributed, adaptive and low power QoS scheduling at lower layer
  - QoS aware routing at upper layer