



IEEE Recommended Practice for CASE Tool Interconnection—Characterization of Interconnections

IEEE Computer Society

Sponsored by the
Software and Systems Engineering Standards Committee

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IEEE Recommended Practice for CASE Tool Interconnection—Characterization of Interconnections

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Abstract: Interconnections that need to be understood and evaluated when buying, building, testing, or using Computer-Aided Software Engineering (CASE) tools are described in this recommended practice. This recommended practice is intended to help people interconnect tools by identifying and characterizing various contexts for tool interconnection. Each context serves to define a group of interconnections pertinent to various functional perspectives. Each group contains interconnections that have a common kind of endpoint in the environment. This recommended practice considers four contexts: an organizational context for a tool, the individual user context for a tool, the platform context for a tool, and a peer context for a tool. Within a context, subsets of interconnections are characterized by a collection of common features applicable to a given functional perspective. The purpose of this recommended practice is to establish sets of interconnection features with which each perspective on a CASE tool's interconnections can be characterized.

Keywords: Computer-Aided Software Engineering (CASE) tools, tool communications, tool interconnections

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Introduction

This introduction is not part of IEEE Std 1175.2-2006, IEEE Recommended Practice for CASE Tool Interconnection—Characterization of Interconnections.

The 1175™ family of standards

NOTE—References to “P1175.X” in this recommended practice refer to members of the 1175 family of standards that were not yet approved at the time that this recommended practice was published.

This recommended practice is a member of the 1175 family of IEEE standards. The members of this family include the following:

Standard number	Title
IEEE Std 1175.1™-2002 * † ‡	IEEE Guide for CASE Tool Interconnections—Classification and Description
IEEE Std 1175.2™-2006	IEEE Recommended Practice for CASE Tool Interconnection—Characterization of Interconnections
IEEE Std 1175.3™-2004	IEEE Standard for CASE Tool Interconnections—Reference Model for Specifying Software Behavior
IEEE P1175.4 ‡	Draft Standard for CASE Tool Interconnections—Reference Model for Specifying System Behavior
IEEE P1175.5 ‡	Draft Standard for CASE Tool Interconnections—Syntax for Transferring Behavior Specifications

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This family of standards replaces IEEE Std 1175™-1991.^a IEEE Std 1175-1991 was advanced to a full-use standard in 1994. It covered a number of closely related subjects, and the scope of material contained was able to serve a number of divergent interests.

This family of standards restructures and substantially augments the material in IEEE Std 1175-1991. It has been divided into several individually useful documents in order to facilitate its use by different communities of interest. These guides, recommended practices, and standards generally address issues involved in characterizing the kinds of interconnections that exist between a computing system tool and its

^a Although approved in 1991, IEEE Std 1175-1991 was actually published in 1992, and is sometimes found referenced as IEEE Std 1175-1992. It appears in the standards listing on the IEEE Xplore Web site (<http://ieeexplore.ieee.org/>) as “IEEE Std 1175, 17 Aug. 1992,” with the title “IEEE trial-use standard reference model for computing system tool interconnections.” In 1994, the term “trial-use” was removed from the title when the standard was approved for full-use status. The 1994 version, which was identical to the 1992 publication except for the title and minor editorial corrections, is not available on the IEEE Web site.

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environment. Although particularly intended to address the implementation and use of computer-aided software engineering (CASE) tools, the discussion of interconnections in this family actually has wider applicability to computing system tools in general, beyond only CASE tools.

Four kinds of interconnections with a computing system tool are addressed: interconnections with organizations, users, platforms, and other computing system tools. Consideration of interconnections is important to understanding, selecting, implementing, and using computing system tools. Also, although many computing system tools do not need to communicate behavior descriptions of subject systems, their creators need to develop such behavior descriptions for the tools themselves.

A brief summary overview of each of the members of this family of standards is given in the following paragraphs. A more complete overview is available in IEEE Std 1175.1-2002, which provides an integrated overview of the members of the 1175 family of standards, and it describes the fundamental concepts that provide a basis for organizing the material.

IEEE Std 1175.1-2002, IEEE Guide for CASE Tool Interconnections— Classification and Description

IEEE Std 1175.1-2002 is a guide to the IEEE 1175 family of standards. It describes how these standards are intended to be used to accomplish the effective integration of computing system tools into a productive engineering environment and sets forth the fundamental concepts on which these standards are based. These concepts establish the integrating framework for the other members of this family of standards. IEEE Std 1175.1-2002 describes the scope of application of each member standard, the various issues addressed in each standard, and the interrelationships among the members of the 1175 family of standards.

IEEE Std 1175.2-2006, IEEE Recommended Practice for CASE Tool Interconnection—Characterization of Interconnections

This recommended practice presents four contexts for a computing system tool's interconnections that offer insight into the operational problems of interconnecting computing system tools with their environment. This recommended practice establishes recommended collections of standard contextual attributes describing relationships between a computing system tool and its organizational deployment, its human user, its executable platform, and its peer tools, as illustrated in Figure a. These contextual attributes are of the "news-story" form that includes: who, what, when, where, and why. The values of these contextual attributes are references to organizational, industrial, and professional standards. By assisting users to reach a clear understanding of the context of operation for a computing system tool, this recommended practice contributes to the effective implementation and application of computing system tools.

IEEE Std 1175.3-2004, IEEE Standard for CASE Tool Interconnections— Reference Model for Specifying Software Behavior

IEEE Std 1175.3-2004 is an expansion of Part 3 of IEEE Std 1175-1991. It focuses specifically on a common set of modeling concepts found in commercial CASE tools for describing the operational behavior of a software product, and it provides a formal, logical model for describing this behavior. IEEE Std 1175.3-2004 also defines a Semantic Transfer Language (STL) for communicating software behavior descriptions from one tool to another. A notable feature of the STL is its design for human readability, which makes STL text files suitable for use in software design reviews by users unfamiliar with computing system tool diagramming notations. In addition, the design of the STL syntax readily permits analysts to prepare and edit STL descriptions using a text editor or word processor.

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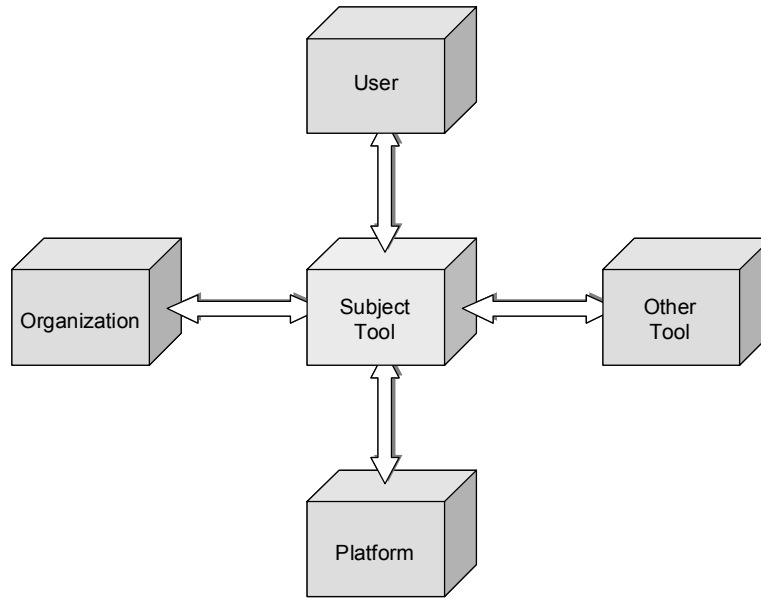


Figure a

To permit backward compatibility with Part 3 of IEEE Std 1175-1991, IEEE Std 1175.3-2004 makes no changes to the STL syntax or to the rules for conformance to this syntax as originally defined in Part 3 of IEEE Std 1175-1991. However, some aspects of the 1991 syntax that were previously left as user-defined have now been specified in order to increase the consistency and reliability with which the STL may be used for exchanging software specification information. In addition, improvements have been made in how the STL syntax is defined and explained. Finally, the STL Interconnection Profile has been replaced with more straightforward, “user-friendly” tabular and comma-separated-value formats to define a Tool Interconnection Profile that can serve the same purpose as the original form of the profile.

IEEE P1175.4, Draft Standard for CASE Tool Interconnections—Reference Model for Specifying System Behavior

IEEE P1175.4 encompasses the description of other computing systems supported by IEEE Std 1175.3-2004, but it goes further, providing a basis for representing a wider variety of computing systems. Specifically, IEEE P1175.4 provides the necessary semantic elements for describing general hardware/software systems, including hardware-only, software-only, or mixed system components, and it allows these different types of components to be treated in a consistent manner.

IEEE P1175.5, Draft Standard for CASE Tool Interconnections—Syntax for Transferring Behavior Specifications

IEEE P1175.5 provides a structured syntax and a specific set of data elements that can be exchanged as a text stream or text file with users or other tools. This syntax permits describing a system’s operational behavior as an instance of the reference metamodel in IEEE P1175.4. Figure b illustrates the relationship between the IEEE P1175.4 metamodel and the IEEE P1175.5 XML syntax in the context of the Tool–Tool exchange of a computing system description. IEEE P1175.5 also provides a logically equivalent human-readable syntax.

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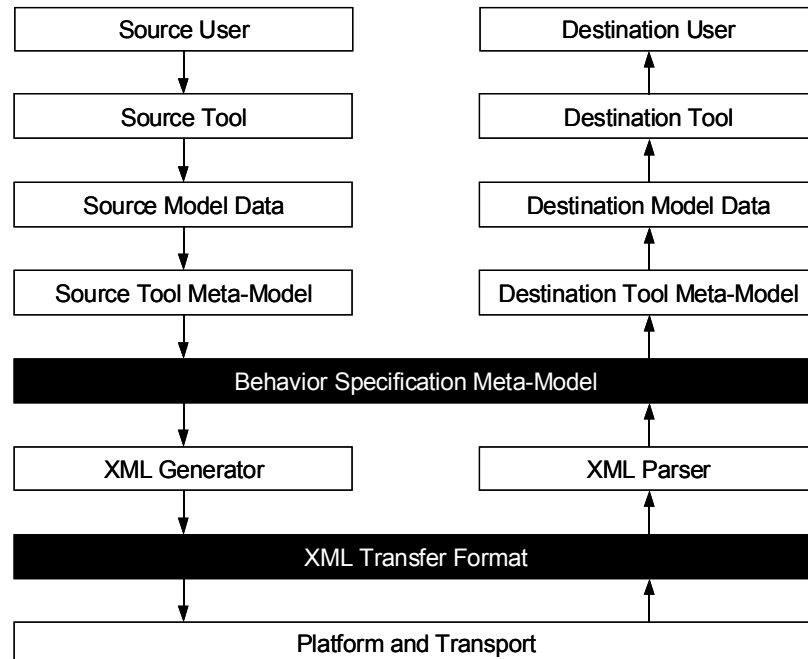


Figure b

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IEEE Recommended Practice for CASE Tool Interconnection—Characterization of Interconnections

1. Overview

1.1 Scope

This recommended practice presents four contexts for a computing system tool's interconnections that offer insight into the operational problems of interconnecting computing system tools with their environment. This recommended practice establishes recommended collections of standard contextual attributes describing relationships between a computing system tool and its organizational deployment, its human user, its executable platform, and its peer tools. The values of these contextual attributes are references to organizational, industrial, and professional standards.

This recommended practice describes interconnections that need to be understood and evaluated when buying, building, testing, or using Computer-Aided Software Engineering (CASE) tools. CASE tools are developed for use in creating computing systems. By assisting users to reach a clear understanding of the context of operation for a computing system tool, this recommended practice contributes to the effective implementation and application of computing system tools.

This recommended practice does not describe the processes of evaluating, acquiring, or adopting CASE tools. This recommended practice is limited to the technical aspects of CASE tools. It does not include issues in the management, marketing, or training domains.

1.2 Interconnections

In this family of standards, the word *interconnection* has an abstract connotation—it includes all ways in which a CASE tool's successful operation depends on its environment.¹ Thus, an interconnection is an association between a CASE tool and something in the environment. This association affects both endpoints of the association, though not necessarily in the same way. There are the following two categories of interconnections:

¹ IEEE Std 1175.1-2002 [B12] provides an introduction to the IEEE 1175 family of standards.

- a) A *passive* interconnection is an interoperability agreement. It describes a common interpretation of one or more phenomena shared between the tool and something in the environment. A passive interconnection describes a semantic issue at the boundary between a CASE tool and its environment.
- b) An *active* interconnection is an interaction mechanism. It allows the action of one thing to cause a change or to stimulate an action in another thing. An active interconnection describes a physical interaction between the CASE tool and its environment.

NOTE—An example of a passive interconnection is a statement that Tool A executes on microprocessor M. The shared phenomenon is a CPU instruction set, and the interpretation is that the software executable has been compiled into instructions for the cited CPU. An example of an active interconnection is the invocation of a server-side function through the Common Gateway Interface (CGI) by an HTTP GET request over an Ethernet connection.²

Interconnections could be organized and described on the basis of their structural and operational characteristics, but a much more powerful and flexible approach is to segregate and characterize them based on purpose or significance in the system life cycle (see 4.3).

Within this recommended practice, CASE tool interconnections are partitioned into contexts and interconnection perspectives. Each context serves to define a group of interconnections pertinent to various functional perspectives. A group contains interconnections that have a common kind of endpoint in the environment. Within a group, subsets of interconnections are characterized by a collection of common features. Such subsets represent different perspectives in the interconnection group. Perspectives are associated with a viewpoint from which various persons regard CASE tools. Because perspectives are based on human needs and interests, they provide a more suitable organization of interconnection descriptions than would the basic structural or operational aspects of the interconnections themselves.

An interconnection feature is a property by which members of an interconnection perspective are characterized. This recommended practice recommends that interconnection features be characterized by reference to specific documentation. These documents may be project or organization documents, vendor documents, training material, books, articles published in the archival literature, professional or industry standards, or international standards. What is important is that feature characterizations are written down and are readily available as references to members of the organization.

1.3 Purpose

The purpose of this recommended practice is to establish sets of interconnection features with which each perspective on a CASE tool's interconnections can be characterized. Passive interconnections require nothing more than an interpretation agreement. Active interconnections require characterization of actual interactions between the tool and its context. Such characterization may include the possible sequences of interactions (protocol), the form of interaction contents (syntax), and the interpretation of interaction contents (semantics).

A unique feature of CASE tools is that the contents of their primary interactions with users and with other tools are descriptions of other computing systems. IEEE Std 1175.3TM-2004 [B13] and IEEE P1175.4³ focus specifically on the specification of computing system component behaviors. Those standards are semantic references for characterizing Tool–User interactions and Tool–Tool interactions at CASE tool interfaces.

Recognizing the importance of context for achieving meaningful information exchange, this recommended practice is intended to help people working to interconnect tools identify the context for tool

² Notes in text, tables, and figures of a standard are given for information only and do not contain requirements needed to implement this standard.

³ This IEEE standards project was not approved by the IEEE-SA Standards Board at the time this publication went to press. For information about obtaining a draft, contact the IEEE.

communications. Each context serves to define a group of interconnections pertinent to various perspectives. This recommended practice considers four contexts: Clause 4 identifies an organizational context for a tool; Clause 5 identifies the individual user context for a tool; Clause 6 identifies the platform context for tool use; and Clause 7 identifies a transfer context for a tool. Each context establishes one endpoint for the interconnections included in that group. Figure 1 illustrates these context relationships.

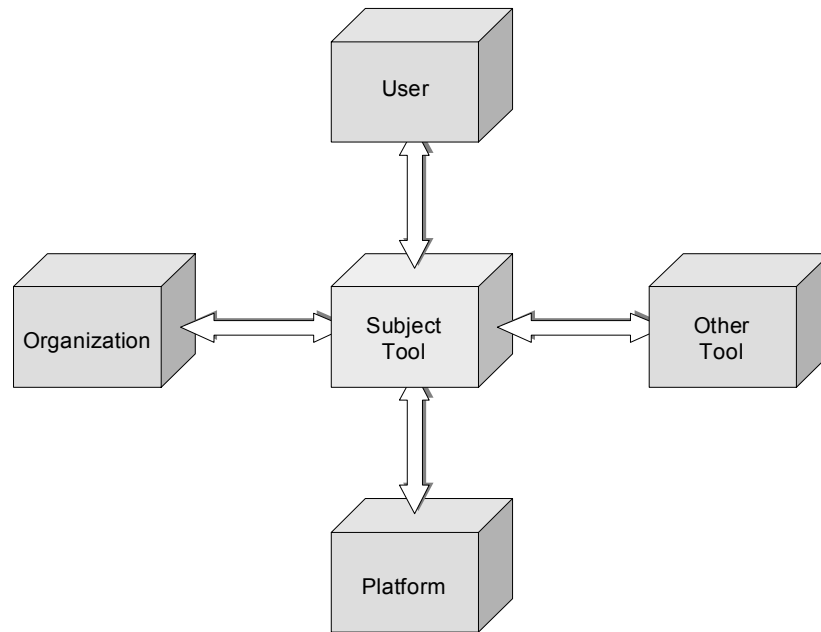


Figure 1—Context for tool usage and information exchange

When a tool is integrated into (or transferred into) an organization, some things usually change. Tool users may need to learn new methods or skills. Company policies or standards may need to be updated. Measurements of work products may need to be reconsidered. The changes that an organization makes to adopt a new tool often cost more than the tool itself. Knowing what changes an organization needs to make to use a tool should make integrating the tool easier. To help integrate tools into organizations, this standard provides recommended practices for characterizing **Tool–Organization interconnections** (see Clause 4).

When a tool is first learned by a new user, is re-learned after a period of not being used, or is used intensively over a period of time, the manner in which the tool interacts with the user becomes a critical factor for the ultimate success of the tool. Tools that are too difficult to learn or use will not survive over the long run, as users will either keep complaining until management replaces the tool (in an organizational setting) or will find ways to do their jobs without using the tool. To help the selection of tools that will work well, this standard provides recommended practices for characterizing **Tool–User interconnections** (see Clause 5).

When a tool is integrated into a hardware-software platform, it needs to operate with the components of the platform. The tool will need a physical context—the mechanisms that enable information transfer. The physical context or environment is provided by a platform. A platform consists of computer hardware (e.g., CPUs, disk drives, networks) and computer software (e.g., operating systems, database management systems, human interface systems). To help integrate tools into platforms, this standard provides recommended practices for characterizing **Tool–Platform interconnections** (see Clause 6).

When tools are integrated into a family of tools, they need to exchange information. There are many different methods or mechanisms for implementing information exchanges, processes for transferring information, and kinds of information to be transferred. To help tools exchange information, this standard provides recommended practices for characterizing **Tool–Tool interconnections** (see Clause 7).