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Software Interface for Maintenance Information Collection and Analysis (SIMICA)

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SOFTWARE INTERFACE FOR MAINTENANCE INFORMATION COLLECTION AND ANALYSIS (SIMICA)

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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 19 March 2009

IEEE-SA Standards Board

Approved as a Full-Use Standard 5 December 2013

IEEE-SA Standards Board

Abstract: This document provides 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 will support service definitions for creating application programming interfaces (API) for the access, exchange, and analysis of historical diagnostic and maintenance information. This will address the pervasive need of organizations to assess the effectiveness of diagnostics for complex systems throughout the product life cycle. The use of formal information models will facilitate exchanging historical maintenance information between information systems and analysis tools. The models will facilitate creating open system software architectures for maturing system diagnostics.

Keywords: AI-ESTATE, Automated Test Markup Language (ATML), diagnostic maturation, IEEE 1636™, Maintenance Action Information, maintenance data, Software Interface for Maintenance Information Collection and Analysis (SIMICA), Test Results and Session Information

IEEE Introduction

This introduction is not part of IEEE Std 1636-2009, IEEE Standard for Software Interface for Maintenance Information Collection and Analysis (SIMICA).

The requirement for a specification for access and exchange of diagnostic and maintenance product information has arisen due to a pervasive need for the organizations who deliver complex systems to monitor the effectiveness of their product health management solutions in their customers' application domains. Accordingly, The IEEE SCC20 Diagnostic and Maintenance Control (DMC) subcommittee has undertaken the task of developing a standard which fulfills this need. It is envisioned that SIMICA will fulfill this need for all such consumers of diagnostic and maintenance data.

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Software Interface for Maintenance Information Collection and Analysis (SIMICA)

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1. Overview

1.1 General

This Standard Software Interface for Maintenance Information Collection and Analysis (SIMICA) was developed by the Diagnostic and Maintenance Control Subcommittee of the IEEE Standards Coordinating Committee 20 on Test and Diagnosis for Electronic Systems (SCC20) to provide standard, unambiguous definitions of maintenance information semantics, interrelationships, and access services. This standard defines a formal conceptual information model to relate maintenance information across concrete information models. These models are related to the maturation of diagnostic systems and as such are directly related to IEEE Std 1232™[1]. However this standard, in conjunction with its component standards, can also be used independent of AI-ESTATE.

The goals of the 1636 family of standards are summarized here:

- Provide definitions of maintenance concepts and terminology relevant to the maturation of diagnostic systems.
- Provide a set of information models that will serve as a basis for unambiguous interpretation and communication of such data.

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

— Support the development of a software interface for moving such data between conforming applications.

This standard specifically describes a set of formal specifications consisting of the logical representation of the information that is used and generated during related diagnostic and maintenance processes. The information model contained in this document provides a standard model of the top-level information concepts that support these processes. Other components of this family of standards will further develop conceptual decompositions of key elements of these processes down to the elemental data level, where specific software interfaces can be represented. The relationship of these components to each other is shown in Figure 1. IEEE Std 1636.1™ defines an information model and XML schema for exchanging test result and session information. IEEE P1636.2™ defines an information model and XML schema for exchanging maintenance action information. Precise specification of the semantics of these data elements will provide the basis for services supporting the unambiguous exchange of information between producers and consumers of historical diagnosis and maintenance information in a platform-independent manner. SIMICA exhibits a close relationship to the IEEE Std 1232 through its direct use of Dynamic Context Model historical records of diagnostic sessions, which is also shown in Figure 1. The intent of this relationship is to relate diagnostic session information to associated maintenance actions for further analysis and maturation of diagnostic models and reasoner learning mechanisms.

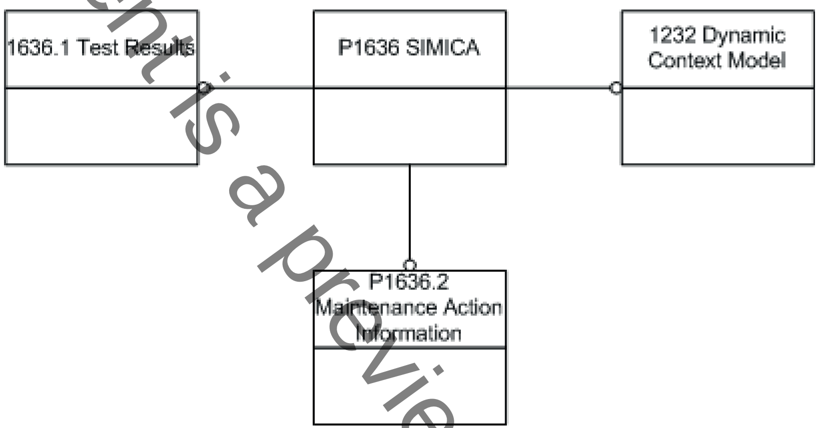

Figure 1—Relationship of SIMICA component EXPRESS schemata

This standard family provides a controlled extension mechanism of its software interface components to allow inclusion of relevant new maintenance information elements currently outside the scope of the SIMICA specification.

The SIMICA family of standards defines key information specification formats. Implementations that use only these specification formats will be portable. This does not preclude use of SIMICA interfaces with non-conformant specification formats; however, such implementations may not be portable.

Software specifications defined in the SIMICA family of standards will support the interchangeability of information between conformant applications. This will allow a large degree of flexibility in implementation of information application architectures that support information reuse and realize various maintenance information services (such as, but not limited to, client-server approaches, service oriented architectures, etc.).

1.2 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 will support service definitions for creating application programming interfaces (API) for the access, exchange, and analysis of historical diagnostic and maintenance information. The standard will use the information models of IEEE Std 1232 as a foundation.

1.3 Purpose

The purpose of this standard is to specify a software interface for access, exchange, and analysis of product diagnostic and maintenance information. This will address the pervasive need of organizations to assess the effectiveness of diagnostics for complex systems throughout the product life cycle. The use of formal information models will facilitate exchanging historical maintenance information between information systems and analysis tools. The models will facilitate creating open system software architectures for maturing system diagnostics.

1.4 Application

This standard should be applied in the development of software applications that access or provide information relevant to the diagnosis and maintenance of systems. In the event of conflict between this standard and a component standard in the IEEE 1636 family, the component standard shall take precedence. In the event of conflict between this standard and a related standard such as IEEE Std 1232, the standard as it applies to the information being produced shall take precedence. In the event of any conflict between model comments and lexical definitions, lexical definitions shall take precedence.

1.5 Conventions used in this document

Clause 5 presents entity and concept definitions using the EXPRESS language as defined in ISO 10303-11:1994 and uses the following conventions in their presentation:

All specifications in the EXPRESS language are given in the `Courier` type font when model elements are represented outside the scope of the model.

This standard uses the vocabulary and definitions of relevant IEEE standards. In case of conflict of definitions, the following precedence shall be observed: 1) Clause 3, Definitions; 2) *The Authoritative Dictionary of IEEE Standards Terms* [B1][2] with preference given to versions of those definitions that are attributed to SCC20 standards.

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

IEEE Std 1232™, IEEE Standard for Artificial Intelligence Exchange and Service Tie to All Test Environments (AI-ESTATE). [3, 4]

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).

IEEE P1636.2™/D3.0 (August 2008), Draft Trial-Use Standard for Software Interface for Maintenance Information Collection and Analysis (SIMICA): Exchanging Maintenance Action Information (MAI) via the eXtensible Markup Language (XML).[5]

ISO 10303-11:1994. Industrial automation systems and integration—Product data representation and Exchange—Part 11: Description methods: The EXPRESS language reference manual, Geneva, Switzerland: International Organization for Standardization.[6]

3. Definitions

For the purposes of this standard, the following terms and definitions apply. *The Authoritative Dictionary of IEEE Standards Terms* [B1] should be referenced for terms not defined in this clause. This clause defines terms used in the SIMICA set of standards. A clear understanding of the following terms with respect to testability and diagnosability is particularly important in order to understand this standard.

3.1 architectural device: In the context of software systems, a means that facilitates the arrangement of software components or model elements to accomplish a specific purpose.

3.2 conceptual information model: An information model that is independent of any particular instantiation form, i.e., is never intended to be realized.

3.3 concrete information model: An information model that is specialized to take account of a particular instantiation method or data exchange format.

3.4 diagnostic maturation: The process of monitoring diagnostic system predicted vs. actual performance to identify and implement corrective action. 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 even product design improvements.

3.5 information model: A formal description of types of ideas, facts, and processes that together form a model of a portion of interest of the real world and which provides an explicit set of interpretation rules.

3.6 level of indenture: A hierarchical partition in a physical or functional system decomposition.

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