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Automatic Test Markup Language (ATML) for Exchanging Automatic Test Equipment and Test Information via XML

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IEEE Std 1671™-2010
(Revision of
IEEE Std 1671-2006)

IEEE Standard for Automatic Test Markup Language (ATML) for Exchanging Automatic Test Equipment and Test Information via XML

Sponsor

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

Approved 30 September 2010

IEEE-SA Standards Board

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Abstract: This document specifies a framework for the automatic test markup language (ATML) family of standards. ATML allows automatic test system (ATS) and test information to be exchanged in a common format adhering to the extensible markup language (XML) standard.

Keywords: ATE description, ATE test results, ATML, ATS, automatic test equipment, automatic test markup language, automatic test system, interface test adapter, ITA, SI, synthetic instrumentation, test configuration, unit under test, UUT description, UUT maintenance, XML instance document, XML schema

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IEEE Introduction

This introduction is not part of IEEE Std 1671-2010, IEEE Standard for Automatic Test Markup Language (ATML) for Exchanging Automatic Test Equipment and Test Information via XML.

Historical background

In 2002, an automatic test markup language (ATML) focus group was formed (outside any formal standardization body) with a mission to "define a collection of XML [extensible markup language] schemas that allows ATE [automatic test equipment] and test information to be exchanged in a common format adhering to the XML standard."

The scope of this effort was the standardization of test information, which would allow for test program (TP) and test asset interoperability, as well as unit under test (UUT) data (including results and diagnostics), to be interchanged between heterogeneous ATE systems.

In 2004, the efforts of the focus group were brought into IEEE Standards Coordinating Committee 20 (SCC20), where the formal standardization process has taken place. Further refinements and updates to the work accomplished by the ATML focus group has (and continues to) take place within both the ATML focus group and IEEE SCC20.

IEEE 1671 ATML family of standards

The ATML family of standards supports TP, test asset, and UUT interoperability within an automatic test environment.

This document provides an overview of the ATML goals, defines the ATML framework, defines the ATML family of standards, and specifies common ATML data elements, and common ATML schemas.

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1. Overview

1.1 General

Automatic test markup language (ATML) is a collection of IEEE standards and associated extensible markup language (XML) schemas that allows automatic test system (ATS) and test information to be exchanged in a common format adhering to the XML standard.[1]

The ATML framework and the ATML family of standards have been developed and are maintained under the guidance of the Test Information Integration (TII) Subcommittee of IEEE Standards Coordinating Committee 20 (SCC20) to serve as a comprehensive environment for integrating design data, test strategies, test requirements, test procedures, test results management, and test system implementations, while allowing test program (TP), test asset interoperability, and unit under test (UUT) data to be interchanged between heterogeneous systems.

[1] This information is given for the convenience of users of this standard and does not constitute an endorsement by the IEEE of this consortium standard. Equivalent standards or products may be used if they can be shown to lead to the same results.

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1.1.1 ATML framework referenced IEEE standard

The ATML framework can reference IEEE Std 1641™ [B29].[2] This referenced IEEE standard, when utilized, is then considered part of the ATML framework.

1.1.2 Application of this document's annexes

This document includes twelve annexes. Of these twelve, four are normative (Annex A, Annex B, Annex C, and Annex D).

Annex A contains style guidelines for the ATML family XML schemas. Annex A guidelines shall be followed by ATML XML schema developers and maintainers during the development and maintenance of all ATML family XML schemas, including the XML schemas associated with this document.

Annex B contains XML schema element description and definitions for the **ATML common element XML schemas**. Annex B shall be utilized by ATML XML schema developers, maintainers, and ATML users. Annex B shall be referenced during the development and maintenance of all ATML family XML schemas, including the XML schemas associated with this document.

Annex C contains XML schema element description and definitions for the **ATML internal model XML schemas**. Annex C shall be utilized by ATML XML schema developers, maintainers, and ATML users. Annex C shall be referenced during the creation and development of ATML Capabilities or ATML WireLists documents.

Annex D contains guidelines for ATML services. Annex D shall be referenced by ATML users implementing an ATML framework.

Annex E through Annex L are informative and thus are provided strictly as information for both users and maintainers of this document.

1.2 Scope

ATML defines a standard exchange medium for sharing information between components of ATSs. This information includes test data, resource data, diagnostic data, and historic data. The exchange medium is defined using XML. This standard specifies the framework for the family of ATML standards.

1.3 Purpose

The purpose of ATML is to support TP, test asset, and UUT interoperability within an automatic test environment. ATML accomplishes this through a standard medium for exchanging UUT, test, and diagnostic information between components of the test system. The purpose of this standard is to provide an overview of ATML goals, define the ATML family of standards, and specify common data elements for the ATML family of standards.

[2] The numbers in brackets correspond to the numbers of the bibliography in Annex L.

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1.4 Application

1.4.1 General

This document should be applied anywhere ATS and test information is to be exchanged. This ATS and test information includes the following:

- Data that will be utilized for the design, development, and utilization of automatic test equipment (ATE).
- Data that will be utilized for the design, development, and utilization of test program sets (TPSs) to test a product (e.g., UUT) on a particular ATE.
- Product design data that will be utilized during the testing of the product (e.g., UUT).
- Shared usage of maintenance data and the results of testing a product (e.g., UUT).
- Testing requirements of a particular product (e.g., UUT).
- Data that will be utilized for the design, development, and utilization of instrumentation that will be utilized within a particular ATS configuration.
- A definition of allowable ATS configurations that can be use to test and evaluate a particular product (e.g., UUT).
- A definition of the capabilities of ATSs as well as the elements of the ATS.

1.4.2 Users

Anticipated users of the ATML family of standards include the following:

- Product (e.g., UUT) developers
- Product (e.g., UUT) maintainers
- TPS developers
- TPS maintainers
- ATE system developers
- ATE system maintainers
- Instrumentation developers
- Developers of ATML-based tools and systems
- Developers of prime mission equipment that use the supported UUT as a component

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1.4.3 Precedence

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

In the event of conflict between this document and a normatively referenced standard (*Extensible Markup Language (XML) 1.0*),[3] the normatively referenced standard, as it applies to the information being produced, shall take precedence.

In the event of conflict between this document's XML schema definition and/or annotations and an ATML family component standard and/or XML schemas, this document's XML schema definition and/or annotations shall take precedence.

1.5 Conventions used in this document

1.5.1 General

Within the body of this document, the conventions defined in Table 1 are utilized.

Table 1—Document conventions

Item	Convention
The use of **bolded** text	Emphasizes a word or concept.
The use of *italics*	Represents bibliography references and quoted text from other documents.
The term "ATML framework"	Represents the sub-domains of an ATS architecture specifically addressed by the ATML family of standards.
The term "ATML family of standards"	Represents the complete set of ATML family component standards and associated XML schemas (see Table 3).
The term "ATML family component standard"	Represents a particular IEEE 1671 series standard (IEEE Std 1671.1™ [B31] through IEEE Std 1671.6™ [B36]).
The term "ATML common element schemas"	Reflects only the ATML Common, ATML HardwareCommon, and ATML TestEquipment XML schemas defined in this document (B.1, B.2, and B.3). These schemas **shall not have** associated XML instance documents.
The term "ATML internal model schemas"	Reflects only the ATML Capabilities and ATML WireLists XML schemas defined in this document (C.1 and C.2). These schemas **shall have** associated XML instance documents.
The term "subdomain"	Represents the complete set of ATML family component standards and associated XML schemas.
The term "subframework"	Represents the ATS or support software.
The term "external interface"	Represents the IEEE 1671 series standards (IEEE Std 1671.1 through IEEE Std 1671.6).
The term "internal model"	Represents the Capabilities and WireLists XML schemas defined in Annex C.
The term "ATML <component name> XML schema"	Represents the XML schema associated with the ATML family component standard. <component name> is defined in Table 3.
The term "ATML <component name> document"	Represents an XML instance document conforming to the ATML <component name> XML schema. For example, an ATML Test Description document is an XML instance document conforming to the ATML Test Description XML schema. <component name> is defined in Table 3.

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

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Annex A, Annex B, Annex C, Annex D, Annex E, Annex F, Annex G, and Annex I present XML schema and XML instance document information. The conventions used in their presentation are defined in Table 2.

Table 2—XML schema and XML instance document conventions

Item	Convention
All specifications in the XML language	Are given in the `Courier` type font where the XML elements are represented outside the XML schema or instance document.
The terms "isRef (0)" and "isRef (1)"	Is a XML boolean indicator used to identify whether an object is a reference. The term isRef (0) indicates it is not a reference; isRef (1) indicates that it is a reference.
The term "final #all"	Is an XML property that prevents all derivation. Used by the Complex Type `c:Extension`.
The use of "—" in tables	Indicates that no information is associated with this table cell or, with respect to attribute usage, implies optional.
The term "content simple"	Indicates that the XML element is not allowed to have attributes or subelements.
The term "content complex"	Indicates that a new complex data type is being defined, which can be used to declare elements to accept attributes and/or subelements.
The use of *italics*	Represents a XML element defined outside the subclause.
The use of "1 … ∞" and "0 … ∞" in tables	Represents the number of times an XML element may appear in an XML instance document. i.e., either one to infinity times or zero to infinity times.
XML snippets of XML instance documents	Are given in the `Courier` type font.
The XML attribute "`xsi:type`"	Explicitly declares the XML element type.
The use of "|" in XML simple types descriptions	Indicates a logical OR.

This document uses the vocabulary and definitions of relevant IEEE standards. In case of conflict of definitions, except for the portions quoted from standards, the following precedence shall be observed: (1) Clause 3, (2) Annex K, and (3) *The IEEE Standards Dictionary: Glossary of Terms & Definitions.*

For clarity, portions of IEEE Std 1641 [B29] have been duplicated within this document. In the event of revision to IEEE Std 1641, the current, approved version of the revised standard shall take precedence.

1.5.2 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.

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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). The latest edition of the referenced document (including any amendments, corrigenda, and/or working group drafts) applies unless the specific year of publication or edition is referenced.

Extensible Markup Language (XML) 1.0, (Fifth Edition). W3C Proposed Edited Recommendation, 5 Feb. 2008.[4]

[4] This document is available from the World Wide Web Consortium (W3C®) (http://www.w3.org/xml).

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