EASEL: Engineering Architectures and Software in the Embedded Landscape

Motivation
The projected technology trends in IC fabrication suggest that cost of design is the greatest threat to the future. Hence there is great deal of ongoing effort around the world to develop design methodologies that can bring down design costs that supports reuse of large blocks of pre-designed components as well as early detection of errors. To be effective, such design methodologies must start at a high level of abstraction where no distinctions are made between hardware and software components and no assumptions about the platforms on which these components will be implemented. These are called system-level design methodologies. (99 words)

Objective
To develop a tool chain that can be used all the way starting from a formal specification of an application, to design space exploration, code generation and hardware synthesis. (29 words)

Scope
The areas covered by this research include: (i) System-level modeling; (ii) Software performance analysis; (iii) Power analysis; (iv) Analysis techniques targeting streaming applications (v) Debugging and Testing of Code; (vi) Design space exploration and code generation; (vii) Compiler optimizations to improve hardware quality; (viii) Application-specific processor customization (47 words)

Innovative Ideas
The design infrastructure to be developed will cover three key aspects:

i) System level models developed using standard notations,
ii) Analysis techniques for software performance, system performance, and power and
iii) Design space exploration and code generation.

These three aspects will be tied together by a common intermediate language. We believe that the UML 2.0 notational framework is a good guide for developing system-level models while SystemC is a sound candidate for a common intermediate language. In addition, a tool chain and analysis methods will be constructed to glue together the different layers of the design flow. (97 words)

Demonstrable Activities
The technology demonstration vehicle for EHS II will be a body-area network for healthcare monitoring. The demonstration vehicle will involve sensors whose data needs to be fused, transmitted by low-power wireless communication to a base station which in turn will communicate with the outside world. We believe that system level design methodologies and tools to be explored in EASEL will support the modeling, design, implementation, and testing of the technology demonstration vehicle. The platform will in turn serve as a realistic application driver for the research involving the tools. (89 words)

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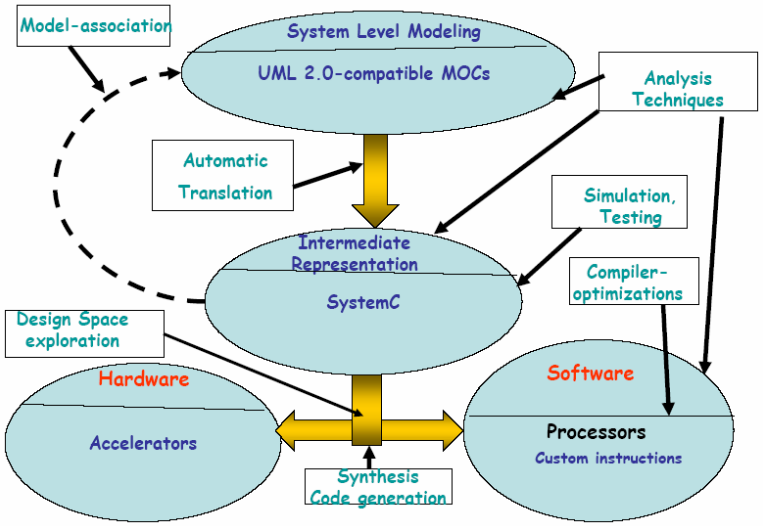

Figure 1. The EASEL Framework