Detecting Denial-of-Service Attacks against Sensor Networks

Steven Cheung, Bruno Dutertre, Ulf Lindqvist

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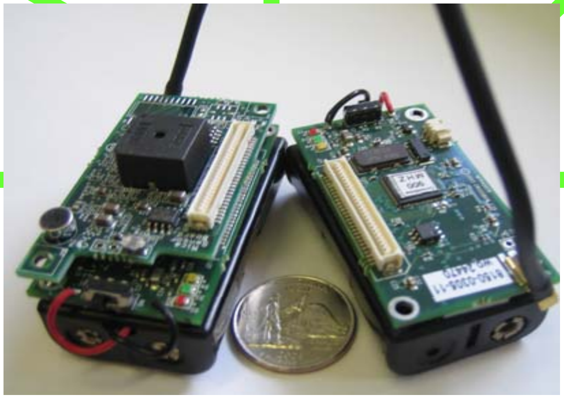
Wireless sensor networks

Structural integrity monitoring

Wildlife monitoring

Protection for critical infrastructure

Precision agriculture



Intruder detection and tracking

Characteristics of wireless sensor networks

- Resource constraints
  - Limited energy reserve, computation power, memory
- Physical exposure
  - Possibly deployed in remote locations, and spread across a large geographic region
- Collaborative processing
  - Use sensor nodes for routing
- Unpredictable communication links

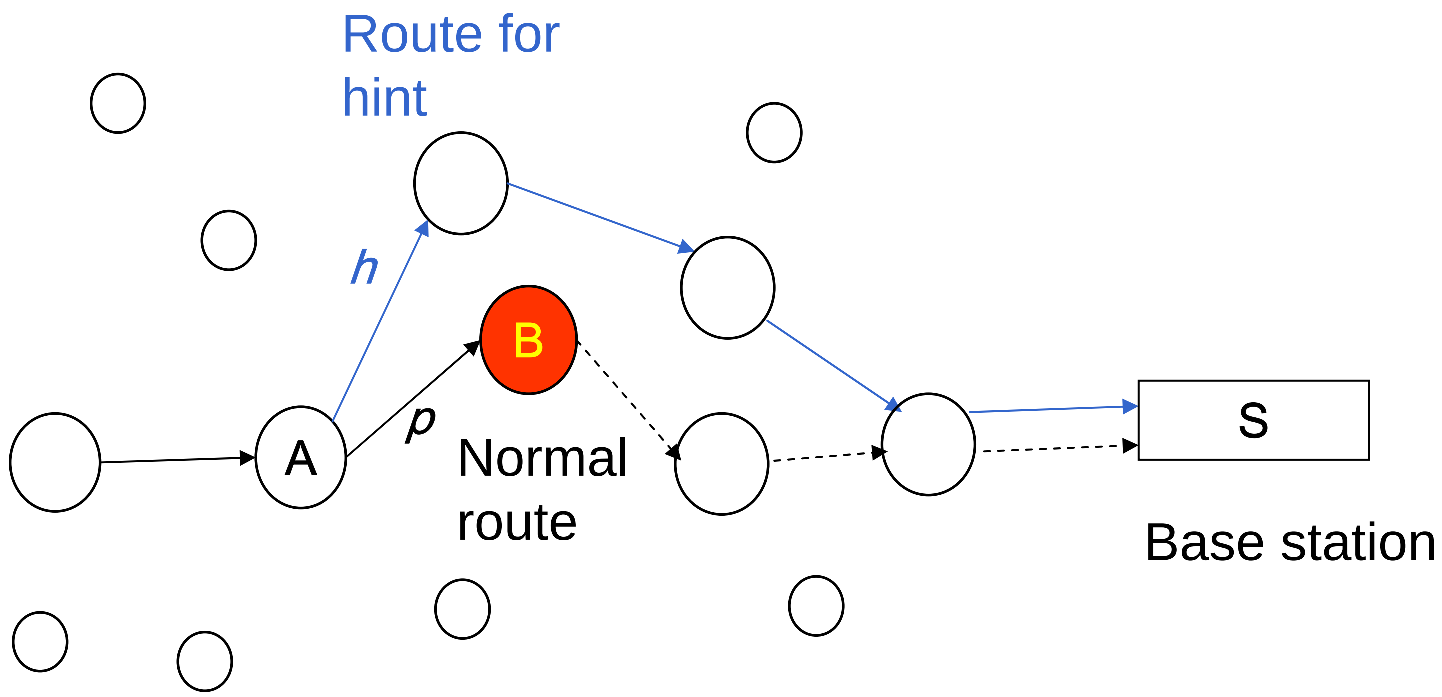
Physical attacks

- Examples:
  - Destroying sensor nodes using physical or electrical means
  - Relocating sensor nodes
  - Turning off sensor nodes
- Detection approaches:
  - Nodes periodically send “I’m alive” packets to the base station
  - Cooperative monitoring: Neighbor nodes exchange heartbeat messages with each other

Disruptive routers

- Compromised sensor nodes may drop or corrupt packets
- Related work:
  - Secure implicit sampling [McCune et al ‘05]
  - Secure trace-route [Padmanabhan-Simon ‘02]
  - Hop-by-hop checking [Marti et al ‘00]
  - Conservation of flow [Cheung-Levitt ‘97, Bradley et al ‘98]
- Need a scheme that is lightweight and can handle “malicious” routers

Hint-based approach



- When a node *A* forwards a packet *p* to its next-hop neighbor *B*, with probability δ it will also send a hint *h* to the base station
- The hint is routed via the path that avoids *B*