BS ISO/IEC 18384-1:2016

BSI Standards Publication

Information technology — Reference Architecture for Service Oriented Architecture (SOA RA)

Part 1: Terminology and concepts for SOA

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National foreword

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The UK participation in its preparation was entrusted to Technical Committee IST/38, Cloud Computing and Distributed Platforms.

A list of organizations represented on this committee can be obtained on request to its secretary.

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Published by BSI Standards Limited 2016

ISBN 978 0 580 81293 4

ICS 35.100.05

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This British Standard was published under the authority of the Standards Policy and Strategy Committee on 30 June 2016.

Amendments/corrigenda issued since publication

Date	Text affected

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INTERNATIONAL STANDARD

ISO/IEC 18384-1

First edition
2016-06-01

Information technology — Reference Architecture for Service Oriented Architecture (SOA RA) —

Part 1: Terminology and concepts for SOA

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

Partie 1: Terminologie et concepts pour SOA

Reference number
ISO/IEC 18384-1:2016(E)

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Foreword

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The committee responsible for this document is ISO/IEC JTC 1, *Information technology*, Subcommittee SC 38, *Cloud Computing and Distributed Platforms*.

ISO/IEC 18384 consists of the following parts, under the general title *Reference Architecture for Service Oriented Architecture (SOA RA)*:

— *Part 1: Terminology and Concepts for SOA*

— *Part 2: Reference Architecture for SOA Solutions*

— *Part 3: Service Oriented Architecture Ontology*

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Introduction

Service oriented architecture (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, is self-contained, and it may be composed of other services but consumers of the service 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 realize agile and rapid response of information systems to ever-changing business needs.

This International Standard describes 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.

This International Standard defines the terminology, technical principles, reference architecture, and the ontology for SOA. The targeted audience of this International Standard 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. For example, this part of ISO/IEC 18384 can be used to introduce SOA concepts and to guide to the developing and managing SOA solutions.

This International Standard contains three parts:

a) ISO/IEC 18384-1 which defines the terminology, basic technical principles and concepts for SOA;

b) ISO/IEC 18384-2 which defines the detailed SOA reference architecture layers, including a metamodel, capabilities, architectural building blocks, as well as types of services in SOA solutions;

c) ISO/IEC 18384-3 which defines the core concepts of SOA and their relationships in the Ontology.

Users of this part of ISO/IEC 18384 will find it useful to read this part of ISO/IEC 18384 for an understanding of SOA basics. This part of ISO/IEC 18384 should be read before reading or applying ISO/IEC 18384-2. For those new to SOA, ISO/IEC 18384-2:2016, Clause 4 provides a high level understanding of the reference architecture for SOA solutions. The remaining clauses provide comprehensive details of the architectural building blocks and trade-offs needed for a SOA solution. ISO/IEC 18384-3 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 ISO/IEC 18384-1 and ISO/IEC 18384-2.

This part of ISO/IEC 18384 presents and explains basic SOA concepts. It gives definitions for terms that are used in ISO/IEC 18384 with specific meanings that may differ or be more precise than the definitions of those terms found in major English language dictionaries. The terms defined here are used in a unique fashion for SOA. Terms used in their normal English sense are not redefined.

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Information technology — Reference Architecture for Service Oriented Architecture (SOA RA) —

Part 1: Terminology and concepts for SOA

1 Scope

This part of ISO/IEC 18384 establishes vocabulary, guidelines, and general technical principles underlying service oriented architecture (SOA), including principles relating to functional design, performance, development, deployment, and management.

2 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

2.1
actor
person or system component that interacts with the system as a whole and that provides stimulus which invokes actions

[SOURCE: ISO/IEC 16500-8:1999, 3.1]

2.2
architecture
fundamental concepts or properties of a system in its environment embodied in its elements, relationships, and in the principles of its design and evolution

[SOURCE: ISO/IEC/IEEE 42010:2011, 3.2]

2.3
choreography
type of *composition* (2.5) whose *elements* (2.8) interact in a non-directed fashion with each autonomous part knowing and following an observable predefined pattern of behaviour for the entire (global) composition

Note 1 to entry: Choreography does not require complete or perfect knowledge of the pattern of behaviour.

Note 2 to entry: See ISO/IEC 18384-3:2016, 8.3.

2.4
collaboration
type of *composition* (2.5) whose *elements* (2.8) interact in a non-directed fashion, each according to their own plans and purposes without a predefined pattern of behaviour

Note 1 to entry: See ISO/IEC 18384-3:2016, 8.3.

2.5
composition
result of assembling a collection of *elements* (2.8) for a particular purpose

Note 1 to entry: See ISO/IEC 18384-3:2016, 8.2.

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2.6
endpoint
location at which information is received to invoke and configure interaction

2.7
effect
outcome of an interaction with a *service* (2.20)

Note 1 to entry: The effect is how a service delivers results to its consumer, through the *element* (2.8) that performs it.

Note 2 to entry: See ISO/IEC 18384-3:2016, 7.10.

2.8
element
unit at a given level of abstraction and with a clearly defined boundary

Note 1 to entry: An element can be any type of *entity* (2.9).

Note 2 to entry: See ISO/IEC 18384-3:2016, 5.1.

2.9
entity
individual *element* (2.8) in a system with an identity which can act as a *service provider* (2.50) or *service consumer* (2.29)

Note 1 to entry: Examples of entities are organizations, enterprises and individuals, software, and hardware.

2.10
event
something that occurs to which an *element* (2.8) may choose to respond

Note 1 to entry: Any element can generate (emit) or respond to an event.

Note 2 to entry: See ISO/IEC 18384-3:2016, Clause 10.

2.11
execution context
set of technical and business *elements* (2.8) needed by those with needs and capabilities to permit *service providers* (2.50) and *service consumers* (2.29) instantiation and communication

Note 1 to entry: The execution context of a *service interaction* (2.37) is the set of infrastructure elements, process entities, policy assertions, and agreements that are identified as part of an instantiated service interaction, and thus forms a path between those with needs and those with capabilities.

Note 2 to entry: See Reference [8].

2.12
human actor
actor (2.1) restricted to a person or an organizational *entity* (2.9)

Note 1 to entry: This classification is not exhaustive.

Note 2 to entry: See ISO/IEC 18384-3:2016, 6.2.

2.13
human task
task (2.60) which is done by a *human actor* (2.12)

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2.14
interface
shared boundary between two functional units, defined by various characteristics pertaining to the functions, physical interconnections, signal exchanges, and other characteristics, as appropriate

[SOURCE: ISO/IEC 2382:2015, 2121308]

2.15
loose coupling
principle where dependencies between *elements* (2.8) of a *SOA solution* (2.56) are intentionally reduced

2.16
orchestration
type of *composition* (2.5) where one particular *element* (2.8) is used by the composition to oversee and direct the other elements

Note 1 to entry: The element that directs an orchestration is not part of the orchestration (Composition instance) itself.

Note 2 to entry: See ISO/IEC 18384-3:2016, 8.3.

2.17
policy
statement that an *entity* (2.9) intends to follow or intends that another entity should follow

Note 1 to entry: See ISO/IEC 18384-3:2016, Clause 9).

2.18
process
type of *composition* (2.5) whose *elements* (2.8) are composed into a sequence or flow of activities and interactions with the objective of carrying out certain work

Note 1 to entry: A process may also be a *collaboration* (2.4), *choreography* (2.3), or *orchestration* (2.16).

Note 2 to entry: See ISO/IEC 18384-3:2016, 8.6.

2.19
real-world effect
change relevant to and experienced by specific stakeholders

Note 1 to entry: See Reference [8].

2.20
service
logical representation of a set of activities that has specified outcomes, is self-contained, may be composed of other services, and is a "black box" to consumers of the service

Note 1 to entry: The word "activity" in the "service" definition is used in the general English language sense of the word, not in the process-specific sense of that same word [i.e. activities are not necessarily *process* (2.18) activities].

Note 2 to entry: See ISO/IEC 18384-3:2016, 7.2.

2.21
service broker
element (2.8) that enables the communication with *services* (2.20), either at a business level or at the implementation level, i.e. with intermediaries

Note 1 to entry: The intermediaries provide any number of functions, such as unified *service registration* (2.51) and publishing, *service discovery* (2.34), routing, location-transparent service access, for *service providers* (2.50) and *service consumers* (2.29).

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2.22
service bus
design and runtime pattern for enabling *service* (2.20) interactions, such as communication, access, consumption, transformation, intermediaries, and message routing

Note 1 to entry: A service bus can range from a logical collection of such functions to the functions collected into a single commercial product. Service bus is widely used in an organizational context and often equates to the enterprise service bus (ESB).

2.23
service candidate
service (2.20) identified during the *SOA lifecycle* (2.58) that meets broad service requirements, and from which one or more are selected for further development as part of an overall *SOA solution* (2.56)

2.24
service catalogue
service registry/repository (reg/rep)
logical collection of *service descriptions* (2.31) and related artefacts that supports publication, registration, search, management, and retrieval of those artefacts

2.25
service choreography
choreography (2.3) whose *elements* (2.8) are *services* (2.20)

Note 1 to entry: See ISO/IEC 18384-3:2016, Clause 8.

2.26
service collaboration
collaboration (2.4) whose *elements* (2.8) are *services* (2.20)

Note 1 to entry: See ISO/IEC 18384-3:2016, Clause 8.

2.27
service component
element (2.8) that implements *services* (2.20)

2.28
service composition
service assembly
composition (2.5) that provides (in the operational sense) higher level *services* (2.20) that are only an assembly of other *services* (2.20)

Note 1 to entry: A composition can support different composition patterns, such as *collaboration* (2.4), *choreography* (2.3), *orchestration* (2.16).

Note 2 to entry: See ISO/IEC 18384-3:2016, Clause 8).

2.29
service consumer
entity (2.9) that uses *services* (2.20)

Note 1 to entry: Consumers may interact with services operationally or contractually (legal responsibility).

Note 2 to entry: See ISO/IEC 18384-3:2016, 7.4.

2.30
service contract
terms, conditions, and interaction rules that interacting *service consumers* (2.29) and *service providers* (2.50) agree to (directly or indirectly)

Note 1 to entry: A service contract is binding on all participants in the interaction, including the *service* (2.20) itself and the *element* (2.8) that provides it for the particular interaction in question.

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Note 2 to entry: See ISO/IEC 18384-3:2016, 7.6.

2.31
service description
information needed in order to use, or consider using, a *service* (2.20)

Note 1 to entry: The service description usually includes the *service interfaces* (2.38), contracts, and policies.

Note 2 to entry: See ISO/IEC 18384-3:2016, Clause 7.

2.32
service deployment
activities by which implementations of *services* (2.20) are made able to run in a specific hardware and software environment and usable by *service consumers* (2.29)

2.33
service development
activities by which needs and constraints are identified and *services* (2.20) are designed as part of a *SOA solution* (2.56) in order to address those needs within the constraints

2.34
service discovery
activities by which a *service consumer* (2.29) can find *services* (2.20) which meet their specific functional and/or non-functional requirements

2.35
service governance
strategy and control mechanism that applies across the *service lifecycle* (2.41) and service portfolio, which includes the establishment of chains of responsibility, driving monitoring of compliance with policies by providing appropriate *processes* (2.18) and measurements as part of *SOA solution governance* (2.57)

Note 1 to entry: Aspects of the service lifecycle that need to be governed include: addressing service modifications, version updates, notice of termination, decomposition subdivision, agency capacity, decomposition capacity, and ability to meet individual demands.

2.36
service implementation
activities performing technical development and the physical implementation of the *service* (2.20) that is part of a *service lifecycle* (2.41), and results in the creation of a *service component* (2.27)

2.37
service interaction
activity involved in making use of a capability offered, usually across an ownership boundary, in order to achieve a particular desired *real-world effect* (2.19)

Note 1 to entry: See Reference [8].

2.38
service interface
interface (2.14) by which other *elements* (2.8) can interact and exchange information with the service where the form of the request and the outcome of the request is in the *service description* (2.31)

Note 1 to entry: See ISO/IEC 18384-3:2016, 7.13.

2.39
service interoperability
ability of *service providers* (2.50) and *service consumers* (2.29) to communicate, invoke *services* (2.20) and exchange information at both the syntactic and semantic level leading to effects as defined by the *service description* (2.31)

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2.40
service level agreement
SLA
type of *service contract* (2.30) that defines measureable conditions of interactions between a *service provider* (2.50) and a *service consumer* (2.29)

Note 1 to entry: A service level agreement may specify: the set of *services* (2.20) the service provider will deliver, a sufficient, specific definition of each service, the responsibilities of the service provider and the service consumer, the set of metrics to determine whether the service provider is delivering the service as promised, an auditing mechanism to monitor the service, the remedies available to the service consumer and service provider if the terms of the SLA are not met, and how the SLA will change over time.

2.41
service lifecycle
set of phases for realizing a *service* (2.20) that can go through from conception and identification to instantiation and retirement

2.42
service management
monitoring, controlling, maintaining, optimizing, and operating *services* (2.20)

2.43
service modeling
set of activities to develop a series of *service candidates* (2.23) for functions or actions on a *SOA solution* (2.56) using *service oriented analysis* (2.47) processes

2.44
service monitoring
tracking state and operational conditions related to the execution, performance, and *real-world effects* (2.19) of *services* (2.20)

2.45
service orchestration
orchestration (2.16) where the orchestrated *elements* (2.8) are *services* (2.20)

2.46
service orientation
approach to designing systems in terms of *services* (2.20) and service-based development

2.47
service oriented analysis
preparatory information gathering steps that are completed in support of a *service modeling* (2.43) sub-process that results in the creation of a set of *services* (2.20)

Note 1 to entry: It provides guidance to the subsequent phases of the SOA lifecycle and might be carried out just once for each business *process* (2.18) or iteratively.

2.48
service oriented architecture
SOA
architectural style that supports *service orientation* (2.46) and is a paradigm for building business solutions

Note 1 to entry: *Services* (2.20) realized in this style utilize activities that comprise business *processes* (2.18), have descriptions to provide context, may be implemented via *service composition* (2.28), have environment-specific implementations which are described in the context that constrains or enables them, require governance, and place requirements on the infrastructure to achieve interoperability and location transparency using standards to the greatest extent possible.

Note 2 to entry: See ISO/IEC 18384-3:2016, Clause 4.

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2.49
service policy
policy (2.17) as applied to a *service* (2.20)

2.50
service provider
entity (2.9) providing *services* (2.20)

Note 1 to entry: Service providers may be responsible for the operation of the services or the contract for the services (legal responsibility) or both.

Note 2 to entry: See ISO/IEC 18384-3:2016, 7.4.

2.51
service publishing
service registration
cataloguing of *service descriptions* (2.31) in an accessible location, such as a *service registry/repository* (2.24), where supporting activities, such as search and retrieval of descriptions, make service information visible and available to potential *service consumers* (2.29)

2.52
SOA implementation
methods and techniques used to develop *SOA* (2.48) based solutions

2.53
SOA maturity
assessment of an organization's ability to adopt *SOA* (2.48) and the current level of adoption

2.54
SOA maturity model
framework stating overall objectives and a method to evaluate an organization's *SOA maturity* (2.53) against these objectives

2.55
SOA resource
elements (2.8) that provide the IT resources used by *services* (2.20)

2.56
SOA solution
solutions, in part or as a whole, implemented by applying *SOA* (2.48) principles, concepts, methods, and techniques

Note 1 to entry: The SOA solutions include the physical instantiation of *service implementations* (2.36), including infrastructure, other architectural elements, and capabilities needed to support governance and lifecycle processes, that together enable domain-specific effects that represent a SOA-based solution to business problems.

2.57
SOA solution governance
specialization of IT governance specifically focused on management strategies and mechanisms for the end users' specific *SOA solution* (2.56)

Note 1 to entry: SOA solution governance manages the entire *SOA solution lifecycle* (2.58) by setting out personnel, roles, management procedures, and decision-making. SOA solution governance needs to adopt the appropriate methodology and best practices. SOA solution governance usually requires tools for assistance to customize and manage the governance strategy according to the needs.

Note 2 to entry: While management means the specific *process* (2.18) for governance and control to execute the policies, governance looks at assigning the rights to make decisions, and deciding what measures to use and what policies to follow to make those decisions.

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2.58
SOA solution lifecycle
set of activities for engineering *SOA solutions* (2.56), including analysis, design, implementation, deployment, test, and management

2.59
SOA solution management
measurement, monitoring, and configuration of the entire lifecycle of a *SOA solution* (2.56)

Note 1 to entry: At runtime, it is the set of activities for the specific measurement and operation of the implementation of the SOA solution according to the strategies and mechanisms identified by the *SOA solution governance* (2.57) process.

2.60
task
atomic action which accomplishes a defined result

Note 1 to entry: Tasks are done by people or organizations, specifically by *human actors* (2.12).

Note 2 to entry: See ISO/IEC 18384-3:2016, 6.4.

2.61
web services
software system designed to support interoperable machine-to-machine interaction over a network

Note 1 to entry: Original definition: Software system designed to support interoperable machine-to-machine interaction over a network. It has an *interface* (2.14) described in a machine-processable format (specifically WSDL). Other systems interact with the Web service in a manner prescribed by its description using SOAP messages, typically conveyed using HTTP with an XML serialization in conjunction with other Web-related standards.

Note 2 to entry: See Reference [18].

3 Abbreviated terms

For the purposes of this document, the following abbreviated terms apply.

ABB	Architectural Building Block
BPMN	Business Process Model and Notation
COBIT	Control Objectives for Information and Related Technology
EA	Enterprise Architecture
ESB	Enterprise Service Bus
HTTP	Hyper Text Transfer Protocol
HTTPS	Hyper Text Transfer Protocol Secure
IT	Information Technology
ITIL	Information Technology Infrastructure Library
KPI	Key Performance Indicator
L2TP	Layer 2 Tunneling Protocol
MPLS	Multiprotocol Label Switching
OWL	Web Ontology Language
PKI	Public Key Infrastructure
QoS	Quality of Service
RA	Reference Architecture
REST	Representational State Transfer
RPC	Remote Procedure Call

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SLA	Service Level Agreement
SOA	Service Oriented Architecture
SOAP	Standard message protocol to exchange structured data
SQL	Structured Query Language
UML	Unified Modeling Language
VPN	Virtual Private Network
WSDL	Web Services Description Language
WSRP	Web Services Remote Portlet
XML	Extensible Markup Language

4 Notations

4.1 General

The following provides instruction on the interpretation of diagrams.

4.2 UML

Most diagrams are not UML. Those that are have text to that effect before the diagram identifying the type of UML diagram so that the reader knows how to interpret it.

4.3 Entity Relationship

Entity relationship diagrams (like Figure 1 and Figure 2) with boxes, lines, arrows, and circled numbers should be interpreted according to the following rules.

— Boxes are the metamodel concepts, layers, architectural building blocks, capabilities, or components.

— Arrows are relationships between metamodel concepts; single arrow heads show direction of relationship; double headed arrows indicate the relationship is bidirectional.

— Relationships are named, represented as labelled lines or arrows, and no cardinality is implied.

— Cardinality indications are participation in the relationship, well-known mathematical conventions are used (* = = 0..*; 0..1 = = optional and only 1; 1 = = required as defined in ISO/IEC 15474-1).

4.4 Cycles

Circular diagrams with states in them show the progression of a state or lifecycle and progress clockwise. Figure 10 is an example of a cycle diagram.

4.5 Flows

Flows are often used for examples and should be interpreted with the following rules:

— boxes that are layers, architectural building blocks, or components;

— directional arrows showing the direction of the flow between the boxes;

— circled numbers on the flow arrows show the sequence of the flow and are used as a point of reference in any explanatory text.

Figure 5 and Figure 6 are flows used as examples.

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5 Conventions

This reference architecture is defined in three parts. This part of ISO/IEC 18384 defines the terminology and concepts for service oriented architecture. Understanding the terms and concepts defined in this part of ISO/IEC 18384 is important before reading or using ISO/IEC 18384-2 and ISO/IEC 18384-3. This part of ISO/IEC 18384 defines a reference architecture for SOA solutions. It defines a metamodel, a set of layers for the layered architecture, and a set of common service types. ISO/IEC 18384-3 defines the ontology for SOA, with a more formal expression of core SOA concepts and relationships between them. The terminology in this part of ISO/IEC 18384 is consistent with the ontology in ISO/IEC 18384-3.

This International Standard can be read in sequence or used as a reference. This part of ISO/IEC 18384 contains vocabulary and thorough introductory material and SOA concepts (this part of ISO/IEC 18384). ISO/IEC 18384-2 provides a short introduction to SOA. Introduction is followed by a high level overview of the 10 layers and the service types defined in this International Standard. This is followed by the definition and explanation of the metamodel used in the SOA RA. The metamodel defines layer, capabilities, and ABB concepts along with other core logical concepts. ABBs and capabilities are each defined uniquely in each layer. Capabilities and ABBs may require capabilities and ABBs defined in other layers in order to do fulfil their architectural requirements. The layers, capabilities, and ABBs in this part of ISO/IEC 18384 are all logical elements and any reference to these logical elements “performing”, “supporting”, or “interacting” means that when a SOA solution is developed, the physical realization of the capabilities and ABBs are actually “performing”, “supporting”, or “interacting”.

6 Conformance

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

a) terminology and concepts — conformance only to terms and adherence to the semantics in the definitions;

b) reference architecture for SOA solutions — conformance only to semantics of the metamodel and any layers, ABBs, or capabilities that are used;

c) SOA Ontology — conformance for OWL or non-OWL applications.

Conformance to this part of ISO/IEC 18384 is defined as follows.

If any document, product, or standard claims conformance, then the terms in this part of ISO/IEC 18384 shall be used with the same semantics as these definitions.

Principles and concepts are provided as explanatory material and not meant for performance.

7 SOA Concepts

7.1 Introduction to SOA

Service oriented architecture (abbreviated SOA) (see 2.48) is an architectural style that supports service orientation (see 2.46) and is a paradigm for business and IT. This architectural style is for designing systems in terms of services available at an interface and the outcomes of services. As noted in 2.20, a service is a logical representation of a set of activities that has specified outcomes, is self-contained, may be composed of other services and is a “black box” to consumers of the service.

In common with other architectural styles, SOA

— places unique requirements on system infrastructure,

— has environment-specific implementations, constrained or enabled by context and described within that context,

— recommends governance of IT and systems and EA,

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— has business solutions that are designed to mirror real-world business activities, and

— provides criteria to allow consumers to determine whether the business solution offered has been properly and completely executed in accordance with their expectations.

In addition, SOA has distinguishing characteristics that set it apart from other architectural styles, notably the following:

a) it promotes the use of open standards and interfaces in order to achieve interoperability and location opacity;

b) services and processes are designed explicitly to operate both within or between organizations;

c) it requires clear descriptions of the service offered;

d) services and processes are designed to mirror real-world business activities;

e) service representation uses business descriptions to provide context (i.e. business process, goal, rule, policy, service interface, and service component);

f) it requires appropriate governance of service representation and implementation;

g) service composition is used as a means to implement business processes;

h) it provides criteria to allow service consumers to determine whether the service has been properly and completely executed in accordance with the service description.

SOA takes "service" as its basic element to construct information systems so that they are suitable for a variety of solution requirements. Service from a business perspective is the delivery of business outcomes of business processes; service from an IT perspective is the IT implementation of those business processes. The activities in developing a SOA solution can be private to an organization (e.g. deploying a service), collaborative between a set of business entities (e.g. service invocations and choreographies), or joint activities for maintaining the viability of the service ecosystem (e.g. publishing new services).

Some of the intended benefits of using SOA are improvement in the efficiency of development of information systems, efficiency of integration, and efficiency of reuse of resources.

While there is interest in SOA as a means of delivering these efficiencies, a single set of SOA technical principles, specific norms, and standards have not been established for the world-wide market. Existing products and solutions have used various standards, methods, and technologies, which has added to the confusion about the effectiveness of SOA. To increase standardization and potentially the quality of solutions, as well as promote effective large-scale adoption of SOA, it is necessary to establish a unified set of terms, principles, and concepts for SOA.

It should be noted that these SOA principles defined here are applicable to software engineering and can also be applicable to systems engineering in order to formalize service-based systems (i.e. complex systems, federation of systems, systems of systems, enterprise architecture).

7.2 Concepts

7.2.1 Roles

7.2.1.1 Overview

In general, a role is defined by a set of activities that serve a common purpose. When an entity is assigned or assumes a role, it performs the activities of the role. The definition of a role includes whether all of the activities are required and when they are performed. Service providers and service consumers are fundamental roles in a service oriented architecture. A SOA ecosystem comprises services that deliver functionality, service consumers who interact with services, and service providers who develop and host the services for the consumer. However, the roles of service providers and service consumers can

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