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Information technology — Open distributed processing — Reference model — Enterprise language

Technologies de l'information — Traitement réparti ouvert — Modèle de référence — Langage d'entreprise

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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. In the field of information technology, ISO and IEC have established a joint technical committee, ISO/IEC JTC 1.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of the joint technical committee is to prepare International Standards. Draft International Standards adopted by the joint technical committee are circulated to national bodies for voting. Publication as an International Standard requires approval by at least 75 % of the national bodies casting a vote.

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.

ISO/IEC 15414 was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 7, *Software and systems engineering*, in collaboration with ITU-T. The identical text is published as ITU-T X.911 (09/2014).

This third edition cancels and replaces the second edition (ISO/IEC 15414:2006), which has been technically revised.

Introduction

The rapid growth of distributed processing led to the adoption of the Reference Model of Open Distributed Processing (RM-ODP). This Reference Model provides a coordinating framework for the standardization of open distributed processing (ODP). It creates an architecture within which support of distribution, interworking and portability can be integrated. This architecture provides a framework for the specification of ODP systems.

The Reference Model of Open Distributed Processing is based on precise concepts derived from current distributed processing developments and, as far as possible, on the use of formal description techniques for specification of the architecture.

This Recommendation | International Standard refines and extends the definition of how ODP systems are specified from the enterprise viewpoint, and is intended for the development or use of enterprise specifications of ODP systems.

0.1 RM-ODP

The RM-ODP consists of:

- Part 1: Rec. ITU-T X.901 | ISO/IEC 10746-1: **Overview**: This contains a motivational overview of ODP, giving scoping, justification and explanation of key concepts, and an outline of the ODP architecture. It contains explanatory material on how the RM-ODP is to be interpreted and applied by its users, who may include standards writers and architects of ODP systems. It also contains a categorization of required areas of standardization expressed in terms of the reference points for conformance identified in ITU-T Rec. X.903 | ISO/IEC 10746-3. This part is informative.
- Part 2: Rec. ITU-T X.902 | ISO/IEC 10746-2: **Foundations**: This contains the definition of the concepts and analytical framework for normalized description of (arbitrary) distributed processing systems. It introduces the principles of conformance to ODP standards and the way in which they are applied. This is only to a level of detail sufficient to support Rec. ITU-T X.903 | ISO/IEC 10746-3 and to establish requirements for new specification techniques. This part is normative.
- Part 3: Rec. ITU-T X.903 | ISO/IEC 10746-3: **Architecture**: This contains the specification of the required characteristics that qualify distributed processing as open. These are the constraints to which ODP standards shall conform. It uses the descriptive techniques from Rec. ITU-T X.902 | ISO/IEC 10746-2. This part is normative.
- Part 4: Rec. ITU-T X.904 | ISO/IEC 10746-4: **Architectural semantics**: This contains a formalization of the ODP modelling concepts defined in Rec. ITU-T X.902 | ISO/IEC 10746-2 clauses 8 and 9. The formalization is achieved by interpreting each concept in terms of the constructs of one or more of the different standardized formal description techniques. This part is normative.
- Rec. ITU-T X.911 | ISO/IEC 15414: **Enterprise language**: this Recommendation | International Standard.

0.2 Overview and motivation

Part 3 of the Reference Model, Rec. ITU-T X.903 | ISO/IEC 10746-3, defines a framework for the specification of ODP systems comprising:

1) five viewpoints, called enterprise, information, computational, engineering and technology, which provide a basis for the specification of ODP systems;
2) a viewpoint language for each viewpoint, defining concepts and rules for specifying ODP systems from the corresponding viewpoint.

The purpose of this Recommendation | International Standard is to:

- Refine and extend the enterprise language defined in Rec. ITU-T X.903 |ISO/IEC 10746-3 to enable full enterprise viewpoint specification of an ODP system.
- Explain the correspondences of an enterprise viewpoint specification of an ODP system to other viewpoint specifications of that system.
- Ensure that the enterprise language, when used together with the other viewpoint languages, is suitable for the specification of a concrete application architecture to fill a specific business need.

This Recommendation | International Standard uses concepts taken from Recs ITU-T X.902 | ISO/IEC 10746-2 and X.903 | ISO/IEC 10746-3 and structuring rules taken from clause 5 of Rec. ITU-T X.903 | ISO/IEC 10746-3; it introduces refinements of those concepts, additional viewpoint-specific concepts, and prescriptive structuring rules for enterprise viewpoint specifications. The additional viewpoint-specific concepts are defined using concepts from Recs ITU-T X.902 | ISO/IEC 10746-2 and X.903 | ISO/IEC 10746-3.

This Recommendation | International Standard provides a common language (set of terms and structuring rules) to be used in the preparation of an enterprise specification capturing the purpose, scope and policies for an ODP system. An enterprise specification is a part of the specification of an ODP system using viewpoints defined by Recommendation ITU-T X.903 | ISO/IEC 10746-3. The specification of the ODP system can describe any or all of:

- an existing system within its environment;
- an anticipated future structure or behaviour of that existing system within an existing or an anticipated future environment;
- a system to be created within some environment.

The primary audience for this Recommendation | International Standard is those who prepare and use such specifications. The audience includes ODP system owners and users, including subject management experts, and developers and maintainers of ODP systems, tools and methodologies.

The motivation for the enterprise language is to support standardized techniques for specification. This improves communication and helps create consistent specifications.

The preparation of specifications often falls into the category referred to as analysis or requirement specification. There are many approaches used for understanding, agreeing and specifying systems in the context of the organizations of which they form a part. The approaches can provide useful insights into both the organization under consideration and the requirements for systems to support it, but they generally lack the rigour, consistency and completeness needed for thorough specification. The audiences of the specifications also vary. For agreement between the potential users of an ODP system and the provider of that system, it may be necessary to have different presentations of the same system – one in terms understood by clients, and one in terms directly related to system realization.

The use of enterprise specifications can be wider than the early phases of the software engineering process. A current trend is to integrate existing systems into global networks, where the functionality of interest spans multiple organizations. The enterprise language provides a means to specify the joint agreement of common behaviour of the ODP systems within and between these organizations. The enterprise specification can also be used in other phases of the system life cycle. The specification can, for example, be used at system run-time to control agreements between the system and its users, and to establish new agreements according to the same contract structure. Enterprise viewpoint specifications may contain rules for inter-organizational behaviour.

This Recommendation | International Standard also provides a framework for the development of software engineering methodologies and tools exploiting ODP viewpoint languages, and a set of concepts for the development of enterprise viewpoint specification languages. For these purposes, this Recommendation | International Standard provides rules for the information content of specifications and the grouping of that information. Further requirements on the relationships between enterprise language concepts and concepts in other viewpoints are specific to the methodologies, tools or specification languages to be developed.

An enterprise specification defines the purpose, scope, and policies of an ODP system and it provides a statement of conformance for system implementations. The purpose of the system is defined by the specified behaviour of the system while policies capture further restriction on the behaviour between the system and its environment or within the system itself related to the business decisions by the system owners.

An enterprise specification also allows the specification of an ODP system that spans multiple domains and is not owned by a single party, and specification of the collective behaviour of a system that is divided into independently specified and independently working subsystems.

This generality places greater emphasis on the expression of correct or normal behaviour and on the chains of responsibility involved in achieving it. For example, the advent of service oriented and cloud computing has led to the need to specify business rules and behaviour in a way that clearly describes obligations, permissions, authorizations and prohibitions, as well as the accountability of each of the objects involved in an enterprise specification. This involves the expression of the so-called deontic aspects of the behaviour of the system, and of the accountability of the objects involved.

Annex A presents a metamodel of the enterprise language, illustrating the key concepts of the enterprise language and their relationships. This annex is normative. Annex B provides examples using the concepts and structuring rules of the enterprise language and provides examples of how they may be used. Annex C indicates how the semantics of deontic constraints may be expressed. Annexes B and C are informative.

INTERNATIONAL STANDARD
ITU-T RECOMMENDATION

Information technology – Open distributed processing – Reference model – Enterprise language

1 Scope

This Recommendation | International Standard provides:

a) a language (the enterprise language) comprising concepts, structures, and rules for developing, representing and reasoning about a specification of an ODP system from the enterprise viewpoint (as defined in Rec. ITU-T X.903 | ISO/IEC 10746-3);

b) rules which establish correspondences between the enterprise language and the other viewpoint languages (defined in Rec. ITU-T X.903 | ISO/IEC 10746-3) to ensure the overall consistency of a specification.

The language is specified to a level of detail sufficient to enable the determination of the compliance of any modelling language to this Recommendation | International Standard and to establish requirements for new specification techniques.

This Recommendation | International Standard is intended for use in preparing enterprise viewpoint specifications of ODP systems, and in developing notations and tools to support such specifications.

As specified in clause 5 of Rec. ITU-T X.903 | ISO/IEC 10746-3, an enterprise viewpoint specification defines the purpose, scope and policies of an ODP system.

This Recommendation | International Standard is a refinement and extension of Rec. ITU-T X.903 | ISO/IEC 10746-3, clauses 5 and 10, but does not replace them.

2 Normative references

The following Recommendations and International Standards contain provisions which, through reference in this text, constitute provisions of this Recommendation | International Standard. At the time of publication, the editions indicated were valid. All Recommendations and Standards are subject to revision, and parties to agreements based on this Recommendation | International Standard are encouraged to investigate the possibility of applying the most recent edition of the Recommendations and Standards listed below. Members of IEC and ISO maintain registers of currently valid International Standards. The Telecommunication Standardization Bureau of the ITU maintains a list of currently valid ITU-T Recommendations.

2.1 Identical ITU-T Recommendations | International Standards

– Recommendation ITU-T X.902 (2009) | ISO/IEC 10746-2:2010, *Information technology – Open Distributed Processing – Reference Model: Foundations*.

– Recommendation ITU-T X.903 (2009) | ISO/IEC 10746-3:2010, *Information technology – Open Distributed Processing – Reference Model: Architecture*.

– Recommendation ITU-T X.904 (1997) | ISO/IEC 10746-4:1998, *Information technology – Open Distributed Processing – Reference Model: Architectural semantics*.

– Recommendation ITU-T X.906 (1997) | ISO/IEC 19793:2012, *Information technology – Open distributed processing – Use of UML for ODP system specifications.*

2.2 Additional References

– ISO/IEC 19505-2:2012, *Information Technology – Object Management Group Unified Modelling Language (OMG UML) – Part 2: Superstructure*.