IEC 61691-7

Edition 1.0 2009-12

INTERNATIONAL STANDARD

IEEE Std 1666™

Behavioural languages –
Part 7: SystemC® Language Reference Manual

IEC 61691-7:2009(E) IEEE Std 1666-2005(E)

IEC Central Office
3, rue de Varembé
CH-1211 Geneva 20
Switzerland
Email: inmail@iec.ch
Web: www.iec.ch

Institute of Electrical and Electronics Engineers, Inc
3 Park Avenue
New York, NY10016-5997
USA
Email: stds.ipr@ieee.org
Web: www.ieee.org

About the IEC

The International Electrotechnical Commission (IEC) is the leading global organization that prepares and publishes International Standards for all electrical, electronic and related technologies.

About IEC publications

The technical content of IEC publications is kept under constant review by the IEC. Please make sure that you have the latest edition, a corrigenda or an amendment might have been published.

- Catalogue of IEC publications: www.iec.ch/searchpub

The IEC on-line Catalogue enables you to search by a variety of criteria (reference number, text, technical committee,…). It also gives information on projects, withdrawn and replaced publications.

- IEC Just Published: www.iec.ch/online_news/justpub

Stay up to date on all new IEC publications. Just Published details twice a month all new publications released. Available on-line and also by email.

- Electropedia: www.electropedia.org

The world's leading online dictionary of electronic and electrical terms containing more than 20 000 terms and definitions in English and French, with equivalent terms in additional languages. Also known as the International Electrotechnical Vocabulary online.

- Customer Service Centre: www.iec.ch/webstore/custserv

If you wish to give us your feedback on this publication or need further assistance, please visit the Customer Service Centre FAQ or contact us:

Email: csc@iec.ch
Tel.: +41 22 919 02 11

IEC 61691-7

Edition 1.0 2009-12

INTERNATIONAL STANDARD

IEEE Std 1666™

Behavioural languages – Part 7: SystemC® Language Reference Manual

INTERNATIONAL ELECTROTECHNICAL COMMISSION

PRICE CODE XH

ICS 25.040, 35.060

ISBN 978-0-7381-6284-3

CONTENTS

INTERNATIONAL ELECTROTECHNICAL COMMISSION

BEHAVIOURAL LANGUAGES –

Part 7: SystemC® Language Reference Manual

FOREWORD

1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
6) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

International Standard IEC 61691-7/IEEE Std 1666 has been processed through IEC technical committee 93: *Design automation*.

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.

A list of parts of the IEC 61691 series can be found on the IEC web site.

The committee has decided that the contents of this publication will remain unchanged until the maintenance result date indicated on the IEC web site under "http://webstore.iec.ch" in the data related to the specific publication. At this date, the publication will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

IEC/IEEE Dual Logo International Standards

This Dual Logo International Standard is the result of an agreement between the IEC and the Institute of Electrical and Electronics Engineers, Inc. (IEEE). The original IEEE Standard was submitted to the IEC for consideration under the agreement, and the resulting IEC/IEEE Dual Logo International Standard has been published in accordance with the ISO/IEC Directives.

IEEE Standards documents are developed within the IEEE Societies and the Standards Coordinating Committees of the IEEE Standards Association (IEEE-SA) Standards Board. The IEEE develops its standards through a consensus development process, approved by the American National Standards Institute, which brings together volunteers representing varied viewpoints and interests to achieve the final product. Volunteers are not necessarily members of the Institute and serve without compensation. While the IEEE administers the process and establishes rules to promote fairness in the consensus development process, the IEEE does not independently evaluate, test, or verify the accuracy of any of the information contained in its standards.

Use of an IEC/IEEE Dual Logo International Standard is wholly voluntary. The IEC and IEEE disclaim liability for any personal injury, property or other damage, of any nature whatsoever, whether special, indirect, consequential, or compensatory, directly or indirectly resulting from the publication, use of, or reliance upon this, or any other IEC or IEEE Standard document.

The IEC and IEEE do not warrant or represent the accuracy or content of the material contained herein, and expressly disclaim any express or implied warranty, including any implied warranty of merchantability or fitness for a specific purpose, or that the use of the material contained herein is free from patent infringement. IEC/IEEE Dual Logo International Standards documents are supplied “AS IS”.

The existence of an IEC/IEEE Dual Logo International Standard does not imply that there are no other ways to produce, test, measure, purchase, market, or provide other goods and services related to the scope of the IEC/IEEE Dual Logo International Standard. Furthermore, the viewpoint expressed at the time a standard is approved and issued is subject to change brought about through developments in the state of the art and comments received from users of the standard.

Every IEEE Standard is subjected to review at least every five years for revision or reaffirmation. When a document is more than five years old and has not been reaffirmed, it is reasonable to conclude that its contents, although still of some value, do not wholly reflect the present state of the art. Users are cautioned to check to determine that they have the latest edition of any IEEE Standard.

In publishing and making this document available, the IEC and IEEE are not suggesting or rendering professional or other services for, or on behalf of, any person or entity. Neither the IEC nor IEEE is undertaking to perform any duty owed by any other person or entity to another. Any person utilizing this, and any other IEC/IEEE Dual Logo International Standards or IEEE Standards document, should rely upon the advice of a competent professional in determining the exercise of reasonable care in any given circumstances.

Interpretations – Occasionally questions may arise regarding the meaning of portions of standards as they relate to specific applications. When the need for interpretations is brought to the attention of IEEE, the Institute will initiate action to prepare appropriate responses. Since IEEE Standards represent a consensus of concerned interests, it is important to ensure that any interpretation has also received the concurrence of a balance of interests. For this reason, IEEE and the members of its societies and Standards Coordinating Committees are not able to provide an instant response to interpretation requests except in those cases where the matter has previously received formal consideration.

Comments for revision of IEC/IEEE Dual Logo International Standards are welcome from any interested party, regardless of membership affiliation with the IEC or IEEE. Suggestions for changes in documents should be in the form of a proposed change of text, together with appropriate supporting comments. Comments on standards and requests for interpretations should be addressed to:

Secretary, IEEE-SA Standards Board, 445 Hoes Lane, Piscataway, NJ 08854, USA and/or General Secretary, IEC, 3, rue de Varembé, PO Box 131, 1211 Geneva 20, Switzerland.

Authorization to photocopy portions of any individual standard for internal or personal use is granted by the Institute of Electrical and Electronics Engineers, Inc., provided that the appropriate fee is paid to Copyright Clearance Center. To arrange for payment of licensing fee, please contact Copyright Clearance Center, Customer Service, 222 Rosewood Drive, Danvers, MA 01923 USA; +1 978 750 8400. Permission to photocopy portions of any individual standard for educational classroom use can also be obtained through the Copyright Clearance Center.

NOTE – Attention is called to the possibility that implementation of this standard may require use of subject matter covered by patent rights. By publication of this standard, no position is taken with respect to the existence or validity of any patent rights in connection therewith. The IEEE shall not be responsible for identifying patents for which a license may be required by an IEEE standard or for conducting inquiries into the legal validity or scope of those patents that are brought to its attention.

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.

Notice to users

Errata

Errata, if any, for this and all other standards can be accessed at the following URL: http://standards.ieee.org/reading/ieee/updates/errata/index.html. Users are encouraged to check this URL for errata periodically.

Interpretations

Current interpretations can be accessed at the following URL: http://standards.ieee.org/reading/ieee/interp/index.html.

Patents

Attention is called to the possibility that implementation of this standard may require use of subject matter covered by patent rights. By publication of this standard, no position is taken with respect to the existence or validity of any patent rights in connection therewith. The IEEE is not responsible for identifying Essential Patent Claims for which a license may be required, for conducting inquiries into the legal validity or scope of Patents Claims or determining whether any licensing terms or conditions provided in connection with submission of a Letter of Assurance, if any, or in any licensing agreements are reasonable or non-discriminatory. Users of this standard are expressly advised that determination of the validity of any patent rights, and the risk of infringement of such rights, is entirely their own responsibility. Further information may be obtained from the IEEE Standards Association.

IMPORTANT NOTICE: This standard is not intended to ensure safety, security, health, or environmental protection in all circumstances. Implementers of the standard are responsible for determining appropriate safety, security, environmental, and health practices or regulatory requirements.

This IEEE document is made available for use subject to important notices and legal disclaimers. These notices and disclaimers appear in all publications containing this document and may be found under the heading "Important Notice" or "Important Notices and Disclaimers Concerning IEEE Documents." They can also be obtained on request from IEEE or viewed at http://standards.ieee.org/IPR/disclaimers.html.

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.