

Seminars on PhD research activities: “Modeling, Design and Implementation of Mixed-Criticality Cyber Physical systems”

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Time: Thursday, June 16, 11:00AM

Location: Room A1.1 (Coppito, Blocco 0)

Title: Modeling, Design and Implementation of Mixed-Criticality Cyber Physical systems

Abstract: In the *Cyber-Physical Systems* (CPS) domain, a relevant industrial challenge is to integrate multiple applications with different criticality on a single computing platform both efficiently (in terms of costs) and correctly (to preserve the proper execution). These platforms, called *Mixed-Critical Systems* (MCS), can concurrently run multiple applications with different criticality-levels, i.e. some for which failures may cause risks and danger for people, large losses of money or extensive environmental damages, and others for which the effects of a malfunction are normally tolerable and manifest themselves primarily as a QoS decay. In this case, the system is designed in order to guarantee that the less critical applications must not be able to disturb high critical ones (space/time isolation), whose appear to be the most expensive to be designed and validated. In such a context, the use of multi/many-core embedded platforms can allow to significantly improve the integration and performance of MCS but this poses also more challenges to the proper management of shared resources.

However, in spite of their importance, a mature CPS engineering discipline and a general *Electronic System Level* (ESL) design flow for CPS are still missing. In fact, the main design problems are currently to model (i.e. specify) F/NF requirements and to validate their satisfaction before final implementation. To solve them, designers commonly try to use system-level models (e.g. block diagrams, *UML*, *SystemC*, etc.) to have a complete problem view but, unfortunately, a general methodology for this purpose is still missing and the only option is to refer to experienced designers for taking advantage on empirical criteria and qualitative assessments.

In such a context, this talk presents a MC/CPS environment that starts from a real-time perspective to discuss about safety assurance standards and MCS model, design and implementation. The final goal is to debate about HW/SW design and development flows for MC/CPS, considering concurrent processes models (like *Communicating Sequential Processes*), safety and security requirements, system-level models for performance and estimation analysis, and considering also the possibility to have an automatic *Design Space Exploration* (DSE) in order to improve development process.

The talk is part of a series of seminars given by PhD students on ICT of our University, presenting their ongoing research activities in the area of telecommunications.

The goal of the seminars is to provide an overview on ongoing research activities, highlight common interests and explore emerging possibilities for collaboration between different research areas.

