Chapter 4

An ASM Based SystemC Simulation Semantics

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Abstract We present a formal definition of the event based SystemC V2.0 simulation semantics by means of distributed Abstract State Machines (ASMs). Our definition provides a rigorous and concise, but yet readable, definition of the SystemC specific operations and their interaction with the simulation scheduler that covers channel updates, notify, notify_delayed, wait, and next_trigger operations. We present the semantics in the form of rules by means of distributed ASMs reflecting the lines of the SystemC V2.0 Standard Manuals and reference implementation. The semantics introduced is defined to complement the language reference manual with a precise definition reflecting an abstract model of the SystemC reference implementation, which can be used for advanced applications and for investigating interoperabilities with other languages.

4.1 Introduction SystemC is the emerging de facto standard for system level modeling and design from the Open SystemC Initiative (OSCI). In 2002, SystemC received a major revision and upgrade to Version 2.0 which provides the stable basis for future versions. With this upgrade the main principles were clarified by a generalization, e.g., of the underlying event based synchronizations and channel based communication concepts. SystemC V2.0 currently comes with well-written manuals [OSCI, 2002a, OSCI, 2002b], a stable reference implementation, and complementary text books, e.g., [Grötker et al., 2002]. However, the precise meaning of several parts of the underlying concepts cannot be easily captured since natural language descriptions often lack precision. Thus a precise semantics is mandatory for advanced SystemC application in simulation, synthesis, and formal verification.