

## Bachelor Thesis

# Implementation of E<sup>2</sup>DCA in Linux Kernel

Wireless communication using IEEE 802.11p is the key technology for Vehicle to Vehicle (V2V) and Vehicle to Infrastructure (V2I) communication. Current applications building on top of this stack mostly use broadcast communication to exchange information. This has the advantage that every node within the vicinity of the sender can receive the packet if it can be correctly decoded.

However broadcasting does not provide any reliability or feedback in the event of packet loss. For traditional Wi-Fi unicast operation enforcing acknowledged frames has shown to be beneficial for reliable communication.

In our group we have studied the unicast retransmit mechanism standardized by IEEE 802.11p and found its operation to be harmful for Vehicular Networks. Worse, the highly dynamic mobility of vehicles together with the exponential backoff procedure for unacknowledged frames leads to head of line blocking – thus lowering the overall performance of the network.

To avoid the HOL blocking in IEEE 802.11p unicast transmissions we came up with an improved channel access method in order to minimize the impact of HOL blocking to acceptable values.

### ■ Goals of the thesis

In the context of the above topic this thesis implements the developed queuing algorithm into the Linux ath9k driver for Atheros based wireless network cards. The implementation needs to be validated to ensure its proper function for regular as well as for corner cases (e.g., empty channel, overloaded channel, lost acknowledgements); for this, we provide a system for selectively jamming unicast acknowledgements. As a last step, performance measures of the implemented system (e.g., added system load, added latency) are investigated.

We plan to make the developed software available as Open Source.

### ■ Keywords

Linux, Wireless Networking



- [1] F. Klingler, F. Dressler, and C. Sommer, “IEEE 802.11p Unicast Considered Harmful,” in *7th IEEE Vehicular Networking Conference (VNC 2015)*, Kyoto, Japan: IEEE, Dec. 2015.