

Embedded World 2013**Class 06: Embedded Software Development on Virtual Platforms – Are you ready for Industrial Deployment?****Title:**

“The power of Software Design Automation with Formal Verification in combination with Virtual Prototyping”

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Abstract:

Software is everywhere, its complexity and development costs are no longer inferior to the hardware, and software problems are more and more often the cause of product failures after market introduction. This is no longer accepted in for example safety critical or medical applications. Semiconductor companies today have also to deliver silicon with a working software stack to allow easy development and deployment of the most complex and emerging software applications - “apps”. The early availability of a high performance virtual prototype is no longer point of discussion to reduce software development costs while speeding up development time and increasing product quality.

While the creation of such a virtual prototype in the past was difficult, time consuming, error-prone and limited to SystemC/TLM2.0 gurus only, its creation today in environments like Cadence® Virtual System Platform is easy, highly automated and offers almost real-time simulation performance and fully synchronized and coherent hardware/software co-debugging. ARM-based platforms built around the ARM® Fast Models offer binary compatibility with the final software and are fast enough to run complex software applications with hundreds of millions of instructions per second on top of Linux or Android or as bare metal software.

But there is more needed than virtual prototyping to deal with the increasing complexity and exploding amount of software in today’s embedded systems. The software still has to be created and the conventional way is simply too labor intensive and too error prone. Model Driven Design approaches enable design at higher level of abstraction which is absolutely required to speed up the develop process and to increase the software quality. By expressing the models in an unambiguous and precise language that both software developers and system architects understand, the models can become the golden reference for the software instead of the generated source code.

Despite all these advantages, automatic code generation is still difficult to accept for many software developers. Without, MDD has almost no value. The size, quality and suitability for a certain domain (e.g. MISRA-C compliancy) of the generated code, are important elements to consider when going for a certain MDD approach.

But even more important is that the models are executable. Simulation is widely used but is not sufficient to guarantee the correctness of the code. As E.W. Dijkstra (Dijkstra 1969) once observed,

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“program testing can be used to show the correctness of bugs, but never to show their absence!”. Avoiding the creation of bugs, is also more effective than hunting for bugs.

These observations ask for model driven software generation with formal verification that can examine the total state space of the software.

Our presentation will introduce the audience to a unique Software Design Automation environment, the Verum ASD:Suite that enables Model Driven Design incorporating fully automated formal verification of the models before the code is generated in the language of choice (C, C++, Misra-C, Java) and for a particular execution platform (Windows, Android, Linux, etc). The component based approach, where components are verified component per component, makes the approach scalable to industrial applications. The unique way in ASD to give components interface models describing externally visible behavior, opens the door for a real HW/SW contract that can be guaranteed for both the hardware and the software and should avoid misunderstandings between HW and SW communities.

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