Section D. Leaflet

Title of the experiment

Cross-Layer Control of Data Flows (CORAL)

Name of organization and logo

University of Macedonia

Goal(s) of experiment

- Propose novel SDN-inspired cross-layer network control and protocols mechanisms aligned to the challenging requirements of Internet of Things (IoT) devices.
- Experiment with intelligent routing over IoT devices using both the w-iLab.2 test-bed and the Cooja emulator.
- Implement a demonstrator of the proposed framework using state-of-the-art visualization components.

Main challenge(s) of experiment

- Experiment with network control capabilities and network protocols that adapt to various network conditions in Internet of Things networks.

- Investigate SDN-inspired protocol strategies.

- Demonstrate the WiSHFUL assets in the studied context, e.g., its novel architecture and UPIs.

- Introduce a bespoke dashboard and a real-time visualization tool.

Description of setup of Experiment

We introduced the CORAL experimentation infrastructure for SDN-inspired network control and protocol mechanisms over IoT networks. We used fixed and mobile RM090 motes located in the IMEC w-iLab.2 test-bed as well as Cooja emulated motes, all communicating with IEEE 802.15.4 wireless connectivity. The nodes were running three SDN-inspired routing protocols we implemented (Fig. 1).
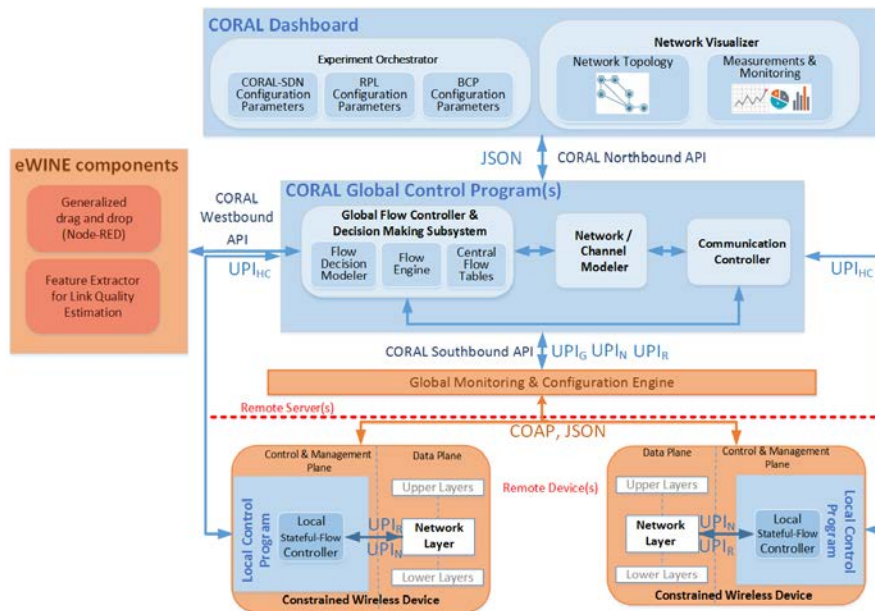

Fig.1: The CORAL architecture

Main results

We demonstrated CORAL with three SDN-inspired network protocols and their relevant network control functionalities, their dynamic adaptation to different network conditions and the ease to be extended with new features (Fig. 2). We evaluated a number of relevant network control and protocol strategies, such as on topology control and flow establishments based on cross-layer measurement inputs (Fig. 3).
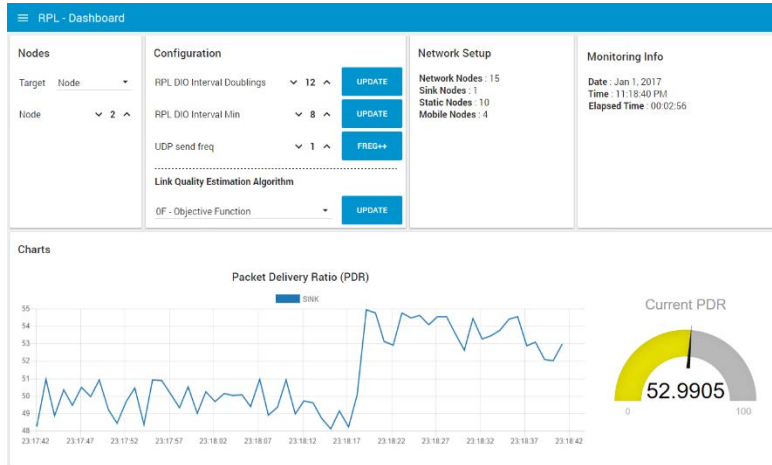

Fig. 2: The adaptable RPL protocol: real-time configuration and PDR response
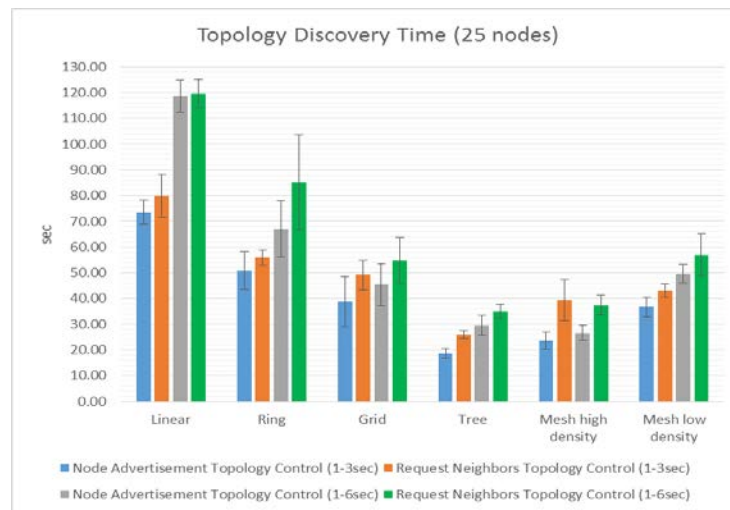

Fig. 3: Topology discovery duration for 25 nodes in our OpenFlow-like

Conclusions

We introduced our experimentation environment for SDN-inspired capabilities in IoT networks. We experimented with novel network control features, our OpenFlow-like protocol and adaptable versions of the RPL and Back-Pressure Routing protocols while targeting their performance shortcomings, especially in mobile and heterogeneous IoT networks.

Feedback

Thanks to the unique assets of the WiSHFUL test-beds and platform we are able to experiment with a number of SDN-inspired network control and protocol strategies over IoT networks, adapting to various challenging network conditions.