Open Thesis / Project

Benchmarking Geographically-Distributed Low-Power Wireless Systems

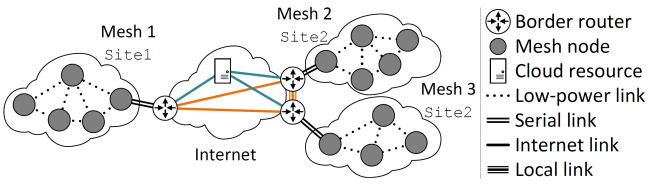
Thesis Type

Master Project / Master Thesis

Motivation

IoT solutions often leverage the cloud for connecting different geographically-distributed deployments. The figure below shows how multiple mesh networks can be connected through the Internet by means of edge devices acting as border routers. Links through the Internet shown in blue represent the classical cloud paradigm, where each site is connected to one or more central servers. However, such a paradigm may introduce unwanted delays when end-devices in different instances needs to exchange data (e.g., in the context of *tactile* applications requiring millisecond-level latencies such as teleoperation). Links through the Internet shown in orange illustrate the approach followed by modern IoT deployments, which allows edge devices to exchange data directly (hence, at a lower latency) without losing access to cloud resources.

We aim to study, characterize, and optimize the end-to-end delays across such mesh-cloud-continuum, and compare different approaches. To this end, we can exploit our *unique* testbed infrastructure connecting a low-power mesh facility installed in Graz with a replica that is located 4000 miles away in Abu Dhabi at the Technology Innovation Institute (TII) premises.



Goals and Tasks

Within this context, the student can explore several directions and perform different tasks, such as:

- Getting familiar with IPv6-based protocols on the Nordic nRF52840 SoC (OSF and 6TSCH in Contiki-NG, OpenThread and Matter in Zepyhr);
- Getting familiar with experimentation on a cross-continent testbed infrastructure;
- Systematically study, characterize, and optimize the end-to-end communication performance (e.g., delays) for different kinds of traffic and their ability to cope with interference in the local network.

Target Group

- Students of ICE/Telematics;
- Students of Computer Science;
- Students of Electrical Engineering.

Required Prior Knowledge

- Excellent C programming skills;
- Knowledge of networked embedded systems;
- Ideally, successful completion of the Embedded Internet (VU/LU) course.

Contact Person

- Dr.techn. Markus Schuß
  markus.schuss@tugraz.at
- Assoc.Prof. Carlo Alberto Boano
  cboano@tugraz.at

4480 – Institute of Technical Informatics (ITI)

Low-Power Embedded Networked Systems (LENS) Group

Group leader: Assoc.Prof. Carlo Alberto Boano