

## Master's thesis

# Fine-grained QoS management for Mixed-criticality Traffic in Wi-Fi 7

## Abstract

New Wi-Fi standard 802.11be comes with several novel features to increase throughput and reliability in wireless communication. For example, Enhanced Distributed Channel Access (EDCA) enables configuring channel access for different access categories (ACs) to prioritize critical traffic, aiming for bounded latency. Another feature, multi-link operation (MLO), enables the concurrent use of multiple links that can be dynamically assigned to such ACs (or QoS classes) to reduce the impact of wireless channel conditions on critical traffic. Leveraging these features, we can combine (i) a high-level link-to-AC mapping via MLO and (ii) a low-level AC-based channel access via EDCA to achieve better QoS guarantees. Accordingly, the main goal of this thesis is to develop joint link assignment and channel access strategies to reduce latency and jitter for high-priority traffic with minimal impact on the best-effort traffic.

## Objectives

In the context of the thesis, you are going to:

- develop link assignment strategies for mixed-criticality traffic using MLO.
- investigate the optimal EDCA parameters for mixed-criticality traffic, combined with the link assignment strategies.
- evaluate latency and jitter improvements of the proposed strategies.

## Requirements

It is a big plus to be experienced in (or strongly motivated to learn) the following:

- Fundamentals of wireless communication, particularly Wi-Fi.
- Understanding of channel access mechanisms, e.g., DCF, EDCA etc.
- Programming skills in C++
- Network simulators, i.e., OMNeT++

## Literature

- E. Khorov, I. Levitsky and I. F. Akyildiz, "Current Status and Directions of IEEE 802.11be, the Future Wi-Fi 7," in IEEE Access, vol. 8, pp. 88664-88688, 2020, doi: 10.1109/ACCESS.2020.2993448.
- G. Naik, D. Ogbe and J.M. J. Park, "Can Wi-Fi 7 Support Real-Time Applications? On the Impact of Multi Link Aggregation on Latency," IEEE International Conference on Communications (ICC), Montreal, QC, Canada, 2021, doi: 10.1109/ICC42927.2021.9500256.
- P. Serrano, A. Banchs, P. Patras and A. Azcorra, "Optimal Configuration of 802.11e EDCA for Real-Time and Data Traffic," in IEEE Transactions on Vehicular Technology, vol. 59, no. 5, pp. 2511-2528, Jun 2010, doi: 10.1109/TVT.2010.2043274.