# High-Level Performance Estimation Using Simulators At Multiple Abstraction Levels

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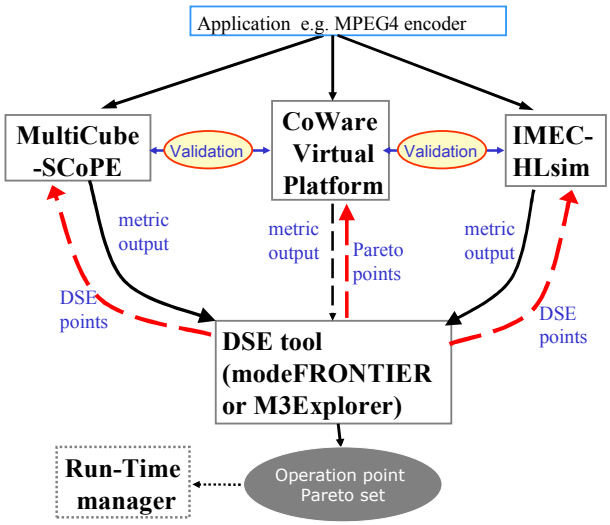
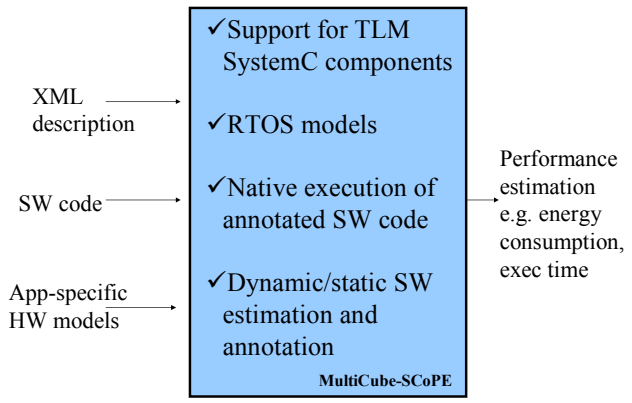
**High-level simulators** used in **EU-MULTICUBE** project, enable a multi-abstraction-level system specification and modeling framework to provide **static and dynamic evaluation** of the **system-level performance metrics** (e.g. execution time, energy consumption). These simulators are coupled with Design-Space Exploration (**DSE**) tools (using a common XML interface) to generate **Pareto set of** optimum **system configurations** for a specified application on a specified platform. This Pareto set (of optimum configurations) is used by a **Run-Time Manager** during the application run to optimize platform resource usage.



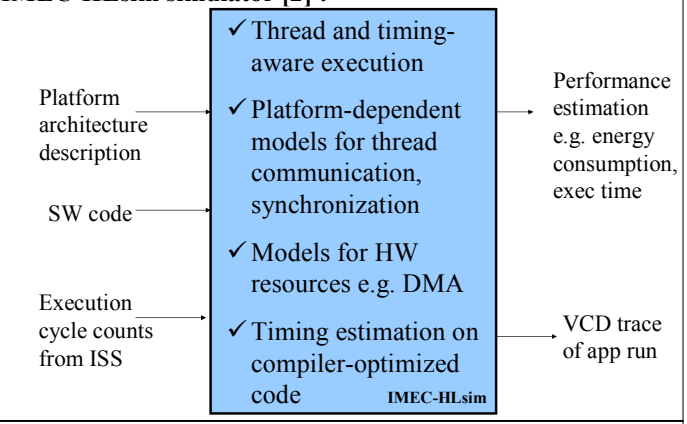

**Motivation for various abstraction levels of simulation :**

- **DSE** for an application running on a specific platform requires a large number of application runs (typically on platform simulator).
- There is a trade-off between the accuracy of the simulation results and the time taken for simulating the application.
- Using multiple simulators at various abstraction levels enables DSE to be done with faster higher-level simulators (e.g. **IMEC-HLsim** and **MultiCube-SCoPE**). The DSE end results (Pareto set of optimum points) are verified using more accurate platform simulator (i.e. cycle-accurate simulator e.g. **CoWare Virtual Platform**).
- To maintain interoperability of the application code across various abstraction levels, a **Run-Time Library (RTLib)** API is defined to specify platform-dependent part of the application e.g. thread spawning, communication, synchronization. Each abstraction level simulator links its own implementation of RTLib with the application.

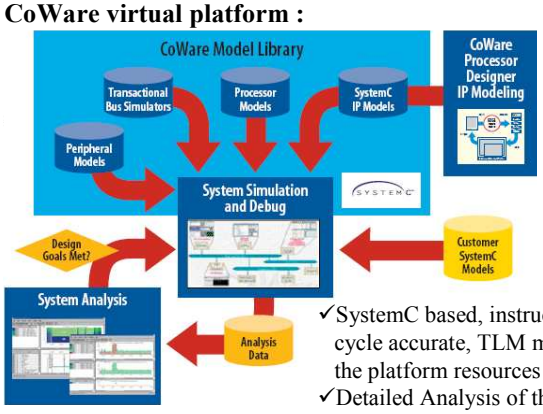
**MultiCube-SCoPE simulator [1]:**




**IMEC-HLsim simulator [2] :**

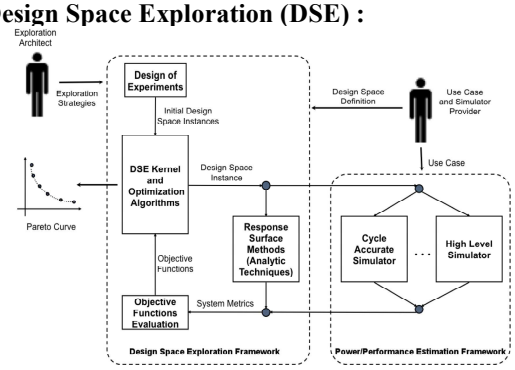



**CoWare virtual platform :**




✓SystemC based, instruction and cycle accurate, TLM models of the platform resources
✓Detailed Analysis of the resource usage e.g. bus accesses

**Design Space Exploration (DSE) :**




**Hooking up the simulators with DSE tools to generate Pareto set of platform configurations.**

References:

1) J. Castillo, V. Fernández, H. Posadas, D. Quijano, E. Villar: "SystemC Platform Modeling for Behavioral Simulation and Performance Estimation of Embedded Systems", in the book "Behavioral Modeling for Embedded Systems and Technologies: Applications for Design and Implementation". IGI International ed (to be published).
2) R. Baert, E. Brockmeyer, S. Wuytack, T. J. Ashby, "Exploring Parallelizations of Application for MPSoC platforms using MPA", Design, Automation and Test in Europe (DATE), 2009 .

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