ANR Diaforus
Detecting spatio-correlated events

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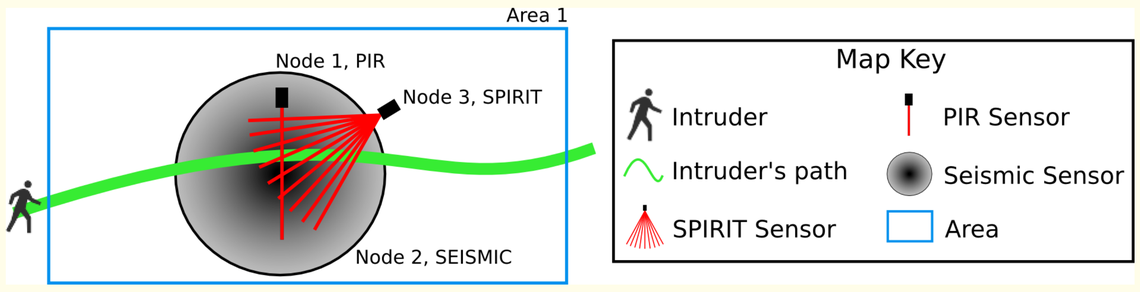
Area Monitoring using a Wireless Sensor Network

Pros:

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

Challenges:

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



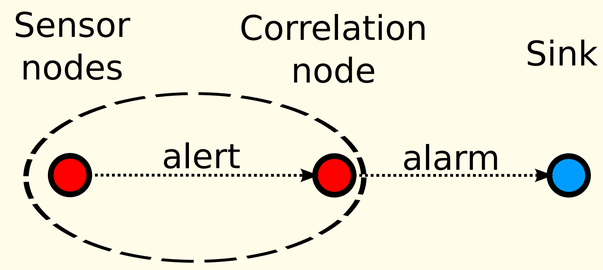
Saving power

Source of power consumption:

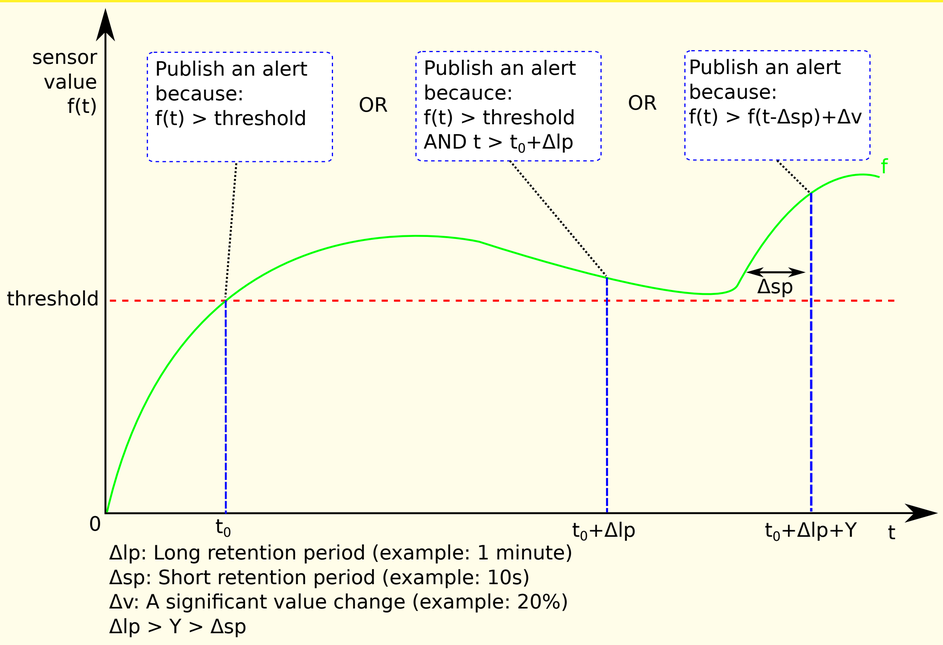
- CPU
- Radio transmissions
- 1 byte sent $\simeq$ a few ms worth of processing
- sensors (outside of the scope of the study)

Proposition:

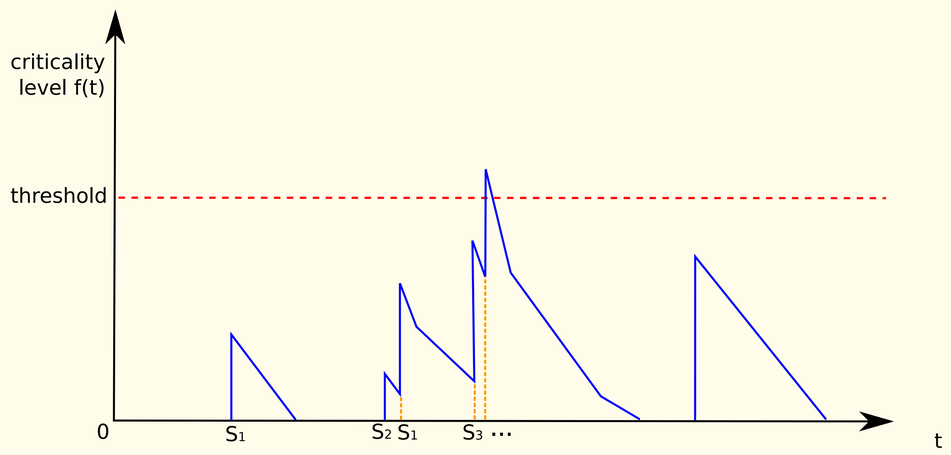
- Favour local processing
- Transmit semantic informations (alerts and alarms instead of data)
- Semantic routing to allow in-network usage (Publish/Subscribe)



Two levels of Reasoning



a) Sensor-level Reasoning



b) Zone-level Reasoning

Comparaison with the State of the Art

Network type	Multi hop	Shortens communications	Local data processing	User	Heterogeneous correlation	Autonomous
Sink [1]	X			External		
Cluster aggregation [2]	X	X		External		
Local data aggregation [3]	X		X	External		
Collaborative detection [4]	X	X	X	External		
Diaforus [5]	X	X	X	Internal & External	X	X

a) Comparaison with the state of the art: features

Système (p = 10%)	Lectures capteurs	Communications courtes	Communications longues
Classique [1]	5400	0 (0%)	5400 (100%)
Cluster aggregation [2]	5400	3600 (66,6%)	1800 (33%)
Local data aggregation [3]	5400	0 (0%)	540 (10%)
Détection Collaborative [4]	5400	Max. 545 (10%)	Faible
Diaforus [5]	5400	Max. 540 (10%)	Très faible

b) Comparaison with the state of the art: efficience

Limits & Implications

Few messages arrive at the administrator:

- Difficult to monitor the availability
- Difficult to detect false negative (absence of detection)
- Difficult to know how limit the false-positives/negatives

Nodes should be as autonomous as possible:

- Auto-configuration: React to changing the number of sensors
- Auto-optimization: Learn the error rate of sensors
- Logging: Save the most important events for the administrator

Sensor reputation

$$reputation\_fp(a,s) = \frac{area\_detection\_count\_involving(a,s)}{sensor\_events\_count(s)} \quad (1)$$

$$reputation\_fn(a,s) = \frac{sensor\_correlated\_count(s)}{area\_detection\_count(a)} \quad (2)$$

Simulation and deployment