Reasoning Services for Security and Energy Management in Wireless Sensor Networks

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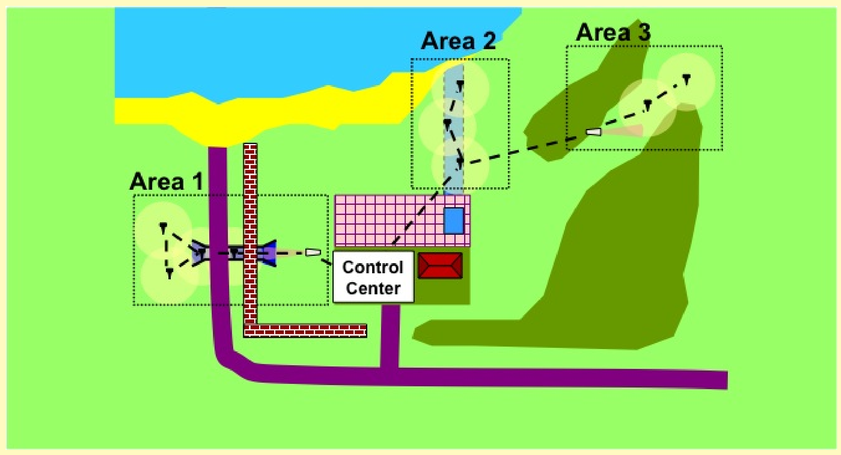
Area Monitoring using a Wireless Sensor Network

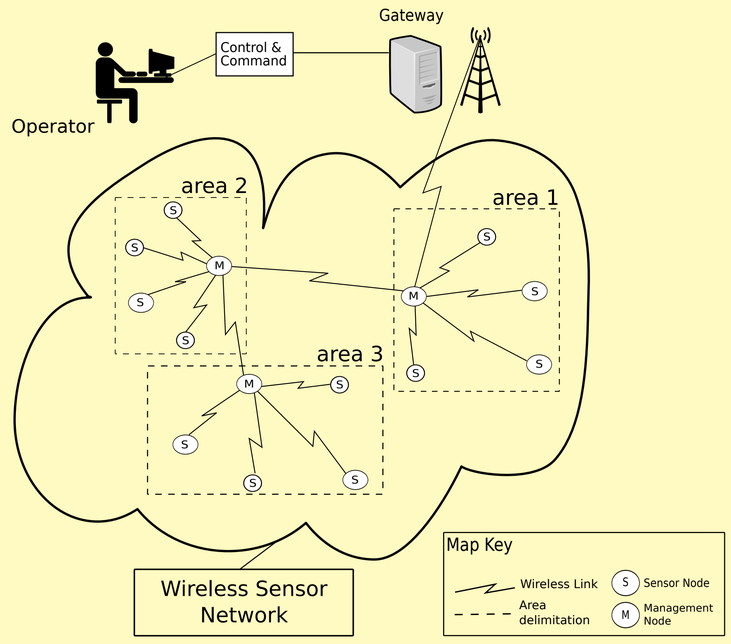
Pros:
- Easy to deploy
- Reduced cost
- Dynamic configuration
- Redundant & heterogeneous sensors

Challenges:
- Management and Maintenance cost and overhead
- Energy consumption / Network Lifespan
- Security

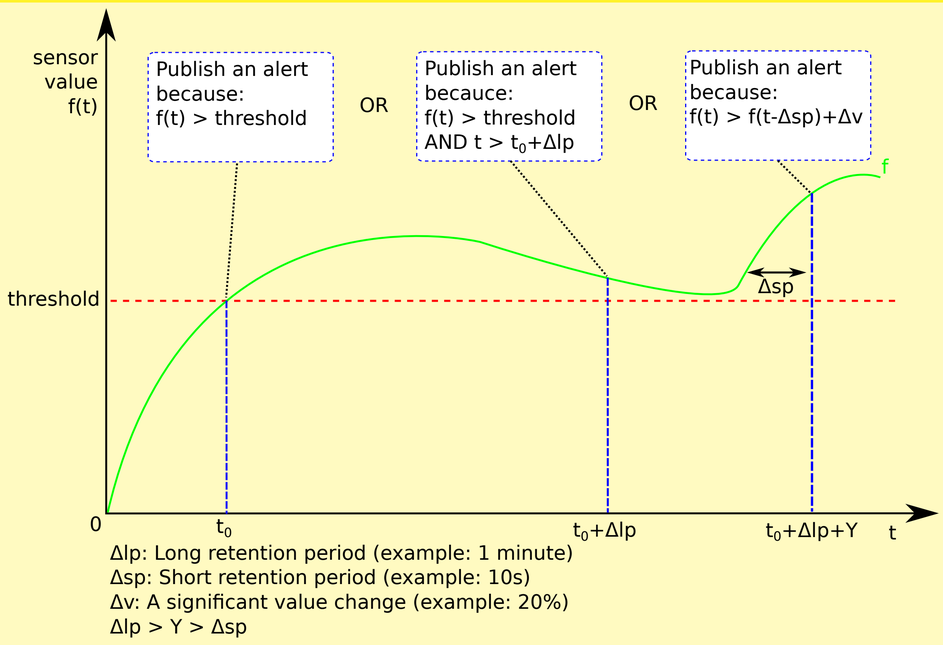


Power Management Scheme

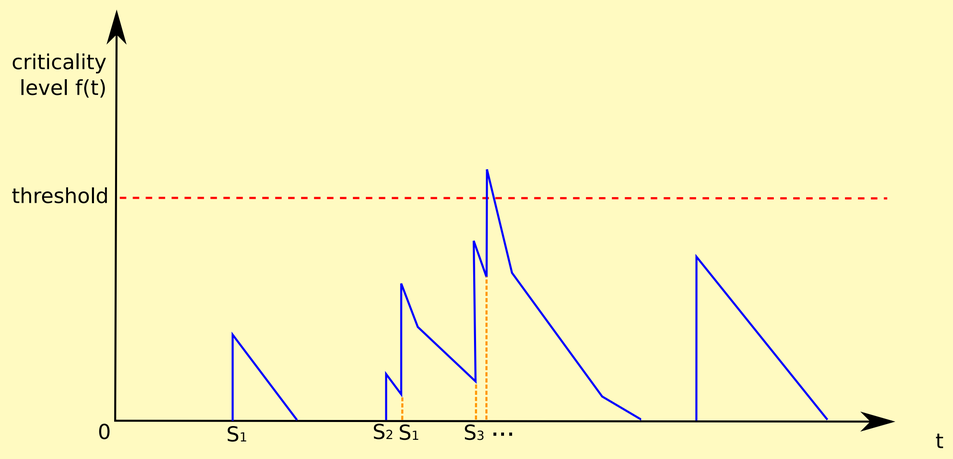
Reasoning Services:
- Use reasoning tools
- Divide the area to monitor into zones
- Elect management Node in each zone
- Correlate events within zones
- Send alarms to operator only when necessary



Two levels of Reasoning



a) Sensor-level Reasoning



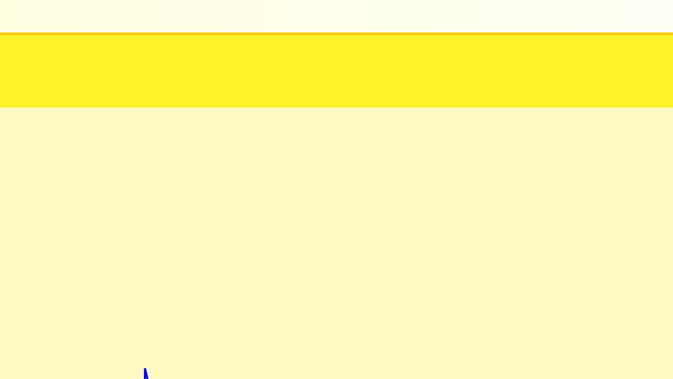
b) Zone-level Reasoning

Simulations

Wavesim simulator:
- Implements the Wavenis stack
- Callback-based programming
- Developed & maintained by the sensors manufacturers

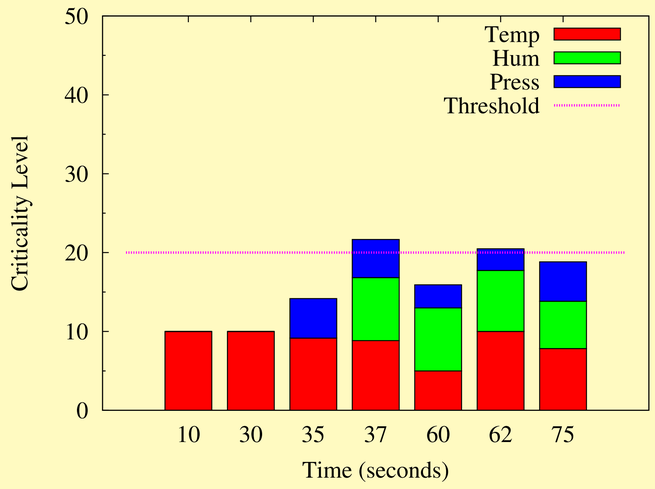
Configuration:
- 10 nodes randomly deployed
- Single zone: 200*200m
- 3 types of sensors: temperature, humidity and pressure

Node-level Results



- A single alert for each event
- Reduced sent messages by filtering the sensor's values
- **Conclusion:** All sensors values are not immediately sent to the sink

Management-level Results



- Combining different type of alerts
- Dynamically evolving criticality level
- Alarms sent to the administrator in case of correlated alerts
- **Conclusion:** Alerts are only sent to the administrator when correlated

Summary : Reasoning-based Management

Less messages ⇒ Reduced power consumption

Future Work

- Management of nodes reputation
- Real implementation on sensor nodes
- Using a Publish/Subscribe communication paradigm for more dynamic configurations