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Behavioural languages –
Part 7: SystemC® Language Reference Manual

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IEC Secretariat
3, rue de Varembé
CH-1211 Geneva 20
Switzerland
Tel.: +41 22 919 02 11
info@iec.ch
www.iec.ch

Institute of Electrical and Electronics Engineers, Inc.
3 Park Avenue
New York, NY 10016-5997
United States of America
stds.ipr@ieee.org
www.ieee.org

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IEEE Std 1666™-2023
(Revision of IEEE Std 1666-2011)

IEEE Standard for Standard SystemC® Language Reference Manual

Developed by

Design Automation Standards Committee
of the
IEEE Computer Society

Approved 5 June 2023

IEEE SA Standards Board

Abstract: SystemC® is defined in this standard. SystemC is an ISO 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 the users of the class library.

Keywords: C++, computer languages, digital systems, discrete event simulation, electronic design automation, electronic system level, electronic systems, embedded software, fixed-point, hardware description language, hardware design, hardware verification, IEEE 1666™, SystemC, system modeling, system-on-chip, transaction level

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Introduction

This introduction is not part of IEEE Std 1666-2023, IEEE Standard for Standard SystemC® Language Reference Manual.

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 modeling hardware 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 Accellera Systems Initiative. 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 user's guide or to provide an introduction to SystemC. Readers requiring a SystemC tutorial or information on the intended use of SystemC should consult the Accellera Systems Initiative Web site (www.accellera.org) to locate the many books and training classes available.

Acknowledgments

Contributed updates to IEEE Std 1666-2011 from the Accellera Systems Initiative SystemC Language Working Group are acknowledged.

IEEE Standard for Standard SystemC® Language Reference Manual

1. Overview

1.1 Scope

This standard defines SystemC® with Transaction Level Modeling (TLM) as an ISO standard C++ class library for system and hardware design.[1]

1.2 Purpose

The general purpose of this standard 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 including a TLM library so that a SystemC implementation can be developed with reference to this standard alone. This standard is not intended to serve as a user's guide or to provide an introduction to SystemC, but it does contain useful information for end users.

1.3 Word usage

The word *shall* indicates mandatory requirements strictly to be followed in order to conform to the standard and from which no deviation is permitted (*shall* equals *is required to*).[2, 3]

The word *should* indicates that among several possibilities one is recommended as particularly suitable, without mentioning or excluding others; or that a certain course of action is preferred but not necessarily required (*should* equals *is recommended that*).

The word *may* is used to indicate a course of action permissible within the limits of the standard (*may* equals *is permitted to*).

[1] SystemC® is a registered trademark of the Accellera Systems Initiative.

[2] The use of the word *must* is deprecated and cannot be used when stating mandatory requirements; *must* is used only to describe unavoidable situations.

[3] The use of *will* is deprecated and cannot be used when stating mandatory requirements; *will* is only used in statements of fact.