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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)*

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200 **Foreword**

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

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

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

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

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

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

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

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

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

223

224 **Introduction**

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

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

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

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

242 This ISO/IEC 18384 contains three parts:

- 243 1. Part 1: Terminology and Concepts – which defines the terminology, basic technical principles and
244 concepts for SOA
- 245 2. Part 2: Reference Architecture for SOA Solutions – which defines the detailed SOA reference
246 architecture layers, including a metamodel, capabilities, architectural building blocks, as well as types of
247 services in SOA solutions.
- 248 3. Part 3: SOA Ontology – which defines the core concepts of SOA and their relationships in
249 anOntology.

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

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

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

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

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

272 The content of this part of this International Standard is defined in the following clauses:
273

274 Forward – abstract for this part

275 Introduction – high level overview of this Part

276 Clause 1 – Scope

277 Clause 2 Normative references

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

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

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

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

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

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

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

289 Clause 9 – Policy– describes the Policy concept

290 Clause 10 – Event– describes the Event concept

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

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

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

ISO/IEC FDIS 18384 Part 3

294	Annex D contains a relationship matrix that details the class relationships implied by the OWL definitions
295	of the ontology.
296	Annex E contains 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
299	

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300 1 Scope

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

304 2 Normative references

305 The following referenced documents are indispensable for the application of this document. For dated
306 references, only the edition cited applies. For undated references, the latest edition of the referenced
307 document (including any amendments) applies.

308 ISO/IEC 18384 1, Information technology – Reference architecture for SOA – Part 1 Terminology and
309 Concepts for SOA

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

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

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

315 3 Terms and Definitions

316 3.1 Definitions

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

319 3.1.1 Opaque

320 having no internal structure that is visible to an external observer

321 3.1.2 Ontology

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

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

326 **3.2 Acronyms**

- 327 BPMN – Business Process Model and Notation
- 328 EA – Enterprise Architecture
- 329 ESB – Enterprise Service Bus
- 330 IT – Information Technology
- 331 OWL – Web Ontology Language
- 332 RA – Reference Architecture
- 333 RDF – Resource Definition Framework
- 334 SLA – Service Level Agreement
- 335 SOA – Service Oriented Architecture
- 336 UML – Unified Modeling Language

337 **3.3 Notations**

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

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

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

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

356 3.4 Conventions

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

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

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

360 An unlabeled arrow in the illustrative UML diagrams means subclass.

361
362 The examples in this document are strictly informative and are for illustrative purposes.

363 3.5 Conformance

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

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

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

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

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

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

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

381 A conforming non-OWL application:

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