

Bachelor Thesis

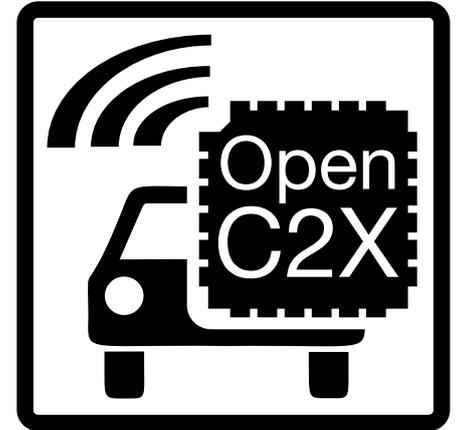
Integration of OpenC2X for OpenWRT/LEDE

Wireless communication in the vehicular networking domain is the key technology for the upcoming era of connected vehicles. Usecases for inter-vehicle communication range from pure safety to efficiency and entertainment purposes to support a variety of different application domains.

Among the big challenges in this field is the integration of all these applications into a common protocol stack to allow concurrent operation on the same wireless network. In particular this is necessary to avoid overloading of the wireless channel by one or multiple of these applications, as well as to provide a minimum set of quality of service to ensure a fair channel usage among all vehicles.

In the past standardization bodies picked up on that challenge and developed ETSI ITS-G5, a vehicular communication stack to provide a holistic networking concept. It ranges from standardized application layers down to the access layer on the wireless channel. Moreover hardware developers all around the world provide commercial hardware prototypes implementing this standard for vehicular communication. However these prototypes are expensive, built on closed source software, and only allow limited extensibility for research.

Recently we developed *OpenC2X*, an open source prototyping platform for vehicular communication providing a standard compliant ETSI ITS-G5 protocol implementation taking advantage of commodity WLAN hardware. OpenC2X builds upon the Linux kernel and consists of several building blocks to provide connectivity to GPS modules and OBD2 connectors for in-car data retrieval. Besides this, in the open source community the OpenWRT/LEDE framework for integrating Linux into consumer hardware like WiFi-Routers has gained a lot of attraction as it provides compatibility for a large number of different hardware platforms. The focus of OpenWRT/LEDE is to provide an easy interface to allow quick deployment of a larger number of devices.



■ Goals of the thesis

In the above context the idea of this thesis is to port our current implementation of OpenC2X to the OpenWRT/LEDE software ecosystem, to build a *firmware-like* distribution of the ETSI ITS-G5 software stack.

To approach this goal, first the implementation of OpenC2X needs to be modified to match the requirements of OpenWRT/LEDE in terms of shared libraries and dependencies to other software packages. Next, the thesis creates tools for easy configuration of OpenC2X on the embedded system.

Finally the developed system is evaluated on different hardware platforms focusing on resource requirements, e.g., memory consumption, firmware-size, and CPU load.

■ Project Website

<http://www.ccs-labs.org/software/openc2x/>

■ Keywords

Linux, OpenWRT/LEDE