

INTERNATIONAL
STANDARD

ISO/IEEE
11073-
20701

First edition
2020-03

Health informatics — Device interoperability —

Part 20701: Point-of-care medical device communication — Service oriented medical device exchange architecture and protocol binding

Informatique de santé — Interopérabilité des dispositifs —

Partie 20701: Communication entre dispositifs médicaux sur le site des soins — Architecture d'échange orientée services entre dispositifs médicaux et liaison par protocole



Reference number
ISO/IEEE 11073-20701:2020(E)



Documents

Document Sharing Hub
© IEEE 2019

Authorized licensed use limited to: Tsinghua University. Downloaded on February 24, 2026 at 09:33:07 UTC from IEEE Xplore. Restrictions apply.



COPYRIGHT PROTECTED DOCUMENT

© IEEE 2019

All rights reserved. Unless otherwise specified, or required in the context of its implementation, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from IEEE at the address below.

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) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

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 documents should be noted (see www.iso.org/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.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO 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).

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.

ISO/IEEE 11073-20701 was prepared by the IEEE 11073 Standards Committee of the IEEE Engineering in Medicine and Biology Society (as IEEE Std 11073-20701-2018) 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 Technical Committee ISO/TC 215, *Health informatics*.

A list of all parts in the ISO/IEEE 11073 series can be found on the ISO website.

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.

Health informatics—Point-of-care medical device communication

Part 20701: Service-Oriented Medical Device Exchange Architecture and Protocol Binding

Sponsor

IEEE 11073™ Standards Committee
of the
IEEE Engineering in Medicine and Biology Society

Approved 27 September 2018

IEEE-SA Standards Board

Abstract: Within the context of the ISO/IEEE 11073 family of standards for point-of-care (PoC) medical device communication, an architecture for service-oriented distributed PoC medical devices and medical IT systems is defined. This standard defines a binding of the Participant, Discovery, and Communication Model defined in IEEE Std 11073-10207™ to the profile for transport over Web Services defined in IEEE Std 11073-20702™. Moreover, a binding to Network Time Protocol (NTP) and Differentiated Services (DiffServ) is defined for time synchronization and transport Quality of Service requirements.

Keywords: alert systems, BICEPS, DiffServ, IEEE 11073-20701™, ISO/IEEE 11073, MDPWS, medical device communication, NTP, patient, point-of-care, remote control, service-oriented architecture

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

Copyright © 2019 by The Institute of Electrical and Electronics Engineers, Inc.
All rights reserved. Published 15 January 2019. Printed in the United States of America.

IEEE is a registered trademark in the U.S. Patent & Trademark Office, owned by The Institute of Electrical and Electronics Engineers, Incorporated.

W3C is a trademark (registered in numerous countries) of the World Wide Web Consortium; marks of W3C are registered and held by its host institutions MIT, ERCIM, Keio, and Beihang.

PDF: ISBN 978-1-5044-5264-9 STD23381
Print: ISBN 978-1-5044-5265-6 STDPD23381

IEEE prohibits discrimination, harassment, and bullying. For more information, visit <http://www.ieee.org/web/aboutus/whatis/policies/p9-26.html>. No part of this publication may be reproduced in any form, in an electronic retrieval system or otherwise, without the prior written permission of the publisher.

Important Notices and Disclaimers Concerning IEEE Standards Documents

IEEE documents are made available for use subject to important notices and legal disclaimers. These notices and disclaimers, or a reference to this page, appear in all standards and may be found under the heading “Important Notices and Disclaimers Concerning IEEE Standards Documents.” They can also be obtained on request from IEEE or viewed at <http://standards.ieee.org/IPR/disclaimers.html>.

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

IEEE Standards documents (standards, recommended practices, and guides), both full-use and trial-use, are developed within IEEE Societies and the Standards Coordinating Committees of the IEEE Standards Association (“IEEE-SA”) Standards Board. IEEE (“the Institute”) develops its standards through a consensus development process, approved by the American National Standards Institute (“ANSI”), which brings together volunteers representing varied viewpoints and interests to achieve the final product. IEEE Standards are documents developed through scientific, academic, and industry-based technical working groups. Volunteers in IEEE working groups are not necessarily members of the Institute 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 Standards do not guarantee or ensure safety, security, health, or environmental protection, or ensure against interference with or from other devices or networks. 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.

IEEE does not warrant or represent the accuracy or content of the material contained in its standards, and expressly disclaims all warranties (express, implied and statutory) not included in this or any other document relating to the standard, including, but not limited to, the warranties of: merchantability; fitness for a particular purpose; non-infringement; and quality, accuracy, effectiveness, currency, or completeness of material. In addition, IEEE disclaims any and all conditions relating to: results; and workmanlike effort. 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: PROCUREMENT OF 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 should be considered 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, or 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 his or her views should be considered the personal views of that individual rather than the formal position of IEEE.

Comments on standards

Comments for revision of IEEE Standards documents are welcome from any interested party, regardless of membership affiliation with IEEE. However, IEEE does not provide 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 revisions to an IEEE standard is welcome to join the relevant IEEE working group.

Comments on standards should be submitted to the following address:

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

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 imply 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.

Copyrights

IEEE draft and approved standards are copyrighted by IEEE under U.S. 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 fee, 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. 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 existing 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 ten years. When a document is more than ten 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 at <http://ieeexplore.ieee.org/> or contact IEEE at the address listed previously. For more information about the IEEE-SA or IEEE's standards development process, visit the IEEE-SA Website at <http://standards.ieee.org>.

Errata

Errata, if any, for all IEEE standards can be accessed on the IEEE-SA Website at the following URL: <http://standards.ieee.org/findstds/errata/index.html>. Users are encouraged to check this URL for errata periodically.

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 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 <http://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.

Participants

At the time this IEEE standard was completed, the Point of Care Devices Working Group had the following membership:

Jan Wittenber, *Chair*
Stefan Schlichting, *Subgroup Chair*

Bjoern Anderson
Malcolm Clarke
Todd Cooper
Chris Courville
Michael Faughn
Kenneth Fuchs
John Garguilo

Frank Golatowski
David Gregorczyk
Kai Hassing
John Hatcliff
Stefan Karl
Martin Kasparick
Koichiro Matsumoto
Joerg-Uwe Meyer

Stephan Poehlsen
Tracy Rausch
John Rhoads
Paul Schluter
Masato Tanaka
Eugene Vasserman
Stan Wiley

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

Bjoern Andersen
Lyle Bullock
Carole Carey
Keith Chow
Sourav Dutta
Kenneth Fuchs
David Fuschi
David Gregorczyk
Randall Groves

Werner Hoelzl
Noriyuki Ikeuchi
Atsushi Ito
Raj Jain
Stefan Karl
Piotr Karocki
Martin Kasparick
Thomas Kurihara
Joerg-Uwe Meyer
Beth Pumo

Stefan Schlichting
Janek Schumann
Sarah Shafqat
Walter Struppler
J. Wiley
Jan Wittenber
Oren Yuen
Janusz Zalewski
Daidi Zhong

When the IEEE-SA Standards Board approved this standard on 27 September 2018, it had the following membership:

Jean-Philippe Faure, *Chair*
Gary Hoffman, *Vice Chair*
John D. Kulick, *Past Chair*
Konstantinos Karachalios, *Secretary*

Ted Burse
Guido R. Hiertz
Christel Hunter
Joseph L. Koepfinger*
Thomas Koshy
Hung Ling
Dong Liu

Xiaohui Liu
Kevin Lu
Daleep Mohla
Andrew Myles
Paul Nikolich
Ronald C. Petersen
Annette D. Reilly

Robby Robson
Dorothy Stanley
Mehmet Ulema
Phil Wennblom
Philip Winston
Howard Wolfman
Jingyi Zhou

*Member Emeritus

Introduction

This introduction is not part of IEEE Std 11073-20701-2018, Health Informatics—Point-of-care medical device communication—Part 20701: Service-Oriented Medical Device Exchange Architecture and Protocol Binding.

ISO/IEEE 11073 standards enable communication between medical devices and external computer systems. They provide automatic and detailed electronic data capture of patient vital signs information and device operational data. The primary goals are to:

- Provide real-time plug-and-play interoperability for medical devices
- Facilitate the efficient exchange of vital signs and medical device data, acquired at the Point-of-Care (PoC), in all health care environments

“Real-time” means that data from multiple devices can be retrieved, time correlated, and displayed or processed in fractions of a second. “Plug-and-play” means that all the clinician has to do is to make the connection—the Participants automatically detect, configure, and communicate without any other human interaction.

“Efficient exchange of medical device data” means that information that is captured at the PoC (e.g., patient vital signs data) can be received, parsed, and interpreted by many different types of applications without unnecessary loss of information. The standards are especially targeted at acute, surgical, and continuing care devices, such as patient monitors, ventilators, infusion pumps, ECG devices, endoscopic camera system, insufflators, endoscopic light sources, dissectors, etc. They comprise a family of standards that can be bound to one another to provide optimized connectivity for devices at the Point-of-Care.

Within the context of the ISO/IEEE 11073 family of standards for PoC medical device communication, this standard defines an architecture for service-oriented distributed PoC medical devices and medical IT systems. It defines a binding of the Participant, Discovery, and Communication Model defined in IEEE Std 11073-10207 to the profile for transport over Web Services defined in IEEE Std 11073-20702. Moreover, a binding to Network Time Protocol (NTP) and Differentiated Services (DiffServ) is defined to satisfy time synchronization and transport Quality of Service requirements.

Contents

1. Overview	10
1.1 Scope	10
1.2 Purpose	10
2. Normative references.....	10
3. Definitions	11
4. Notational conventions.....	15
4.1 XML schema namespaces	15
5. Introduction	16
6. Service-oriented medical device exchange architecture	17
7. Service-oriented device connectivity (SDC) participant model binding	18
7.1 Coded values	18
7.2 Remote-control capabilities	18
7.3 Retrievability of containment tree entries.....	20
7.4 Dynamic containment tree changes	21
7.5 MDIB versioning	22
7.6 Types	22
8. Communication model binding	23
8.1 Service	23
8.2 Message	25
9. Discovery binding	27
9.1 Discovery mechanism.....	27
9.2 Complex device component based discovery	27
9.3 SDC PARTICIPANT KEY PURPOSE based discovery	28
9.4 Context-based discovery.....	29
9.5 Announcing absence.....	31
10. Non-functional quality attributes.....	31
10.1 Cybersecurity.....	31
10.2 Patient safety.....	33
10.3 Clinical effectiveness.....	34
11. Conformance	36
11.1 General format.....	36
11.2 ICS tables.....	37
Annex A (normative) Constants	39
Annex B (normative) SDC service provider WSDL service descriptions	40
B.1 Get Service.....	40
B.2 Set Service	40
B.3 Description Event Service.....	40
B.4 State Event Service	41
B.5 Context Service.....	41
B.6 Waveform Service	41

B.7 Containment Tree Service..... 42

B.8 Archive Service..... 42

B.9 Localization Service..... 42

Annex C (informative) Bibliography..... 43

Health informatics—Point-of-care medical device communication

Part 20701: Service-Oriented Medical Device Exchange Architecture and Protocol Binding

1. Overview

1.1 Scope

The scope of this standard is a service-oriented medical device architecture and communication protocol specification for distributed system of Point-of-Care (PoC) medical devices and medical IT systems that need to exchange data or safely control networked PoC medical devices. It identifies the functional components, their communication relationships as well as the binding of the components and communication relationships to protocol specifications.

1.2 Purpose

This standard defines an architecture for service-oriented distributed PoC medical devices and medical IT systems. It describes a binding of the Participant and Communication model as defined in IEEE Std 11073-10207™ to Medical Devices Communication Profile for Web Services (MDPWS) as defined in IEEE Std 11073-20702™ for transport over Web Services.¹ Moreover, a binding to the Network Time Protocol (NTP) and Differentiated Services (DiffServ) is specified for time synchronization and transport Quality of Service requirements.

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.

IEEE Std 11073-10207-2017, IEEE Health informatics—Point-of-care medical device communication—Part 10207: Domain Information and Service Model for Service-Oriented Point-of-Care Medical Device Communication.^{2, 3}

¹ Information on references can be found in Clause 2.

² IEEE publications are available from the Institute of Electrical and Electronics Engineers (<http://standards.ieee.org/>).

IEEE Std 11073-20701-2018
Health informatics—Point-of-care medical device communication
Part 20701: Service-Oriented Medical Device Exchange Architecture and Protocol Binding

IEEE Std 11073-20702-2016, IEEE Health informatics—Point-of-care medical device communication—Part 20702: Medical Devices Communication Profile for Web Services.

IETF RFC 1305, Network Time Protocol (Version 3) Specification, Implementation and Analysis, D. Mills, March 1992. Available at <https://tools.ietf.org/html/rfc1305>.

IETF RFC 1769, Simple Network Time Protocol (SNTP), D. Mills, March 1995. Available at <https://tools.ietf.org/html/rfc1769>.

IETF RFC 2474, Definition of the Differentiated Services Field (DS Field) in the IPv4 and IPv6 Headers, K. Nichols et al., December 1998. Available at <https://tools.ietf.org/html/rfc2474>.

IETF RFC 2475, An Architecture for Differentiated Services, S. Blake et al., December 1998. Available at <https://tools.ietf.org/html/rfc2475>.

IETF RFC 4330, Simple Network Time Protocol (SNTP) Version 4 for IPv4, IPv6 and OSI, D. Mills, January 2006. Available at <https://tools.ietf.org/html/rfc4330>.

IETF RFC 5227, IPv4 Address Conflict Detection, S. Cheshire, July 2008. Available at <https://tools.ietf.org/html/rfc5227>.

IETF RFC 5246, The Transport Layer Security (TLS) Protocol Version 1.2, T. Dierks et al., August 2008. Available at <https://tools.ietf.org/html/rfc5246.txt>.

IETF RFC 5905, Network Time Protocol Version 4: Protocol and Algorithms Specification, D. Mills et al., June 2010. Available at <https://tools.ietf.org/html/rfc5905>.

ISO/IEEE Std 11073-10101:2004, Health informatics—Point-of-care medical device communication—Part 10101: Nomenclature.⁴

3. Definitions

For the purposes of this document, the following terms and definitions apply. The *IEEE Standards Dictionary Online* should be consulted for terms not defined in this clause.⁵

ALERT: Synonym for the combination of patient-related physiological alarms, technical alarms and equipment user advisory signals.

NOTE 1—Patient-related physiological alarms as well as technical alarms are ALARM SIGNALS indicating the presence of ALARM CONDITIONS. An ALERT CONDITION is an ALARM CONDITION if the priority is LOW PRIORITY, MEDIUM PRIORITY, or HIGH PRIORITY and where the origin is a Physiological or Technical. See IEC 60601-1-8:2006+AMD1:2012 [B3].^{6, 7}

NOTE 2—Equipment user advisory signals are INFORMATION SIGNALS indicating the presence of conditions that are not ALARM CONDITIONS. An ALERT CONDITION is not an ALARM CONDITION if the priority is neither LOW PRIORITY nor MEDIUM PRIORITY nor HIGH PRIORITY. See IEC 60601-1-8:2006+AMD1:2012 [B3].

³ The IEEE standards or products referred to in Clause 2 are trademarks owned by the Institute of Electrical and Electronics Engineers, Incorporated.

⁴ ISO/IEEE publications are available from the International Organization for Standardization (<http://www.iso.org/>) and the Institute of Electrical and Electronics Engineers (<http://standards.ieee.org/>).

⁵ *IEEE Standards Dictionary Online* is available at: <http://dictionary.ieee.org>.

⁶ The numbers in brackets correspond to those of the bibliography in Annex C.

⁷ Notes in text, tables, and figures of a standard are given for information only and do not contain requirements needed to implement this standard.