INTERNATIONAL STANDARD

ISO/ IEC/IEEE 8802-1CS

First edition
2022-07

Telecommunications and exchange between information technology systems — Requirements for local and metropolitan area networks —

Part 1CS: Link-local registration protocol

Télécommunications et échange entre systèmes informatiques — Exigences pour les réseaux locaux et métropolitains —

Partie 1CS: Protocole d'enregistrement de type liaison locale

Reference number
ISO/IEC/IEEE 8802-1CS:2022(E)

Institute of Electrical and Electronics Engineers, Inc
3 Park Avenue, New York
NY 10016-5997, USA

Email: stds.ipr@ieee.org
Website: www.ieee.org

Published in Switzerland

Foreword

ISO (the International Organization for Standardization) and IEC (the International Electrotechnical Commission) form the specialized system for worldwide standardization. National bodies that are members of ISO or IEC participate in the development of International Standards through technical committees established by the respective organization to deal with particular fields of technical activity. ISO and IEC technical committees collaborate in fields of mutual interest. Other international organizations, governmental and non-governmental, in liaison with ISO and IEC, also take part in the work.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO/IEC documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives or www.iec.ch/members_experts/refdocs).

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.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO and IEC shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents) or the IEC list of patent declarations received (see https://patents.iec.ch).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html. In the IEC, see www.iec.ch/understanding-standards.

ISO/IEC/IEEE 8802-1CS was prepared by the LAN/MAN of the IEEE Computer Society (as IEEE 802.1CS™-2020) and drafted in accordance with its editorial rules. It was adopted, under the "fast-track procedure" defined in the Partner Standards Development Organization cooperation agreement between ISO and IEEE, by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 6, *Telecommunications and information exchange between systems.*

A list of all parts in the ISO/IEC/IEEE 8802 series can be found on the ISO and IEC websites.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html and www.iec.ch/national-committees.

IEEE Std 802.1CS™–2020

IEEE Standard for Local and Metropolitan Area Networks—

Link-local Registration Protocol

Developed by the

LAN/MAN Standards Committee
of the
IEEE Computer Society

Approved 3 December 2020

IEEE SA Standards Board

Abstract: Protocols, procedures, and managed objects for a Link-local Registration Protocol (LRP) to replicate a registration database from one end to the other of a point-to-point link and to replicate changes to parts of that database are specified in this standard. A facility is provided to purge the replicated database if the source becomes unresponsive. LRP is optimized for databases on the order of 1 Mbyte.

Keywords: Bridged Local Area Networks, bridges, bridging, IEEE 802®, IEEE 802.1CS™, IEEE 802.1Q™, Link-local Registration Protocol, local area networks (LANs), LRP, MAC Bridges, Time-Sensitive Networking, TSN, Virtual Bridged Local Area Networks (virtual LANs)

The Institute of Electrical and Electronics Engineers, Inc.
3 Park Avenue, New York, NY 10016-5997, USA

PDF: ISBN 978-1-5044-7253-1 STD24533
Print: ISBN 978-1-5044-7254-8 STDPD24533

Important Notices and Disclaimers Concerning IEEE Standards Documents

IEEE Standards documents are made available for use subject to important notices and legal disclaimers. These notices and disclaimers, or a reference to this page (https://standards.ieee.org/ipr/disclaimers.html), appear in all standards and may be found under the heading "Important Notices and Disclaimers Concerning IEEE Standards Documents."

Notice and Disclaimer of Liability Concerning the Use of IEEE Standards Documents

IEEE Standards documents are developed within the IEEE Societies and the Standards Coordinating Committees of the IEEE Standards Association (IEEE SA) Standards Board. IEEE develops its standards through an accredited consensus development process, which brings together volunteers representing varied viewpoints and interests to achieve the final product. IEEE Standards are documents developed by volunteers with scientific, academic, and industry-based expertise in technical working groups. Volunteers are not necessarily members of IEEE or IEEE SA, and participate without compensation from IEEE. While IEEE administers the process and establishes rules to promote fairness in the consensus development process, IEEE does not independently evaluate, test, or verify the accuracy of any of the information or the soundness of any judgments contained in its standards.

IEEE makes no warranties or representations concerning its standards, and expressly disclaims all warranties, express or implied, concerning this standard, including but not limited to the warranties of merchantability, fitness for a particular purpose and non-infringement. In addition, IEEE does not warrant or represent that the use of the material contained in its standards is free from patent infringement. IEEE standards documents are supplied "AS IS" and "WITH ALL FAULTS."

Use of an IEEE standard is wholly voluntary. The existence of an IEEE 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 IEEE 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.

In publishing and making its standards available, IEEE is not suggesting or rendering professional or other services for, or on behalf of, any person or entity, nor is IEEE undertaking to perform any duty owed by any other person or entity to another. Any person utilizing any IEEE Standards document, should rely upon his or her own independent judgment in the exercise of reasonable care in any given circumstances or, as appropriate, seek the advice of a competent professional in determining the appropriateness of a given IEEE standard.

IN NO EVENT SHALL IEEE BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO: THE NEED TO PROCURE SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY OUT OF THE PUBLICATION, USE OF, OR RELIANCE UPON ANY STANDARD, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE AND REGARDLESS OF WHETHER SUCH DAMAGE WAS FORESEEABLE.

Translations

The IEEE consensus development process involves the review of documents in English only. In the event that an IEEE standard is translated, only the English version published by IEEE is the approved IEEE standard.

Official statements

A statement, written or oral, that is not processed in accordance with the IEEE SA Standards Board Operations Manual shall not be considered or inferred to be the official position of IEEE or any of its committees and shall not be considered to be, nor be relied upon as, a formal position of IEEE. At lectures, symposia, seminars, or educational courses, an individual presenting information on IEEE standards shall make it clear that the presenter's views should be considered the personal views of that individual rather than the formal position of IEEE, IEEE SA, the Standards Committee, or the Working Group.

Comments on standards

Comments for revision of IEEE Standards documents are welcome from any interested party, regardless of membership affiliation with IEEE or IEEE SA. However, **IEEE does not provide interpretations, consulting information, or advice pertaining to IEEE Standards documents**.

Suggestions for changes in documents should be in the form of a proposed change of text, together with appropriate supporting comments. Since IEEE standards represent a consensus of concerned interests, it is important that any responses to comments and questions also receive 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 comments, or questions except in those cases where the matter has previously been addressed. For the same reason, IEEE does not respond to interpretation requests. Any person who would like to participate in evaluating comments or in revisions to an IEEE standard is welcome to join the relevant IEEE working group. You can indicate interest in a working group using the Interests tab in the Manage Profile & Interests area of the IEEE SA myProject system. An IEEE Account is needed to access the application.

Comments on standards should be submitted using the Contact Us form.

Laws and regulations

Users of IEEE Standards documents should consult all applicable laws and regulations. Compliance with the provisions of any IEEE Standards document does not constitute compliance to any applicable regulatory requirements. Implementers of the standard are responsible for observing or referring to the applicable regulatory requirements. IEEE does not, by the publication of its standards, intend to urge action that is not in compliance with applicable laws, and these documents may not be construed as doing so.

Data privacy

Users of IEEE Standards documents should evaluate the standards for considerations of data privacy and data ownership in the context of assessing and using the standards in compliance with applicable laws and regulations.

Copyrights

IEEE draft and approved standards are copyrighted by IEEE under US and international copyright laws. They are made available by IEEE and are adopted for a wide variety of both public and private uses. These include both use, by reference, in laws and regulations, and use in private self-regulation, standardization, and the promotion of engineering practices and methods. By making these documents available for use and adoption by public authorities and private users, IEEE does not waive any rights in copyright to the documents.

Photocopies

Subject to payment of the appropriate licensing fees, IEEE will grant users a limited, non-exclusive license to photocopy portions of any individual standard for company or organizational internal use or individual, non-commercial use only. To arrange for payment of licensing fees, please contact Copyright Clearance Center, Customer Service, 222 Rosewood Drive, Danvers, MA 01923 USA; +1 978 750 8400; https://www.copyright.com/. Permission to photocopy portions of any individual standard for educational classroom use can also be obtained through the Copyright Clearance Center.

Updating of IEEE Standards documents

Users of IEEE Standards documents should be aware that these documents may be superseded at any time by the issuance of new editions or may be amended from time to time through the issuance of amendments, corrigenda, or errata. An official IEEE document at any point in time consists of the current edition of the document together with any amendments, corrigenda, or errata then in effect.

Every IEEE standard is subjected to review at least every 10 years. When a document is more than 10 years old and has not undergone a revision process, 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 order to determine whether a given document is the current edition and whether it has been amended through the issuance of amendments, corrigenda, or errata, visit IEEE Xplore or contact IEEE. For more information about the IEEE SA or IEEE's standards development process, visit the IEEE SA Website.

Errata

Errata, if any, for all IEEE standards can be accessed on the IEEE SA Website. Search for standard number and year of approval to access the web page of the published standard. Errata links are located under the Additional Resources Details section. Errata are also available in IEEE Xplore. Users are encouraged to periodically check for errata.

Patents

IEEE Standards are developed in compliance with the IEEE SA Patent Policy.

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 by the IEEE with respect to the existence or validity of any patent rights in connection therewith. If a patent holder or patent applicant has filed a statement of assurance via an Accepted Letter of Assurance, then the statement is listed on the IEEE SA Website at https://standards.ieee.org/about/sasb/patcom/patents.html. Letters of Assurance may indicate whether the Submitter is willing or unwilling to grant licenses under patent rights without compensation or under reasonable rates, with reasonable terms and conditions that are demonstrably free of any unfair discrimination to applicants desiring to obtain such licenses.

Essential Patent Claims may exist for which a Letter of Assurance has not been received. 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

IEEE Standards do not guarantee or ensure safety, security, health, or environmental protection, or ensure against interference with or from other devices or networks. IEEE Standards development activities consider research and information presented to the standards development group in developing any safety recommendations. Other information about safety practices, changes in technology or technology implementation, or impact by peripheral systems also may be pertinent to safety considerations during implementation of the standard. Implementers and users of IEEE Standards documents are responsible for determining and complying with all appropriate safety, security, environmental, health, and interference protection practices and all applicable laws and regulations.

Participants

At the time this standard was submitted to the IEEE SA for approval, the Higher Layer LAN Protocols Working Group had the following membership:

Glenn Parsons, *Chair*
Jessy V. Rouyer, *Vice Chair*
Norman Finn, *Editor*

Astrit Ademaj
Ralf Assmann
Christian Boiger
Paul Bottorff
Radhakrishna Canchi
Feng Chen
Weiying Cheng
Paul Congdon
Rodney Cummings
Josef Dorr
Hesham Elbakoury
Thomas Enzinger
János Farkas
Donald Fedyk
Geoffrey Garner
Craig Gunther
Marina Gutierrez
Stephen Haddock
Ruibo Han
Mark Hantel
Jerome Henry
Marc Holness
Satoko Itaya
Yoshihiro Ito
Michael Karl
Stephan Kehrer
Randy Kelsey
Hajime Koto
James Lawlis
Christophe Mangin
Scott Mansfield
Kenichi Maruhashi
David McCall
Larry McMillan
John Messenger
Hiroki Nakano
Bob Noseworthy
Tomoki Ohsawa
Hiroshi Ohue
Donald R. Pannell
Michael Potts
Dieter Proell
Wei Qiu
Karen Randall
Maximilian Riegel
Atsushi Sato
Frank Schewe
Michael Seaman
Maik Seewald
Ramesh Sivakolundu
Johannes Specht
Marius Stanica
Guenter Steindl
Karim Traore
Balazs Varga
Tongtong Wang
Hao Wang
Karl Weber
Ludwig Winkel
Jordon Woods
Takahiro Yamaura
Xiang Yu
Nader Zein
William Zhao
Helge Zinner

The following members of the individual Standards Association balloting group voted on this standard. Balloters may have voted for approval, disapproval, or abstention.

Thomas Alexander
Amelia Andersdotter
Christian Boiger
Vern Brethour
William Byrd
Paul Cardinal
Steven Carlson
Pin Chang
Jin Seek Choi
Paul Congdon
Charles Cook
Rodney Cummings
Norman Finn
Avraham Freedman
Matthias Fritsche
Stephen Haddock
Marco Hernandez
Werner Hoelzl
Russell Housley
Yasuhiro Hyakutake
Raj Jain
Pranav Jha
Peter Jones
Piotr Karocki
Stephan Kehrer
Randy Kelsey
Stuart Kerry
Evgeny Khorov
Yongbum Kim
Hyeong Ho Lee
James Lepp
Christophe Mangin
Arthur Marris
Jonathon Mclendon
Nick S. A. Nikjoo
Paul Nikolich
Satoshi Obara
Robert O'Hara
Bansi Patel
Clinton Powell
Dieter Proell
R. K. Rannow
Maximilian Riegel
Jessy V. Rouyer
Peter Saunderson
Frank Schewe
Manikantan Srinivasan
Walter Struppler
Mitsutoshi Sugawara
Mark-Rene Uchida
John Vergis
George Vlantis
Lisa Ward
Karl Weber
Scott Willy
Yu Yuan
Oren Yuen

When the IEEE SA Standards Board approved this standard on 3 December 2020, it had the following membership:

Gary Hoffman, *Chair*
Jon Walter Rosdahl, *Vice Chair*
John D. Kulick, *Past Chair*
Konstantinos Karachalios, *Secretary*

Ted Burse
Doug Edwards
J. Travis Griffith
Grace Gu
Guido R. Hiertz
Joseph L. Koepfinger*
David J. Law
Howard Li
Dong Liu
Kevin Lu
Paul Nikolich
Damir Novosel
Dorothy Stanley
Mehmet Ulema
Lei Wang
Sha Wei
Philip B. Winston
Daidi Zhong
Jingyi Zhou

*Member Emeritus

Introduction

This introduction is not part of IEEE Std 802.1CS-2020, IEEE Standard for Local and Metropolitan Area Networks—Link-local Registration Protocol.

This standard defines the Link-local Registration Protocol.

This standard contains state-of-the-art material. The area covered by this standard is undergoing evolution. Revisions are anticipated within the next few years to clarify existing material, to correct possible errors, and to incorporate new related material. Information on the current revision state of this and other IEEE 802 standards can be obtained from

Secretary, IEEE SA Standards Board
445 Hoes Lane
Piscataway, NJ 08854
USA

Contents

IEEE Standard for Local and Metropolitan Area Networks—

Link-local Registration Protocol

1. Overview

1.1 Scope

This standard specifies protocols, procedures, and managed objects for a Link-local Registration Protocol (LRP) to replicate a registration database from one end to the other of a point-to-point link and to replicate changes to parts of that database. A facility is provided to purge the replicated database if the source becomes unresponsive. Provision is made for a proxy system to operate LRP on behalf of a controlled system. LRP is optimized for databases on the order of 1 Mbyte.

1.2 Purpose

LRP is designed to facilitate the creation of applications that distribute information through all or part of a network.

1.3 State diagram conventions

This document uses the state diagram conventions defined in Annex E of IEEE Std 802.1Q-2018.[1] The programming language C (ISO/IEC 9899:2018) is also used to document the operation of conformant systems. C functions are distinguished with `this special fixed-width font` (e.g., 9.4.6).

1.4 Specification model

The model of operation documented by this standard is simply a basis for describing the functionality of a compliant equipment. Implementations can adopt any internal model of operation compatible with the externally visible behavior that this standard specifies. Conformance of equipment to this standard is purely in respect of observable protocol.

[1] Information on references can be found in Clause 2.

1.5 Note on inter-table references

A number of state machine variables, managed objects, and interface primitives in this standard use the phrase "a reference to *xyz*" (see e.g., 7.3.2.8). Such a reference might be implemented by a pointer, an integer index into an array, the value of some other object in *xyz* that is sufficiently unique to make the reference unambiguous. Other techniques are also possible. This is an implementation choice and is not specified by this standard. This use of "a reference to" is also used for managed objects in Clause 11. The actual data representations of references to managed objects in Clause 12 and Clause 13, of course, are not arbitrary.

1.6 Specification precedence

If any conflict among parts of this standard become apparent, state machine diagrams (see 1.3) take precedence over other parts of the standard, followed by information in normative tables, followed by that in normative text, followed by that in normative figures, followed by YANG and MIB modules. Non-normative tables, figures, and text are in annexes and are clearly marked as such.

1.7 Introduction

The Link-local Registration Protocol (LRP) provides an LRP Database Synchronization (LRP-DS) service interface (Clause 10) that can be used by one or more LRP applications in a network, each of which needs to distribute information to some or all of the relay systems and end systems in a network. The information is passed hop-by-hop, in the sense that each information element is associated with a specific pair of connected ports in the network.

LRP accomplishes its task by creating point-to-point bi-directional associations between systems' application instances, each association consisting of two one-way paths, and each path consisting of an applicant database at one end, and a registrar database at the other. LRP quickly and reliably replicates each applicant database to its neighbor's registrar database. Locally to a system, the application instance performs any propagation or modification of information among the applicant and registrar databases on different ports within a system. Globally, the application instances plus LRP can propagate information throughout a network. This standard does not specify any LRP application that might use LRP. These basic relationships are illustrated in Figure 1-1.

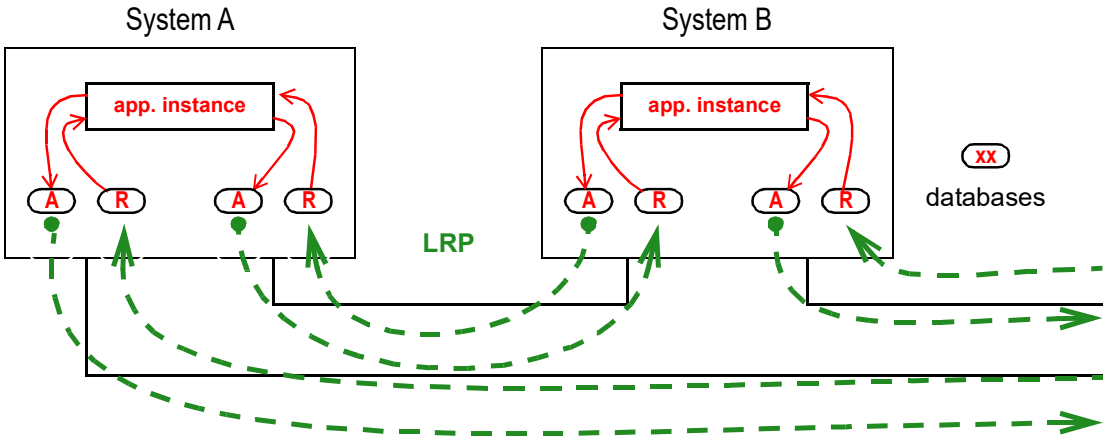

Figure 1-1—LRP simplified

LRP also supports a mode where a Proxy system operates the application instance, databases, and LRP on behalf of a Controlled system.

2. Normative references

The following referenced documents are indispensable for the application of this document (i.e., they must be understood and used, so each referenced document is cited in text and its relationship to this document is explained). For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments or corrigenda) applies.

Non-normative references (i.e., that provide additional information not required for the application of this document) are given in Annex D.

NOTE—The inclusion of a document in this list of normative references indicates that information in that document is necessary to implement the present standard. It does not imply that any other part of that referenced document is required to be implemented by a system conformant to the present standard.[2]

IEEE Std 802®, IEEE Standard for Local and metropolitan area networks—Overview and Architecture.[3, 4]

IEEE Std 802.1AB™-2016, IEEE Standard for Local and metropolitan area networks—Station and Media Access Control Connectivity Discovery.

IEEE Std 802.1Q™, IEEE Standard for Local and metropolitan area networks—Bridges and Bridged Networks.

IEEE Std 1003.1™, IEEE Standard for Information Technology—Portable Operating System Interface (POSIX™) Base Specifications, Issue 7.

IETF RFC 793, Transmission Control Protocol, September 1981.[5]

IETF RFC 2578, Std 58, Structure of Management Information Version 2 (SMIv2), April 1999.

IETF RFC 2579, Std 58, Textual Conventions for SMIv2, April 1999.

IETF RFC 2580, Std 58, Conformance Statements for SMIv2, April 1999.

IETF RFC 2863, The Interfaces Group MIB, June 2000.

IETF RFC 3232, Assigned Numbers: RFC 1700 is Replaced by an On-line Database, January 2002.

IETF RFC 4001, Textual Conventions for Internet Network Addresses, February 2005.

IETF RFC 6335, Internet Assigned Numbers Authority (IANA) Procedures for the Management of the Service Name and Transport Protocol Port Number Registry, August 2011.

IETF RFC 7950, The YANG 1.1 Data Modeling Language, August 2016.

Internet Assigned Numbers Authority (IANA) database, Service Name and Transport Protocol Port Number Registry.[6]

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

[3] IEEE publications are available from The Institute of Electrical and Electronics Engineers (https://standards.ieee.org/).

[4] The IEEE standards or products referred to in Clause 2 are trademarks owned by The Institute of Electrical and Electronics Engineers, Incorporated.

[5] IETF documents (i.e., RFCs) are available for download at http://www.rfc-archive.org/.

[6] The IANA database is available at https://www.iana.org/assignments/service-names-port-numbers/service-names-port-numbers.xhtml.

ISO/IEC 8473-1:1998, Information technology — Protocol for providing the connectionless-mode network service: Protocol specification.[7]

ISO/IEC 9899:2018, Information technology—Programming languages—C.

OMG® Unified Modeling Language™ (OMG UML®), Version 2.5, March 2015.[8, 9]

[7]ISO publications are available from the International Organization for Standardization (https://www.iso.org/) and the American National Standards Institute (https://www.ansi.org/). IEC publications are available from the International Electrotechnical Commission (https://www.iec.ch) and the American National Standards Institute (https://www.ansi.org/).

[8]OMG publications are available from the Object Management Group, at http://www.omg.org.

[9]OMG, UML, and Unified Modeling Language are either registered trademarks or trademarks of Object Management Group, Inc. in the United States and/or other countries.