Industrial networks

Component
École Nationale Supérieure d'Électrotechnique d'Électronique d'Informatique d'Hydraulique et des Télécommunications

In brief

- **Ametys Code:** N8EE17B
- **Open to exchange students:** Yes

Presentation

Objectives

This module presents the specific features of network architectures in the context of applications that must meet time constraints. It draws on a set of significant examples from different application contexts, in particular the automotive, aeronautics, and space industries.

Description

Shared communication architectures have been used since the 1980s for real-time applications, replacing dedicated links, which were far too costly in terms of cabling and did not scale. Initially, fieldbus-type solutions, dedicated to specific application contexts, became the norm. These solutions control communication latencies but often offer limited throughput. They are therefore gradually being replaced by real-time Ethernet solutions, which offer much higher throughput and better system integration into their environment. The module is structured as follows.

- We introduce the general issues surrounding real-time communications and the different communication paradigms used.
- We study Controller Area Network (CAN), the associated temporal analysis methods, and protocol developments.

• We study the Airborne Switched Ethernet (AFDX) network with a particular focus on the worst-case analysis implemented by manufacturers.

• We highlight the problems posed by sharing a real-time Ethernet network between flows with different levels of criticality. We present the Ethernet TSN solution.

• We present the Mil-Std-1553 and Spacewire technologies used in the space sector.