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Software engineering — Software life cycle processes — Maintenance

Ingénierie du logiciel — Processus du cycle de vie du logiciel — Maintenance

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Foreword

ISO (the International Organization for Standardization) and IEC (the International Electrotechnical Commission) form the specialized system for worldwide standardization. National bodies that are members of ISO or IEC participate in the development of International Standards through technical committees established by the respective organization to deal with particular fields of technical activity. ISO and IEC technical committees collaborate in fields of mutual interest. Other international organizations, governmental and non-governmental, in liaison with ISO and IEC, also take part in the work.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO/IEC documents should be noted. This document was drafted in accordance with the rules given in the ISO/IEC Directives, Part 2 (see www.iso.org/directives or www.iec.ch/members_experts/refdocs).

IEEE Standards documents are developed within the IEEE Societies and the Standards Coordinating Committees of the IEEE Standards Association (IEEE-SA) Standards Board. The IEEE develops its standards through a consensus development process, approved by the American National Standards Institute, which brings together volunteers representing varied viewpoints and interests to achieve the final product. Volunteers are not necessarily members of the Institute and serve without compensation. While the IEEE administers the process and establishes rules to promote fairness in the consensus development process, the IEEE does not independently evaluate, test, or verify the accuracy of any of the information contained in its standards.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO and IEC shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document are in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents) or the IEC list of patent declarations received (see https://patents.iec.ch).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html. In the IEC, see www.iec.ch/understanding-standards.

ISO/IEC/IEEE 14764 was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 7, *Systems and software engineering*, in cooperation with the Systems and Software Engineering Standards Committee of the IEEE Computer Society, under the Partner Standards Development Organization cooperation agreement between ISO and IEEE.

This third edition cancels and replaces the second edition (ISO/IEC 14764:2006), which has been technically revised.

The main changes compared to the previous edition are as follows:

— alignment of the standard with ISO/IEC/IEEE 12207:2017 and updates to other ISO/IEC JTC1/SC7 standards;

— introduction of modern approaches to “maintenance”.

Any feedback or questions on this document should be directed to the user’s national standards body. A complete listing of these bodies can be found at www.iso.org/members.html and www.iec.ch/national-committees.

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Introduction

This document provides guidance on the software maintenance process. Maintenance is a technical process in the life cycle of a software product, as described in ISO/IEC/IEEE 12207. The maintenance process contains the activities and tasks of the maintenance organization. This document is the result of the harmonization of ISO/IEC 14764 and IEEE Std 1219, and the update for ISO/IEC/IEEE 12207:2017.

Because maintenance consumes a major share of a software life cycle financial resources, it should be an important project consideration.

During operation of the software, problems may be detected that were not detected during verification, validation and acceptance. Therefore, a maintenance effort is needed to cope with these problems. This maintenance effort also covers software improvements needed to meet new or modified user requirements. Software maintenance is commonly needed when upgrading system components, such as operating systems and databases, as well as when changes are made to external software and systems' interfaces. Software maintenance is typically a significant portion of life cycle costs, even when a part of the system under maintenance includes COTS software.

Software maintenance organizations uses a number of specific tools, methods, and techniques. This document does not specify how to implement or perform the activities and tasks in the software maintenance process since these are dependent upon the formal agreement and organizational requirements. Maintenance is required on all types of software, whatever the technology, technique, or tool used to create it.

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Software engineering — Software life cycle processes — Maintenance

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1 Scope

1.1 Overview

This document provides guidance for the maintenance of software, based on the maintenance process and its activities and tasks defined in ISO/IEC/IEEE 12207:2017, 6.4.13. Moreover, this document describes the maintenance process in greater detail and establishes definitions for the various types of maintenance. This includes maintenance for multiple software products with the same maintenance resources. "Maintenance" in this document means software maintenance unless otherwise stated.

The document does not address the operation of software and the operational functions, e.g. backup, recovery, system administration, which are normally performed by those who operate the software. However, it does include the related disposal process defined in ISO/IEC/IEEE 12207:2017, 6.4.14.

This document is written primarily for managers, maintenance organizations, quality managers, users and acquirers of systems containing software.

Many of the activities and tasks discussed in this document apply equally to maintenance services, as well as to maintained software products. For example, in a COTS intensive system, maintenance services are performed to sustain the product in operations.

While the scope of this document is software maintenance, hardware and hardware costs are important considerations for maintenance.

1.2 Purpose

This document provides guidance on the maintenance process. It identifies how the maintenance process can be invoked during acquisition and operation. This document also emphasizes the following in the maintenance process: the maintainability of software products; the need for maintenance service models; and the need for a maintenance strategy.

1.3 Field of application

This document is intended to provide guidance for the planning for and maintenance of software products or services, whether performed internally or externally to an organization. It is not intended to apply to the operation of the software.

This document is intended to provide guidance for two-party situations and can be equally applied where the two parties are from the same organization. This document is intended to also be used by a single party as self-imposed tasks (ISO/IEC/IEEE 12207).

This document is not intended for software products that are "throw-away" or a "short-term" solution.

This document is intended for self-imposition by organizations that develop off-the-shelf software products to maintain such products. Maintenance is applied to computer programs, code, data, documents, and records. It is intended to apply to software products created during the development of the software product. This can include, for example, the test software, test databases, the software test environment (STE), or the software engineering environment (SEE).

This document is intended for use in all maintenance efforts, regardless of the life cycle model (e.g. incremental, waterfall, evolutionary, spiral, agile, continuous iterative development). This document is not restricted by size, complexity, criticality, reliability, or application of the software product.

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1.4 Limitations

This document describes the framework of the maintenance process but does not specify the details of how to implement or perform the activities and tasks included in the process.

In this document, there are a number of lists. None of these is presumed to be exhaustive. They are intended as examples.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO/IEC/IEEE 12207, *Systems and Software engineering — Software life cycle processes*

3 Terms, definitions and abbreviated terms

3.1 Terms and definitions

For the purposes of this document, the terms and definitions in ISO/IEC/IEEE 12207 and the following apply.

ISO, IEC and IEEE maintain terminology databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

— IEEE Standards Dictionary Online: available at https://dictionary.ieee.org

3.1.1
adaptive maintenance
modification of a software product, performed after delivery, to keep a software product usable in a changed or changing environment

Note 1 to entry: Adaptive maintenance provides *enhancements* (3.1.7) necessary to accommodate changes in the environment in which a software product operates. These changes help keep pace with the changing environment, e.g. an upgrade to the operating system results in changes in the applications.

3.1.2
additive maintenance
modification of a software product performed after delivery to add functionality or features to enhance the usage of the product

Note 1 to entry: Additive maintenance may be excluded from the definition of maintenance in the context of dependability that addresses recovery of a system to previous operational, functional and performance level, e.g. definition, monitor or measurement of availability, recoverability, or MTBF (mean time between failure).

Note 2 to entry: "Additive maintenance" type is distinguished from *"perfective maintenance"* (3.1.9) type and recognized as a different maintenance type to be able to:

— provide additional new functions or features to improve software usability, performance, *maintainability* (3.1.6), or other software attributes for the future;

— add functionality or features with relatively large additions or changes on software for improving software attributes after delivery with identified opportunities to negotiate any of additions or changes on maintenance strategy, methods, resources, agreements, or service levels between suppliers and acquirers.

Note 3 to entry: Additions or *enhancements* (3.1.7) can be handled through the maintenance process, while larger changes can involve a new development effort.

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