ITS-EASY is an industrial research school in Embedded Software and Systems, affiliated with the School of Innovation, Design and Engineering (IDT) at Mälardalen University (MDH) as an integrated part of the MDH strategic research area Embedded Systems (ES).

ITS-EASY is funded by the Knowledge Foundation (KKS), and the nine participating companies. ITS-EASY started October 1st 2011, and will continue until September 30th 2020. During that period the PhD students will complete their studies and obtain the doctoral degree in Computer Science.

ITS-EASY is a large organization: it counts 22 PhD students, 14 main advisors from IDT, 18 co-advisors from IDT and the partner companies, and more than 25 associated members; senior researchers and industrial specialists. The board, led by Helena Malmqvist, ABB, has five members, and the industrial committee where all participating companies are represented, has 11 members. The management team of the research school consists of five members. All in all, about 85 persons are directly engaged in ITS-EASY.

www.mrtc.mdh.se/projects/itseasy

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The ITS-EASY Post Graduate School for Embedded Software and Systems

Multiple Property-based Partitioning for Embedded Applications
Gaetana Sapienza
Licentiate Thesis, June 10 2014

ABB
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Abstract

The new development of different types of computation units, such as FPGAs and multicore CPUs, enables a tremendous improvement in performance of applications that utilize the dedicated types of computations. For complex applications this however introduces a new challenge - what is the optimal deployment configuration of their components?

Today the application deployment is based on ad-hoc architectural decisions taken in an early design phase, when many design details are unknown, and as a consequence they often change in a later phase, increasing so the development costs. In addition, the decisions are taken based on a limited number of requirements, mostly related to runtime properties such as performance, resource utilization and power consumption, but do not consider many other aspects related to lifecycle properties, or to the project constraints. This approach increases the risk that a decision has a negative impact on a runtime or a lifecycle system property and may lead to the mentioned changes.

This thesis addresses the problem of optimal hardware/software deployment of an application. The main objective is to define a process in which the deployment decisions are taken in a systematic way in a later phase of the design process, and the partition decision process takes into account all artifacts on which the decisions have direct impact. These artifacts include the application’s runtime properties, the properties related to the application lifecycle, the business goals, and the development project constraints.

To achieve this objective we have a) defined a development process model that addresses the deployment explicitly in the late design phase, b) designed a metamodel of component-based applications deployed as hardware or software executable units, and c) analyzed the suitability of Multiple Criteria Decision Analysis methods for providing partitioning decisions based on a large number of criteria. In addition we have analysed which properties are affected by the partitioning decisions in the Control and Automation domains. The feasibility of the proposed process is demonstrated throughout an industrial case study.

Partitioning Process Design

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