SCBench: A Benchmark Design Suite for SystemC Verification and Validation

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Agenda

• Background and Motivation
• Overview of Benchmark Designs
• Key Features of SCBench
• Characteristics of SCBench
• Benchmark Validation
• Summary and Future Work
What is SystemC?

• A hardware description language (HDL) extending C++

• A set of C++ classes and macros for hardware design

• IEEE Standard 1666™-2011
Major SystemC Structures

System (Module)

Submodule

Process

Signals

Process

Channels

Submodule

Process

Port

Port
Motivation

• The quality of SystemC designs is critical
• It is challenging to assure the quality of SystemC designs
• It is important to evaluate the performance of SystemC verification approaches
• There lack common and up-to-date benchmarks
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• **Overview of Benchmark Designs**

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## Overview of Benchmark Designs

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<th>SystemC Specifics</th>
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<td>Modules, Hierarchical modules, SC_METHOD, SC_THREAD, SC_CTHREAD, Ports, Interfaces, Signals, FIFOs, Events, Timers, Bit vectors, Fixed-point numbers, Fixed-precision types, Arbitrary-precision types, LT/AT coding styles, Blocking transport interface, Non-blocking transport interface, Direct memory interface, Debug transport interface, Generic payload</td>
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Key Features of SCBench

• Consists of 38 well-written SystemC designs
• Ranges from small single-process to large multi-process designs
• Provides a testbench and a set of stimuli for each design
• Freely available online at (http://svl.cs.pdx.edu/scbench/scbench.html)
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Characteristics of SCBench

Fig. 1. Occurrence Rate of Operations per Design
Characteristics of SCBench (cont.)

Fig. 2. Occurrence Rate of Statements per Design
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Benchmark Validation

Fig. 3. Testbench
Benchmark Validation (cont.)

Fig. 4. Code Coverage
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- **Summary and Future Work**
Summary of SCBench

• 38 well-written SystemC designs
• A variety of application domains
• Most core features of SystemC
• A testbench and a set of stimuli for each design
• Freely available online at
  (http://svl.cs.pdx.edu/scbench/scbench.html)
Future Work

• Extend the benchmark with very large designs, such as system-on-chip designs
• Develop new designs to cover the SystemC features yet to be covered, such as Semaphore and four-valued logic types
Thank you!