

Bachelor Thesis

Automated Testing of Testbed Hardware

Motivation

The Magdeburg Internet of Things Laboratory (MIoT-Lab) is a testbed for the research on wireless communication and embedded systems [1][2]. In the future, it will consist of 200 computer nodes distributed around the campus.

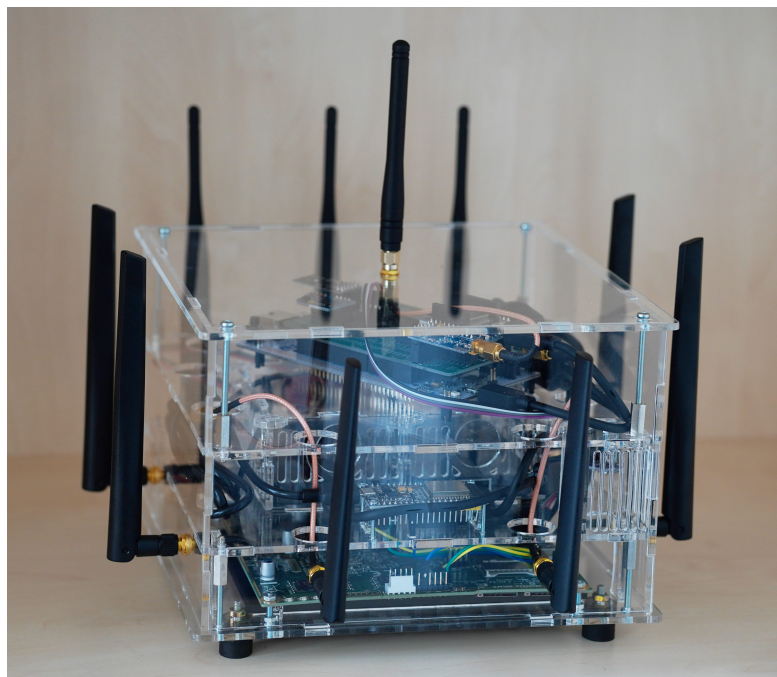


Figure 1. A computer node as currently deployed in the MIoT-Lab.

As can be seen in Figure 1, the nodes contain several components such as an x86 board as well as several Microcontroller Units (MCUs), sensors and wireless network cards with the corresponding antennas. Although cabling between nodes, MCUs, sensors, network cards and antennas are checked during the build process of a physical node, and overall operation (boot process, network reachability) is ensured during deployment, it is unknown if all components are actually operational and working normally, until defects are discovered during experimentation - that is, if defects are discovered at all. Needless to say, defect or abnormally operating hardware can be frustrating for researchers, but also unintentionally influence experiments negatively.

Project type Bachelor Thesis
Software Project
Language(s) English, German
Field Computer Science



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Goal

The goal of this thesis is to design and implement a testing suite for the MIoT-Lab and evaluate its effectiveness and coverage.

Depending on the type of the module (thesis or software project), the scope can be adjusted accordingly.

Tasks

- get familiar with the MIoT-Lab, its architecture and its nodes
- design and implement an automated testing suite
 - embedded applications (e.g. RIOT OS)
 - * sanity checks for sensors
 - * reachability tests for wireless technologies
 - small console applications (e.g. Python or Bash scripts)
 - * unit tests for reset solution
 - * stress testing (optional)
 - * ...
- evaluate the suite
- write a thesis about it

References

- [1] *Communication and Networked Systems (ComSys) - MIoT-Lab*, Mar. 2025. [Online]. Available: https://comsys.ovgu.de/MIOT_Lab.html.
- [2] K. Kientopf, M. Buschsieweke, and M. Güneş, “Technical report: Designing a testbed for wireless communication research on embedded devices,” *18. GI/ITG KuVS Fachgespräch Sensornetze–FGSN 2019*, pp. 41–44, 2019.

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