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Behavioural languages –
Part 7: SystemC® Language Reference Manual

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The text of this standard is based on the following documents:

IEEE Std	FDIS	Report on voting
1666 (2005)	93/279/FDIS	93/285/RVD

Full information on the voting for the approval of this standard can be found in the report on voting indicated in the above table.

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IEEE Standard SystemC® Language Reference Manual

Sponsor

Design Automation Standards Committee
of the
IEEE Computer Society

Approved 28 March 2006

American National Standards Institute

Approved 6 December 2005

IEEE-SA Standards Board

Grateful acknowledgment is made to Open SystemC Initiative for the permission to use the following source material:
SystemC® Language Reference Manual Version 2.1

Abstract: SystemC®[1] is defined in this standard. SystemC is an ANSI standard C++ class library for system and hardware design for use by designers and architects who need to address complex systems that are a hybrid between hardware and software. This standard provides a precise and complete definition of the SystemC class library so that a SystemC implementation can be developed with reference to this standard alone. The primary audiences for this standard are the implementors of the SystemC class library, the implementors of tools supporting the class library, and users of the class library.
Keywords: C++, computer languages, digital systems, discrete event simulation, electronic design automation, electronic systems, electronic system level, embedded software, fixed-point, hardware description language, hardware design, hardware verification, SystemC, system modeling, system-on-chip, transaction level

[1]SystemC® is a registered trademark of Open SystemC Initiative.

IEEE introduction

This document defines SystemC, which is a C++ class library.

As the electronics industry builds more complex systems involving large numbers of components including software, there is an increasing need for a modeling language that can manage the complexity and size of these systems. SystemC provides a mechanism for managing this complexity with its facility for modelinghardware and software together at multiple levels of abstraction. This capability is not available in traditional hardware description languages.

Stakeholders in SystemC include Electronic Design Automation (EDA) companies who implement SystemC class libraries and tools, Integrated Circuit (IC) suppliers who extend those class libraries and use SystemC to model their intellectual property, and end users who use SystemC to model their systems.

Before the publication of this standard, SystemC was defined by an open source proof-of-concept C++ library, also known as *the reference simulator*, available from the Open SystemC Initiative (OSCI). In the event of discrepancies between the behavior of the reference simulator and statements made in this standard, this standard shall be taken to be definitive.

This standard is not intended to serve as a users' guide or to provide an introduction to SystemC. Readers requiring a SystemC tutorial or information on the intended use of SystemC should consult the OSCI Web site (www.systemc.org) to locate the many books and training classes available.

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BEHAVIOURAL LANGUAGES –
Part 7: SystemC® Language Reference Manual

1. Overview

1.1 Scope

This standard defines SystemC®[1] as an ANSI standard C++ class library for system and hardware design.

1.2 Purpose

The general purpose of SystemC is to provide a C++-based standard for designers and architects who need to address complex systems that are a hybrid between hardware and software.

The specific purpose of this standard is to provide a precise and complete definition of the SystemC class library so that a SystemC implementation can be developed with reference to this standard alone. This standard is not intended to serve as a users' guide or to provide an introduction to SystemC, but does contain useful information for end users.

1.3 Subsets

It is anticipated that tool vendors will create implementations that support only a subset of this standard or that impose further constraints on the use of this standard. Such implementations are not fully compliant with this standard but may nevertheless claim partial compliance with this standard and may use the name SystemC.

1.4 Relationship with C++

This standard is closely related to the C++ programming language and adheres to the terminology used in ISO/IEC 14882:2003. This standard does not seek to restrict the usage of the C++ programming language; a SystemC application may use any of the facilities provided by C++, which in turn may use any of the facilities provided by C. However, where the facilities provided by this standard are used, they shall be used in accordance with the rules and constraints set out in this standard.

This standard defines the public interface to the SystemC class library and the constraints on how those classes may be used. The SystemC class library may be implemented in any manner whatsoever, provided only that the obligations imposed by this standard are honored.

A C++ class library may be extended using the mechanisms provided by the C++ language. Implementors and users are free to extend SystemC in this way, provided that they do not violate this standard.

[1] SystemC® is a registered trademark of Open SystemC Initiative.

NOTE—It is possible to create a well-formed C++ program that is legal according to the C++ programming language standard but that violates this standard. An implementation is not obliged to detect every violation of this standard.[2]

1.5 Guidance for readers

Readers who are not entirely familiar with SystemC should start with Annex A, "Inroduction to SystemC," which provides a brief informal summary of the subject intended to aid in the understanding of the normative definitions. Such readers may also find it helpful to scan the examples embedded in the normative definitions and to see Annex B, "Glossary."

Readers should pay close attention to Clause 3, "Terminology and conventions used in this standard." An understanding of the terminology defined in Clause 3 is necessary for a precise interpretation of this standard.

Clause 4, "Elaboration and simulation semantics," defines the behavior of the SystemC kernel and is central to an understanding of SystemC. The semantic definitions given in the subsequent clauses detailing the individual classes are built upon the foundations laid in Clause 4.

The clauses from Clause 5 onward define the public interface to the SystemC class library. The following information is listed for each class:

a) A C++ source code listing of the class definition
b) A statement of any constraints on the use of the class and its members
c) A statement of the semantics of the class and its members
d) For certain classes, a description of functions, typedefs, and macros associated with the class.
e) Informative examples illustrating both typical and atypical uses of the class

Readers should bear in mind that the primary obligation of a tool vendor is to implement the abstract semantics defined in Clause 4, using the framework and constraints provided by the class definitions starting in Clause 5.

Annex A is intended to aid the reader in the understanding of the structure and intent of the SystemC class library.

Annex B is a glossary giving informal descriptions of the terms used in this standard.

Annex C lists the deprecated features, that is, features that were present in version 2.0.1 of the Open SystemC Initiative (OSCI) open source proof-of-concept SystemC implementation but are not part of this standard.

Annex D lists the changes between SystemC version 2.0.1 and version 2.1 Beta Oct 12 2004, and the changes between SystemC 2.1 Beta Oct 12 2004 and this standard.

[2]Notes in text, tables, and figures are given for information only, and do not contain requirements needed to implement the standard.

2. References

The following documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the document (including any amendments or corrigenda) applies.

This standard shall be used in conjunction with the following publications:

ISO/IEC 14882:2003, Programming Languages—C++.[3]

IEC 61691-4:2004, Behavioural languages - Part 4: Verilog® hardware description language ¦ IEEE Std 1364™-2001, IEEE Standard Verilog® Hardware Description Language.[4, 5, 6]

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[6] IEEE Std 1364-2001 was adopted as IEC 61691-4:2004