FINAL
DRAFT

INTERNATIONAL
STANDARD

**ISO/IEC
FDIS
18384-3**

ISO/IEC JTC **1**/SC **38**

Secretariat: ANSI

Voting begins on:
2015-06-19

Voting terminates on:
2015-08-19

Information Technology — Reference Architecture for Service Oriented Architecture (SOA) —

Part 3:
Service Oriented Architecture Ontology

Technologie de l'information — Architecture de référence pour l'architecture orientée service (SOA)

Reference number
ISO/IEC FDIS 18384-3:2015(E)

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and knon-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

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

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

ISO 18384 was prepared by Technical Committee ISO/JTC 1, Subcommittee SC 38, Cloud Computing and Distributed Platforms.

ISO/IEC FDIS 18384 consists of three parts, under the general title: Reference Architecture for Service Oriented Architecture

ISO/IEC FDIS 18384-1, Information technology – Reference Architecture for Service Oriented Architecture – Part 1: Terminology and Concepts for SOA

ISO/IEC FDIS 18384-2, Information technology – Reference Architecture for Service Oriented Architecture – Part 2: Reference Architecture for SOA Solutions

ISO/IEC FDIS 18384-3, Information technology – Reference Architecture for Service Oriented Architecture – Part 3: SOA Ontology

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO/IEC shall not be held responsible for identifying any or all such patent rights.

Introduction

Service Oriented Architecture (abbreviated SOA) is an architectural style in which business and IT systems are designed in terms of services available at an interface and the outcomes of these services. A service is a logical representation of a set of activities that has specified outcomes and is self-contained, it may be composed of other services but consumers of the service (3.1.20) need not be aware of any internal structure.

SOA takes ‘service’ as its basic element to constitute and integrate information systems so that they are suitable for a variety of solution requirements. SOA enables interactions between businesses without needing to specify aspects of any particular business domain. Using the SOA architectural style can improve the efficiency of developing information systems, and integrating and reusing IT resources. In addition, using the SOA architectural style can help enable rapid response of information systems to ever-changing business needs.

ISO/IEC 18384 is intended to be a single set of SOA technical principles, specific norms, and standards for the world-wide market to help remove confusion about SOA and improve the standardization and quality of solutions.

ISO/IEC 18384 defines the terminology, technical principles, reference architecture and ontology for SOA. ISO/IEC 18384 can be used to introduce SOA concepts, as a guide to the development and management of SOA solutions, as well as be referenced by business and industry standards

This ISO/IEC 18384 contains three parts:

1. Part 1: Terminology and Concepts – which defines the terminology, basic technical principles and concepts for SOA

2. Part 2: Reference Architecture for SOA Solutions – which defines the detailed SOA reference architecture layers, including a metamodel, capabilities, architectural building blocks, as well as types of services in SOA solutions.

3. Part 3: SOA Ontology – which defines the core concepts of SOA and their relationships in anOntology.

The targeted audience of ISO/IEC 18384 includes, but is not limited to, standards organizations; architects, architecture methodologists, system and software designers, business people, SOA service providers, SOA solution and service developers, and SOA service consumers who are interested in adopting and developing SOA.

Users of ISO/IEC 18384 will find it useful to read ISOIEC 18384-1 for an understanding of SOA basics. ISOIEC 18384-1 should be read before reading or applying ISOIEC 18384-2. For those new to the SOA reference architecture, clause 4 in ISOIEC 18384-2 provides a high level understanding of the Reference Architecture for SOA Solutions. The remaining clauses provide comprehensive details of the architectural building blocks and tradeoffs needed for a SOA Solution. This part of this International Standard contains the SOA Ontology, which is a formalism of the core concepts and terminology of SOA, with mappings to both UML and OWL. The SOA Ontology can be used independent of or in conjunction with the other two Parts.

The purpose of this part of this International Standard is to contribute to developing and fostering common understanding of Service-Oriented Architecture (SOA) in order to improve alignment between the business and information technology communities, and facilitate SOA adoption.

The SOA Ontology defines the concepts, terminology, and semantics of SOA in both business and technical terms, in order to:

- Create a foundation for further work in domain-specific areas
- Enable communications between business and technical people
- Enhance the understanding of SOA concepts in the business and technical communities
- Provide a means to state problems and opportunities clearly and unambiguously to promote mutual understanding
- It may provide a starting point for model-driven development of SOA solutions

The content of this part of this International Standard is defined in the following clauses:

Forward – abstract for this part

Introduction – high level overview of this Part

Clause 1 – Scope

Clause 2 Normative references

Clause 3 – Terminology – defines terms used when discussing or designing Service Oriented Solutions. Terms defined here are used in some unique fashion for SOA. It does not define terms that are used in general English manner.

Clause 4 – SOA ontology overview - provides an introduction to the SOA ontology.

Clauses 5 through 10 provide the formal definitions (OWL and natural language) of the terms and concepts included in the ontology organized as follows:

Clause 5 – System and Element – describes the System and Element concepts

Clause 6 – Human Actor and Task – describes the Human Actor and Task concepts

Clause 7 – Service, Service Contract, and Service Interface – describes the Service, Service Contract and Service Interface concepts

Clause 8 – Composition and its Subclasses– describes the Composition concepts

Clause 9 – Policy– describes the Policy concept

Clause 10 – Event– describes the Event concept

Annex A contains the complete car wash example that is used as a common example throughout.

Annex B contains an additional elaborate example utilizing most of the classes in the ontology.

Annex C contains the formal OWL definitions of the ontology, collected together.

294 Annex D contains a relationship matrix that details the class relationships implied by the OWL definitions
295 of the ontology.

296 Annex E conatins a mapping of the terms from ISO/IEC 18384-1 to the terms and concepts in this part of
297 this International Standard and identifies where the terms are discussed in 18384-2 .

298 Bibliography

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1 Scope

This part of this International Standard defines a formal ontology for Service-Oriented Architecture (SOA), an architectural style that supports service orientation. The terms defined in this ontology are key terms from the vocabulary in ISO/IEC 18384-1.

2 Normative references

The following referenced documents are indispensable for the application 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 18384 1, Information technology – Reference architecture for SOA – Part 1 Terminology and Concepts for SOA

OWL Web Ontology Language Reference, W3C Recommendation, 10 February 2004, World-Wide Web Consortium; available from www.w3.org/TR/owl-ref.

ISO/IEC 19505-2:2012, Information technology -- Object Management Group Unified Modeling Language (OMG UML) -- Part 2: Superstructure

ISO/IEC TR 24800-1:2007, Information technology – JPSearch – Part 1: System framework and components

3 Terms and Definitions

3.1 Definitions

For the purposes of this document, the terms and definitions given in ISO/IEC 18384-1 and the following apply.

3.1.1 Opaque

having no internal structure that is visible to an external observer

3.1.2 Ontology

model that represents a domain and is used to reason about the objects in that domain and the relations between them [SOURCE: ISO/IEC TR 24800-1:2007, 2.1.9]

Note 1 to entry: This part of this International Standard is high level and not meant to be used for formal reasoning

3.2 Acronyms

BPMN – Business Process Model and Notation

EA – Enterprise Architecture

ESB – Enterprise Service Bus

IT – Information Technology

OWL – Web Ontology Language

RA – Reference Architecture

RDF – Resource Definition Framework

SLA – Service Level Agreement

SOA – Service Oriented Architecture

UML – Unified Modeling Language

3.3 Notations

The ontology is represented in the Web Ontology Language (OWL) defined by the World-Wide Web Consortium. OWL has three increasingly expressive sub-languages: OWL-Lite, OWL-DL, and OWL-Full. (See Bibliography [8] for a definition of these three dialects of OWL.) This ontology uses OWL-DL, the sub-language that provides the greatest expressiveness possible while retaining computational completeness and decidability.

The ontology contains classes and properties corresponding to the concepts of SOA. The formal OWL definitions are supplemented by natural language descriptions of the concepts, with graphic illustrations of the relations between them, and with examples of their use. For purposes of exposition, the ontology also includes UML (See Bibliography [6]) diagrams that graphically illustrate its classes and properties of the ontology. The natural language and OWL definitions contained in this document constitute the authoritative definition of the ontology; the diagrams are for explanatory purposes only. Some of the natural language terms used to describe the concepts are not formally represented in the ontology; those terms are meant in their natural language sense.

The availability of an OWL expression a standard RDF format allows easy loading into tools for architects and developers and allows validation.

This document uses examples to illustrate the ontology. One of these, the car-wash example, is used consistently throughout to illustrate the main concepts (See Annex A for the complete example.) Other examples are used ad hoc in individual clauses to illustrate particular points.

3.4 Conventions

Bold font is used for OWL class, property, and instance names where they appear in clause text.

Italic strings are used for emphasis and to identify the first instance of a word requiring definition.

OWL definitions and syntax are shown in fixed-width font.

An unlabeled arrow in the illustrative UML diagrams means subclass.

The examples in this document are strictly informative and are for illustrative purposes.

3.5 Conformance

ISO/IEC 18384 contains three parts which have different conformance requirements:

1. Terminology and Concepts – conformance only to terms and adherence to the semantics in the definitions
2. Reference Architecture for SOA Solutions – conformance only to semantics of the metamodel and any Layers, ABBs, or capabilities that are used.
3. SOA Ontology – conformance for OWL or non-OWL applications

Conformance to this part of this International Standard is defined as follows:

There are two kinds of applications that may conform to this ontology. One is the OWL-based ontologies (typically extensions of the SOA ontology); the other is a non-OWL application such as a meta-model or a piece of software. (See clause 2 for the OWL version that is required)

A conforming OWL application (derived OWL-based ontology):

- Shall conform to the OWL standard specified in clause 2
- Shall include the whole of the ontology contained in Annex C of this document
- May add other OWL constructs, including class and property definitions
- May import other ontologies in addition to the SOA ontology

Note: this part of this International Standard does not use any OWL 2 (See Bibliography [13]) constructs; however, conforming applications may choose to use OWL or OWL 2.

A conforming non-OWL application:

- Shall include a defined and consistent transformation (at least semantic mapping) to a non-trivial subset of the ontology contained in Annex C of this document
- May add other constructs, including class and property definitions
- May import and/or use other ontologies in addition to the SOA ontology