

# CODES/ISSS 2014 Hands-on tutorial

## Title

Methods and tools for smart device integration and simulation

## Organizers

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## Abstract

The main design issue of smart devices is their high degree of heterogeneity, due to the simultaneous presence of multiple domains and extra-functional properties, together with the traditional system functionality. This makes design and simulation very challenging, even because heterogeneity implies that the functionality is not the only dimension that must be considered at validation time. Other properties, such as power consumption or thermal dissipation, are critical to ensure correctness of the final product and to correctly estimate its behavior. This makes component integration and simulation key phases in the design and verification process of smart devices. Thus, to efficiently master smart device design, it is fundamental being aware of design issues and knowing how to solve them through innovative tools and methods, which allow integrating all the components of a smart device into an efficient and flexible simulation platform. Such issues, methods and tools are the topic of this hands-on tutorial, which aims to provide participants with a practical (learn-by-doing) introduction to new methods and tools for the integration and simulation of smart devices.

By covering practical aspects of smart device design, the tutorial targets people who are working and studying on hardware/software modeling, component integration and simulation under different positions (system integrators, designers, developers, researchers, teachers, students etc.). In particular, it is a good introduction to people who have interest in managing heterogeneous components in an efficient and effective way. The tutorial gives not only key technological aspects for component integration, such as model of computations, interface definition, co-simulation strategies, etc., but also their practical aspects by experimenting methods and tools directly on a complex case study. Participants will be guided to the implementation of a homogeneous SystemC/C++ transactional model of a smart device by integrating heterogeneous components derived from different domains (analog, digital, SW), at different abstraction levels (physical, structural, etc.), targeting both functional and extra-functional (temperature, power, etc.) properties. Practical activities will include automatic conversion and abstraction of component descriptions, interface definition, component integration, and finally efficient simulation of the whole smart device. In particular, after a brief introduction concerning issues related to smart device design, the tutorial will be divided in two parts. First, participants will experiment a set of conversion tools that allow harmonizing heterogeneous descriptions of different parts of the design into a homogeneous SystemC model. Then, they will be introduced to a set of optimization tools to achieve a more efficient SystemC simulation.

Through this tutorial, people active in smart device development can understand both the current status of practice and future research directions.

Participants will work directly on a case study implemented during the FP7-ICT-288827 SMAC European project. They will learn how to solve smart device design issues by means of innovative methods, standards and tools, like, IEEE 1685 IP-XACT standard, SCNSL ([sourceforge.net/projects/scnsl](http://sourceforge.net/projects/scnsl)) and HIFSuite ([www.hifsuite.com](http://www.hifsuite.com)). Tools used in the tutorial are open-source (SCNSL) or licensed by EDALab s.r.l. (HIFSuite). EDALab will donate HIFSuite for teaching, training and research purposes to participants at the end of the tutorial.