Industry is looking for efficient methods bridging the application (product) design and its implementation methods (platform-based design). The link between these two worlds is established by exchange or combination of models. If we make the following two assumptions:

- for system specification purposes the systems and design community can apply UML (Unified Modeling Language) version 2.0
- the implementation flow is based on SystemC.

**Several questions can be raised:**

- The above assumptions are not necessarily correct—there might exist different views on this…
- What kind of models need to be used, for what purpose, and how do they relate to each other?
- What are the relevant levels of abstraction at which models can be exchanged?
- What are the models that application developers need from platform providers and vice versa?
- What is the adequate (optimal) language representation for models: UML, SystemC or others?
- How to give a common formal semantics to them in order to combine models in these languages?
- How can the system be decomposed into HW, SW components and interfaces between them?
- How to validate platform architectures i.e. how to ensure that platform provides the functionality and performance expected by the new product concepts?

The OMG’s MDA approach involving meta-models, mapping between models, platform independent vs. platforms specific models seems to fit well here, but we need to ensure that we interpret it appropriately.

The workshop will provide the industry point of view on some of the above issues to initiate discussion and exchange of opinions and experiences.

Moreover some view on real-world experiences will be provided on e.g. how UML is used for deeply embedded systems development and how platforms are modeled in SystemC at very high level of abstraction (the level that is relevant for architecture validation/application development) and what are the lessons learned.

**Workshop items**

- Model-based development
  - OMG approach
  - Functional correctness
  - Performance analysis
  - …
- Property driven design
  - Specification of essential properties of a system in UML
  - UML models refinement
  - Support for property proven refinements
  - Automatic derivation of SystemC models
  - Towards a mathematical semantic backbone for the UML/SystemC combination
  - …
- Platform-based design
  - Platform architecture modeling in UML
  - Use of SystemC for modeling and validation of platforms at high level of abstraction (architecture validation/application development)
  - UML-SystemC link/combination
  - Property languages for the UML
  - SystemC models made to fit UML-models (one step before automatic derivation)
  - …
- Standardization issues
  - The SystemC TLM standardization effort
  - The UML 2.0. Is it what SOC and ES designers expect?
  - …
- Real-world experiences
  - Industrial view on the use of UML for deeply embedded systems development
  - Platform models development in SystemC
  - Lessons learned from MDA application
  - …

Note: The intention is that this workshop remains complementary to the event organized at DAC 2004 “UML for SOC Design” and possibly bring material to it.
Workshop Agenda

Morning sessions starting at 9:30 am

1. **Requirements of an UML-SystemC based methodology**
   An overview of a system design methodology outlining the way how UML can be associated to SystemC to satisfy the requirements of SoC and Embedded systems design.
   **Presenter:** Pierre Boulet, LIFL - **Duration:** 30min

   **UML Specification of Platform-based Design**
   **Presenter:** Florian Schäfer, Cadence Design Systems - **Duration:** 30 min.

2. **General requirements for the design methodology from a perspective of the system house**
   **Presenter:** Klaus Kronlöf, Nokia - **Duration:** 30 min.

11:00 am - Break 30 min.

3. **UML2.0**
   **3.1. UML 2.0 features introduction**
   The main UML2.0 features will be presented with specific focus on its applicability to system design.
   **Presenter:** François Terrier, CEA - **Duration:** 30 min.

   **3.2 Platform modeling in UML + UML profile example**
   The presentation will provide an overview of system platform modeling in UML, give an example of a profile definition, explore the link between architecture of software and hardware with validation facets (schedulability and performance).
   **Presenter:** François Terrier, CEA - **Duration:** 30 min.

4. **Formal bridge between UML and SystemC**
   The definition of formal framework in which UML is linked to SystemC through a formal B semantics will be presented: (UML-B/U2B and B-SystemC).

   **4.1 Part I: UML-B**
   The existing tool U2B creates B models from UML-B models. The existing tool can be used for software and hardware development based on a translation to EventB. The basics of the translation will be outlined, as they are applicable to hardware and software alike. UML2 offers mechanisms for component-based design that were not present in UML1. Using these we will outline some future evolution of UML-B and U2B.

   **4.2 Part II: B and BHDL**
   The B models generated from UML-B models may represent hardware or software. Using Atelier B hardware models that suit the subset BHDL of B can be translated into SystemC. The SystemC design can then be regarded as correct with respect to the formal properties proven. The path from UML-B to SystemC on RT-level will be outlined. Subsequently, we will continue with the component-based designed as introduced in part I, and show how they may lead to higher level SystemC models.
   **Presenters:** Colin Snook, U Southampton & Stefan Hallerstede, KeesDA - **Duration:** 60 min.

13:00 – Lunch
Afternoon sessions starting at: 14:00

5. Model checking of temporal system properties
   **Presenter:** Alexander Knapp, Universität München - **Duration:** 30 min.

6. Model Driven Architecture
   6.1 Usage of MDA based Methods in Rigorous System Design
   **Presenter:** Ian Oliver, Nokia - **Duration:** 30 min.
   6.2 MDA for SOC Design
   **Presenter:** Pierre Boulet, LIFL - **Duration:** 30 min.

15:30 Break 30 min.

7. UML-SystemC Based Design Flow
   A Design Flow based on SystemC Starting from UML Models
   **Presenter:** Donatella Sciuto/Francesco Bruschi, P. di Milano - **Duration:** 30 min.

8. Industrial point of view: UML-SystemC flow
   Presentations from Thales Communication and STMicroelectronics
   **Duration:** 30 min. each