Research project offer

Location : ISAE SUPAERO, Toulouse, France **Department** : DISC **Research group** : Communication Networks **Supervisor** : Oana Hotescu **Email** : oana.hotescu@isae-supaero.fr	
OFFER DESCRIPTION	
Title : Configuration and performance analysis of a Time Sensitive Network **Proposed duration and period** : 6 months, March-August 2021	
Context (max 10 lines)	The work of the IEEE Time-Sensitive Networking (TSN) group aims to provide deterministic services on local networks (IEEE 802), and in particular guarantees for a transport of packets with limited latency and reduced jitter and packet loss. These services, applied over Ethernet technology (IEEE 802.3), provide a new response to the needs of "real-time" Ethernet, in particular in the industrial control and automotive on-board network sectors. Recently, aircraft manufacturers have also shown an interest in the capacity of these networks to carry traffic of different types and criticalities.
Objectives and work (max 20 lines)	In order to deal with all these real-time requirements, TSN implements complex mechanisms of scheduling different classes of traffic (time-triggered gating, credit-based shaper …) for both asynchronous and synchronous applications providing stream reservation and a synchronization protocol. The first goal of this internship is to identify the main components of a TSN communication and the parameters required for the evaluation. Then it will be necessary to define a network configuration to be evaluated. We can consider an industrial or an automotive case study (see Use Cases IEC/IEEE 60802). The second part of the internship consists in implementing the decided configuration on real network devices and realizing experiments and measurements of network parameters. To do this, it is necessary to understand the specification of the devices (Ethernet switches or FPGA boards) and figure out how to do the configuration or how to program them with the TSN behavior. Finally, a network simulator can be developed in order to compare results with the real platform. The following outcome is so expected: • Configure network devices (switches, network cards) with TSN specifications • Measure traffic and analyze performance of several TSN configurations • Develop a network simulator for TSN components. Such a simulator allows testing and evaluating different TSN configurations in comparison with the real network measurements.

<table>
<tr><td colspan="2">Bibliography:
[1] IEEE Official Website of the 802.1 Time Sensitive Networking Task Group: https://1.ieee802.org/tsn/ accessed 15.10.2020
[2]Lo Bello, Lucia, and Wilfried Steiner. "A perspective on IEEE time-sensitive networking for industrial communication and automation systems." Proceedings of the IEEE 107.6 (2019): 1094-1120.
[3] Falk, Jonathan, et al. "NeSTiNg: Simulating IEEE time-sensitive networking (TSN) in OMNeT++." 2019 International Conference on Networked Systems (NetSys). IEEE, 2019.</td></tr>
<tr><td colspan="2">Possibility to continue with a PhD (Yes/No) : Yes (funding to be discussed)</td></tr>
<tr><td colspan="2">REQUIRED APPLICANT PROFILE AND SKILLS</td></tr>
<tr><td>Study level
(tick possible choices)</td><td>■ Undergraduate students (3rd or 4th year)
■ Master students (1st or 2nd year)</td></tr>
<tr><td>Required profile and skills</td><td>Good understanding of operating systems (UNIX) and TCP/IP stack
Programming languages skills: C/C++, Java, Python
Good level of spoken and written English</td></tr>
<tr><td>Other useful information</td><td>None</td></tr>
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