Cyber-OF : An adaptive cyber-physical OF for smart cities applications

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Motivation

- RPL-based sensor network for weather and climate conditions behave exactly the same as if they carry a normal data packet or a critical event data packet (fire, flood ,car accidents …) , which might not be appropriate.

RPL protocol

- RPL is a distance–vector (DV) and a source routing protocol that is designed for lossy and low power networks.

- RPL is based on the topological concept of Directed Acyclic Graphs (DAGs)

- In the construction process of network topology, each router identifies a stable set of parents on a path towards the DODAG root, and associates itself to a preferred parent, which is selected based on the Objective Function.
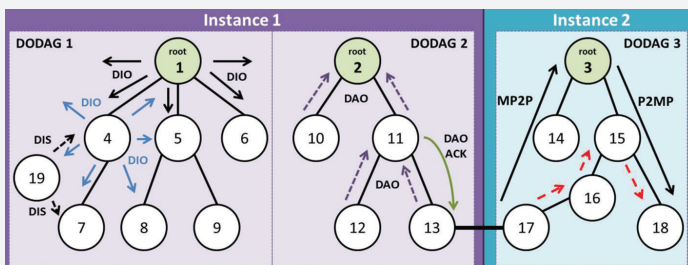
References

[1] : O. Gaddour and A. Koubaa, "RPL in a nutshell: A survey," Computer Networks, vol. 56, no. 14, pp. 3163–3178, 2012.
[2] : H.-S. Kim, J. Paek, and S. Bahk, "Qu-rpl: Queue utilization based rpl for load balancing in large scale industrial applications," in Sensing, Communication, and Networking (SECON), 2015 12th Annual IEEE International Conference on, pp. 265–273, IEEE, 2015.
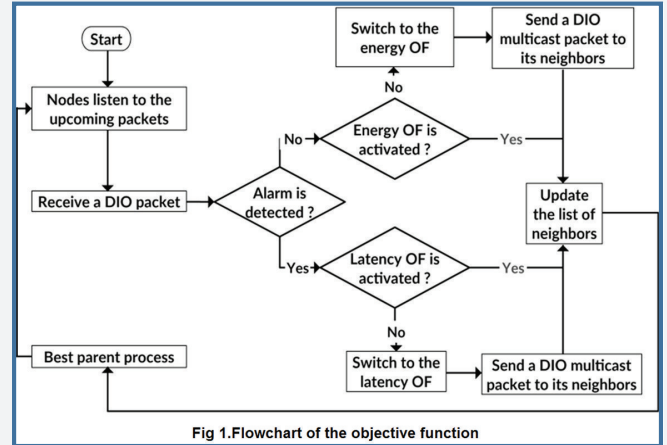
Proposed objective function

Fig 1.Flowchart of the objective function

- We designed the Cyber-Physical objective function to adapt the network tree structure in real-time to the cyber-physical properties of the environment based on the event criticality

Preliminary results

- In the performance evaluation we compared three objective functions and we examined the impact of the end-to-end delay and network lifetime.

Fig 3. Average end-to-end delay **Fig 4. Network lifetime**
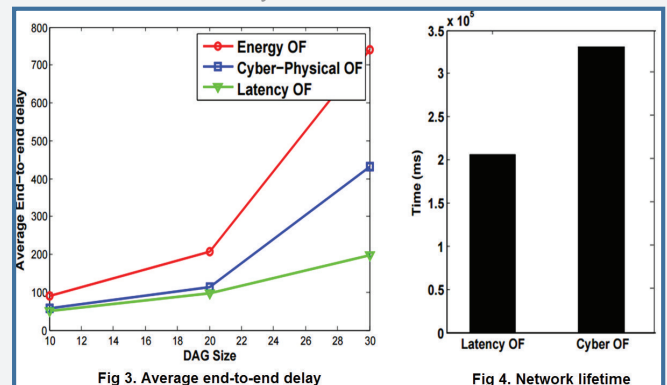
- These results confirm the tendency of the Cyber-OF to minimize the delay when critical events are detected.

- The Cyber-OF can save energy and maximizes the network lifetime more than the latency OF during 5 minutes of the simulation.

Future work

- In future, we plan to storing two parent candidates in the sensor to speed up the advertisement of the alarm. One is used when a critical event is detected and the other is used in normal conditions.