

Bachelor/Master Thesis

Remote Control App for Smart Home Applications

Motivation

A wide range of solutions exist for connecting devices in the Internet of Things (IoT). For example, ZigBee & Z-Wave exist for the world of home automation and smart buildings. While other technologies usually introduce entirely new network stacks and require specialized hardware transceivers or at least the drivers for it, Constrained Application Protocol (CoAP) works on well-known and widely adopted Internet Protocol (IP)-based infrastructure and already deployed hardware [1]. This makes it the perfect cost-efficient and ready-to-use candidate for most IoT use cases.

While there are sophisticated systems for home automation and smart home applications such as Home Assistant [2] and other mostly proprietary systems that also offer smartphone apps, sometimes a simple CoAP server suffices and is much easier to set up and maintain, especially for people with programming skills. However, the app stores of this world are missing a good open-source remote control app to interact with CoAP endpoints in an intuitive, user-friendly way.

Goal

The goal of this thesis is to develop, implement and evaluate an application for remote control of smart home devices via CoAP. Figure 1 sketches how such an application would fundamentally work and how it could roughly look like.

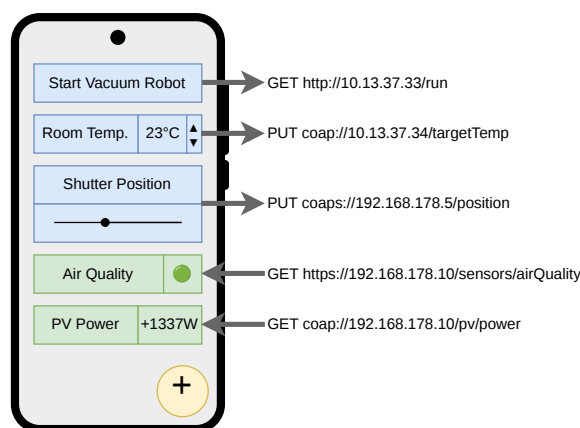


Figure 1. Sketch of the application.

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



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While the hidden agenda behind this topic is partially to make CoAP more suitable and popular for smart home applications, it may make sense to also offer the HyperText Transfer Protocol (HTTP) as a transport due to wide adoption and the similarities to CoAP (e.g. request-response paradigm, client-server model, resource identifiers).

Depending on the type of the module (thesis or software project), the scope can be adjusted accordingly. Of course, own ideas are much appreciated.

Tasks

- do some market research (comparable apps, home automation software et cetera)
- design and implement an application for remote control of smart home devices via CoAP
 - open source
 - web, mobile (Android, iOS), PC, or completely platform independent
 - Graphical User Interface (GUI) to lay out buttons, sliders, status indicators, graphs, ...
 - support for authentication
 - (optional) setup via QR codes
- evaluate the application
 - questionnaires about User eXperience (UX)
 - comparison of features with similar software
 - scalability
- write a thesis about it

References

- [1] Z. Shelby, K. Hartke, and C. Bormann, *The Constrained Application Protocol (CoAP)*, RFC 7252, Jun. 2014. DOI: 10.17487/RFC7252. [Online]. Available: <https://www.rfc-editor.org/info/rfc7252>.
- [2] *IoT NAT Traversal*, Mar. 2026. [Online]. Available: <https://www.home-assistant.io/>.

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