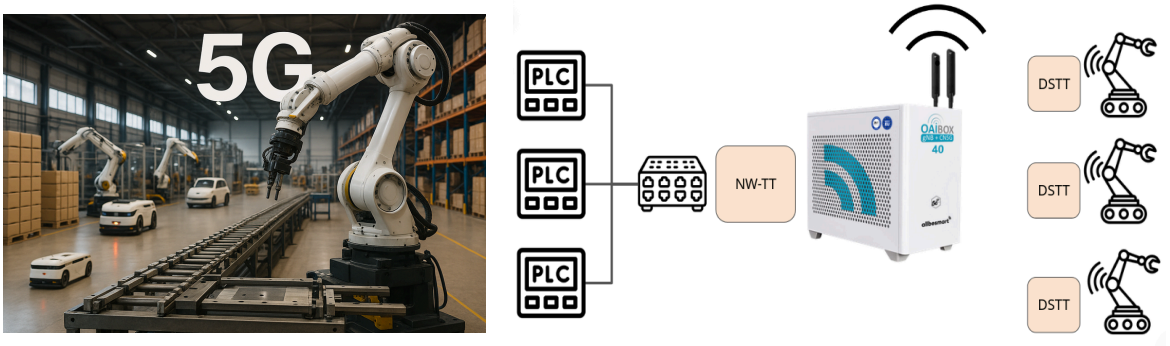
Dresden University of Technology

ComNets
Deutsche Telekom Chair of Communication Networks

Faculty of Electrical and Computer Engineering Institute of Communication Technology

Investigation of Selected 5G-TSN Translator Features using OAI Box

Project topic adaptable for Oberseminar, Student Thesis, Bachelor, or Master/Diploma-Thesis



Objective of Work

Industrial networks are evolving rapidly, with future applications such as smart factories, autonomous robots, and real-time control systems demanding communication that is not only fast but also predictable and highly reliable. 5G/6G promises flexible wireless connectivity, while Time-Sensitive Networking (TSN) provides deterministic and time-aware communication over Ethernet. However, these two worlds do not naturally align, and without seamless integration, their combined potential cannot be fully realized.

This thesis addresses the challenge of integrating 5G/6G with Time-Sensitive Networking by investigating extensions of the User Plane Function (UPF) with deterministic features and the incorporation of TSN mechanisms such as traffic scheduling and precise synchronization on both the network and device side. Building on the OAIBOX platform based on OpenAirInterface, the work aims to design and experimentally validate an integration framework in which 5G and TSN operate seamlessly, enabling communication with guaranteed latency, reliability, and timing accuracy. The outcome of this research contributes to advancing industrial communication systems capable of meeting the stringent requirements of future connected production and automation.

Focus of Work

In the work, the following tasks should be addressed:

- literature research 5G-TSN translator procedures and functionalities
- design of a testbed to study the performance (of selected KPIs) in 5G cellular networks
- get familiar with the hardware or emulation framework
- implementation of the testbed in hardware using OAIBOX or as emulation
- implementation of NWTT and DSTT functionalities in the implemented testbed
- measurement, analysis, discussion, documentation of the work scientific way
- presentation of the results in a scientific way

In the thesis, the following tasks can be addressed if time allows:

- Investigation of advanced TSN features beyond the basic translator functions
- Extension of the testbed setup to more complex or larger-scale scenarios
- Comparative evaluation of different implementation approaches (hardware vs. emulation)

Material for Further Reading

- https://oaibox.allbesmart.pt/
- https://5g-acia.org/whitepapers/integration-of-5g-with-time-sensitive-networking-for-industrial-communications/
- Open-Source Testbeds for Integrating Time-Sensitive Networking with 5G and beyond: doi:10.1109/CCNC51644.2023.10060159

Keywords

5G/6G, TSN, testbed, TSN-Translators, measurements, OpenAirInterface

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