

Overview of the Open SystemC Initiative

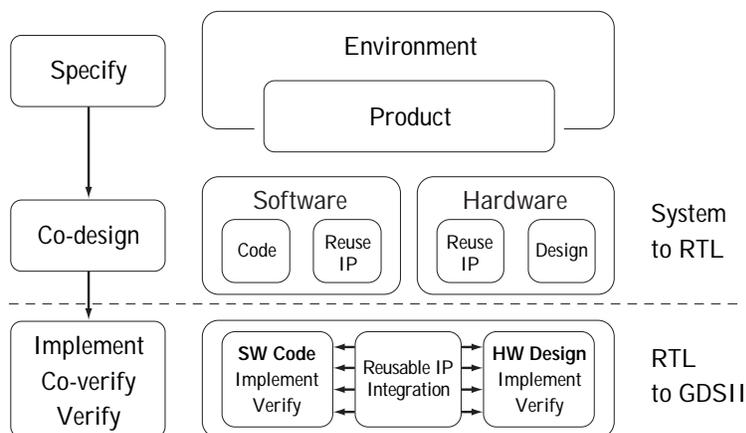
Motivation

Huge new design challenges for System-on-Chip (SoC) are the result of decreasing time-to-market coupled with rapidly increasing gate counts and embedded software representing 50-90 percent of the functionality. The exchange of system-level intellectual property (IP) models for creating executable specifications has become a key strategic element for efficient system-to-silicon design flows.

Because C and C++ are the dominant languages used by chip architects, systems engineers and software engineers today, initiative members believe that a C-based approach to hardware modeling is necessary. This will enable co-design, providing a more natural solution to partitioning functionality between hardware and software.

The preferred C-based hardware modeling approach is to add hardware modeling constructs using C++ class libraries and a simulation kernel, which define a particular C++ modeling style. Because C++ treats extensions as native operators and data types, models are more readable and maintainable. To date there has been no commonly accepted C++ style available in the industry, forcing companies to maintain multiple C++ models in order to exchange and reuse system-level models with other companies.

The problem of multiple C++ dialects can only be solved by the adoption of a common C++ style. With a common C++ style, designers can create, validate and share models with other companies using a standard ANSI C++ compiler. This delivers the level of interoperability and portability required by the design community.



System-on-Silicon Design Flow

Open SystemC Community

Addressing the interoperability problem requires the cooperation of companies in the semiconductor, systems, IP, EDA and embedded software industries. The Open SystemC Initiative establishes a common C++ modeling style for the entire electronics industry. Our vision is simple: to enable the exchange of system-level IP models and support the co-design and partitioning of hardware and software. The community is open to any company, and there are no licensing fees associated with the use of SystemC.

The first version of SystemC is the result of technical collaboration between Synopsys, CoWare and Frontier Design. The collaboration is the first of its kind in the EDA industry and promises to quickly establish a de-facto modeling standard for the benefit of the entire electronics industry. Given the enthusiastic support we expect other companies, organizations and individuals to contribute to the Initiative and help drive C-based design into the future.

Interoperability is the primary goal, which is achieved through the Open Community License. Community members are required to license bug fixes back to all licensees on the same terms as the original SystemC source code. Shared modifications require licensing the source code back to all licensees. Modifications that effect interoperability are not allowed.

Companies become members of the Open SystemC community by accepting simple non-

commercial licensing terms using a click-through mechanism via a web browser. A commercial license attachment is available, and must be signed to allow companies to develop larger works based on SystemC.

Charter members of the initiative include the following companies: Alcatel, Altera, Aptix, Arcadia Design Systems, ARC Cores, ARM, Billions of Operations Per Second, Chameleon Systems, Inc., Co-Design Automation, CoWare, CSELT, Cygnus Solutions, Denali, Ericsson, Frequency Technology, Frontier Design, Fujitsu Microelectronics, IKOS Systems, I-Logix, Infineon Technologies, Integrated Silicon Systems, Intellectual Property Inc., Internet CAD, LogicVision, Lucent Technologies, Magma Design Automation, MIPS Technologies, Monterey Design Systems, Motorola, Inc., Seva Technologies, Sican Microelectronics Corp., Snaketech, Sony Corporation, STMicroelectronics, Sun Microsystems, Synchronicity, Synopsys, Tensilica, Texas Instruments, TransModeling, Ultima, Verplex, and Xilinx.

SystemC Evolution

Synopsys is contributing the results of its internal C++ R&D effort, code named Scenery, to the Initiative. CoWare is contributing its communication interface abstraction mechanism and experience with RTC, a C-based hardware modeling solution. Frontier Design is contributing its know-how on fixed-point data types and experience with the AJRT Library tool. The initial focus

of SystemC is on hardware modeling at multiple abstraction levels, yet even the first version supports systems and software modeling.

Every member of the community has the right and responsibility to propose enhancements to SystemC. The open nature of this initiative ensures that good ideas will be recognized as important contributions to the evolution of SystemC. To ensure structured innovation and stability of the standard, a small Steering Group is responsible for defining the technical direction of SystemC. In addition, this group is responsible for reference implementations of the source code.

Licensing

The goals of licensing are to ensure interoperability for users of SystemC. The licensing model builds on the best ideas from open source licensing and Sun's community source licensing model for Jini.

Open source licensing, as represented by the GNU Public License, exhibits two main problems. First, it does not permit proprietary modifications or additions and therefore limits motivation to develop commercial applications. Second, there is no mechanism to ensure that any derivative works are compatible for interoperability, only that such derivatives must be made available under the same license terms. These issues have been addressed with Sun's community source licensing model and we have applied those principals to Open Community Licensing.

Steering Group

The mission of the Steering Group is as follows:

- Ensure structured innovation and stability of the standard
 - Produce source code reference implementations of new SystemC versions
 - Drive software and system perspective into evolution of language
 - Determine interoperability issues
- Set technical direction
 - Solicit Points of View (POV) from community
 - Distill and publish requirements
 - Solicit feedback and update requirements

The structure and representation of the Steering Group is as follows:

- Keep it relatively small to enable decision making
 - Economic incentive in success of Initiative
 - Resources assigned to support Initiative
- Representation from five different industries
 - Semiconductor, Systems, IP, EDA and Embedded Software
 - Strong technical background in C-based modeling

The initial members of the Steering Group are ARM, CoWare, Cygnus Solutions, Ericsson, Fujitsu Microelectronics, Infineon Technologies AGs, Lucent Technologies, Sony Corporation, STMicroelectronics, Synopsys and Texas Instruments.



For more information regarding Open SystemC, visit the website at www.systemc.org