



IEC/TC or SC TC93	Secretariat USA	Date 2006-05
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Title of TC
Design Automation

A. Background

The automation of design and manufacturing techniques has been evolving world-wide for over a quarter of a century. This evolution has taken place at the systems level, and for the electrotechnical industries, at the box, board, and component level. Since the inception of TC93, in 1992, a concentrated effort has been made to bring order and standardization to this rapidly changing area of technology.

EDA standards are used in creating and representing designs. The design process yields volumes of data. The data describe product requirements; product specifications; simulation models; synthesis models; foundry interchange files; ASIC, MCM, and PCB layouts; and mechanical design descriptions. The EDA data are placed in libraries. Mechanical, electrical and model data libraries are created. The EDA data are used in the manufacturing process, for test and for product redesign and upgrade. Standards make reuse of this data viable.

In recent years, the issue of data transfer between design and manufacturing has become a major concern. The Internet is being used where design customers send an initial design description using standardized data transfer formats intended for fabrication, assembly, and testing methodologies. Design customers are requesting that as members of the supply chain produce the electronic assemblies, they provide data that can be returned so it can be archived. This archival data represents the product as-built and will be used for the next design implementation.

A.1 Scope:

Standardization to enable the integration and automation of electrotechnical product design, engineering, manufacturing, and logistics support processes, and to facilitate procedures for product operation and maintenance. This standardization should also support the integrated system design of electrotechnical products which encompasses the electrical, electronic, electromechanical and embedded software performance aspects.

Such standardization involves computer-sensible representations of electrotechnical hardware and embedded and control software for use in computer-aided and auxiliary activities that may directly impact these processes. Representative activities include but are not limited to:

- preparing data element descriptions of electrotechnical products,
- preparing information models or such products,
- preparing design, engineering, manufacturing and logistics support process application protocols,
- identifying hardware and software requirements to support the use and validation of the application protocols,
- developing methods and enabling technologies for TC 93 and other IEC Technical Committees.

This work shall be carried out in collaboration with ISO/TC 184/SC 4 and other relevant technical

committees in IEC and ISO.

A.2 Structure of Working Groups

TC93 consists of 6 Working Groups and 1 Joint Working Group as listed below.

WG1: Electronical data harmonization (Approaches, methodologies and technologies)

WG2: Component, circuit and system description languages

WG3: Product Data Exchange (PDX) characteristics and methodology

WG5: Test, validation, conformance and qualification technologies

WG6: Library of reusable parts for electrotechnical products

WG7: Testing of electrotechnical products

JWG11: Product description standard for printed board, printed board assembly, and testing in XML schema (TC91/TC93)

A.3 Liaison

Exists with relevant IEC/ISO TCs and SCs, and also with industrial bodies as listed below.

IEC TCs: SC3, SC23J, SC28A, TC40, TC47, TC48, TC49, TC51, TC91, and TC104

JPCA, JEITA, JEDEC, IEEE

Liaison A: ISO/TC44/SC12

Liaison D: IPC (USA)

A.4 List of P-members

The following lists the P-members of TC93

China, Czech Republic, Finland, Japan, Russian Federation, Spain, United Kingdom, United States of America

B. Environment
B.1 Business environment When looked at from the viewpoint of the tool makers of CAE, CAD, CAM -- CAX equipment for the electrotechnical industry, a market for both equipment and software of over 3 billion dollars exists.
B.2 Market demand Given the increase in competitiveness forced upon all manufacturers operating in the world-wide marketplace, this market is increasing in complexity and needs appropriate international standards.
B.3 Trends in technology and trade Harmonization of standardization activities within IEC and ISO committees is recognized to be a necessary goal; thus the work of TC93 builds on the spirit of cooperation in necessary standardization for the electrotechnical industry. In keeping with the harmonization goals, TC93 will explore all formats intended to meet the mission of improved global data communication.
B.4 Ecological environment Design Automation standards have become very important in order to track the ecological impact of restricted substances and materials used in products that can create a negative condition on the environment. Processes and methods are being developed to help automate the ICT required for recycling.

C. Work programme
C.1 Current work The work of TC93 has been organized to reflect the widespread need for engineering and manufacturing processes and information integration throughout the development cycle. This vision is intended to foster an international EDA standards environment that supports the creation and maintenance of data representing all phases of design, fabrication, assembly and test (electronic and visual), for electrical and electronic products, including mechanical and software design data. The official work programme is shown on the website. http://www.iec.ch/

C.2 Resources/infrastructure needed

The IEC/TC93 activity is primarily focusing on the part of design automation dedicated to "low current" electronic equipment (ICs, boards, equipment) even if some of the results may be applicable to other domains. There is no intent to deal with electric applications such as power plants, smart buildings, high current electromechanical devices, etc. At present there are seven working groups that address various aspects of design automation standards. The working groups cover a portion of TC93 responsibilities. The titles and function of each working group are defined as:

WG 1 - Electrotechnical Standards Interoperability

Established by approval of NWIP 93(USA)1

Addresses approaches, methodologies and technologies

Project 93.3.1: Interoperability model for electrotechnical design and manufacture

Design automation reference model standard - Core Model of the Electronics Domain

Scope: The "Validation of Proposed Standards Interoperability" Working Group 1 (WG1) has the general role of defining methodologies and guidelines for determining the interoperability between proposed new standards that lie within the context of IEC TC93 and existing standards. The goal is to provide the mechanisms necessary to ensure that IEC TC93 standards can coexist in a mutually supportive way to improve the productivity of industry.

WG 2 - Component, Circuit and System Description Languages

Established by approval of NWIP 93(Secretariat)6

Project 93.2.1: Electronics Hardware Description Languages

ASIC Library Representation

Scope: Applying harmonization criteria in accordance to IEC policies, IEC TC93/WG2 performs reviews of draft standards or sets of related draft standards which are recommended in methodologies based on hardware description languages (HDLs), for the design of circuits, the specification of electrical or hardware independent component parts, or the design of systems containing hardware. The work on projects approved by the TC in the domains specified above, and recommendations for additional work on existing drafts or recommendations to allied standards groups such as the IEEE and JEITA for development of new standards in areas belonging to those domains, but not covered by existing IEC or candidate standards, fall also under the scope of WG2.

WG 3 - Product Data Exchange (PDX) characteristics and methodology

Established by approval of the plenary meeting held in 2003 (93/RM/200)

Scope: To develop IEC Standards based on an XML encoding scheme that enables a total product definition to be described at a level appropriate to facilitate supply chain interactions. These standards are designed to transfer technical information including bill of materials (BOM), approved manufacturer list (AML), as-built product configuration, and change (Engineering, Manufacturing, Product) information. Since material declaration for BOM items has become so critical the working group will identify the characteristics for automated techniques used in reporting or data storage required to reflect due diligence in maintaining restricted substance control. This effort requires close coordination with TC111.

WG 5 - Test, Validation, Conformance and Qualification for Standards

Determine TC 93 support requirements for TVCQ

Propose guidelines to ensure testability of TC 93 standards

Scope: The "Test Validation, Conformance and Qualification for Standards" Working Group 5 (WG5) has the general role of defining methodologies and/or guidelines for the conformance and certification testing of any product which implements a TC93 standard. The goal is to get consensus among the member countries as to the acceptable procedures to be used for

conformance and certification testing of products. In addition WG5 will define procedures to verify that standards submitted to TC93 are "testable". Testable in this sense refers to conformance testing of applications which implement the specification. The goal is to provide guidelines for quality assurance with regard to testability and/or test plan requirements for all proposed TC93 standards.

WG 6 - Library of reusable parts for Electrotechnical Products

Scope: To define methods and architecture of the standards for the abstract definition of the commercially available parts and components in libraries for design, engineering, manufacturing and logistic support activities. To define the EDA modeling (semantics of the contents) standard for the specific components (IBIS model, EMC extension). To facilitate the interoperability of the semantic of the component information, TC93/WG6 efforts on this contents definition should be coordinated with other groups, notably TC91, SC3D, IPC.

WG 7 - Testing of Electrotechnical Products

Scope: To provide the management and technical development, expansion and improvement of IEC TC93 system test and other directly related standards under its control. WG7 will operate for the following purposes:

- To provide for the review of system test standards brought before TC93.
- To make recommendations to TC93 on actions concerning standards in the purview of WG7.
- To serve as a forum for development, revision, and improvement of standards related to system test and diagnosis and associated interfaces to test systems.
- To serve as a forum for discussion and development of roadmaps in the area of system test.
- To develop IEC technical reports covering issues related to system test standards.

JWG 11- Product description standard for printed board, printed board assembly, and testing in XML schema (TC91/TC93)

Established by approval of a proposal by IEC TC 52 Recognizes work by TC 52 WG 9: Printed Board Electronic Data Description and Transfer formed in 1987. Moved to TC91: 2000. Parent committee TC93: 2001

Scope: Joint Working Group 11 is responsible for digital descriptions of completely designed printed boards and printed board assemblies with emphasis on the manufacturing requirements of the final product. The IEC document structure for the work items are identified as IEC Publication Series 61182. The first document in the series is IEC 61182-1, "Printed Board Description in Digital Form". IEC 61182-7, "Bare Board Electrical Test Description" is also published. Maintenance of these documents continues. There are a total of ten (10) work items in the 61182 series. Included are digital description of Assemblies, Automatic Test Records, Printed Board Drawings, Electrical Description and Parts Lists, and a Guide for using the Digital Descriptions. IEC 61182-10 "Electronic Data Hierarchy" combines the comprehensive design relationship.

Work started on XML schema for new manufacturing format (Offspring).

A close liaison must be maintained with TC91 Electronics Assembly Technology. This technical committee has the responsibility for design and performance standards that are used to provide the printed board, printed board assembly, and testing procedures used to manufacture electronics assembly technology products. TC93 shares a joint committee with TC91(JWG11). In the future, other liaisons with IEEE (under dual logo procedure) are in the process of being established.

C.3 Safety aspects (only for committees which do not have a reference to safety in their scope)

D. Future work

D.1 TC93 Policy

Oversight of EDA standards efforts:

IEC TC93 should take a leadership role to develop a widely accepted plan to cooperate in the "assignment" of work tasks on both national and international levels, ensure effective interoperability among and between standards and encourage innovative standards efforts.

Consolidation of parallel emerging design automation standards efforts:

If there is a proposed NP that significantly overlaps the goals, scope and requirements covered by an existing international standard or one already in development within the IEC (where both are within the purview of TC93), then the NP must be modified to include an interoperation plan, or a new NP must be created only requiring the definition of interoperating capabilities, or the proposed new work must be consolidated with existing standards or work. This action may require an NP.

For any non-overlapping proposed standard an, NP must be submitted.

Definitions for consolidation of parallel emerging design automation standards efforts:

Proposed new standard:

One that may or may not have a large industrial following and usage, and is not an update or revision of an existing standard.

Existing standard:

One that already is an international standard or one that already has an approved NP for which work is underway

Proposed overlapping standard:

A proposed standard that has at least a subset which functionally satisfies a descriptive capability of an existing standard. The significance of the overlap and the pervasiveness of the proposed standard's use will help to determine the action to be taken by IEC TC93 with respect to the standardization process and the interoperability definition effort.

Consolidation of standards:

When a determination has been made that a proposed standard has a significant overlap with an existing standard, and/or a proposed overlapping standard adds significant capability to an existing standard, and the proposed overlapping standard is not in wide use; then a consolidation process is desirable. Consolidation implies either integration or inclusion in an existing document set.

D.2 Role of TC93

A major role of the IEC TC93 is to enhance the activities of national standards making bodies by providing a coordinating balance between competing proposed standards, by discouraging multiple versions of the same standard, and by facilitation of harmonization among overlapping standards. The role is not to usurp, but rather to promote, the technical expertise of the individual standards making bodies within various nations (e.g. IEEE, EIA, IPC, CENELEC, JEITA). The strengthening of the individual standards making bodies is accomplished through the activities of the national committees and international projects within TC93 working groups. Such a stabilizing force is desperately needed in the international standards making and using community. Only by the creation of a world-wide focal point for EDA standards can the world benefit from the complex standards environment.

There are several work areas that fall in the domain of the TC93 responsibility. The scope of work is organized into six areas of concentration in order to provide technical focus to the TC93. Work areas (WA) are:

WA1 - Enabling Technologies

WA2 - Product Data Exchange

WA3 - Process Interactions

WA4 - Integration Infrastructure

WA5 - Component Information Libraries

WA6 - Educational Materials

Each Work Area will have multiple activities and will be assigned to various existing or new working groups of TC93. Indications of organizations known to be performing work related to an activity are noted in square brackets [].

In each of the work areas special attention will be given to collaboration with ISO TC184. TC93 activities will review existing methodologies developed by TC184 to determine their applicability to TC93 work. The two committees will work together to plan and coordinate the work where there is commonality of interest. A Management Committee has been formed to address complex issues that cross boundaries of WA's, TC93 working groups, or other organizations.

D.3 Definition of TC93 Work Areas

WA1 - ENABLING TECHNOLOGIES

Scope: To make available methods and tools for integration purposes for use by TC93 and other IEC committees including guidelines for their use. To establish a process for interaction with ISO TC184 activities, including the identification of areas where technical compatibility is required. To establish procedures for managing the interactions with TC184. To assess applicable TC184 methods for use within TC93, and to recommend improvements to those methods as necessary. To integrate and provide quality assurance for the work performed in TC93. Relevant External Projects:

- Standard Object Modeling Language (UML)
- Modeling Practices [TC184/SC4, CENELEC TC217/WG1]
- Modeling Support Tools [TC184/SC4]
- Model Integration Technologies [TC184/SC4]
- Electronics/Software Model Interoperability [TC184/SC4/WG3/T16]
- Conformance Testing Methods [TC184/SC4]
- Model Validation Methods [TC184/SC4]
- Quality Review and Assessment Methods [TC184/SC4/WG4]

Liaisons:

ISO TC184/SC4

ISO TC184/SC4/WG10 Architecture

ISO TC184/SC4/WG3/T16 Software Products

IEC TC3-ISO TC184/SC4 (JWG9)

ISO/IEC JTC1/SC7/WG11 (software engineering data descriptions)

ISO/IEC JTC1/SC21/WG3 (IRDS;CSMF)

IEC TC91

Addressed by TC93: WG1, WG2, WG3, WG5, WG7, JWG11

WA2 - PRODUCT DATA EXCHANGE

Scope: To consolidate, integrate and, if necessary standardize electrotechnical description models, working through close liaisons to other relevant IEC TCs and other standards activities. To provide WA1 with the necessary information on electrotechnical requirements for integration into the unified electrotechnical abstract model. To develop and standardize specialized exchange formats that may be needed for electrotechnical design, engineering, manufacturing, and logistics support activities and tools.

Relevant External Projects:

- Product Description [VHDL,IGES]
- Product Representation Interchange Format [EDIF, IEC 61182-1]
- Product As Manufactured (IPC-2510 series, IEC/PAS 62119)
- Shop Floor Communication (IPC-2540 CAMX)

- Supply Chain Communication (IPC-2570 PDX)
- Application Specific Data (IPC-2581)
- Product Representation Access Method [SI2 - DDR]
- Validation/Testing [WAVES]
- Electrotechnical-unique requirements for ISO 10303 (STEP)

Liaisons:

IEC TC3 - ISO TC184/SC4 JWG(9)

IEC TC91

IEC SC3D

CENELEC TC217/WG2,

TC217/WG3

IEEE, EIA, IPC

Addressed by TC93: WG2, WG3, WG7, JWG11

WA3 - PROCESS INTERACTIONS

Scope: To describe and represent electrotechnical design, engineering, manufacturing and logistics support processes, including constraints and process interactions. To develop methods to achieve process integration for electrotechnical design, engineering, manufacturing and logistics support activities.

Relevant External Projects:

- Standard simulator package interfaces (simulation backplane) [VHDL,SI2]
- Process constraints on and interactions with standard tool interface packages [SI2-PI, TC184/SC4-SDAI]
- Process simulation and design rules [SI2-TCAD]

Liaisons:

ISO TC184/SC5

ISO TC184/SC4

CENELEC TC217/WG3, TC217/WG4

IEEE

Addressed by TC93: WG2, WG3, WG7 (others may be identified)

WA4 - INTEGRATION INFRASTRUCTURES

Scope: To define standard integration frameworks for design, engineering, manufacturing, and logistics support environments. These will facilitate the efficient and effective development and support of electrotechnical products. To specify system and user interfaces for workstations within automated electrotechnical design support infrastructure.

Relevant External Projects:

- Workstation operating environment control layer standards (above the native operating system)
- Activities coordinated with SI2 work other than CIR & DDR
- SEMATECH CIM Framework project.
- IPC Frameworks standards, IPC-2500
- IPC Manufacturing Execution Systems (MES), IPC-2550

Liaisons:

ECMA TC33 (PCTE)

ISO/IEC JTC1/SC21/WG3 (IRDS)

TC184/SC5/WG1

CENELEC TC217/WG4

SI2

IPC

Addressed by TC93: WG1, WG5, JWG11

WA5 - COMPONENT INFORMATION LIBRARIES

Scope: To define methods for the abstract definition for electrotechnical parts and components in libraries for design, engineering, manufacturing and logistics support activities. To develop library architectures and interface specifications for the use and maintenance of electrotechnical part and component libraries.

Relevant External Projects:

- Library development and integration techniques
- Component Model Standards [PDES Inc., EIA Design Automation Division, VHDL]
- Electrotechnical components data book [SI2-CIR]
- Existing library solutions
- NIST ECCI (Electronic Commerce of Component Information) (USA)
- E-CALS (Electronic Equipment and Components Industry CALS) (Japan)
- CIREP/CECC (France)
- EIA IBIS input/output buffer standards
- IPC Land Pattern description IPC-7351, IEC 61188-5-1 through -8

Liaisons:

ISO TC184/SC4/WG2 (PLIB)

IEC SC3D, IEC TC91

CECC WG-CAD

CENELEC TC217/WG2

IEEE

SI2

EIA

IPC

Addressed by TC93: WG6, JWG11

WA6 - AWARENESS AND EDUCATION

Scope: To develop guidelines and or specifications that describe how to apply the principles evolved in the foregoing areas so that experts in other TCs can expeditiously use the results of TC93 areas of work.

Potential Projects:

- Develop a set of self training aids to describe modeling processes, procedures and description.
- Establish a video program series as a mechanism for discussion groups to engage in interactive review of the principles of modeling and system integration.

Liaisons:

All applicable IEC TCs

ISO TC184/SC4

IEEE

EIA

SI2

Addressed by TC93: WG1, WG2, WG3, WG5, WG7, JWG11

DEFINITIONS AND ACRONYMS

CECC

CENELEC

EDIF Electronic Design Information Format

EIA Electronic Industries Association

JEITA Japan Electronics and Information Technology Industries Association

IEEE Institute of Electrical and Electronics Engineers

IPC Association Connecting Electronics Industries
 IRDS Information Resource Dictionary System
 PCTE Portable Common Tool Environment
 SI2 Silicon Integration Initiative
 VHDL Very High Speed Integrated Circuit Hardware Description Language

E. Maintenance cycle				
Publication no.	Date of publication	Review date	Maintenance result date	Responsibility (Maintenance Team)
IEC 61182-1	1994-09	2006-12	2008-12	JWG11
IEC 61182-7	1995-09	2006-12	2008-12	JWG11
IEC 61182-10	1999-12	2006-12	2008-12	JWG11
IEC 61523-1	2001-09	2004-09	2007	WG 2
IEC 61523-2	2002-05	2007	2010	WG2
IEC 61523-3	2004-09	2008	2009	WG2
IEC 61690-1	2000-01	2007-01	2010	WG 3
IEC 61690-2	2000-01	2007	2010	WG 3
IEC 61691-1-1	2004-10	2006	2007	WG2
IEC 61691-2	2001-06	2007	2010	WG 2
IEC 61691-3-2	2001-06	2007	2010	WG 2
IEC 61691-3-3	2001-06	2007	2010	WG 2
IEC 61691-4	2004-10	2005	2008	WG2
IEC 61691-5	2004-10	2006	2007	WG2
IEC/TR 61908	2004-11	2006	2007	WG5
IEC 61926-1	1999-10	2002-10	2004-10	WG 7
IEC 61926-1-1	1999-10	2008	2010	WG2
IEC 62014-1	2001-05	2004-04	2010	WG 6
IEC 62016	2003-12	2011	2012	WG 1
IEC/TR 62017-1	2001-04	2007	2010	WG 1/WG5
IEC/TR 62017-2	2001-02	2007	2010	WG 1/WG5
IEC/TR 62248	2002-12	2007	2010	WG6
IEC 62050	2005-07	2007	2009	WG2
IEC 62142	2005-06	2007-10	2010	WG2
IEC 62243	2005-07	2008	2011	WG7
IEC 62265	2005-07	2008	2011	WG2

Name or signature of the secretary

