Tutorial 1

UML and Model-Driven Development for SoC Design

Wolfgang Mueller
Paderborn University / C-LAB,
Paderborn, Germany
wolfgang@c-lab.de

Yves Vanderperren
Katholieke Universiteit Leuven,
Heverlee, Belgium
yves.vanderperren@east.kuleuven.be

Abstract

UML (Unified Modeling Language™) as an OMG standard has received wide acceptance in software engineering over the last years. As electronic systems design moved towards software engineering, there is emerging interest for UML within the hardware community and different UML diagrams and their variations found their application in requirements specification, testbenches, architectural descriptions, and behavioral modeling.

In most cases, UML is just applied as a graphical capture, though UML 2.0 meanwhile comes as a computationally complete language based on a generic metamodeling mechanism. Though it introduces considerable complexity, it is one of the key strengths of UML 2.0, providing a flexible foundation for its customization towards different application domains through so-called UML profiles, which currently receives increasing tool support and gives UML great potential to complement current C++-oriented languages for ESL design. In this context, SysML and the UML for SoC extension are already available as OMG profiles for Systems Engineering and SoC application and several proprietary profiles are under development. In that context, the concepts of the Model Driven Architecture (MDA) are of emerging interest. However, since MDA was mainly introduced for CASE tool support, its full application for hardware design still needs some investigations and certainly comes with some pitfalls.

For industrial applications, the availability of appropriate tool support is crucial for deployment of UML in SoC design. UML tools currently come in different variations based on different UML versions and subsets with the support of specific flows, so that the selection of the appropriate tools becomes a key decision for the successful introduction of UML. Recently, several groups have reported positive outcomes regarding the customization of UML and tool support towards SoC design. These efforts result from collaborations between industrial users, researchers, and tool vendors, and constitute steps in the right direction. Regarding model exchange between tools, the UML-related XMI (XML Metadata Interchange) format and its relationship to SPIRIT, the emerging IEEE standard, are of additional particular interest. Partial overlaps can be identified and are currently under investigations by some projects, like SPRINT.

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