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**Intelligent transport systems — Using  
web services (machine-machine  
delivery) for ITS service delivery —  
Part 3:  
Quality of service**

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# Contents

	Page
Foreword .....	iv
Introduction .....	v
<b>1 Scope</b> .....	<b>1</b>
<b>2 Normative references</b> .....	<b>2</b>
<b>3 Terms and definitions</b> .....	<b>2</b>
<b>4 Abbreviated terms</b> .....	<b>3</b>
<b>5 Notation and conventions</b> .....	<b>4</b>
5.1 Namespace URI and prefixes used in this document .....	4
5.2 Web service syntax notation: pseudo-schemas .....	5
5.3 XPath 1.0 expression .....	6
5.4 XML infoset .....	6
5.5 SOA stack name notation .....	6
5.6 Examples .....	6
<b>6 Web services overview</b> .....	<b>6</b>
<b>7 QoS overview</b> .....	<b>7</b>
<b>8 QoS standards</b> .....	<b>8</b>
8.1 WS-Policy language .....	9
8.2 WS-Policy 1.5 — Framework .....	10
8.2.1 Policy authoring style .....	10
8.2.2 A policy description by combining domain specific policies .....	13
8.3 WS-Policy 1.5 — Attachment .....	13
8.3.1 Combining multiple policies .....	15
8.3.2 Policy attachment points, policy subjects, and policy scope .....	15
<b>9 Domain specific policy overview</b> .....	<b>17</b>
9.1 <b>Messaging metadata</b> (WS-Addressing metadata) .....	18
9.1.1 WS-Addressing standard .....	18
9.1.2 WS-Addressing 1.0 — Core and Web Services Addressing 1.0 — SOAP Binding .....	19
9.1.3 WS-Addressing 1.0 — Metadata .....	20
9.1.4 Elaboration of WS-AddressingMetadata .....	20
9.2 WS-SecurityPolicy (WSSP) .....	21
9.2.1 WSSP standard .....	21
9.2.2 WSSP scope .....	22
9.2.3 WS-SecurityPolicy fundamental .....	23
9.2.4 Cryptographic algorithms and key length .....	24
9.2.5 WSSP use case .....	24
9.2.6 Validation of WS-SecurityPolicy document .....	29
9.3 Web Services Reliable Messaging Policy Assertion .....	29
9.3.1 RM Policy Assertions .....	30
9.4 <b>MTOM policy</b> (MTOM Serialization Policy Assertion 1.1) .....	30
9.5 <b>SOAP usage policy</b> (Web Services SOAP Assertions) .....	31
<b>10 Metadata versioning</b> .....	<b>31</b>
<b>11 Security considerations</b> .....	<b>32</b>
<b>Annex A (informative) Security relevant web services standards</b> .....	<b>34</b>
<b>Annex B (informative) JAX-WS</b> .....	<b>38</b>
<b>Bibliography</b> .....	<b>39</b>

## 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 non-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.

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 documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see [www.iso.org/directives](http://www.iso.org/directives)).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO 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 will be in the Introduction and/or on the ISO list of patent declarations received (see [www.iso.org/patents](http://www.iso.org/patents)).

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](http://www.iso.org/iso/foreword.html).

This document was prepared by Technical Committee ISO/TC 204, *Intelligent transport systems*.

A list of all parts in the ISO 24097 series can be found on the ISO website.

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](http://www.iso.org/members.html).

## Introduction

In order to provide high quality ITS services, various types of service coordination are indispensable, e.g. coordination between financial industries in an Electronic Fee Collections service. Service systems are constructed in a heterogeneous platform, e.g. hardware, OS, middleware, and/or application development language. Web services are technologies for heterogeneous distributed systems coordination.

To provide web services in an agile and interoperable manner, the use of standard based metadata was proposed in ISO 24097-1. Web service (WS) metadata is a formal description of a web service. It is expressed by: **Interface metadata** and **QoS (Quality of Service) metadata**. WS metadata is a technical contract between a web service provider and its consumers, so both sides are aware of this interface. This provides the base of interoperability between a service provider's program and a service consumer's program. Because metadata is based on standards, software tools can support the WS lifecycle through design to servicing and upgrading.

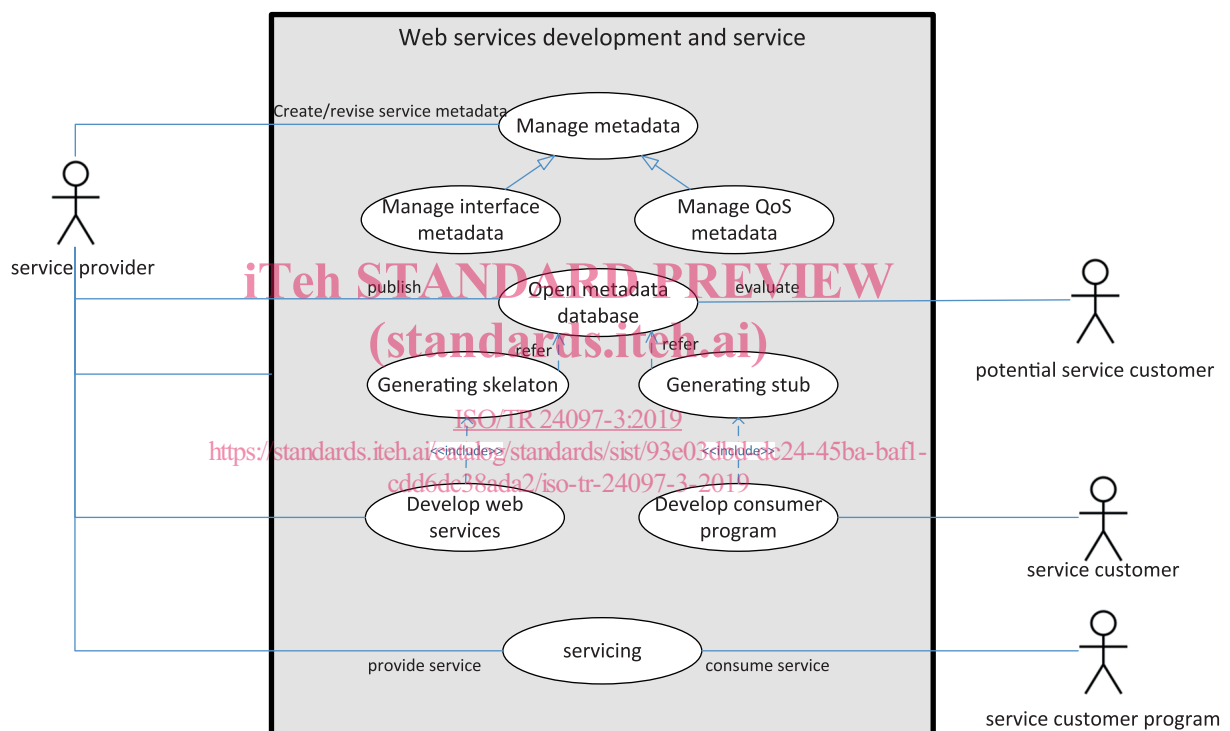


Figure 1 — ITS WS metadata use case

The **interface metadata** standard is the WSDL. This topic was covered in ISO/TR 24097-2.

**QoS metadata** is a combination of domain specific requirements and constraints such as security, reliable messaging, message addressing, and SOAP message transmission optimization.

This document focuses on these QoS topics.

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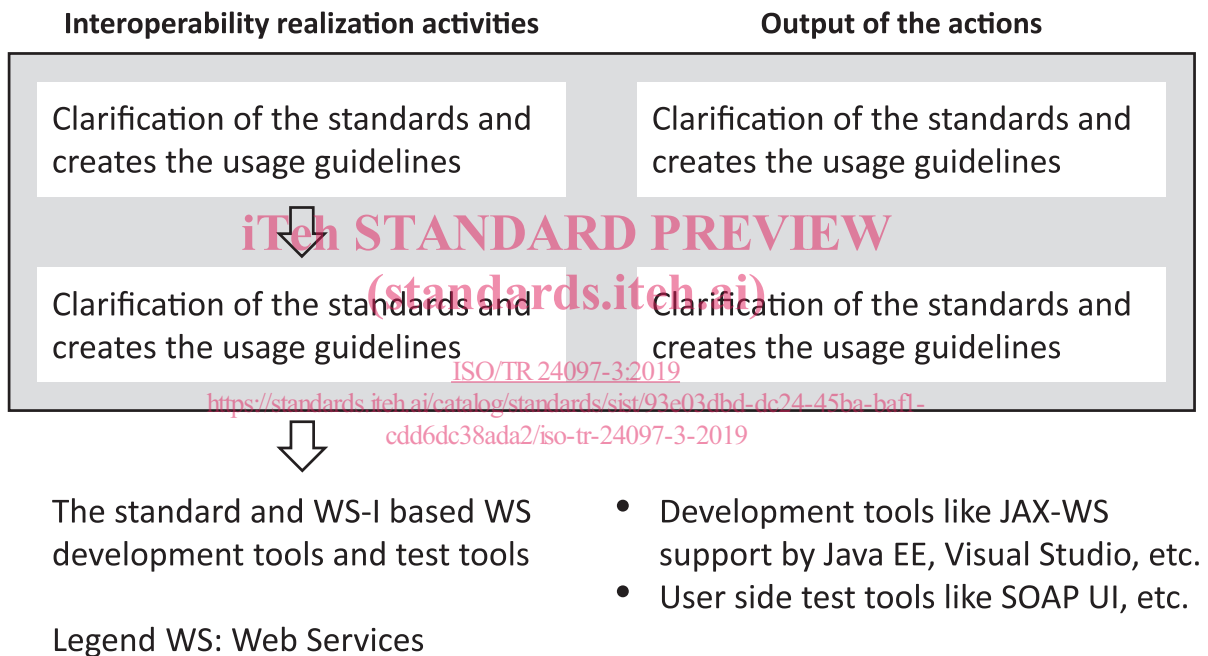
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# Intelligent transport systems — Using web services (machine-machine delivery) for ITS service delivery —

## Part 3: Quality of service

### 1 Scope

This document aims to promote ITS web services interoperability. Historically, web services interoperability evolved through activities shown in [Figure 2](#). Applying the first two steps properly is the key to interoperability.



**Figure 2 — Evolution of web services developing circumstances**

This document focuses on the following topics:

- WS-policy language;
- domain specific policy metadata:
  - WS-Addressing policy metadata;
  - WS-ReliableMessaging policy metadata;
  - WS-Security Policy metadata;
  - SOAP Message transmission optimization Policy;
  - other policies.

## 2 Normative references

There are no normative references in this document.

## 3 Terms and definitions

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

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <http://www.electropedia.org/>

### 3.1 claim

declaration made by an entity

EXAMPLE Name, identity, key, group, privilege, capability.

### 3.2 claim confirmation

process of verifying that a claim applies to an entity

### 3.3 domain

specific area to which policy applies

EXAMPLE Security or message transmission reliability.

### 3.4 endpoint

combination of a binding and a network address

### 3.5 IDE

software that provides comprehensive facilities for application (including web services) development

### 3.6 initiator

<WS-SecurityPolicy> role sending the initial message in a message exchange

### 3.7 instance document

XML document that conforms to a schema

EXAMPLE If the schema is WSDL, the XML document is an WSDL instance document.

### 3.8 metadata

data describing an instance of WS behaviour consisting of interface metadata (WSDL description) and QoS metadata

### 3.9 policy assertion

<WS-Policy> requirement, capability or other property of a web service

### 3.10 policy subject

<WS-Policy>entity with which a policy assertion can be associated

EXAMPLE Endpoint, message, resource, operation.



**3.11****recipient**

<WS-SecurityPolicy> role that processes the initial message in a message exchange

**3.12****security binding**

<WS-SecurityPolicy> set of properties that provide enough information to secure a given message exchange

**3.13****security binding assertion**

<WS-SecurityPolicy> policy assertion that identifies the type of security binding being used to secure an exchange of messages

**3.14****security binding property**

<WS-SecurityPolicy> aspect of securing an exchange of messages

**3.15****security token****token**

<WS-SecurityPolicy> collection of (one or more) claims

**3.16****supporting token**

<WS-SecurityPolicy> security token used to provide additional claims

**3.17****token assertion**

<WS-SecurityPolicy> description of a token requirement

Note 1 to entry: Token assertions defined within a security binding are used to satisfy protection requirements.

**3.18****web service policy language****WS-Policy**

<WS-SecurityPolicy> language that is used to express domain specific policy and/or an instance of a web service requirement and policy attachment to relevant WSDL constructs

**4 Abbreviated terms**

BP	(WS-I) Basic Profile
BPEL	Business Process Execution Language
ENISA	European Union Agency for Network and Information Security Agency
EPR	End Point Reference
HTTP	Hypertext Transfer Protocol
JAX-WS	Java API for XML Web Services
JSR	Java Service Request
IDE	Integrated Development Environment
MAP	Message Addressing Property
MTOM	SOAP Message Transmission Optimization Mechanism

NIST	National Institute of Standards and Technology
OASIS	Organization for the Advancement of Structured Information Standards
SOA	Service Oriented Architecture
STS	Security Token Service
TC	Technical Committee
QoS	Quality of Services
URL	Universal Resource Locator
W3C	World Wide Web Consortium
WG	Working Group
WS	Web Service
WS-I	Web Services Interoperability organization
WSSP	Web Services Security Policy
XKMS	XML Key Management Specification
XML	eXtensible Markup Language (SOAP 1.2)
NOTE	SOAP is not an abbreviated terms. It is a proper noun.

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## 5 Notation and conventions

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### 5.1 Namespace URI and prefixes used in this document

This document uses many namespace prefixes throughout; they are listed in [Table 1](#).

The choice of any namespace prefix is arbitrary and not semantically significant. However, the prefix shall be unique in any single document. We use the namespace prefixes as shown [Table 2](#).

NOTE For reasons of brevity, not all examples are shown as full schemas. In this case, it is assumed that the namespace prefix has been declared in a parent element. In this case, the namespace prefix identified in [Table 2](#) is used as a convention.

**Table 2 — Namespace and prefix convention**

Prefix	XML namespace URI	Specifications
s	Either of s11 or s12	
s11	<a href="http://schemas.xmlsoap.org/wsdl/soap/">http://schemas.xmlsoap.org/wsdl/soap/</a>	SOAP 1.1
s12	<a href="http://schemas.xmlsoap.org/wsdl/soap12/">http://schemas.xmlsoap.org/wsdl/soap12/</a>	SOAP 1.2
wsdl	<a href="http://schemas.xmlsoap.org/wsdl/">http://schemas.xmlsoap.org/wsdl/</a>	WSDL 1.1
wsdl20	<a href="http://www.w3.org/ns/wsdl">http://www.w3.org/ns/wsdl</a> "	WSDL 2.0
wssa	<a href="http://www.w3.org/2011/03/ws-sas">http://www.w3.org/2011/03/ws-sas</a>	SOAP Version assertion policy
xs	<a href="http://www.w3.org/2001/XMLSchema">http://www.w3.org/2001/XMLSchema</a>	[XML-Schema1], [XML-Schema2]
xsi	<a href="http://www.w3.org/2001/XMLSchema-instance">http://www.w3.org/2001/XMLSchema-instance</a>	XML Schema Structures
wsic	<a href="http://ws-i.org/schemas/conformanceClaim">http://ws-i.org/schemas/conformanceClaim</a>	WS-I conformance claim
wssa	<a href="http://www.w3.org/2011/03/ws-sas">http://www.w3.org/2011/03/ws-sas</a>	WS-SOAP Assertions

Table 2 (continued)

Prefix	XML namespace URI	Specifications
bp12	http://ws-i.org/profiles/basic-profile/1.2/	BP 1.0
wsp	http://www.w3.org/2006/07/ws-policy	WS-Policy 1.5
wsam	http://www.w3.org/2007/05/addressing/metadata	WS-Addressing metadata
wsrmp	http://docs.oasis-open.org/ws-rx/wsrmp/200702	WS-ReliableMessaging Policy Assertion
wsu	http://docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-utility-1.0.xsd	Utility schema
wsse	http://docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-secext-1.0.xsd	[WS-Security]
sp	http://docs.oasis-open.org/ws-sx/ws-securitypolicy/v1.3/cd/ws-securitypolicy.xsd	WS-SecurityPolicy 1.3
ds	http://www.w3.org/2000/09/xmldsig#	[XML-Signature]
xenc	http://www.w3.org/2001/04/xmlenc#	[XML-Encrypt]
wsc	http://docs.oasis-open.org/ws-sx/ws-secureconversation/200512	This specification
mtom	http://www.w3.org/2007/08/soap12-mtom-policy	MTOM Serialization Policy Assertion
tns		The "this namespace" (tns) prefix is used as a convention to refer to the current web service.

When developing web services, we need to check what version(s) of the standards the software under development should support. In a standards body like W3C and OASIS, new versions are frequently released, but support tools follow behind with some time lag. Therefore, it is up to the developers to determine if it is appropriate to implement the latest versions.

## 5.2 Web service syntax notation: pseudo-schemas

Every web service language, e.g. WSDL, WS-Policy, has its own schema to validate the user's instance description. Because web service language is complex, it is helpful to know the grammar at a glance. For that reason, pseudo-schemas (or shorthand schemas) are used to represent schema syntax. In this representation:

- The syntax appears as an XML instance, but values indicate data types instead of literal values.
- Characters are appended to elements and attributes to indicate cardinality:
  - "?" (0 or 1);
  - "\*" (0 or more);
  - "+" (1 or more).
- The character "|" is used to indicate a choice between alternatives.
- The characters "(" and ")" are used to indicate that contained items are to be treated as a group with respect to cardinality or choice.
- The characters "[" and "]" are used to call out references and property names.
- Ellipses ("...") indicate points of extensibility. Additional children and/or attributes may be added at the indicated extension points but do not contradict the semantics of the parent and/or owner,

respectively. By default, if a receiver does not understand an extension, the receiver should ignore the extension.

### 5.3 XPath 1.0 expression

An XPath 1.0 expression is used to specify an XML element and/or attribute.

EXAMPLE

```
/wsdl11:definition/wsdl11:message, wsdl11:definition/wsdl11:binding/wsdl11:@name
```

### 5.4 XML infoset

A WS-Policy document relies on the XML Information Set [XML Information Set]. Information item properties are indicated by the style [infoset property].

### 5.5 SOA stack name notation

The SOA stack name is represented in bold italics.

EXAMPLE ***messaging***

### 5.6 Examples

To clarify an explanation, we give examples using "Eclipse" (from Eclipse Foundation) IDE and its plug-in web tool platform (hereafter WTP). This is only an example of an available tool and not a recommendation for Eclipse.

We selected Eclipse because it:

- is open software (not specific vendor software);
- provides an integrated development environment (from design to deployment, based on latest software technology);
- supports many high-quality candidate plug-ins;
- has a context-based wizard;
- was developed by a community that included W3C members;
- has reasonable documentation; and
- is similar to many commercial IDEs, which should facilitate other IDE users to understand the information presented in this document.

In this document all examples are informative.

## 6 Web services overview

The ISO 24097 series enables a plurality of geographically dispersed intelligent transport systems using various platforms to exchange necessary information, thereby realizing a service that is high in quality and reflects user needs. For service providers and service users to realize interoperability, the requirements shown in [Table 1](#) are necessary.

Table 1 — Basic requirements for interoperable ITS web services

Basic requirements	Requirement content	Reference material
To ensure interoperability between the ITS service provider and the service user, the service provider describes and discloses the technical requirements of the ITS service in metadata. The service user creates a program according to the metadata.	Describe the technical requirements with interface and QoS metadata and make it public to the service user in some way (e.g. UDDI and/or endpoint reference). Service users develop user systems under these conditions.	ISO 24097-1:2017
Metadata standards are sometimes generalized, and if you can implement interoperability with restrictions, use WS-I.	When there is a provision in WS-I, use metadata within that range.	ISO 24097-1:2017, A.4.2
As the ITS service may evolve, version control is necessary. When considering new services, consider backward compatibility and protect service users when possible. If backward compatibility cannot be implemented, change the major version number (see the right column), but continue the old version service for a reasonable period.	For each interface and QoS domain metadata, give a version number. Version numbers are given in the following system: Form: m.n.a: m: major version number (xs:positiveInteger) n: minor version number (xs:nonNegativeInteger) a: draft version number (xs:NCName)	ISO 24097-1:2017, 6.2.1.3 ISO 24097-1:2017, 7.2.4
Interface metadata	Use WSDL 1.1.	ISO/TR 24097-2:2015, 6.1
SOAP version	Prioritize SOAP 1.2 over SOAP 1.1.	ISO/TR 24097-2:2015, 7.1
Description of QoS	Define the QoS for each domain. Other than SOAP MTOM, it is described as a policy standardized by the QoS standard. Recommend description of SOAP MTOM based on JSR 224	This document
Enable QoS	Other than SOAP MTOM, based on the WS-PolicyAttachment standard, considering the scope of policy, give it to the correct attachment point.	This document

## 7 QoS overview

The QoS describes the requirements and constraints of a web service. The following figure shows the whole web services stack. The black shaded parts are relevant to QoS standards.