IEC 61636

Edition 2.0 2021-06

INTERNATIONAL STANDARD

IEEE Std 1636™

colour inside

Software Interface for Maintenance Information Collection and Analysis (SIMICA)

IEC 61636:2021-06(en) IEEE Std 1636-2018

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Software Interface for Maintenance Information Collection and Analysis (SIMICA)

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

ICS 25.040.01; 35.060

IEEE (PDF) STD24777

ISBN 978-2-8322-9804-6
ISBN 978-1-5044-7671-3

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SOFTWARE INTERFACE FOR MAINTENANCE INFORMATION COLLECTION AND ANALYSIS (SIMICA)

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IEEE Std	FDIS	Report on voting
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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

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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

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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.

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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.

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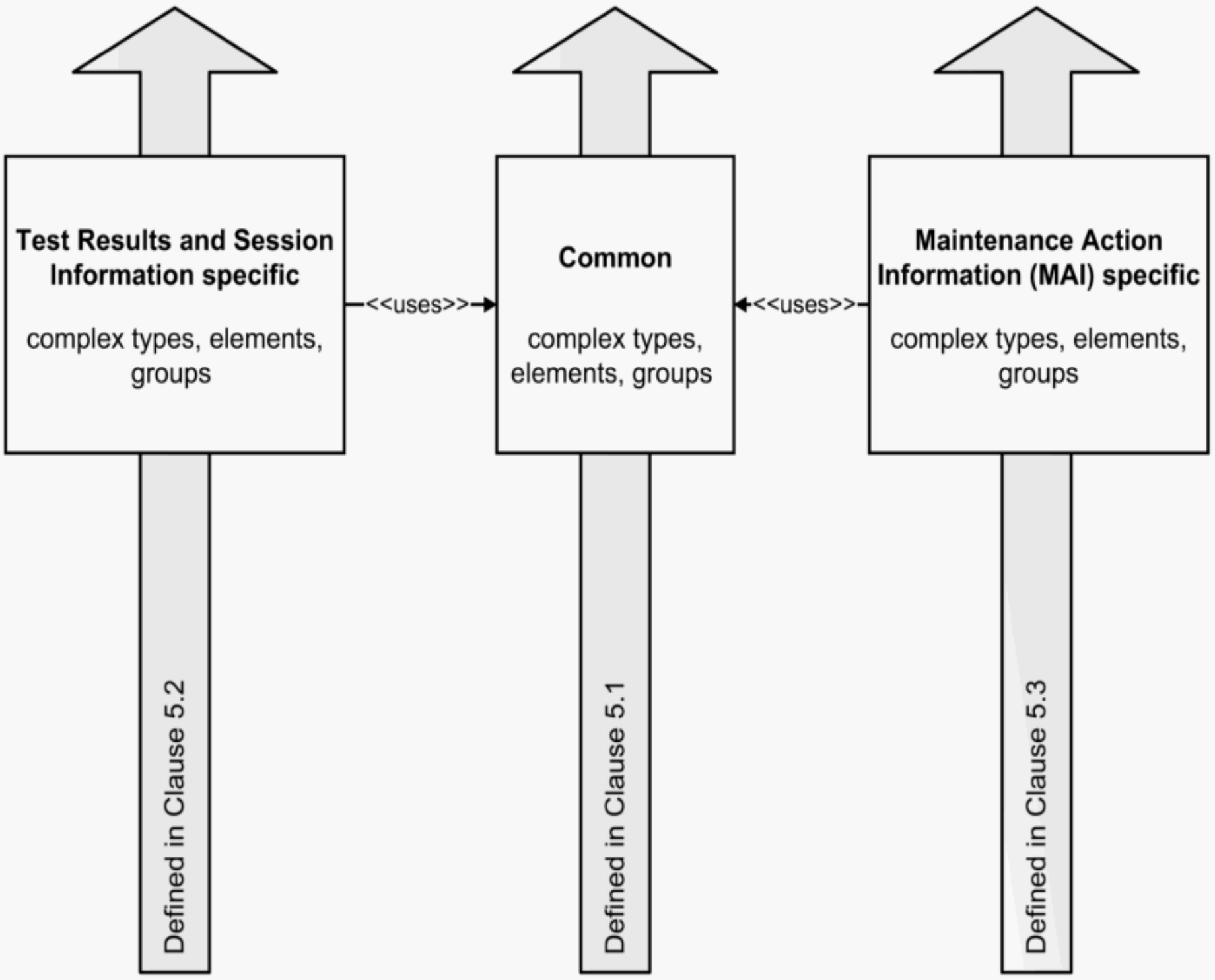

Figure 1—Relationship of the SIMICA family of standards

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).

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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.

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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.

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— 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]

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

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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.

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Extensions shall not repackage 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

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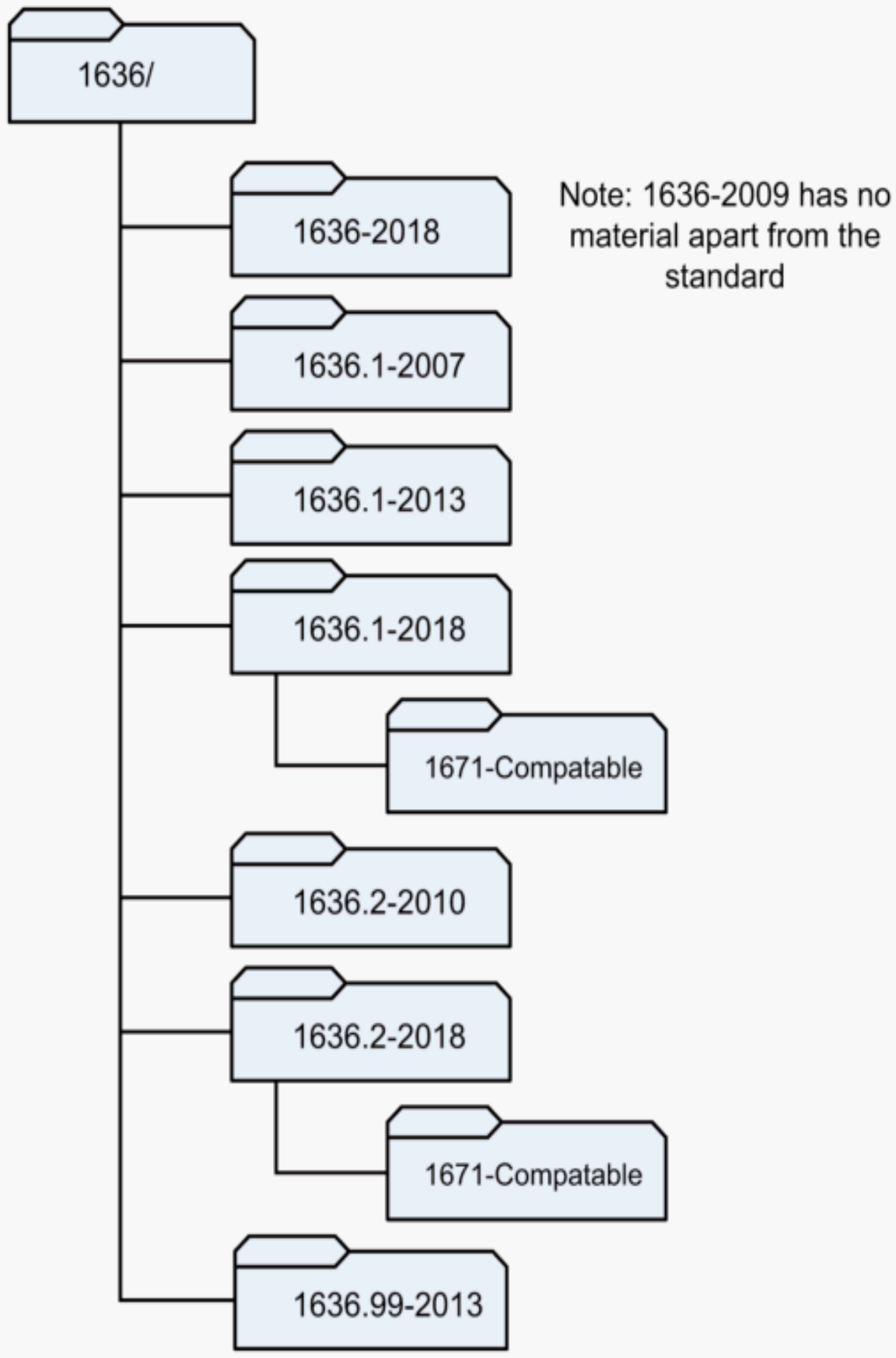

Figure 2—SIMICA download website structure

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.

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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

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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.

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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.

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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.

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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

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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.

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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.

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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.

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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).

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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

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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.

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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.

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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.

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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.

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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.

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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.

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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.

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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 *xsi: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

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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.

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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 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.

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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: \[([0–9]+)((,([0–9]+))*)\] (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.

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In use, attributes derived from this element shall contain a string designating an n-dimensional array index or array dimension, with the format [a,b,c,…,n], where a,b,c,…n are numeric indices.

When a derived attribute specifies the size of an array, the attribute shall indicate the maximum size of each dimension of the array. When a derived attribute indicates a specific element of an array, the index value(s) shall be zero-based ordinal numbers.

Examples: (element index: [0] or [0,1] or [2,2,0]; maximum array index: [2,3] or [3,3,3]). Indexes shall be only positive; in other words, no negative indexing is permitted.

XML Definition:

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

OWL Definition:

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

A.58 ComparisonOperator

Name: *c:ComparisonOperator*

Type: Simple

Description: Shall be used as the base type for any attribute or element that specifies a comparison operator between two elements.

XML Definition:

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

OWL Definition:

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

A.59 EqualityComparisonOperator

Name: *c:EqualityComparisonOperator*

Type: Simple

Description: Base type: restriction of *xs:string*

Enumerations: *EQ* | *NE* | *CIEQ* | *CINE*

This shall be used as the base type for any attribute or element which will specify a comparison operator between two elements.

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— EQ = Case-sensitive equal for strings, equal for all other datatypes.

— NE = Case-sensitive not-equal for strings, not equal for all other datatypes.

— CIEQ = Case-insensitive equal for strings, equal for all other datatypes.

— CINE = Case-insensitive not-equal for strings, not equal for all other datatypes.

XML Definition:

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

OWL Definition:

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

A.60 HexValue

Name: *c:HexValue*

Type: Simple

Description: Base type: restriction of *xs:string*

Regular expression: (0[x|X])?([0–9]|[a-f]|[A-F])* (Restricts contents to a hexadecimal number.)

This type shall be used as the base type for any XML schema attribute or element that contains a hex-encoded binary value. This binary value contains the optional string 0x followed by a finite-length sequence of characters 0–9 and a–f.

XML Definition:

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

OWL Definition:

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

A.61 LogicalOperator

Name: *c:LogicalOperator*

Type: Simple

Description: Shall be used as the base type for any attribute or element that specifies a Boolean logic combination of two elements.

XML Definition:

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

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OWL Definition:

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

A.62 MaskOperator

Name: *c:MaskOperator*

Type: Simple

Description: Shall be used as the base type for any attribute or element that specifies a Boolean logic combination of two mask values.

XML Definition:

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

OWL Definition:

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

A.63 NonBlankString

Name: *c:NonBlankString*

Type: Simple

Description: Shall be used as the base type of any attribute or element that is required to be nonblank.

This type uses the XML *<xs:minLength value = ”1”/&gt*; specification to create a non-nullable string, i.e., a string that must contain at least one character.

Also, white space will be collapsed (i.e., multiple space characters will be replaced with a single space).

XML Definition:

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

OWL Definition:

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

A.64 NonBlankURI

Name: *c:NonBlankURI*

Type: Simple

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Description: Shall be used as the base type of any attribute or element that is intended to contain a nonblank uniform resource identifier (URI).

This type uses the XML *<xs:minLength value = ”1”/>* specification to create a non-nullable string, i.e., a string that must contain at least one character. Also, white space will be collapsed (i.e., multiple space characters will be replaced with a single space).

XML Definition:

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

OWL Definition:

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

A.65 StandardUnit

Name: *c:StandardUnit*

Type: Simple

Description: Shall be used by any attribute or element that contains the unit of measure for a numerical value (e.g., volts, ohms, MHz). The contents of this attribute shall be compliant with IEEE Std 260.1 [B2].

XML Definition:

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

OWL Definition:

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

A.66 Uuid

Name: *c:Uuid*

Type: Simple

Description: Base type: restriction of *xs:string*

Pattern: [A-Fa-f0–9]{32}|(\{|\()?[A-Fa-f0–9]{8}-([A-Fa-f0–9]{4}-){3}[A-Fa-f0–9]{12}(\}|\))?

Shall be used by other attributes or elements that will hold a universal unique identifier (UUID), commonly known as either a globally unique identifier (GUID) or UUID. The regular expression defined limits the contents of an attribute to either a single 32-digit hexadecimal string or a 32-digit hex string patterned as [8]-[4]-[4]-[4]-[12] digits.

XML Definition:

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

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OWL Definition:

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

A.67 ClassifiedAttributes

Name: *c:ClassifiedAttributes*

Type: Attribute Group

Description: Shall be used by all documents that require security classification identification.

XML Definition:

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

OWL Definition:

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

A.68 DocumentRootAttributes

Name: *c:DocumentRootAttributes*

Type: Attribute Group

Description: Shall be used as the root element for all XML schemas.

XML Definition:

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

OWL Definition:

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

A.69 UnitAttributes

Name: *c:UnitAttributes*

Type: Attribute Group

Description: In nearly all ATS use cases, strictly limiting units of measure to SI or English units is restrictive.

In numerous cases, it is desirable to qualify a unit with an additional text string, e.g., Peak-to-Peak or rms for voltage measurements.

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Annex B

(informative)

Bibliography

Bibliographical references are resources that provide additional or helpful material but do not need to be understood or used to implement this standard. Reference to these resources is made for informational use only.

[B1] *Extensible Markup Language (XML) 1.0 (Fifth Edition)*. W3C Proposed Edited Recommendation 06 February 2008.[4]

[B2] IEEE Std 260.1™-2004, IEEE Standard Letter Symbols for Units of Measurement (SI Units, Customary Inch-Pound Units, and Certain Other Units).

[B3] IEEE Std 754™-2008, IEEE Standard for Binary Floating-Point Arithmetic.

[B4] IEEE Std 1232™-2010, IEEE Standard for Artificial Intelligence Exchange and Service Tie to All Test Environments (AI-ESTATE).

[B5] IEEE Std 1636.1™-2007, IEEE Standard for Software Interface for Maintenance Information Collection and Analysis (SIMICA): Exchanging Test Results and Session Information via the Extensible Markup Language (XML).

[B6] IEEE Std 1636.1™-2013, IEEE Standard for Software Interface for Maintenance Information Collection and Analysis (SIMICA): Exchanging Test Results and Session Information via the Extensible Markup Language (XML).

[B7] IEEE Std 1636.1™-2018, IEEE Standard for Software Interface for Maintenance Information Collection and Analysis (SIMICA): Exchanging Test Results and Session Information via the Extensible Markup Language (XML).

[B8] IEEE Std 1636.2™-2010, IEEE Standard for Software Interface for Maintenance Information Collection and Analysis (SIMICA): Exchanging Maintenance Action Information via the Extensible Markup Language (XML).

[B9] IEEE Std 1636.2™-2018, IEEE Standard for Software Interface for Maintenance Information Collection and Analysis (SIMICA): Exchanging Maintenance Action Information via the Extensible Markup Language (XML).

[B10] IEEE Std 1671™-2010, IEEE Standard for Automatic Test Programming Language (ATML) for Exchanging Automatic Test Equipment and Test Information via XML.

[B11] ISO 8601:2004, Data elements and interchangeability formats—Information interchange—Representation of dates and times.[5]

[4]Available from: http://www.w3.org/TR/2008/PER-xml-20080205.
[5]ISO publications are available from the ISO Central Secretariat, Case Postalė 56, 1 rue de Varembė, CH-1211, Genevė 20, Switzerland/. Suissė (http://www.iso.ch/). ISO publications are also available in the United States from the Sales Department, American National Standards Institute, 25 West 43rd Street, 4th floor, New York, NY 10036, USA (http://www.ansi.org/).

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[B12] Namespaces in XML 1.0 (Third Edition). World Wide Web Consortium Recommendation 8 December 2009. [6]

[B13] *OWL Web Ontology Language Guide – W3C.*[7]

[B14] *OWL2 Web Ontology Language.* W3C Recommendation 12 November 2009.[8]

[B15] Sheppard, J. W. and T. J. Wilmering, "Recent Advances in IEEE Standards for Diagnosis and Diagnostic Maturation" Proceedings IEEE Aerospace Conference, Big Sky, MT, 2006.

[B16] *Tutorial on OWL.*[9]

[B17] U.S. Navy, Definitions of Terms for Test, Measurement and Diagnostic Equipment, MIL-STD-1309D, Naval Electronics Systems Command (ELEX-8111), Washington, D.C., 12 February 1992.

[B18] Wilmering, T. J., "Semantic Requirements on Information Integration for Diagnostic Maturation", Autotestcon 2001 Proceedings, Anaheim, CA, 2001.

[B19] Wilmering, T. J., J. Yuan, and D. VanRossum, "*A Metadata Architecture for Mediated Integration of Product Usage Data*" Proceedings of Autotestcon 2003, Anaheim, CA, 2003.

[B20] *XML Schema Part 0: Primer.*[10]

[B21] *XML Schema Tutorial.*[11]

[B22] *XML Schema Tutorial, Part 1.*[12]

---

[6]Available from: <http://www.w3.org/TR/REC-xml-names/.
[7]Available from: https://www.w3.org/TR/owl-guide.
[8]Available from: http://www.w3.org/TR/2008/PER-xml-20080205.
[9]Available from: www.cs.man.ac.uk/~horrocks/ISWC2003/Tutorial/.
[10]Available from: http://www.w3.org/TR/xmlschema-0.
[11]Available from: http://www.xfront.com.
[12]Available from: www.liquid-technologies.com/Tutorials/XmlSchemas/XsdTutorial_01.aspx.

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Annex C
(informative)

IEEE List of participants

At the time this IEEE standard was completed, the P1636 Working Group had the following membership:

John Sheppard, *Chair*
Mike Seavey, *Vice Chair*

Chris Gorringe
Anand Jain
Teresa Lopes
Richard McAllister
Ion Naeg
Na'Shea Wiesner

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

W. Larry Adams Jr.
Charles Barest
Malcom Brown
Demetrio Bucaneg Jr.
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Chris Gorringe
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Ion Neag
Leslie Orlidge
Mike Seavey
John Sheppard
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Walter Struppler
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