

INTERNATIONAL STANDARD

IEEE Std 1636™



**Software Interface for Maintenance Information Collection and Analysis
(SIMICA)**

IECNORM.COM : Click to view the full PDF of IEC 61636:2021



THIS PUBLICATION IS COPYRIGHT PROTECTED

Copyright © 2018 IEEE

All rights reserved. IEEE is a registered trademark in the U.S. Patent & Trademark Office, owned by the Institute of Electrical and Electronics Engineers, Inc. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from the IEC Central Office. Any questions about IEEE copyright should be addressed to the IEEE. Enquiries about obtaining additional rights to this publication and other information requests should be addressed to the IEC or your local IEC member National Committee.

IEC Central Office
3, rue de Varembe
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.info@ieee.org
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 corrigendum or an amendment might have been published.

IEC publications search - webstore.iec.ch/advsearchform

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 It also gives information on projects, replaced and withdrawn publications.

IEC Just Published - webstore.iec.ch/justpublished

Stay up to date on all new IEC publications. Just Published details all new publications released. Available online and once a month by email.

IEC Customer Service Centre - webstore.iec.ch/csc

If you wish to give us your feedback on this publication or need further assistance, please contact the Customer Service Centre: sales@iec.ch.

IEC online collection - oc.iec.ch

Discover our powerful search engine and read freely all the publications previews. With a subscription you will always have access to up to date content tailored to your needs.

Electropedia - www.electropedia.org

The world's leading online dictionary on electrotechnology, containing more than 22 000 terminological entries in English and French, with equivalent terms in 18 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.

INTERNATIONAL IEEE Std 1636™ STANDARD



**Software Interface for Maintenance Information Collection and Analysis
(SIMICA)**

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

ICS 25.040.01; 35.060

ISBN 978-2-8322-9804-6

Warning! Make sure that you obtained this publication from an authorized distributor.

Contents

1. Overview	9
General	9
1.1 Scope	9
1.2 Application	10
1.3 Precedence	11
1.4 Conventions used in this document	11
2. Normative references	11
3. Definitions, acronyms, and abbreviations	12
3.1 Definitions	12
3.2 Acronyms and abbreviations	12
4. Diagnostic maturation	12
5. The SIMICA family component standards	13
5.1 Common elements	13
5.2 Test results and session information—IEEE Std 1636.1	14
5.3 Maintenance action information—IEEE Std 1636.2	14
6. Conformance	14
7. XML schema extensibility	14
8. OWL ontology and XML schema names and locations	15
9. Use of the OWL ontologies, XML schemas, and EXPRESS models associated with the SIMICA family of standards and their publication revisions	16
Annex A (normative) XML schema and OWL ontology	18
Annex B (informative) Bibliography	43
Annex C (informative) IEEE List of participants	44

SOFTWARE INTERFACE FOR MAINTENANCE INFORMATION COLLECTION AND ANALYSIS (SIMICA)

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 document(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.

IEEE Standards documents are developed within IEEE Societies and Standards Coordinating Committees of the IEEE Standards Association (IEEE SA) Standards Board. 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 IEEE and serve without compensation. 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 contained in its standards. Use of IEEE Standards documents is wholly voluntary. *IEEE documents are made available for use subject to important notices and legal disclaimers (see <http://standards.ieee.org/ipr/disclaimers.html> for more information).*

IEC collaborates closely with IEEE in accordance with conditions determined by agreement between the two organizations. This Dual Logo International Standard was jointly developed by the IEC and IEEE under the terms of that agreement.

- 2) The formal decisions 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. The formal decisions of IEEE on technical matters, once consensus within IEEE Societies and Standards Coordinating Committees has been reached, is determined by a balanced ballot of materially interested parties who indicate interest in reviewing the proposed standard. Final approval of the IEEE standards document is given by the IEEE Standards Association (IEEE SA) Standards Board.
- 3) IEC/IEEE Publications have the form of recommendations for international use and are accepted by IEC National Committees/IEEE Societies in that sense. While all reasonable efforts are made to ensure that the technical content of IEC/IEEE Publications is accurate, IEC or IEEE 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 (including IEC/IEEE Publications) transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC/IEEE Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
- 5) IEC and IEEE do not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC and IEEE are not responsible for any services carried out by independent certification bodies.
- 6) All users should ensure that they have the latest edition of this publication.
- 7) No liability shall attach to IEC or IEEE or their directors, employees, servants or agents including individual experts and members of technical committees and IEC National Committees, or volunteers of IEEE Societies and the Standards Coordinating Committees of the IEEE Standards Association (IEEE SA) Standards Board, for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC/IEEE Publication or any other IEC or IEEE Publications.
- 8) Attention is drawn to the normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
- 9) Attention is drawn to the possibility that implementation of this IEC/IEEE Publication may require use of material 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. IEC or IEEE shall not be held responsible for identifying Essential Patent Claims for which a license may be required, for conducting inquiries into the legal validity or scope of Patent 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.

IEC 61636/IEEE Std 1636 was processed through IEC technical committee 91: Electronics assembly technology, under the IEC/IEEE Dual Logo Agreement. It is an International Standard.

The text of this International Standard is based on the following documents:

IEEE Std	FDIS	Report on voting
1636 (2018)	91/1716/FDIS	91/1728/RVD

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

The language used for the development of this International Standard, is English.

The IEC Technical Committee and IEEE Technical Committee have decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under webstore.iec.ch in the data related to the specific document. At this date, the document will be

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

IMPORTANT – The "colour inside" logo on the cover page of this document indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.

IEEE Standard for Software Interface for Maintenance Information Collection and Analysis (SIMICA)

Sponsor

**IEEE Standards Coordinating Committee 20 on
Test and Diagnosis for Electronic Systems**

Approved 27 September 2018

IEEE-SA Standards Board

IECNORM.COM : Click to view the full PDF of IEC 61636:2021

Abstract: Promoting and facilitating interoperability between components of automatic test systems where test results and/or maintenance actions need to be shared is addressed in this standard. The standard defines the common elements between both test results data and maintenance action data. The common schema becomes a class of information that shall be used within the SIMICA family of standards.

Keywords: automated test system (ATS), extensible markup language (XML), IEEE 1636™, maintenance action information, OWL ontology, Software Interface for Maintenance Information Collection and Analysis (SIMICA), test results and session information, XML schema

IECNORM.COM : Click to view the full PDF of IEC 61636:2021

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 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 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. A current 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 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.

Introduction

This introduction is not part of IEEE Std 1636-2018, IEEE Standard for Software Interface for Maintenance Information Collection and Analysis (SIMICA).

Maintainers of complex systems require the ability to capture and share test result and or maintenance action information in a way that supports such activities as performance analysis, post-production product improvement, maintenance process improvement, and diagnostic maturation. Principal stakeholders of this project include but are not limited to, maintenance organizations within various Departments/Ministries of Defense, the commercial airlines, the automotive industry, and the telecommunications industry. This standard is being developed as a component of the IEEE Std 1636, Software Interface for Maintenance Information Collection and Analysis (SIMICA) family. SIMICA's purpose is to specify a software interface for access, exchange, and analysis of product diagnostic and maintenance information.

This document provides the description of the common elements the SIMICA family component (e.g., 'dot') standards shall each utilize.

IEEE Standards downloads and executable files

Files are available in the IEEE 1636-2018 directory located at: <https://standards.ieee.org/downloads>.

IEEE Standard for Software Interface for Maintenance Information Collection and Analysis (SIMICA)

1. Overview

General

Software Interface for Maintenance Information Collection and Analysis (SIMICA) is a family of IEEE standards, associated web ontologies (OWL), and extensible markup language (XML) schemas which allow automatic test system (ATS), test result and session information, and maintenance action information to be exchanged in a common format adhering to the OWL and XML standards.

The SIMICA family of standards has been developed and is being maintained under the guidance of IEEE Standards Coordinating Committee 20 (SCC20) to serve as a comprehensive environment for integrating test results, test session information, and maintenance action information, while allowing this unit under test (UUT) related data to be interchanged between heterogeneous systems.

The SIMICA family of standards is organized as a base Standard (IEEE Std 1636™—this document) and two (2) family component standards:

- Test results and session information (IEEE Std 1636.1™)
- Maintenance action information (IEEE Std 1636.2™)

The SIMICA family 'dot' standards and their relationship to this document are depicted in [Figure 1](#).

This document specifically defines the common complex types, elements and groups that are utilized by both IEEE Std 1636.1 and IEEE Std 1636.2 OWL ontologies and XML schemas.

1.1 Scope

This standard is an implementation-independent specification for a software interface to information systems containing data pertinent to the diagnosis and maintenance of complex systems consisting of hardware, software, or any combination thereof. These interfaces support service definitions for creating application programming interfaces (API) for the access, exchange, and analysis of historical diagnostic and maintenance information.

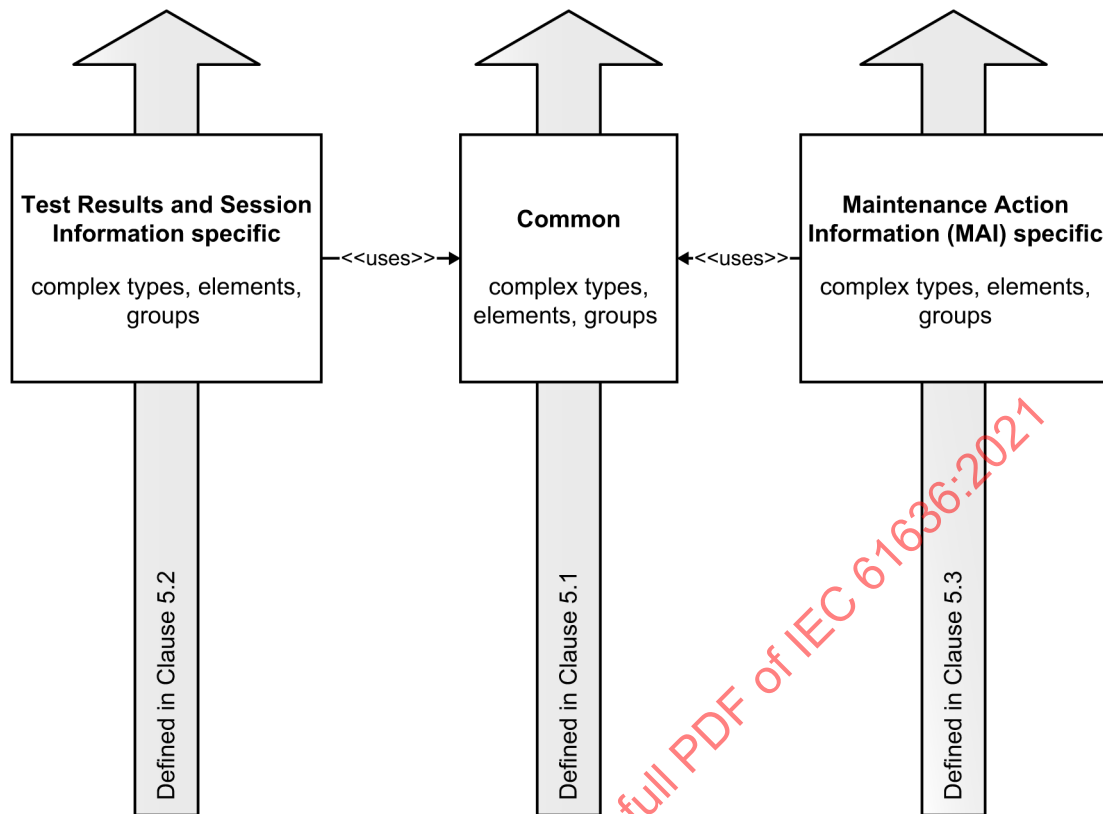


Figure 1—Relationship of the SIMICA family of standards

1.2 Application

1.2.1 Of this document

This document provides formal specifications of the information required for the development of shared maintenance data and the results of testing.

Anticipated users of this standard include the following:

- a) System developers
- b) System maintainers
- c) Test program set (TPS) developers
- d) TPS maintainers
- e) Automatic test equipment (ATE) system developers
- f) ATE systems maintainers
- g) Test instrument developers
- h) Reliability, maintainability, and diagnostic analytical applications

1.2.2 Of this document's annexes

This document includes two annexes. Of these two, one is normative ([Annex A](#)).

[Annex A](#) contains descriptive information about each of the SIMICA common XML schema and OWL ontology elements and types.

[Annex B](#) contains the bibliography. This is informative, and thus is provided strictly as information, for both users and maintainers of this document.

1.3 Precedence

In the event of conflict between this document and a normatively referenced standard (see [Clause 2](#)), the normatively referenced standard, as it applies to the information being produced, shall take precedence.

In the event of conflict between this document and another SIMICA family component standard, this document shall take precedence.

1.4 Conventions used in this document

1.4.1 General

All groups, complex types, simple types, and attribute groups are listed in [Annex A](#). Descriptive information for each is provided.

Where there are references to groups, complex types, simple types, and attribute groups within the associated XML schema or OWL ontology (Simica.xsd and Simica.owl), the convention of [name] at [element] is used to indicate where the user can locate the data within either the Simica.xsd or Simica.owl files.

Example: The 1636-2018 download at: <https://standards.ieee.org/downloads> indicates the user is to open the Simica.xsd schema at the location provided and find *Example* for the schema definition.

The namespace prefix “c:” identifies that the type or attribute group associated with this document.

All specifications for OWL and XML within this document are given in the *Courier* type font and italicized.

1.4.2 Word usage

In this document, the word “shall” is used to indicate a mandatory requirement. The word “should” is used to indicate a recommendation. The word “may” is used to indicate a permissible action. The word “can” is used for statements of possibility and capability.

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.

World Wide Web Consortium, (W3C) extensible Markup Language (XML), 1.0 (Fifth Edition) Proposed Edited Recommendation.¹

World Wide Web Consortium, (W3C) OWL Web Ontology Language (OWL 2), W3C Recommendation Definitions, acronyms and abbreviations.

¹Available at: <https://www.w3.org/>.

3. Definitions, acronyms, and abbreviations

3.1 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.²

diagnostic maturation: The process of monitoring diagnostic system predicted versus actual performance to identify and implement corrective actions. The goal is to enhance diagnostic effectiveness throughout the product life cycle. Diagnostic elements that may benefit from the maturation process include (but are not limited to) diagnostic models, system performance models, test programs, and product design.

ontologies: A formal way to define the structure of knowledge.

system: **(A)** A collection of entities to be processed by applying a top-down, hierarchical approach **(B)** A collection of elements forming a collective, functioning entity **(C)** A collection of hardware or software components necessary for performing a function.

3.2 Acronyms and abbreviations

API	application program interface
ATE	automatic test equipment
ATS	automatic test system
GUID	globally unique identifier
OWL	web ontology language
SCC20	Standards Coordinating Committee 20
SIMICA	software interface to maintenance information collection and analysis
TPS	test program set
URL	universal resource locator
UUID	universal unique identifier
UUT	unit under test
W3C	World Wide Web Consortium
XML	extensible markup language

4. Diagnostic maturation

The process of maturing a system diagnostic design begins in the system's conceptual design phase and continues throughout the system life cycle. Generally, diagnostic design is demonstrated prior to delivery of the first unit to meet the diagnostic and health management requirements that have been levied. However, once a system is fielded and used in an operational environment, unexpected and unplanned system level design interactions, operational and environmental stresses, performance characteristics of tests and monitors, and other influences tend to reveal deficiencies in the diagnostic capabilities. When such deficiencies result in a system readiness/availability or cost of ownership problem, remedial actions shall be taken:

- The performance issue must be clearly characterized in terms of scope, impact, and ownership.

²The *IEEE Standards Dictionary Online* can be found at: available at: <http://dictionary.ieee.org>.

- Root cause analysis must be performed to identify potential courses of actions, including adjustments, improvements, or refinements to support and operational elements.
- The resulting courses of action must be deployed in a manner that is both economically feasible and consistent with product functional and operational requirements.

The diagnostic maturation process requires access to design, test, diagnostic, maintenance, and logistics support information sources. Often, this specific data of interest resides in multiple systems each with different owners where it does exist—and it should be recognized that some data that is desirable to have might not be captured in data systems at all.

The problem can be reduced by operating with a single, unified conceptual view of the data to be extracted from multiple sources. Therefore, the challenge is how to extract the information of interest—heterogeneous system failure and performance data—from the disparate data systems where it resides. The idea is to identify the information of interest, and to create an OWL ontology so that it is clear what that data is and what it means in the context of system usage and analysis, and then determine the process for obtaining that information. Once data requirements and availability are determined, one can then begin to integrate the heterogeneous information to be obtained by relating the vital information from any one system to the others that capture related information but using disparate data formats and semantics.

Data collection is a prerequisite for the maturation process, and the product data that is typically required for maturation analysis is generally stored in heterogeneous data systems. The SIMICA family of standards facilitates improved access, retrieval, and integration of the requisite information from these data systems. The intent of the SIMICA family of standards is to provide an implementation-independent specification for an interface to information systems containing data pertinent to the diagnosis and maintenance of complex systems consisting of hardware, software, or any combination thereof. These interfaces will support the creation of service definitions for application programming interfaces (API) for the access, exchange, and analysis of historical diagnostic and maintenance information. The use of OWL ontologies (in previous version of this standard formal information models based on EXPRESS were used) facilitates exchanging historical maintenance information between information systems and analysis tools, supporting the creation of open system software architectures for maturing system diagnostics. The component standards will further enhance the exchange of instance information between conforming applications through the use of standard exchange formats.

More information on the diagnostic maturation process and associated issues can be found in *IEEE Standards Dictionary Online*, Wilmering 2001 [B18], and Wilmering, Yuan, and VanRossum 2003 [B19].

5. The SIMICA family component standards

5.1 Common elements

Common elements provide for a single definition (in both XML and OWL) of types and attributes that are utilized within both IEEE Std 1636.1 and IEEE Std 1636.2.

The Common elements are defined in the *Simica.xsd* schema. *Simica.xsd* is a subset of the IEEE Std 1671™-2010 *Common.xsd* schema. The common elements defined in the *Simica.xsd* schema are identical in name, type, and definition with those defined in IEEE Std 1671-2010. These SIMICA common elements are defined in [Annex A](#). Refer to IEEE Std 1671-2010 for the description of the *Common.xsd* schema.

NOTE—IEEE Std 1671-2010 does not contain an associated OWL ontology as the SIMICA family of standards provide.³

³Notes in text, tables, and figures of a standard are given for information only and do not contain requirements needed to implement this standard.

In the event SIMICA common is found to be insufficient or an error is identified, a change proposal to this document should be directed to the Secretary, IEEE-SA Standards Board.

5.2 Test results and session information—IEEE Std 1636.1

IEEE Std 1636.1 provides the definition of an exchange format, utilizing an OWL ontology and XML schema, for exchanging data resulting from executing tests of a unit under test (UUT) via a test program in an automatic test environment.

For new applications of test results and session information that do not require adherence to IEEE Std 1671, the TestResults.xsd schema that includes Simica.xsd shall be utilized. (This schema is contained in the download site folder 1636.1-2018, see Clause 7.)

For new or legacy applications of test results and session information that require adherence to IEEE Std 1671, the TestResults.xsd schema that includes Common.xsd shall be utilized. (This schema is contained in the download site folder 1636.1-2018/1671-Compatible, see Clause 7.)

5.3 Maintenance action information—IEEE Std 1636.2

IEEE Std 1636.2 provides the definition of an exchange format, utilizing an OWL ontology and XML schema, for exchanging maintenance action information (MAI) associated with the removal, repair, and replacement of system components to maintain/support an operational system.

For new applications of maintenance action information that do not require adherence to IEEE Std 1671, the MaintenanceActionInformation.xsd schema that includes Simica.xsd shall be utilized. (This schema is contained in the download site folder 1636.2-2018, see Clause 7.)

For legacy applications of maintenance action information that require adherence to IEEE Std 1671, the MaintenanceActionInformation.xsd schema that includes Common.xsd shall be utilized. (This schema is contained in the download site folder 1636.2-2018/1671-Compatible, See Clause 7)

6. Conformance

For new applications as defined in 5.2 and 5.3 the common SIMICA XML types and attributes ([Annex A](#)) shall be utilized as required by the IEEE Std 1636.1 and IEEE Std 1636.2 XML schemas.

For new applications as defined in 5.2 and 5.3 the common SIMICA OWL types and attributes ([Annex A](#)) shall be utilized as required by the IEEE Std 1636.1 and IEEE Std 1636.2 OWL ontology models.

For legacy applications as defined in 5.2 and 5.3 the common XML types and attributes defined in IEEE Std 1671-2010 shall be utilized as required by the IEEE Std 1636.1 and IEEE Std 1636.2 XML schemas.

7. XML schema extensibility

A provision in the XML schema of an extension mechanism is necessary to ensure the viability of the specification and allow producers and consumers of SIMICA XML instance documents to interoperate in those cases where there is a requirement to exchange relevant data that is not included in the Simica.xsd schema. The use of the extensions shall be done in a way that ensures that a conformant consumer can utilize the extended file without error, discard, or otherwise sidestep the extended data and use the non-extended portions of the data as it is intended without error or loss of functionality.

Extensions shall be additional information added to the content model of the element being extended.

Extensions shall not repackaging existing information entities that are already supported by this standard.

An extended instance document shall be accompanied by the extension XML schema and documentation sufficient to explain the need for the extension as well as the underlying semantics and relationship(s) to the base schema.

Simica.xsd supports two forms of extension:

- a) Wildcard-based extensions allow for the extension of SIMICA schemas with additional elements.
- b) Type derivation allows for extending the set of data types by deriving a new type from an existing type.

XML schemas control the location and type of extension allowed.

An element has an extensible content model if in instance documents that element can contain elements and data beyond that specified by the schema. SIMICA schemas should explicitly identify where they can be extended. Only elements from a namespace different from the document namespace should be allowed in an extension. The schema shall use the Simica <Extension> type to identify where extension is allowed.

Allowing the extension of a schema using type substitution should be avoided. Schemas should mark elements defined via a simple or complex type with the block attribute set to #all if type substitution is to be avoided. Elements which use type substitution as their means of definition should set the abstract attribute to true.

8. OWL ontology and XML schema names and locations

This document includes two (2) files. This material is published by the IEEE in association with this document, presented in a machine-friendly format. This is digital rights management restricted use material. The SIMICA family of standards utilizes this download Website to allow easy accessibility to the XML schema and OWL ontology referenced within this document.

The IEEE download website (<http://standards.ieee.org/downloads/>) contains several folders, each folder labeled by an associated IEEE standards number (e.g., the IEEE Std 1636 standard related material is in the 1636 folder). SIMICA standards are identified by their IEEE 1636 standard number and the year in which that standard was published by the IEEE.

Figure 2 depicts a portion of the entire IEEE download website, as it pertains to the SIMICA family of standards.

The material available on the IEEE download Website in association with this document is described in Table 1.

Table 1—IEEE Std 1636-2018 folder contents

Component	Defined In:	Name	IEEE Download Site Folder (See Figure 2)
XML schema	Annex A	Simica.xsd	1636/1636-2018
OWL ontology	Annex A	Simica.owl	1636/1636-2018

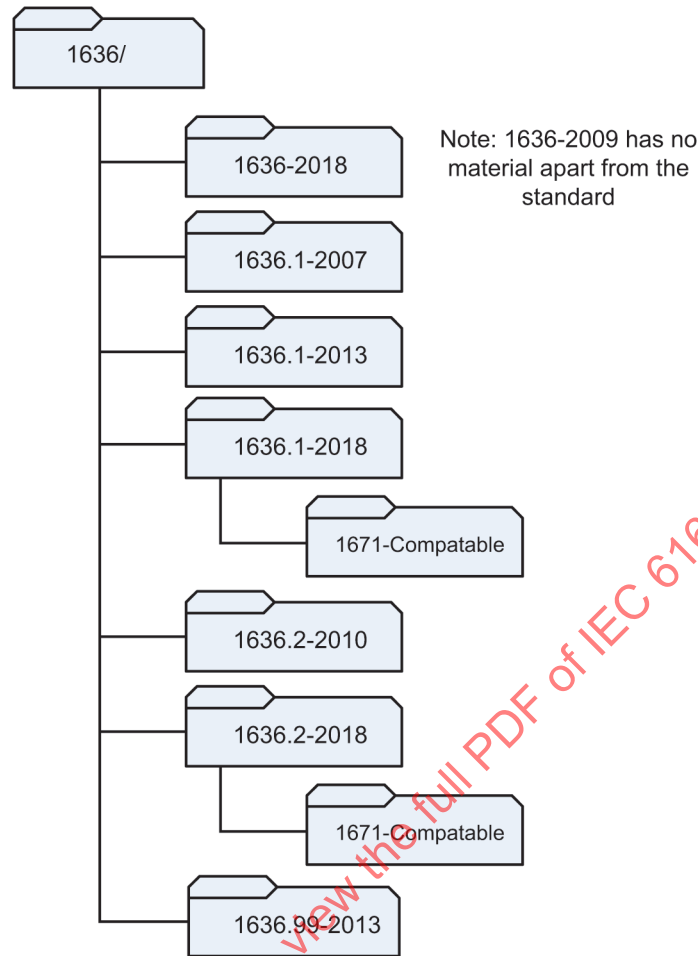


Figure 2—SIMICA download website structure

9. Use of the OWL ontologies, XML schemas, and EXPRESS models associated with the SIMICA family of standards and their publication revisions

Since the inception of SIMICA, there have been revisions to the SIMICA family “dot” standards as well as this base document. The revisions to the Standards are not backward compatible; nor are elements they include interchangeable. Table 2 provides a summary of the publications and what each includes; as well as providing a color designation to indicate which elements may be used together in an implementation. Elements from different shaded standards publication dates shall not be intermixed, nor does the SIMICA family of standards support this. The green shaded standards represent the 2018 SIMICA baseline definition, and should be used for all new implementations effective the date of this publication.

Table 2—SIMICA family standards and allowable implementation usage

SIMICA Standard and Date	XML Schema Name(s)	XML Schema Imports	EXPRESS Model Name	OWL Ontology Name
IEEE Std 1636-2009	None	None	Model is contained in the text of the standard	None
IEEE Std 1636-2018	Simica.xsd	None	None	Simica.owl
IEEE Std 1636.1-2007	TestResults.xsd (ver. 2.02)	ATMLCommon.xsd (ver. 1.06)	Model is contained in the text of the standard	None
IEEE Std 1636.1-2013	TestResults.xsd (ver. 6.02) and TestResultsCollection.xsd (ver. 1.00)	SimicaCommon.xsd (ver. 4.00) and ATMLCommon.xsd (ver. 3.17)	1636.1.exp	None
IEEE Std 1636.1-2018 *	TestResults.xsd and TestResultsCollection.xsd	Simica.xsd	None	TestResults.owl
IEEE Std 1636.2-2010	MaintenanceActionInformation.xsd (ver. 1.1)	SimicaCommon.xsd (ver. 1.02) and ATMLCommon.xsd (ver. 3.11)	Model is contained in the text of the standard	None
IEEE Std 1636.2-2018	MaintenanceActionInformation.xsd	Simica.xsd	None	MAI.owl
IEEE Std 1636.99-2013	SimicaCommon.xsd (ver. 4.00)	ATMLCommon.xsd (ver. 3.17)	Model is contained in the text of the standard	None

Annex A

(normative)

XML schema and OWL ontology

A.1 General

Should the reader not have a general understanding of XML schemas, there are several XML schema tutorials available for reference (see the XML Schema Part 0: Primer [B20], the XML Schema Tutorial [B21] and the XML Schema Tutorial, Part 1 [B22]). These tutorials will help with the understanding of the contents of the Simica.xsd schema which this annex is defining the elements.

Should the reader not have a general understanding of OWL ontologies, there are several OWL tutorials available for reference (see the Tutorial on OWL [B16] and OWL Web Ontology Language Guide—W3C [B13]). These tutorials will help with the understanding of the contents of the Simica.owl ontology which this annex is defining the elements.

A.2 DatumQuality

Name: *c:DatumQuality*

Type: Group

Description: Shall be used by any element that requires the specification of any of the group's child elements.

XML Definition:

See Simica.xsd at: *DatumQuality* located in the 1636-2018 download at: <https://standards.ieee.org/downloads>.

OWL Definition:

See Simica.owl at: *DatumQuality* located in the 1636-2018 download at: <https://standards.ieee.org/downloads>.

A.3 binary

Name: *c:binary*

Type: Complex

Description: Shall be the *xsi:type* of any element of type *c:DatumType* that contains a binary value.

XML Definition:

See Simica.xsd at: *binary* located in the 1636-2018 download at: <https://standards.ieee.org/downloads>.

OWL Definition:

See Simica.owl at: *binary* located in the 1636-2018 download at: <https://standards.ieee.org/downloads>.

A.4 binaryArray

Name: *c:binaryArray*

Type: Complex

Description: Shall be the *xsi:type* of any element of type *c:IndexedArrayType* that contains an array of binary values.

XML Definition:

See Simica.xsd at: *binaryArray* located in the 1636-2018 download at: <https://standards.ieee.org/downloads>.

OWL Definition:

See Simica.owl at: *binaryArray* located in the 1636-2018 download at: <https://standards.ieee.org/downloads>.

A.5 boolean

Name: *c:boolean*

Type: Complex

Description: Shall be the *xsi:type* of any element of type *c:DatumType* that contains a boolean value.

XML Definition:

See Simica.xsd at: *Boolean* located in the 1636-2018 download at: <https://standards.ieee.org/downloads>.

OWL Definition:

See Simica.owl at: *Boolean* located in the 1636-2018 download at: <https://standards.ieee.org/downloads>.

A.6 booleanArray

Name: *c:booleanArray*

Type: Complex

Description: Shall be the *xsi:type* of any element of type *c:IndexedArrayType* that contains an array of boolean values.

XML Definition:

See Simica.xsd at: *booleanArray* located in the 1636-2018 download at: <https://standards.ieee.org/downloads>.

OWL Definition:

See Simica.owl at: *booleanArray* located in the 1636-2018 download at: <https://standards.ieee.org/downloads>.

A.7 Collection

Name: *c:Collection*

Type: Complex

Description: Shall be the base type for elements intended to contain multiple data values, i.e., unordered sets of values, ordered vectors of values (with the order of items in the vector being represented by the order of *c:Collection/Item* child elements), or collections of named values, also known as records (with the names being represented by the name attribute of the *c:Collection/Item* child element).

XML Definition:

See Simica.xsd at: *Collection* located in the 1636-2018 download at: <https://standards.ieee.org/downloads>.

OWL Definition:

See Simica.owl at: *Collection* located in the 1636-2018 download at: <https://standards.ieee.org/downloads>.

A.8 CollectionArray

Name: *c:CollectionArray*

Type: Complex

Description: Shall be the *xsi:type* of any element of type *c:IndexedArrayType* that contains an array of collection values.

XML Definition:

See Simica.xsd at: *CollectionArray* located in the 1636-2018 download at: <https://standards.ieee.org/downloads>.

OWL Definition:

See Simica.owl at: *CollectionArray* located in the 1636-2018 download at: <https://standards.ieee.org/downloads>.

A.9 complex

Name: *c:complex*

Type: Complex

Description: Shall be the *xsi:type* for any element of type *c:DatumType* that will contain complex numbers (i.e., with real and imaginary components).

XML Definition:

See Simica.xsd at: *complex* located in the 1636-2018 download at: <https://standards.ieee.org/downloads>.

OWL Definition:

See Simica.owl at *complex* located in the 1636-2018 download at: <https://standards.ieee.org/downloads>.

A.10 **complexArray**

Name: *c:complexArray*

Type: Complex

Description: Shall be the base type of any XML schema element that will contain an array of complex numbers (i.e., with real and imaginary components).

XML Definition:

See Simica.xsd at: *complexArray* located in the 1636-2018 download at: <https://standards.ieee.org/downloads>.

OWL Definition:

See Simica.owl at *complexArray* located in the 1636-2018 download at: <https://standards.ieee.org/downloads>.

A.11 **dateTime**

Name: *c:dateTime*

Type: Complex

Description: Shall be the *xsi:type* of any XML schema element of *c:DatumType* that contains a date-time value.

The specific format for dateTime data shall follow the ISO 8601 [B11] variable-length character form: [YYYY]-[MM]-[DD]T[hh:mm:ss(.s)][TZD], where .s represents optional fractional seconds and TZD must be Z or +hh:mm or -hh:mm. By default, all dateTime elements are assumed to represent coordinated universal time (UTC). If a different time zone is represented by the literal value of the data element, the specific UTC offset must be appended to the literal. For example, 2009-07-08T12:00:00+05:00 is 2009-07-08T07:00:00Z.

XML Definition:

See Simica.xsd at: *dateTime* located in the 1636-2018 download at: <https://standards.ieee.org/downloads>.

OWL Definition:

See Simica.owl at *dateTime* located in the 1636-2018 download at: <https://standards.ieee.org/downloads>.

A.12 **dateTimeArray**

Name: *c:dateTimeArray*

Type: Complex

Description: Shall be the *xsi:type* of any element of type *c:IndexedArrayType* that contains an array of date-time values.

XML Definition:

See Simica.xsd at: *dateTimeArray* located in the 1636-2018 download at: <https://standards.ieee.org/downloads>.

OWL Definition:

See Simica.owl at *dateTimeArray* located in the 1636-2018 download at: <https://standards.ieee.org/downloads>.

A.13 DatumType

Name: *c:DatumType*

Type: Complex

Description: Shall be the base type for elements that contain a numeric, Boolean, string, or a date-time data value, each with an optional unit.

XML Definition:

See Simica.xsd at: *DatumType* located in the 1636-2018 download at: <https://standards.ieee.org/downloads>.

OWL Definition:

See Simica.owl at: *DatumType* located in the 1636-2018 download at: <https://standards.ieee.org/downloads>.

A.14 Document

Name: *c:Document*

Type: Complex

Description: Shall be the base type for any element that will capture identification information for a document.

This information may be in the form of a universal unique identifier (UUID) and the name of the document, a universal resource locator (URL), or the contents of the document.

For documents that consist only of short strings, the *c:Text* element may be used to capture the entire contents of the document.

XML Definition:

See Simica.xsd at: *Document* located in the 1636-2018 download at: <https://standards.ieee.org/downloads>.

OWL Definition:

See Simica.owl at: *Document* located in the 1636-2018 download at: <https://standards.ieee.org/downloads>.

A.15 DocumentList

Name: *c:DocumentList*

Type: Complex

Description: Shall be the base type for any element that will identify one or more documents.

XML Definition:

See Simica.xsd at: *DocumentList* located in the 1636-2018 download at: <https://standards.ieee.org/downloads>.

OWL Definition:

See Simica.owl at: *DocumentList* located in the 1636-2018 download at: <https://standards.ieee.org/downloads>.

A.16 DocumentReference

Name: *c:DocumentReference*

Type: Complex

Description: Shall be the base type for any element that will identify an external document.

XML Definition:

See Simica.xsd at: *DocumentReference* located in the 1636-2018 download at: <https://standards.ieee.org/downloads>.

OWL Definition:

See Simica.owl at: *DocumentReference* located in the 1636-2018 download at: <https://standards.ieee.org/downloads>.

A.17 double

Name: *c:double*

Type: Complex

Description: Shall be the base type for any XML schema element, including elements of type *c:DatumType*, that contains a numeric value that corresponds to the IEEE Std 754™ [B3] double precision 64-bit floating point type.

XML Definition:

See Simica.xsd at: *double* located in the 1636-2018 download at: <https://standards.ieee.org/downloads>.

OWL Definition:

See Simica.owl at: *double* located in the 1636-2018 download at: <https://standards.ieee.org/downloads>.

A.18 doubleArray

Name: *c:doubleArray*

Type: Complex

Description: Shall be the *xsi:type* of any element of type *c:IndexedArrayType* that contains an array of numeric values that correspond to the IEEE Std 754 [B3] double precision 64-bit floating point type.

XML Definition:

See Simica.xsd at: *doubleArray* located in the 1636-2018 download at: <https://standards.ieee.org/downloads>.

OWL Definition:

See Simica.owl at: *doubleArray* located in the 1636-2018 download at: <https://standards.ieee.org/downloads>.

A.19 Extension

Name: *c:Extension*

Type: Complex

Description: Provided for the convenience of XML schema developers.

The Extension type shall be used only as the base type of extension elements in XML schemas. Such elements are provided to permit implementers to extend a XML schema as required to meet the unique needs of their use case.

Use shall follow the W3C standard XML extension mechanism.

XML Definition:

See Simica.xsd at: *Extension* located in the 1636-2018 download at: <https://standards.ieee.org/downloads>.

OWL Definition:

See Simica.owl at: *Extension* located in the 1636-2018 download at: <https://standards.ieee.org/downloads>.

A.20 HardwareInstance

Name: *c:HardwareInstance*

Type: Complex

Description: Shall be the base type for any element that is intended to capture data describing or identifying a specific instance of physical hardware.

XML Definition:

See Simica.xsd at: *HardwareInstance* located in the 1636-2018 download at: <https://standards.ieee.org/downloads>.

OWL Definition:

See Simica.owl at: *HardwareInstance* located in the 1636-2018 download at: <https://standards.ieee.org/downloads>.

A.21 hexadecimal

Name: *c:hexadecimal*

Type: Complex

Description: Shall be the *xsi:type* of any element of type *c:DatumType* that contains a hex-encoded binary value.

XML Definition:

See Simica.xsd at: *hexadecimal* located in the 1636-2018 download at: <https://standards.ieee.org/downloads>.

OWL Definition:

See Simica.owl at: *hexadecimal* located in the 1636-2018 download at: <https://standards.ieee.org/downloads>.

A.22 hexadecimalArray

Name: *c:hexadecimalArray*

Type: Complex

Description: Shall be the *xsi:type* of any element of type *c:IndexedArrayType* that contains an array of hex-encoded binary values.

XML Definition:

See Simica.xsd at: *hexadecimalArray* located in the 1636-2018 download at: <https://standards.ieee.org/downloads>.

OWL Definition:

See Simica.owl at: *hexadecimalArray* located in the 1636-2018 download at: <https://standards.ieee.org/downloads>.

A.23 IdentificationNumber

Name: *c:IdentificationNumber*

Type: Complex

Description: Shall be the base type of any element that will contain entity identification (such as hardware part number).

XML Definition:

See Simica.xsd at: *IdentificationNumber* located in the 1636-2018 download at: <https://standards.ieee.org/downloads>.

OWL Definition:

See Simica.owl at: *IdentificationNumber* located in the 1636-2018 download at: <https://standards.ieee.org/downloads>.

A.24 IndexedArrayType

Name: *c:IndexedArrayType*

Type: Complex

Description: Shall be the base type for any element that will contain an array of numeric, Boolean, string, or date-time data values, or an array of collections, with an optional unit. The array may be sparse.

XML Definition:

See Simica.xsd at: *IndexedArrayType* located in the 1636-2018 download at: <https://standards.ieee.org/downloads>.

OWL Definition:

See Simica.owl at: *IndexedArrayType* located in the 1636-2018 download at: <https://standards.ieee.org/downloads>.

A.25 integer

Name: *c:integer*

Type: Complex

Description: The integer complex type shall be the *xsi:type* for elements of type *c:DatumType* that contain a 32-bit signed integer value.

XML Definition:

See Simica.xsd at: *integer* located in the 1636-2018 download at: <https://standards.ieee.org/downloads>.

OWL Definition:

See Simica.owl at: *integer* located in the 1636-2018 download at: <https://standards.ieee.org/downloads>.

A.26 integerArray

Name: *c:integerArray*

Type: Complex

Description: The integerArray complex type shall be the *xsi:type* of any element(s) of type *c:IndexedArrayType* that contain an array of 32-bit signed integer values.

XML Definition:

See Simica.xsd at: *integerArray* located in the 1636-2018 download at: <https://standards.ieee.org/downloads>.

OWL Definition:

See Simica.owl at: *integerArray* located in the 1636-2018 download at: <https://standards.ieee.org/downloads>.

A.27 ItemDescription

Name: *c:ItemDescription*

Type: Complex

Description: Shall be the base type for any element that is intended to contain descriptive and identification information for any entity.

XML Definition:

See Simica.xsd at: *ItemDescription* located in the 1636-2018 download at: <https://standards.ieee.org/downloads>.

OWL Definition:

See Simica.owl at: *ItemDescription* located in the 1636-2018 download at: <https://standards.ieee.org/downloads>.

A.28 ItemDescriptionReference

Name: *c:ItemDescriptionReference*

Type: Complex

Description: Shall be the base type for any element that requires element(s) referencing *c:ItemDescription* element(s).

XML Definition:

See Simica.xsd at: *ItemDescriptionReference* located in the 1636-2018 download at: <https://standards.ieee.org/downloads>.

OWL Definition:

See Simica.owl at: *ItemDescriptionReference* located in the 1636-2018 download at: <https://standards.ieee.org/downloads>.

A.29 ItemInstance

Name: *c:ItemInstance*

Type: Complex

Description: Shall be the base type for any element that is intended to capture identification information specifying a single instance of an item.

XML Definition:

See Simica.xsd at: *ItemInstance* located in the 1636-2018 download at: <https://standards.ieee.org/downloads>.

OWL Definition:

See Simica.owl at: *ItemInstance* located in the 1636-2018 download at: <https://standards.ieee.org/downloads>.

A.30 ItemInstanceReference

Name: *c:ItemInstanceReference*

Type: Complex

Description: Shall be the base type for any element that requires an element to reference a *c:ItemInstance* that has no serial number.

XML Definition:

See Simica.xsd at: *ItemInstanceReference* located in the 1636-2018 download at: <https://standards.ieee.org/downloads>.

OWL Definition:

See Simica.owl at: *ItemInstanceReference* located in the 1636-2018 download at: <https://standards.ieee.org/downloads>.

A.31 Limit

Name: *c:Limit*

Type: Complex

Description: Shall be the base type for any element that contains limit data where such data are a comparison to a single value. The data types must be consistent for the purposes of comparison; e.g., should a limit be represented as a string, strings shall be used through the entire limit description so that strings can be compared to strings.

XML Definition:

See Simica.xsd at: *Limit* located in the 1636-2018 download at: <https://standards.ieee.org/downloads>.

OWL Definition:

See Simica.owl at: *Limit* located in the 1636-2018 download at: <https://standards.ieee.org/downloads>.

A.32 LimitExpected

Name: *c:LimitExpected*

Type: Complex

Description: Shall be the base type for any element that requires identification of the desired or expected value that will be used for the purposes of limit comparison.

XML Definition:

See Simica.xsd at: *LimitExpected* located in the 1636-2018 download at: <https://standards.ieee.org/downloads>.

OWL Definition:

See Simica.owl at: *LimitExpected* located in the 1636-2018 download at: <https://standards.ieee.org/downloads>.

A.33 LimitMask

Name: *c:LimitMask*

Type: Complex

Description: Shall be the base type for any element that requires identification of a numeric mask value.

XML Definition:

See Simica.xsd at: *LimitMask* located in the 1636-2018 download at: <https://standards.ieee.org/downloads>.

OWL Definition:

See Simica.owl at: *LimitMask* located in the 1636-2018 download at: <https://standards.ieee.org/downloads>.

A.34 LimitPair

Name: *c:LimitPair*

Type: Complex

Description: Shall be the base type for any element that captures paired boundary condition data used in a comparison or evaluation.

XML Definition:

See Simica.xsd at: *LimitPair* located in the 1636-2018 download at: <https://standards.ieee.org/downloads>.

OWL Definition:

See Simica.owl at: *LimitPair* located in the 1636-2018 download at: <https://standards.ieee.org/downloads>.

A.35 long

Name: *c:long*

Type: Complex

Description: Shall be the *xsi:type* for elements of type *c:DatumType* that contain a 64-bit signed integer value.

XML Definition:

See Simica.xsd at: *long* located in the 1636-2018 download at: <https://standards.ieee.org/downloads>.

OWL Definition:

See Simica.owl at: *long* located in the 1636-2018 download at: <https://standards.ieee.org/downloads>.

A.36 longArray

Name: *c:longArray*

Type: Complex

Description: Shall be the *xsi:type* for elements of type *c:IndexedArrayType* that contain an array of 32-bit signed integer value.

XML Definition:

See Simica.xsd at: *longArray* located in the 1636-2018 download at: <https://standards.ieee.org/downloads>.

OWL Definition:

See Simica.owl at: *longArray* located in the 1636-2018 download at: <https://standards.ieee.org/downloads>.

A.37 MailingAddress

Name: *c:MailingAddress*

Type: Complex

Description: Shall be the base type for any element that will contain a street or mailing address. An example is the mailing address information for a manufacturer.

XML Definition:

See Simica.xsd at: *MailingAddress* located in the 1636-2018 download at: <https://standards.ieee.org/downloads>.

OWL Definition:

See Simica.owl at: *MailingAddress* located in the 1636-2018 download at: <https://standards.ieee.org/downloads>.

A.38 ManufacturerData

Name: *c:ManufacturerData*

Type: Complex

Description: Shall be the base type for any element that is intended to contain information identifying the manufacturer of an item.

XML Definition:

See Simica.xsd at: *ManufacturerData* located in the 1636-2018 download at: <https://standards.ieee.org/downloads>.

OWL Definition:

See Simica.owl at: *ManufacturerData* located in the 1636-2018 download at: <https://standards.ieee.org/downloads>.

A.39 ManufacturerIdentificationNumber

Name: *c:ManufacturerIdentificationNumber*

Type: Complex

Description: Shall be the base type for any element that will identify the manufacturer of an item.

XML Definition:

See Simica.xsd at: *ManufacturerIdentificationNumber* located in the 1636-2018 download at: <https://standards.ieee.org/downloads>.

OWL Definition:

See Simica.owl at: *ManufacturerIdentificationNumber* located in the 1636-2018 download at: <https://standards.ieee.org/downloads>.

A.40 NamedValue

Name: *c:NamedValue*

Type: Complex

Description: Shall be the base type for any element that will contain a data value with which a textual name must be associated.

XML Definition:

See Simica.xsd at: *NamedValue* located in the 1636-2018 download at: <https://standards.ieee.org/downloads>.

OWL Definition:

See Simica.owl at: *NamedValue* located in the 1636-2018 download at: <https://standards.ieee.org/downloads>.

A.41 octal

Name: *c:octal*

Type: Complex

Description: Shall be the base type for any XML schema elements of type *c:DatumType* that contain an octal-encoded binary value.

XML Definition:

See Simica.xsd at: *octal* located in the 1636-2018 download at: <https://standards.ieee.org/downloads>.

OWL Definition:

See Simica.owl at: *octal* located in the 1636-2018 download at: <https://standards.ieee.org/downloads>.

A.42 octalArray

Name: *c:octalArray*

Type: Complex

Description: Shall be the *xsi:type* of any element of type *c:IndexedArrayType* that contains an array of octal-encoded binary values.

XML Definition:

See Simica.xsd at: *octalArray* located in the 1636-2018 download at: <https://standards.ieee.org/downloads>.

OWL Definition:

See Simica.owl at: *octalArray* located in the 1636-2018 download at: <https://standards.ieee.org/downloads>.

A.43 Operator

Name: *c:Operator*

Type: Complex

Description: Shall be the base type for any element that contains identifying information for the human operator of an ATE or other test equipment.

XML Definition:

See Simica.xsd at: *Operator* located in the 1636-2018 download at: <https://standards.ieee.org/downloads>.

OWL Definition:

See Simica.owl at: *Operator* located in the 1636-2018 download at: <https://standards.ieee.org/downloads>.

A.44 Organization

Name: *c:Organization*

Type: Complex

Description: Shall be the base type for any element that contains identifying information for an organization or entity.

XML Definition:

See Simica.xsd at: *Organization* located in the 1636-2018 download at: <https://standards.ieee.org/downloads>.

OWL Definition:

See Simica.owl at: *Organization* located in the 1636-2018 download at: <https://standards.ieee.org/downloads>.

A.45 Person

Name: *c:Person*

Type: Complex

Description: Shall be the base type for any element that contains identifying information for a person.

XML Definition:

See Simica.xsd at: *Person* located in the 1636-2018 download at: <https://standards.ieee.org/downloads>.

OWL Definition:

See Simica.owl at: *Person* located in the 1636-2018 download at: <https://standards.ieee.org/downloads>.

A.46 SingleLimit

Name: *c:SingleLimit*

Type: Complex

Description: Shall be the base type of any element that will contain a single limit value used in a comparison.

XML Definition:

See Simica.xsd at: *SingleLimit* located in the 1636-2018 download at: <https://standards.ieee.org/downloads>.

OWL Definition:

See Simica.owl at: *SingleLimit* located in the 1636-2018 download at: <https://standards.ieee.org/downloads>.

A.47 SoftwareInstance

Name: *c:SoftwareInstance*

Type: Complex

Description: Shall be the base type for any element that is intended to capture identification information of a single instance of a software item.

XML Definition:

See Simica.xsd at: *SoftwareInstance* located in the 1636-2018 download at: <https://standards.ieee.org/downloads>.

OWL Definition:

See Simica.owl at: *SoftwareInstance* located in the 1636-2018 download at: <https://standards.ieee.org/downloads>.

A.48 string

Name: *c:string*

Type: Complex

Description: Shall be the *xst:type* of any attribute or an element of type *c:DatumType* that contains a string value.

XML Definition:

See Simica.xsd at: *string* located in the 1636-2018 download at: <https://standards.ieee.org/downloads>.

OWL Definition:

See Simica.owl at: *string* located in the 1636-2018 download at: <https://standards.ieee.org/downloads>.

A.49 stringArray

Name: *c:stringArray*

Type: Complex

Description: Shall be the *xsi:type* of any element of type *c:IndexedArrayType* that contains an array of string values.

XML Definition:

See Simica.xsd at: *stringArray* located in the 1636-2018 download at: <https://standards.ieee.org/downloads>.

OWL Definition:

See Simica.owl at: *stringArray* located in the 1636-2018 download at: <https://standards.ieee.org/downloads>.

A.50 unsignedInteger

Name: *c:unsignedInteger*

Type: Complex

Description: Shall be the *xsi:type* for elements of type *c:DatumType* that contain a 32-bit unsigned integer value.

XML Definition:

See Simica.xsd at: *unsignedInteger* located in the 1636-2018 download at: <https://standards.ieee.org/downloads>.

OWL Definition:

See Simica.owl at: *unsignedInteger* located in the 1636-2018 download at: <https://standards.ieee.org/downloads>.

A.51 unsignedIntegerArray

Name: *c:unsignedIntegerArray*

Type: Complex

Description: Shall be the *xsi:type* of any element of type *c:IndexedArrayType* that contains an array of unsigned integer values.

XML Definition:

See Simica.xsd at: *unsignedIntegerArray* located in the 1636-2018 download at: <https://standards.ieee.org/downloads>.

OWL Definition:

See Simica.owl at: *unsignedIntegerArray* located in the 1636-2018 download at: <https://standards.ieee.org/downloads>.

A.52 unsignedLong

Name: *c:unsignedLong*

Type: Complex

Description: Shall be the *xsi:type* for elements of type *c:DatumType* that contain a 64-bit unsigned integer value.

XML Definition:

See Simica.xsd at: *unsignedLong* located in the 1636-2018 download at: <https://standards.ieee.org/downloads>.

OWL Definition:

See Simica.owl at: *unsignedLong* located in the 1636-2018 download at: <https://standards.ieee.org/downloads>.

A.53 unsignedLongArray

Name: *c:unsignedLongArray*

Type: Complex

Description: Shall be the *xsi:type* for elements of type *c:IndexedArrayType* that contain an array of 32-bit unsigned integer values.

XML Definition:

See Simica.xsd at: *unsignedLongArray* located in the 1636-2018 download at: <https://standards.ieee.org/downloads>.

OWL Definition:

See Simica.owl at: *unsignedLongArray* located in the 1636-2018 download at: <https://standards.ieee.org/downloads>.

A.54 UserDefinedIdentificationNumber

Name: *c:UserDefinedIdentificationNumber*

Type: Complex

Description: Shall be the base type for any element that will identify an item.

XML Definition:

See Simica.xsd at: *UserDefinedIdentificationNumber* located in the 1636-2018 download at: <https://standards.ieee.org/downloads>.

OWL Definition:

See Simica.owl at: *UserDefinedIdentificationNumber* located in the 1636-2018 download at: <https://standards.ieee.org/downloads>.

A.55 Value

Name: *c:Value*

Type: Complex

Description: Shall be utilized for elements that contain values (e.g., Boolean, numeric, date-time, string, collections and arrays). Different child elements shall be used to represent a single data value, a collection of data values, or an array of data values.

XML Definition:

See Simica.xsd at: *Value* located in the 1636-2018 download at: <https://standards.ieee.org/downloads>.

OWL Definition:

See Simica.owl at: *Value* located in the 1636-2018 download at: <https://standards.ieee.org/downloads>.

A.56 WorkOrder

Name: *c:WorkOrder*

Type: Complex

Description: Shall be utilized for the identification of a work order related to, or authorizing, the testing of the UUT.

XML Definition:

See Simica.xsd at: *WorkOrder* located in the 1636-2018 download at: <https://standards.ieee.org/downloads>.

OWL Definition:

See Simica.owl at: *WorkOrder* located in the 1636-2018 download at: <https://standards.ieee.org/downloads>.

A.57 ArrayIndexor

Name: *c:ArrayIndexor*

Type: Simple

Description: Regular expression: $\backslash([0-9]+)(([0-9]+)*)\backslash$ (Restricts contents to a comma-delimited set of decimal numbers.)

This type shall be used as the base type of any attribute or element that specifies the size of an array or the index of an element within an array.