

Master Thesis Project

“Design and Evaluation of a Wifi-based Ultra-reliable Low-latency Communications Solutions for Industrial Automation Applications”

Keywords: URLLC, industrial automation, machine learning

Background: Over the last decade, Industry 4.0 has become a leading paradigm in industrial automation. This has led to the digitalization of manufacturing processes, ubiquitous data collection, as well as real-time communication and processing being an integral part of best practise in automation. However, the increasing mobility of machines and robots, as well as flexibility in installation mandates more and more to replace cables by wireless communication systems. In the past, several such solutions have been proposed, among them 5G Rel16 being the most important one addressing ultra-reliable low-latency communication (URLLC) features. Nevertheless, alternative solutions are of interest due to complexity and cost reasons. Such alternative solutions shall be considered by a master thesis student in this thesis project, in collaboration with the industrial partner VAHLE (www.vahle.com) and under supervision of KTH Stockholm.

Project Description: This project targets the design and initial evaluation of an alternative solution leveraging upcoming IEEE802.11 systems. A central question relates to the utilization of new IEEE802.11 system features towards a URLLC-enabled system. Based on this central direction, any new design generally shall take aspects of layers 1, 2 and 3 into account. The solution to be developed shall meet well-defined requirements with respect to delay, delay distribution, error rates, data throughput and supported number of nodes. The solution shall furthermore be developed for specific radio environments. Any design elaborated during the thesis shall be evaluated either analytically or through system-level simulation.

Project Partners, Organization and Prerequisites: VAHLE (www.vahle.com) is a global system provider for mobile industrial applications. As one of the world market leaders, VAHLE develops high-quality power, data transmission and automation systems that are used in mobile industrial applications worldwide. The cross-industry portfolio includes smart solutions for flexible power and data transmission, positioning and control. VAHLE was the first company which implemented a reliable and interference-free communication system using a slotted microwave guide as transmission media. Today, these systems are running worldwide at facilities of global players in different market areas.

The project will be conducted in collaboration with Prof. James Gross at KTH Stockholm. The project can be performed fully remotely while VAHLE offers attractive conditions for prospective students. Visits to the VAHLE Innovation Centre (Kufstein/Austria) are welcomed but are not a hard requirement.

Interested students are invited to submit an email application with a short (max 2 page) CV and copy of transcript. Students are generally expected to have a background in wireless communications and networks. Knowledge of automation and control systems is a plus but not essential. Project start shall be beginning of 2023, depending upon the availability of the student.

Contact for questions / applications: jamesgr@kth.se

Latest date to submit application: Oct 30th 2022