

Analysis of Time-sensitive Real-time Communications over 5G Mobile Communication Systems

Master's Thesis (Multiple topics)

Context

The 5G communication standard is an essential enablers for the modernization of industrial automation (Industry 4.0) and an essential component of the Industrial Internet of Things (IIoT). In order to make the production plants and the associated logistics even more flexible, autonomous and efficient, a scalable and pervasive connectivity between machines, people, and objects is essential. 5G opens up important opportunities in the area of industrial networking.

5G mobile communications provides a solid foundation for making mobile and wireless communications sufficiently fast and reliable to meet the demands of Industry 4.0. It introduces novel features to support ultra-reliable low latency communications (URLLC) with latencies below 1ms, synchronization with a precision below 1 μ s and reliability of 99,999% and higher. In order to make these capabilities usable, an efficient and seamless integration of Industrial Ethernet technologies and 3GPP 5G technologies is necessary. To enable this integration, basic features of a mobile network must be mapped to wired real-time communication without losing its real-time capabilities.

Topics

At the begin of this thesis, the student will familiarize with different methods enabling real-time communication in wired and wireless networks. Based on these basics, multiple topics are offered:

- Support of mobility for real-time mission-critical applications,
- Distributed resource allocation in mobile real-time systems,
- Quantitative comparison of "native" 5G real-time communications and Ethernet-based technologies,
- Methods for supporting real-time communication in "backhaul" networks

Requirements

- ✓ Basics in communication systems
- ✓ Good English knowledge
- ✓ Interest in topics covering „end-to-end“ systems
- ✓ Experience with programming in Python and C++

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