Embedded Computer Architecture

ECTS
6 credits

Component
INSTITUT NATIONAL DES SCIENCES APPLIQUEES TOULOUSE

Number of hours
72h

Presentation

Description

Programme (detailed contents):

The Learning Unit is composed of three topics related to embedded computer architecture.

- The first one is about network and middleware used for embedded systems. This part introduces the main concepts on fieldbus and middlewares with CAN (Controller Area Network), industrial Ethernet Industrial, AFDX (Avionic Full DupleX Switched Ethernet) as examples and expose network architecture for connected devices (based on IPv6 and IEEE 802.15.4).

- The second part deals with operating systems used for embedded systems and the constraints induced (portability, memory management, cross-compiler, drivers, scheduling, etc.). Linux and FreeRTOS are used during labwork to illustrate these concepts.

- The objective of the third part is to bring skills to size and evaluate an embedded computer architecture. An overview of different computer architectures for embedded systems (micro-controller, multi-processors, many-core, fpga, gpu, etc) is given, then methods and metrics to evaluate performances (energy consumption, computation capacity, etc.) are presented. A labwork is conducted to confront students with problematics to size an embedded computer architecture in order to fit the needs of an embedded system.

Organisation:

Each topic is introduced by lectures to tackle theoretical aspects. The practical application is done during lab works and illustrates each topic on a shared embedded computer architecture.

An integrated project is coordinated with other Learning Units of SEC to bring into use the skills and knowledges of students on embedded computer architectures to implement a complete embedded system.

Non-contractual information.
Last update on 24 October 2017

Objectives

At the end of this module, the student will have understood and be able to explain:

- Main concepts and specificities of networks used in embedded systems for automotive, avionic and connected devices.

- Specificities of embedded operating systems and main services (scheduling, memory management, privileges, etc.).

- Advantages and drawbacks of different embedded computer architecture (micro-controller, multi-processors, many-core, fpga, gpu, etc.).

- Which components impact the performances of an embedded computer architecture and which methods can optimize them.

The student will be able:

- To choose a networking technology to fit the needs of an embedded system.

- To set up a network for an embedded system.

- To deploy an operating system for embedded systems.

- To implement operating-system-specific drivers.

- To compare performances of embedded computer architectures.

- To choose an embedded computer architecture to fit the needs of embedded applications.

Useful info

Contacts

Education manager

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Place

Toulouse

Non-contractual information.
Last update on 24 October 2017