Web Services Description Language (WSDL) Version 2.0 Part 1: Core Language

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This document is also available in these non-normative formats: XHTML with Z Notation, PDF, PDF with Z Notation, PostScript, XML, and plain text.

Abstract

This document describes the Web Services Description Language Version 2.0 (WSDL 2.0), an XML language for describing Web services. This specification defines the core language which can be used to describe Web services based on an abstract model of what the service offers. It also defines the conformance criteria for documents in this language.

Status of this Document

This section describes the status of this document at the time of its publication. Other documents may supersede this document. A list of current W3C publications and the latest revision of this technical report can be found in the W3C technical reports index at http://www.w3.org/TR/.

This is the W3C Candidate Recommendation of Web Services Description Language (WSDL) Version 2.0 Part 1: Core Language for review by W3C Members and other interested parties. It has been produced by the Web Services Description Working Group, which is part of the W3C Web Services Activity. The publication of this document signifies a call for implementations of this specification. This specification will remain a Candidate Recommendation at least until 15 March 2006.

This Working Draft addresses all the comments received during the second Last Call review period on the WSDL 2.0 drafts. The detailed disposition of the comments received can be found in the Last Call issues list. A diff-marked version against the previous version of this document is available. For a detailed list of changes since the last publication of this document, please refer to appendix **E. Part 1 Change Log** [p.108] .

The Working Group plans to submit this specification for consideration as a W3C Proposed Recommendation if the following exit criteria have been met:

- Two interoperable implementations of all the features, both mandatory and optional, of the specifications have been produced.
- The Working Group releases a test suite along with an implementation report.

The sections **2.7 Feature** [p.39] and **2.8 Property** [p.44] in this specification, defining the feature and property components, are considered at risk. The Working Group may recommend to remove the components from the specification, depending on their use and the implementations.

Implementers are encouraged to provide feedback by 15 March 2006. Comments on this document are to be sent to the public public-ws-desc-comments@w3.org mailing list (public archive).

Issues about this document are recorded in the Candidate Recommendation issues list maintained by the Working Group. A list of formal objections against the set of WSDL 2.0 Working Drafts is also available.

Publication as a Candidate Recommendation does not imply endorsement by the W3C Membership. This is a draft document and may be updated, replaced or obsoleted by other documents at any time. It is inappropriate to cite this document as other than work in progress.

This document has been produced under the 24 January 2002 Current Patent Practice as amended by the W3C Patent Policy Transition Procedure. Patent disclosures relevant to this specification may be found on the Working Group's patent disclosure page. An individual who has actual knowledge of a patent which the individual believes contains Essential Claim(s) with respect to this specification should disclose the information in accordance with section 6 of the W3C Patent Policy.

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1. Introduction

Web Services Description Language Version 2.0 (WSDL 2.0) provides a model and an XML format for describing Web services. WSDL 2.0 enables one to separate the description of the abstract functionality offered by a service from concrete details of a service description such as “how” and “where” that functionality is offered.

This specification defines a language for describing the abstract functionality of a service as well as a framework for describing the concrete details of a service description. It also defines the conformance criteria for documents in this language. The *WSDL Version 2.0 Part 2: Adjuncts* specification [*WSDL 2.0 Adjuncts [p.92]*] describes extensions for Message Exchange Patterns, SOAP modules, and a language for describing such concrete details for SOAP 1.2 [*SOAP 1.2 Part 1: Messaging Framework [p.93]*] and HTTP [*IETF RFC 2616 [p.93]*].

1.1 Web Service

WSDL 2.0 describes a Web service in two fundamental stages: one abstract and one concrete. Within each stage, the description uses a number of constructs to promote reusability of the description and to separate independent design concerns.

At an abstract level, WSDL 2.0 describes a Web service in terms of the messages it sends and receives; messages are described independent of a specific wire format using a type system, typically XML Schema.

An *operation* associates a message exchange pattern with one or more messages. A *message exchange pattern* identifies the sequence and cardinality of messages sent and/or received as well as who they are logically sent to and/or received from. An *interface* groups together operations without any commitment to transport or wire format.

At a concrete level, a *binding* specifies transport and wire format details for one or more interfaces. An *endpoint* associates a network address with a binding. And finally, a *service* groups together endpoints that implement a common interface.

1.2 Document Conformance

An *element information item* (as defined in [*XML Information Set [p.92]*]) whose namespace name is "http://www.w3.org/2006/01/wsdl" and whose local part is `description` conforms to this specification if it is valid according to the XML Schema for that element as defined by this specification (http://www.w3.org/2006/01/wsdl/wsdl20.xsd) and additionally adheres to all the constraints contained in this specification family and conforms to the specifications of any extensions contained in it. Such a conformant *element information item* constitutes a *WSDL 2.0 document*.

The definition of the WSDL 2.0 language is based on the XML Information Set [*XML Information Set [p.92]*] but also imposes many semantic constraints over and above structural conformance to this XML Infoset. In order to precisely describe these constraints, and as an aid in precisely defining the meaning of each WSDL 2.0 document, the WSDL 2.0 specification defines a component model **2. Component Model** [p.12] as an additional layer of abstraction above the XML Infoset. Constraints and meaning are defined in terms of this component model, and the definition of each component includes a mapping that specifies how values in the component model are derived from corresponding items in the XML Infoset.

An XML 1.0 document that is valid with respect to the WSDL 2.0 XML Schema and that maps to a valid WSDL 2.0 Component Model is conformant to the WSDL 2.0 specification.

1.3 The Meaning of a Service Description

A WSDL 2.0 service description indicates how potential clients are intended to interact with the described service. It represents an assertion that the described service fully implements and conforms to what the WSDL 2.0 document describes. For example, as further explained in section **6.1.1 Mandatory extensions** [p.85] , if the WSDL 2.0 document specifies a particular optional extension, the functionality implied by that extension is only optional to the client. It must be supported by the Web service.

A WSDL 2.0 interface describes potential interaction with a service--not required interaction. The declaration of an operation in a WSDL 2.0 interface is not an assertion that the interaction described by the operation must occur. Rather it is an assertion that if such an interaction is (somehow) initiated, then the declared operation describes how that interaction is intended to occur.

1.4 Notational Conventions

All parts of this specification are normative, with the EXCEPTION of notes, pseudo-schemas, examples, and sections explicitly marked as “Non-Normative”.

1.4.1 RFC 2119 Keywords

The keywords “MUST”, “MUST NOT”, “REQUIRED”, “SHALL”, “SHALL NOT”, “SHOULD”, “SHOULD NOT”, “RECOMMENDED”, “MAY”, and “OPTIONAL” in this document are to be interpreted as described in RFC 2119 [*IETF RFC 2119 [p.91]*].

1.4.2 RFC 3986 Namespaces

Namespace names of the general form:

- "http://example.org/..." and
- "http://example.com/..."

represent application or context-dependent URIs [*IETF RFC 3986 [p.92]*].

1.4.3 XML Schema anyURI

This specification uses the XML Schema type `xs:anyURI` (see [*XML Schema: Datatypes [p.92]*]). It is defined so that `xs:anyURI` values are essentially IRIs (see [*IETF RFC 3987 [p.92]*]). The conversion from `xs:anyURI` values to an actual URI is via an escaping procedure defined by (see [*XML Linking Language (XLink) 1.0 [p.94]*]), which is identical in most respects to IRI Section 3.1.

For interoperability, WSDL authors are advised to avoid the US-ASCII characters: "<", ">", ’"’, space, "{", "}", "|", "\", "^", and "‘", which are allowed by the `xs:anyURI` type, but disallowed in IRIs.

1.4.4 Prefixes and Namespaces Used in This Specification

This specification uses predefined namespace prefixes throughout; they are given in the following list. Note that the choice of any namespace prefix is arbitrary and not semantically significant (see [*XML Namespaces [p.92]*]).

wsdl

> "http://www.w3.org/2006/01/wsdl"
>
> Defined by this specification.

wsdli

> "http://www.w3.org/2006/01/wsdl-instance"
>
> Defined by this specification **7.1 wsdli:wsdlLocation attribute information item** [p.88] .

wsdlx

> "http://www.w3.org/2006/01/wsdl-extensions"

Defined by this specification **3.3 Describing Messages that Refer to Services and Endpoints** [p.79] .

wrpc

"http://www.w3.org/2006/01/wsdl/rpc"

Defined by WSDL 2.0: Adjuncts [*WSDL 2.0 Adjuncts [p.92]*].

wsoap

"http://www.w3.org/2006/01/wsdl/soap"

Defined by WSDL 2.0: Adjuncts [*WSDL 2.0 Adjuncts [p.92]*].

whttp

"http://www.w3.org/2006/01/wsdl/http"

Defined by WSDL 2.0: Adjuncts [*WSDL 2.0 Adjuncts [p.92]*].

xs

"http://www.w3.org/2001/XMLSchema"

Defined in the W3C XML Schema specification [*XML Schema: Structures [p.92]*], [*XML Schema: Datatypes [p.92]*].

xsi

"http://www.w3.org/2001/XMLSchema-instance"

Defined in the W3C XML Schema specification [*XML Schema: Structures [p.92]*], [*XML Schema: Datatypes [p.92]*].

1.4.5 Terms Used in This Specification

This section describes the terms and concepts introduced in Part 1 of the WSDL Version 2.0 specification (this document).

Actual Value

As in [*XML Schema: Structures [p.92]*], the phrase actual value is used to refer to the member of the value space of the simple type definition associated with an attribute information item which corresponds to its normalized value. This will often be a string, but may also be an integer, a boolean, an IRI-reference, etc.

Inlined Schema

An XML schema that is defined in the `xs:types` *element information item* of a WSDL 2.0 description. For example, an XML Schema defined in an `xs:schema` *element information item* **3.1.2 Inlining XML Schema** [p.76] .

1.4.6 XML Information Set Properties

This specification refers to properties in the XML Information Set [*XML Information Set [p.92]*]. Such properties are denoted by square brackets, e.g. [children], [attributes].

1.4.7 WSDL 2.0 Component Model Properties

This specification defines and refers to properties in the WSDL 2.0 Component Model **2. Component Model** [p.12] . Such properties are denoted by curly brackets, e.g. {name [p.18] }, {interfaces [p.14] }.

This specification uses a consistent naming convention for component model properties that refer to components. If a property refers to a required or optional component, then the property name is the same as the component name. If a property refers to a set of components, then the property name is the pluralized form of the component name.

1.4.8 Z Notation

Z Notation [*Z Notation Reference Manual [p.94]*] was used in the development of this specification. Z Notation is a formal specification language that is based on standard mathematical notation. The Z Notation for this specification has been verified using the Fuzz 2000 type-checker [*Fuzz 2000 [p.94]*].

Since Z Notation is not widely known, it is not included the normative version of this specification. However, it is included in a non-normative version which allows to dynamically hide and show the Z Notation. Browsers correctly display the mathematical Unicode characters, provided that the required fonts are installed. Mathematical fonts for Mozilla Firefox can be downloaded from the Mozilla Web site.

The Z Notation was used to improve the quality of the normative text that defines the Component Model, and to help ensure that the test suite covered all important rules implied by the Component Model. However, the Z Notation is non-normative, so any conflict between it and the normative text is an error in the Z Notation. Readers and implementors may nevertheless find the Z Notation useful in cases where the normative text is unclear.

There are two elements of Z Notation syntax that conflict with the notational conventions described in the preceding sections. In Z Notation, square brackets are used to introduce basic sets, e.g. [ID], which conflicts with the use of square brackets to denote XML Information Set properties **1.4.6 XML Information Set Properties** [p.11] . Also, in Z Notation, curly brackets are used to denote set display and set comprehension, e.g. {1, 2, 3}, which conflicts with the use of curly brackets to denote WSDL 2.0 Component Model properties **1.4.7 WSDL 2.0 Component Model Properties** [p.11] . However, the intended meaning of square and curly brackets should be clear from their context and this minor notational conflict should not cause any confusion.

1.4.9 BNF Pseudo-Schemas

Pseudo-schemas are provided for each component, before the description of the component. They use BNF-style conventions for attributes and elements: "?" denotes optionality (i.e. zero or one occurrences), "*" denotes zero or more occurrences, "+" one or more occurrences, "[" and "]" are used to form groups, and "|" represents choice. Attributes are conventionally assigned a value which corresponds to their type, as defined in the normative schema. Elements with simple content are conventionally assigned a value which corresponds to the type of their content, as defined in the normative schema. Pseudo schemas do not include extensibility points for brevity.

```
<!-- sample pseudo-schema -->
<defined_element
      required_attribute_of_type_string="xs:string"
      optional_attribute_of_type_int="xs:int"? >
  <required_element />
  <optional_element />?
  <one_or_more_of_these_elements />+
  [ <choice_1 /> | <choice_2 /> ]*
</defined_element>
```

1.4.10 Assertions

Assertions about WSDL 2.0 documents and components that are not enforced by the normative XML schema for WSDL 2.0 are marked in the non-normative version of this specification by a dagger symbol (†) at the end of a sentence. Each assertion has been assigned a unique identifier that consists of a descriptive textual prefix and a unique numeric suffix. The numeric suffixes are assigned sequentially and never reused so there may be gaps in the sequence. The assertion identifiers MAY be used by implementations of this specification for any purpose, e.g. error reporting.

The assertions and their identifiers are summarized in an Assertion Summary Appendix that is included the non-normative version of this specification.

2. Component Model

This section describes the conceptual model of WSDL 2.0 as a set of components with attached properties, which collectively describe a Web service. This model is called the *Component Model* of WSDL 2.0. A *valid WSDL 2.0 component model* is a set of WSDL 2.0 components and properties that satisfy all the requirements given in this specification as indicated by keywords whose interpretation is defined by RFC 2119 [*IETF RFC 2119 [p.91]*].

Components are typed collections of properties that correspond to different aspects of Web services. Each subsection herein describes a different type of component, its defined properties, and its representation as an XML Infoset [*XML Information Set [p.92]*].

Properties are unordered and unique with respect to the component they are associated with. Individual properties' definitions may constrain their content (e.g., to a typed value, another component, or a set of typed values or components), and components may require the presence of a property to be considered conformant. Such properties are marked as REQUIRED, whereas those that are not required to be present are marked as OPTIONAL. By convention, when specifying the mapping rules from the XML Infoset representation of a component to the component itself, an optional property that is absent in the component in question is described as being “empty”. Unless otherwise specified, when a property is identified as being a collection (a set or a list), its value may be a 0-element (empty) collection. In order to simplify the presentation of the rules that deal with sets of components, for all OPTIONAL properties whose type is a set, the absence of such a property from a component MUST be treated as semantically equivalent to the presence of a property with the same name and whose value is the empty set. In other words, every OPTIONAL set-valued property MUST be assumed to have the empty set as its default value, to be used in case the property is absent.

Component definitions are serializable in XML 1.0 format but are independent of any particular serialization of the component model. Component definitions use a subset (see **2.16 XML Schema 1.0 Simple Types Used in the Component Model** [p.71]) of the simple types defined by the XML Schema 1.0 specification [*XML Schema: Datatypes [p.92]*].

In addition to the direct XML Infoset representation described here, the component model allows components external to the Infoset through the mechanisms described in **4. Modularizing WSDL 2.0 descriptions** [p.80] .

A component model can be extracted from a given XML Infoset which conforms to the XML Schema for WSDL 2.0 by recursively mapping Information Items to their identified components, starting with the `wsdl:description` *element information item*. This includes the application of the mechanisms described in **4. Modularizing WSDL 2.0 descriptions** [p.80] .

This document does not specify a means of producing an XML Infoset representation from a component model instance. In particular, there are in general many valid ways to modularize a given component model instance into one or more XML Infosets.

2.1 Description

2.1.1 The Description Component

At the abstract level, the Description [p.14] component is just a container for two categories of components: WSDL 2.0 components and type system components.

WSDL 2.0 components are interfaces, bindings and services. Type system components are element declarations and type definitions.

Type system components describe the constraints on a message’s content. By default, these constraints are expressed in terms of the [*XML Information Set [p.92]*], i.e. they define the [local name], [namespace name], [children] and [attributes] properties of an *element information item*. Type systems based upon other data models are generally accommodated by extensions to WSDL 2.0; see **6. Language Extensibility** [p.85] . In the case where they define information equivalent to that of a XML Schema global element declaration, they can be treated as if they were such a declaration.

This specification does not define the behavior of a WSDL 2.0 document that uses multiple schema languages for describing type system components simultaneously.

An Element Declaration component defines the name and content model of an *element information item* such as that defined by an XML Schema global element declaration. It has a {name} property that is the QName of the *element information item* and a {system} property that is the namespace IRI of the extension *element information item*s for the type system, e.g. the namespace of XML Schema.

A Type Definition component defines the content model of an *element information item* such as that defined by an XML Schema global type definition. It has a {name} property that is the QName of the type and a {system} property that is the namespace IRI of the extension *element information item*s for the type system, e.g. the namespace of XML Schema.

Interface [p.18] , Binding [p.50] , Service [p.65] , Element Declaration [p.14] , and Type Definition [p.14] components are directly contained in the Description [p.14] component and are referred to as *top-level components*. The top-level WSDL 2.0 components contain other components, e.g. Interface Operation [p.26] and Endpoint [p.68] , which are referred to as *nested components*. Nested components may contain other nested components. The component that contains a nested component is referred to as the *parent* of the nested components. Nested components have a {parent} property that is a reference to their parent component.

The properties of the Description component are as follows:

- {interfaces} OPTIONAL. A set of Interface [p.18] components.
- {bindings} OPTIONAL. A set of Binding [p.50] components.
- {services} OPTIONAL. A set of Service [p.65] components.
- {element declarations} OPTIONAL. A set of Element Declaration [p.14] components.
- {type definitions} OPTIONAL. A set of Type Definition [p.14] components.

The set of top-level components contained in the Description [p.14] component associated with an initial WSDL 2.0 document consists of the components defined in the initial document and the components associated with the documents that the initial document includes or imports. The component model makes no distinction between the components that are defined in the initial document versus those that are defined in the included or imported documents. However, any WSDL 2.0 document that contains component definitions that refer by QName to WSDL 2.0 components that belong to a different namespace MUST contain a `wsdl:import` *element information item* for that namespace (see **4.2 Importing Descriptions** [p.82]). Furthermore, all QName references, whether to the same or to different namespaces MUST resolve to components (see **2.19 QName resolution** [p.72]).

In addition to WSDL 2.0 components and type system components, additional extension components MAY be added via extensibility **6. Language Extensibility** [p.85] . Further, additional properties to WSDL 2.0 and type system components MAY also be added via extensibility.

2.1.2 XML Representation of Description Component

```
<description
      targetNamespace="xs:anyURI" >
  <documentation />*
  [ <import /> | <include /> ]*
  <types />?
  [ <interface /> | <binding /> | <service /> ]*
</description>
```

WSDL 2.0 definitions are represented in XML by one or more WSDL 2.0 Information Sets (Infosets), that is one or more `description` *element information item*s. A WSDL 2.0 Infoset contains representations for a collection of WSDL 2.0 components which share a common target namespace. A WSDL 2.0 Infoset which contains one or more `wsdl:import` *element information item*s **4.2 Importing Descriptions** [p.82] corresponds to a collection with components drawn from multiple target namespaces.

The components directly defined or included within a Description [p.14] component are said to belong to the same *target namespace*. The target namespace therefore groups a set of related component definitions and represents an unambiguous name for the intended semantics of the collection of components. The value of the `targetNamespace` *attribute information item* SHOULD be dereferenceable. It SHOULD resolve to a human or machine processable document that directly or indirectly defines the intended semantics of those components. It MAY resolve to a WSDL 2.0 document which provides service description information for that namespace.

If a WSDL 2.0 document is split into multiple WSDL 2.0 documents (which may be combined as needed via **4.1 Including Descriptions** [p.80]), then the `targetNamespace` *attribute information item* SHOULD resolve to a master WSDL 2.0 document that includes all the WSDL 2.0 documents needed for that service description. This approach enables the WSDL 2.0 component designator fragment identifiers to be properly resolved.

Imported components have different target namespace values from the WSDL 2.0 document that is importing them. Thus importing is the mechanism to use components from one namespace in definition of components from another namespace.

Each WSDL 2.0 or type system component MUST be uniquely identified by its qualified name. That is, if two distinct components of the same kind (Interface [p.18] , Binding [p.50] , etc.) are in the same target namespace, then their QNames MUST be unique. However, different kinds of components (e.g., an Interface [p.18] component and a Binding [p.50] component) MAY have the same QName. Thus, QNames of components must be unique within the space of those components in a given target namespace.

The `description` *element information item* has the following Infoset properties:

- A [local name] of `description` .
- A [namespace name] of "http://www.w3.org/2006/01/wsdl".
- One or more *attribute information item*s amongst its [attributes] as follows:

- A REQUIRED `targetNamespace` *attribute information item* as described below in **2.1.2.1 targetNamespace attribute information item** [p.16] .
- Zero or more namespace qualified *attribute information items* whose [namespace name] is NOT "http://www.w3.org/2006/01/wsdl".

- Zero or more *element information items* amongst its [children], in order as follows:
  1. Zero or more `documentation` *element information items* (see **5. Documentation** [p.84]).
  2. Zero or more *element information items* from among the following, in any order:
     - Zero or more `include` *element information items* (see **4.1 Including Descriptions** [p.80])
     - Zero or more `import` *element information items* (see **4.2 Importing Descriptions** [p.82])
     - Zero or more namespace-qualified *element information items* whose [namespace name] is NOT "http://www.w3.org/2006/01/wsdl".
  3. An OPTIONAL `types` *element information item* (see **3. Types** [p.73]).
  4. Zero or more *element information items* from among the following, in any order:
     - `interface` *element information items* (see **2.2.2 XML Representation of Interface Component** [p.19]).
     - `binding` *element information items* (see **2.9.2 XML Representation of Binding Component** [p.50]).
     - `service` *element information items* (see **2.14.2 XML Representation of Service Component** [p.66]).
     - Zero or more namespace-qualified *element information items* whose [namespace name] is NOT "http://www.w3.org/2006/01/wsdl".

2.1.2.1 `targetNamespace` *attribute information item*

The `targetNamespace` *attribute information item* defines the namespace affiliation of top-level components defined in this `description` *element information item*. Interface [p.18] , Binding [p.50] and Service [p.65] are top-level components.

The `targetNamespace` *attribute information item* has the following Infoset properties:

- A [local name] of `targetNamespace`
- A [namespace name] which has no value

The type of the `targetNamespace` *attribute information item* is *xs:anyURI*. Its value MUST be an absolute IRI (see [*IETF RFC 3987 [p.92]*]) and should be dereferenceable.

2.1.3 Mapping Description's XML Representation to Component Properties

The mapping from the XML Representation of the `description` *element information item* (see **2.1.2 XML Representation of Description Component** [p.15]) to the properties of the Description [p.14] component is described in Table 2-1 [p.17] .

Table 2-1. Mapping from XML Representation to Description Component Properties

Property	Value
{interfaces [p.14] }	The set of Interface [p.18] components corresponding to all the `interface` *element information items* in the [children] of the `description` *element information item*, if any, plus any included (via `wsdl:include`) or imported (via `wsdl:import`) Interface [p.18] components (see **4. Modularizing WSDL 2.0 descriptions** [p.80]).
{bindings [p.14] }	The set of Binding [p.50] components corresponding to all the `binding` *element information items* in the [children] of the `description` *element information item*, if any, plus any included (via `wsdl:include`) or imported (via `wsdl:import`) Binding [p.50] components (see **4. Modularizing WSDL 2.0 descriptions** [p.80]).
{services [p.14] }	The set of Service [p.65] components corresponding to all the `service` *element information items* in the [children] of the `description` *element information item*, if any, plus any included (via `wsdl:include`) or imported (via `wsdl:import`) Service [p.65] components (see **4. Modularizing WSDL 2.0 descriptions** [p.80]).
{element declarations [p.14] }	The set of Element Declaration [p.14] components corresponding to all the element declarations defined as descendants of the `types` *element information item*, if any, plus any included (via `xs:include`) or imported (via `xs:import`) Element Declaration [p.14] components. At a minimum this will include all the global element declarations defined by XML Schema `element` *element information items*. It MAY also include any declarations from some other type system which describes the [local name], [namespace name], [attributes] and [children] properties of an *element information item*.
{type definitions [p.14] }	The set of Type Definition [p.14] components corresponding to all the type definitions defined as descendants of the `types` *element information item*, if any, plus any (via `xs:include`) or imported (via `xs:import`) Type Definition [p.14] components. At a minimum this will include all the global type definitions defined by XML Schema `simpleType` and `complexType` *element information items*. It MAY also include any definitions from some other type system which describes the [attributes] and [children] properties of an *element information item*. It is an error if there are multiple type definitions for each QName.

2.2 Interface

2.2.1 The Interface Component

An Interface [p.18] component describes sequences of messages that a service sends and/or receives. It does this by grouping related messages into operations. An operation is a sequence of input and output messages, and an interface is a set of operations.

An interface can optionally extend one or more other interfaces. To avoid circular definitions, an interface MUST NOT appear as an element of the set of interfaces it extends, either directly or indirectly. The set of operations available in an interface includes all the operations defined by the interfaces it extends, along with any operations it directly defines. The operations directly defined on an interface are referred to as the *declared* operations of the interface. In the process, operation components that are equivalent per **2.17 Equivalence of Components** [p.71] are treated as one. The interface extension mechanism behaves in a similar way for all other components that can be defined inside an interface, namely Interface Fault [p.22] , Feature [p.40] and Property [p.44] components.

Interfaces are named constructs and can be referred to by QName (see **2.19 QName resolution** [p.72]). For instance, Binding [p.50] components refer to interfaces in this way.

The properties of the Interface component are as follows:

- {name} REQUIRED. An *xs:QName*.
- {extended interfaces} OPTIONAL. A set of declared Interface [p.18] components which this interface extends.
- {interface faults} OPTIONAL. The set of declared Interface Fault [p.22] components. The namespace name of the {name [p.22] } property of each Interface Fault [p.22] in this set MUST be the same as the namespace name of the {name [p.18] } property of this Interface [p.18] component.
- {interface operations} OPTIONAL. A set of declared Interface Operation [p.26] components. The namespace name of the {name [p.26] } property of each Interface Operation [p.26] in this set MUST be the same as the namespace name of the {name [p.18] } property of this Interface [p.18] component.
- {features} OPTIONAL. A set of declared Feature [p.40] components.
- {properties} OPTIONAL. A set of declared Property [p.44] components.

For each Interface [p.18] component in the {interfaces [p.14] } property of a Description [p.14] component, the {name [p.18] } property MUST be unique.

2.2.2 XML Representation of Interface Component

```
<description>
  <interface
        name="xs:NCName"
        extends="list of xs:QName"?
        styleDefault="list of xs:anyURI"? >
    <documentation />*
    [ <fault /> | <operation /> | <feature /> | <property /> ]*
  </interface>
</description>
```

The XML representation for an Interface [p.18] component is an *element information item* with the following Infoset properties:

- A [local name] of `interface`
- A [namespace name] of "http://www.w3.org/2006/01/wsdl"
- One or more *attribute information items* amongst its [attributes] as follows:
    - A REQUIRED `name` *attribute information item* as described below in **2.2.2.1 name attribute information item with interface [owner element]** [p.20] .
    - An OPTIONAL `extends` *attribute information item* as described below in **2.2.2.2 extends attribute information item** [p.20] .
    - An OPTIONAL `styleDefault` *attribute information item* as described below in **2.2.2.3 styleDefault attribute information item** [p.20] .
    - Zero or more namespace qualified *attribute information items* whose [namespace name] is NOT "http://www.w3.org/2006/01/wsdl".
- Zero or more *element information items* amongst its [children], in order, as follows:
    1. Zero or more `documentation` *element information items* (see **5. Documentation** [p.84]).
    2. Zero or more *element information items* from among the following, in any order:
        - Zero or more `fault` *element information items* **2.3.2 XML Representation of Interface Fault Component** [p.23] .
        - Zero or more `operation` *element information items* **2.4.2 XML Representation of Interface Operation Component** [p.28] .
        - Zero or more `feature` *element information items* **2.7.2 XML Representation of Feature Component** [p.43] .

- Zero or more `property` *element information items* **2.8.2 XML Representation of Property Component** [p.47] .
- Zero or more namespace-qualified *element information items* whose [namespace name] is NOT "http://www.w3.org/2006/01/wsdl".

2.2.2.1 `name` *attribute information item* with `interface` [owner element]

The `name` *attribute information item* together with the `targetNamespace` *attribute information item* of the [parent] `description` *element information item* forms the QName of the interface.

The `name` *attribute information item* has the following Infoset properties:

- A [local name] of `name`
- A [namespace name] which has no value

The type of the `name` *attribute information item* is *xs:NCName*.

2.2.2.2 `extends` *attribute information item*

The `extends` *attribute information item* lists the interfaces that this interface derives from.

The `extends` *attribute information item* has the following Infoset properties:

- A [local name] of `extends`
- A [namespace name] which has no value

The type of the `extends` *attribute information item* is a list of *xs:QName*.

2.2.2.3 `styleDefault` *attribute information item*

The `styleDefault` *attribute information item* indicates the default style (see **2.4.1.2 Operation Style** [p.28]) used to construct the {element declaration [p.32] } properties of {interface message references [p.26] } of all operations contained within the [owner element] `interface` .

The `styleDefault` *attribute information item* has the following Infoset properties:

- A [local name] of `styleDefault.`
- A [namespace name] which has no value.

The type of the `styleDefault` *attribute information item* is *list of xs:anyURI*. Its value, if present, MUST contain absolute IRIs (see [*IETF RFC 3987 [p.92]*]).

2.2.3 Mapping Interface's XML Representation to Component Properties

The mapping from the XML Representation of the `interface` *element information item* (see **2.2.2 XML Representation of Interface Component** [p.19]) to the properties of the Interface [p.18] component is as described in Table 2-2 [p.21] .

Table 2-2. Mapping from XML Representation to Interface Component Properties

Property	Value
{name [p.18] }	The QName whose local name is actual value of the `name` *attribute information item* and whose namespace name is the actual value of the `targetNamespace` *attribute information item* of the [parent] `description` *element information item*
{extended interfaces [p.18] }	The set of Interface [p.18] components resolved to by the values in the `extends` *attribute information item*, if any (see **2.19 QName resolution** [p.72]).
{interface faults [p.18] }	The set of Interface Fault [p.22] components corresponding to the `fault` *element information item*s in [children], if any.
{interface operations [p.18] }	The set of Interface Operation [p.26] components corresponding to the `operation` *element information item*s in [children], if any.
{features [p.18] }	The set of Feature [p.40] components corresponding to the `feature` *element information item*s in [children], if any.
{properties [p.18] }	The set of Property [p.44] components corresponding to the `property` *element information item*s in [children], if any.

Recall that, per **2.2.1 The Interface Component** [p.18] , the Interface [p.18] components in the {extended interfaces [p.18] } property of a given Interface [p.18] component MUST NOT contain that Interface [p.18] component in any of their {extended interfaces [p.18] } properties, that is to say, recursive extension of interfaces is disallowed.

2.3 Interface Fault

2.3.1 The Interface Fault Component

A fault is an event that occurs during the execution of a message exchange that disrupts the normal flow of messages.

A fault is typically raised when a party is unable to communicate an error condition inside the normal message flow, or a party wishes to terminate a message exchange. A fault message may be used to communicate out of band information such as the reason for the error, the origin of the fault, as well as other informal diagnostics such as a program stack trace.

An Interface Fault [p.22] component describes a fault that MAY occur during invocation of an operation of the interface. The Interface Fault [p.22] component declares an abstract fault by naming it and indicating the contents of the fault message. When and how the fault message flows is indicated by the Interface

Operation [p.26] component.

The Interface Fault [p.22] component provides a clear mechanism to name and describe the set of faults an interface may generate. This allows operations to easily identify the individual faults they may generate by name. This mechanism allows the ready identification of the same fault occurring across multiple operations and referenced in multiple bindings as well as reducing duplication of description for an individual fault.

Faults other than the ones described in the Interface [p.18] component may also be generated at run-time, i.e. faults are an open set. The Interface [p.18] component describes faults that have application level semantics, i.e. that the client or service is expected to handle, and potentially recover from, as part of the application processing logic. For example, an Interface [p.18] component that accepts a credit card number may describe faults that indicate the credit card number is invalid, has been reported stolen, or has expired. The Interface [p.18] component does not describe general system faults such as network failures, out of memory conditions, out of disk space conditions, invalid message formats, etc., although these faults may be generated as part of the message exchange. Such general system faults can reasonably be expected to occur in any message exchange and explicitly describing them in an Interface [p.18] component is therefore uninformative.

The properties of the Interface Fault component are as follows:

- {name} REQUIRED. An *xs:QName*.
- {element declaration} OPTIONAL. A reference to a Element Declaration [p.14] component in the {element declarations [p.14] } property of the Description [p.14] component. This element represents the content or “payload” of the fault.
- {features} OPTIONAL. A set of Feature [p.40] components.
- {properties} OPTIONAL. A set of Property [p.44] components.
- {parent} REQUIRED. The Interface [p.18] component that contains this component in its {interface faults [p.18] } property.

For each Interface Fault [p.22] component in the {interface faults [p.18] } property of an Interface [p.18] component, the {name [p.22] } property must be unique.

Interface Fault [p.22] components are uniquely identified by the the QName of the enclosing Interface [p.18] component and QName of the Interface Fault [p.22] component itself.

Note:

Despite having a {name [p.22] } property, Interface Fault [p.22] components cannot be identified solely by their QName. Indeed, two Interface [p.18] components whose {name [p.18] } property value has the same namespace name, but different local names, can contain Interface Fault [p.22] components with the same {name [p.22] } property value. Thus, the {name [p.22] } property of Interface Fault [p.22] component is not sufficient to form the unique identity of an Interface Fault [p.22] component. A method for uniquely identifying components is defined in **A.2 Fragment Identifiers** [p.96] . See **A.2.5 The Interface Fault Component** [p.98] for the definition of the fragment identifier for the Interface Fault [p.22] component.

In cases where, due to an interface extending one or more other interfaces, two or more Interface Fault [p.22] components have the same value for their {name [p.22] } property, then the component models of those Interface Fault [p.22] components MUST be equivalent (see **2.17 Equivalence of Components** [p.71]). If the Interface Fault [p.22] components are equivalent then they are considered to collapse into a single component. It is an error if two Interface Fault [p.22] components that are available in the same Interface [p.18] component have the same value for their {name [p.22] } properties but are not equivalent.

Note that, due to the above rules, if two interfaces that have the same value for the namespace name of their {name [p.18] } property also have one or more faults that have the same value for their {name [p.22] } property then those two interfaces cannot both form part of the derivation chain of a derived interface unless those faults are the same fault.

Note:

For the above reason, it is considered good practice to ensure, where necessary, that the local name of the {name [p.22] } property of Interface Fault [p.22] components within a namespace are unique, thus allowing such derivation to occur without inadvertent error.

If a type system NOT based on the XML Infoset [*XML Information Set [p.92]*] is in use (as considered in **3.2 Using Other Schema Languages** [p.78]) then additional properties would need to be added to the Interface Fault [p.22] component (along with extensibility attributes to its XML representation) to allow associating such message types with the message reference.

2.3.2 XML Representation of Interface Fault Component

```
<description>
  <interface>
    <fault
          name="xs:NCName"
          element="xs:QName"? >
      <documentation />*
      [ <feature /> | <property /> ]*
    </fault>
  </interface>
</description>
```

The XML representation for an Interface Fault [p.22] component is an *element information item* with the following Infoset properties:

- A [local name] of `fault`
- A [namespace name] of "http://www.w3.org/2006/01/wsdl"
- One or more *attribute information items* amongst its [attributes] as follows:
    - A REQUIRED `name` *attribute information item* as described below in **2.3.2.1 name attribute information item with fault [owner element]** [p.24] .

- An OPTIONAL `element` *attribute information item* as described below in **2.3.2.2 element attribute information item with fault [owner element]** [p.24] .
- Zero or more namespace qualified *attribute information items* whose [namespace name] is NOT "http://www.w3.org/2006/01/wsdl".

- Zero or more *element information item* amongst its [children], in order, as follows:
  1. Zero or more `documentation` *element information items* (see **5. Documentation** [p.84]).
  2. Zero or more *element information items* from among the following, in any order:
     - Zero or more `feature` *element information items* **2.7.2 XML Representation of Feature Component** [p.43]
     - Zero or more `property` *element information items* **2.8.2 XML Representation of Property Component** [p.47]
     - Zero or more namespace-qualified *element information items* whose [namespace name] is NOT "http://www.w3.org/2006/01/wsdl".

2.3.2.1 `name` *attribute information item* with `fault` [owner element]

The `name` *attribute information item* identifies a given `fault` *element information item* inside a given `interface` *element information item*.

The `name` *attribute information item* has the following Infoset properties:

- A [local name] of `name`
- A [namespace name] which has no value

The type of the `name` *attribute information item* is *xs:NCName*.

2.3.2.2 `element` *attribute information item* with `fault` [owner element]

The `element` *attribute information item* refers, by QName, to an Element Declaration [p.14] component.

The `element` *attribute information item* has the following Infoset properties:

- A [local name] of `element` .
- A [namespace name] which has no value.

The type of the `element` *attribute information item* is *xs:QName*.

2.3.3 Mapping Interface Fault's XML Representation to Component Properties

The mapping from the XML Representation of the `fault` *element information item* (see **2.3.2 XML Representation of Interface Fault Component** [p.23]) to the properties of the Interface Fault [p.22] component is as described in Table 2-3 [p.25] .

Table 2-3. Mapping from XML Representation to Interface Fault Component Properties

Property	Value
{name [p.22] }	The QName whose local name is the actual value of the `name` *attribute information item*. and whose namespace name is the actual value of the `targetNamespace` *attribute information item* of the [parent] `description` *element information item* of the [parent] `interface` *element information item*.
{element declaration [p.22] }	The Element Declaration [p.14] component from the {element declarations [p.14] } property of the Description [p.14] component resolved to by the value of the `element` *attribute information item* if present (see **2.19 QName resolution** [p.72]), otherwise empty. It is an error for the `element` *attribute information item* to have a value and for it to not resolve to an Element Declaration [p.14] component from the {element declarations [p.14] } property of the Description [p.14] component.
{features [p.22] }	The set of Feature [p.40] components corresponding to the `feature` *element information item*s in [children], if any.
{properties [p.22] }	The set of Property [p.44] components corresponding to the `property` *element information item*s in [children], if any.
{parent [p.22] }	The Interface [p.18] component corresponding to the `interface` *element information item* in [parent].

2.4 Interface Operation

2.4.1 The Interface Operation Component

An Interface Operation [p.26] component describes an operation that a given interface supports. An operation is an interaction with the service consisting of a set of (ordinary and fault) messages exchanged between the service and the other parties involved in the interaction. The sequencing and cardinality of the messages involved in a particular interaction is governed by the *message exchange pattern* used by the operation (see {message exchange pattern [p.26] } property).

A message exchange pattern defines placeholders for messages, the participants in the pattern (i.e., the sources and sinks of the messages), and the cardinality and sequencing of messages exchanged by the participants. The message placeholders are associated with specific message types by the operation that uses the pattern by means of message and fault references (see {interface message references [p.26] } and {interface fault references [p.26] } properties). The service whose operation is using the pattern becomes one of the participants of the pattern. This specification does not define a machine understandable language for defining message exchange patterns, nor does it define any specific patterns. The companion specification, [*WSDL 2.0 Adjuncts [p.92]*] defines a set of such patterns and defines identifying IRIs any of which MAY be used as the value of the {message exchange pattern [p.26] } property.

The properties of the Interface Operation component are as follows:

- {name} REQUIRED. An *xs:QName*.
- {message exchange pattern} REQUIRED. An *xs:anyURI* identifying the message exchange pattern used by the operation. This *xs:anyURI* MUST be an absolute IRI (see [*IETF RFC 3987 [p.92]*]).
- {interface message references} OPTIONAL. A set of Interface Message Reference [p.32] components for the ordinary messages the operation accepts or sends.
- {interface fault references} OPTIONAL. A set of Interface Fault Reference [p.36] components for the fault messages the operation accepts or sends.
- {style} OPTIONAL. A set of *xs:anyURI*s identifying the rules that were used to construct the {element declaration [p.32] } properties of {interface message references [p.26] }. (See **2.4.1.2 Operation Style** [p.28] .) These *xs:anyURI*s MUST be absolute IRIs (see [*IETF RFC 3986 [p.92]*]).
- {features} OPTIONAL. A set of Feature [p.40] components.
- {properties} OPTIONAL. A set of Property [p.44] components.
- {parent} REQUIRED. The Interface [p.18] component that contains this component in its {interface operations [p.18] } property.

For each Interface Operation [p.26] component in the {interface operations [p.18] } property of an Interface [p.18] component, the {name [p.26] } property MUST be unique.

Interface Operation [p.26] components are uniquely identified by the the QName of the enclosing Interface [p.18] component and QName of the Interface Operation [p.26] component itself.

Note:

Despite having a {name [p.26] } property, Interface Operation [p.26] components cannot be identified solely by their QName. Indeed, two Interface [p.18] components whose {name [p.18] } property value has the same namespace name, but different local names, can contain Interface Operation [p.26] components with the same {name [p.26] } property value. Thus, the {name [p.26] } property of Interface Operation [p.26] components is not sufficient to form the unique identity of an Interface Operation [p.26] component. A method for uniquely identifying components is defined in **A.2 Fragment Identifiers** [p.96] . See **A.2.6 The Interface Operation Component** [p.98] for the definition of the fragment identifier for the Interface Operation [p.26] component.

In cases where, due to an interface extending one or more other interfaces, two or more Interface Operation [p.26] components have the same value for their {name [p.26] } property, then the component models of those Interface Operation components MUST be equivalent (see **2.17 Equivalence of Components** [p.71]). If the Interface Operation [p.26] components are equivalent then they are considered to collapse into a single component. It is an error if two Interface Operation components have the same value for their {name [p.26] } property but are not equivalent.

Note that, due to the above rules, if two interfaces that have the same value for the namespace name of their {name [p.18] } property also have one or more operations that have the same value for their {name [p.26] } property then those two interfaces cannot both form part of the derivation chain of a derived interface unless those operations are the same operation.

Note:

For the above reason, it is considered good practice to ensure, where necessary, that the {name [p.26] } property of Interface Operation [p.26] components within a namespace are unique, thus allowing such derivation to occur without inadvertent error.

More than one Interface Fault Reference [p.36] component in the {interface fault references [p.26] } property of an Interface Operation [p.26] component may refer to the same message label. In that case, the listed fault types define alternative fault messages. This allows one to indicate that there is more than one type of fault that is related to that message.

2.4.1.1 Message Exchange Pattern

This section describes some aspects of message exchange patterns in more detail. Refer to the *WSDL Version 2.0 Part 2: Adjuncts* specification [*WSDL 2.0 Adjuncts [p.92]*] for a complete discussion of the semantics of message exchange patterns in general as well as the definitions of the message exchange patterns that are predefined by WSDL 2.0.

A *placeholder message* is a template for an actual message as described by an Interface Message Reference [p.32] component. Although a placeholder message is not itself a component, it is useful to regard it as having both a {message label [p.32] } and a {direction [p.32] } property which define the values of the actual Interface Message Reference [p.32] component that corresponds to it. A placeholder message is also associated with some node that exchanges the message with the service. Furthermore, a placeholder message may be designated as optional in the exchange.

A *fault propagation ruleset* specifies the relation between the Interface Fault Reference [p.36] and Interface Message Reference [p.32] components of an Interface Operation [p.26] component. The *WSDL Version 2.0 Part 2: Adjuncts* specification [*WSDL 2.0 Adjuncts [p.92]*] defines three fault propagation rulesets which we'll refer to as *fault-replaces-message* , *message-triggers-fault* , and *no-faults* . These fault propagation rulesets are used by the predefined message exchange patterns. Other message exchange patterns may define additional fault propagation rulesets.

A *message exchange pattern* is a template for the exchange of one or more messages, and their associated faults, between the service and one or more other nodes as described by an Interface Operation [p.26] component. The service and the other nodes are referred to as the *participants* in the exchange. A message exchange pattern consists of a sequence of one or more placeholder messages. Each placeholder message within this sequence is uniquely identified by its {message label [p.32] } property. A message exchange pattern is uniquely identified by an absolute IRI which is used as the value of the {message exchange pattern [p.26] } property of the Interface Operation [p.26] component, and it specifies the fault propagation ruleset that its faults obey.

2.4.1.2 Operation Style

An operation style specifies additional information about an operation. For example, an operation style may define structural constraints on the element declarations of the interface message reference or interface fault components used by the operation. This additional information in no way affects the messages and faults exchanged with the service and it may therefore be safely ignored in that context. However, the additional information may be used for other purposes, for example, improved code generation. The {style [p.26] } property of the Interface Operation [p.26] component contains a set of zero or more IRIs that identify operation styles. An Interface Operation [p.26] component MUST satisfy the specification defined by each operation style identified by its {style [p.26] } property. If no Interface Operation [p.26] component can simultaneously satisfy all of the styles, the document is invalid.

If the {style [p.26] } property of an Interface Operation [p.26] component does have a value, then that value (a set of IRIs) specifies the rules that were used to define the element declarations (or other properties that define the message and fault contents; see **3.2 Using Other Schema Languages** [p.78]) of the Interface Message Reference [p.32] or Interface Fault [p.22] components used by the operation. Although a given operation style has the ability to constrain *all* input and output messages and faults of an operation, it MAY choose to constrain any combination thereof, e.g. only the messages, or only the inputs.

Please refer to the *WSDL Version 2.0 Part 2: Adjuncts* specification [*WSDL 2.0 Adjuncts [p.92]*] for particular operation style definitions.

2.4.2 XML Representation of Interface Operation Component

```
<description>
  <interface>
    <operation
          name="xs:NCName"
          pattern="xs:anyURI"
          style="list of xs:anyURI"? >
      <documentation />*
      [ <feature /> | <property /> |
        [ <input /> | <output /> | <infault /> | <outfault /> ]+
      ]*
    </operation>
  </interface>
</description>
```

The XML representation for an Interface Operation [p.26] component is an *element information item* with the following Infoset properties:

- A [local name] of `operation`
- A [namespace name] of "http://www.w3.org/2006/01/wsdl"
- Two or more *attribute information items* amongst its [attributes] as follows:
  - A REQUIRED `name` *attribute information item* as described below in **2.4.2.1 name attribute information item with operation [owner element]** [p.29] .

- A REQUIRED `pattern` *attribute information item* as described below in **2.4.2.2 pattern attribute information item with operation [owner element]** [p.30] .
- An OPTIONAL `style` *attribute information item* as described below in **2.4.2.3 style attribute information item with operation [owner element]** [p.30] .
- Zero or more namespace qualified *attribute information items* whose [namespace name] is NOT "http://www.w3.org/2006/01/wsdl".

- One or more *element information item* amongst its [children], in order, as follows:
  1. Zero or more `documentation` *element information items* (see **5. Documentation** [p.84]).
  2. One or more *element information items* from among the following, in any order:
     - One or more *element information items* from among the following, in any order:
       - Zero or more `input` *element information items* (see **2.5.2 XML Representation of Interface Message Reference Component** [p.32]).
       - Zero or more `output` *element information items* (see **2.5.2 XML Representation of Interface Message Reference Component** [p.32]).
       - Zero or more `infault` *element information items* (see **2.6.2 XML Representation of Interface Fault Reference** [p.36]).
       - Zero or more `outfault` *element information items* (see **2.6.2 XML Representation of Interface Fault Reference** [p.36]).
     - Zero or more *element information items* from among the following, in any order:
       - A `feature` *element information item* (see **2.7.2 XML Representation of Feature Component** [p.43]).
       - A `property` *element information item* (see **2.8.2 XML Representation of Property Component** [p.47]).
       - Zero or more namespace-qualified *element information items* whose [namespace name] is NOT "http://www.w3.org/2006/01/wsdl".

2.4.2.1 `name` *attribute information item* with `operation` [owner element]

The `name` *attribute information item* identifies a given `operation` *element information item* inside a given `interface` *element information item*.

The `name` *attribute information item* has the following Infoset properties:

- A [local name] of `name`
- A [namespace name] which has no value

The type of the `name` *attribute information item* is *xs:NCName*.

2.4.2.2 **`pattern`** ***attribute information item*** with **`operation`** [owner element]

The `pattern` *attribute information item* identifies the message exchange pattern a given operation uses.

The `pattern` *attribute information item* has the following Infoset properties:

- A [local name] of `pattern`
- A [namespace name] which has no value

The type of the `pattern` *attribute information item* is *xs:anyURI*. Its value MUST be an absolute IRI (see [*IETF RFC 3987 [p.92]*]).

2.4.2.3 **`style`** ***attribute information item*** with **`operation`** [owner element]

The `style` *attribute information item* indicates the rules that were used to construct the {element declaration [p.32] } properties of the Interface Message Reference [p.32] components which are members of the {interface message references [p.26] } property of the [owner element] operation.

The `style` *attribute information item* has the following Infoset properties:

- A [local name] of `style`
- A [namespace name] which has no value

The type of the `style` *attribute information item* is *list of xs:anyURI*. Its value MUST be an absolute IRI (see [*IETF RFC 3987 [p.92]*]).

2.4.3 Mapping Interface Operation's XML Representation to Component Properties

The mapping from the XML Representation of the `operation` *element information item* (see **2.4.2 XML Representation of Interface Operation Component** [p.28]) to the properties of the Interface Operation component (see **2.4.1 The Interface Operation Component** [p.25]) is as described in Table 2-4 [p.30] .

Table 2-4. Mapping from XML Representation to Interface Operation Component Properties

Property	Value
{name [p.26] }	The QName whose local name is the actual value of the `name` *attribute information item* and whose namespace name is the actual value of the `targetNamespace` *attribute information item* of the [parent] `description` *element information item* of the [parent] `interface` *element information item.*
{message exchange pattern [p.26] }	The actual value of the `pattern` *attribute information item*; otherwise ’http://www.w3.org/2006/01/wsdl/in-out’.
{interface message references [p.26] }	The set of message references corresponding to the `input` and `output` *element information item*s in [children], if any.
{interface fault references [p.26] }	The set of interface fault references corresponding to the `infault` and `outfault` *element information item*s in [children], if any.
{style [p.26] }	The set containing the IRIs in the actual value of the `style` *attribute information item*, if present; otherwise the set containing the IRIs in the actual value of the `styleDefault` *attribute information item* of the [parent] `interface` *element information item*, if present; otherwise empty.
{features [p.26] }	The set of Feature [p.40] components corresponding to the `feature` *element information item*s in [children], if any.
{properties [p.26] }	The set of Property [p.44] components corresponding to the `property` *element information item*s in [children], if any.
{parent [p.26] }	The Interface [p.18] component corresponding to the `interface` *element information item* in [parent].

2.5 Interface Message Reference

2.5.1 The Interface Message Reference Component

An Interface Message Reference [p.32] component associates a defined element with a message exchanged in an operation. By default, the element is defined in the XML Infoset [*XML Information Set [p.92]*].

A message exchange pattern defines a set of placeholder messages that participate in the pattern and assigns them unique message labels within the pattern (e.g. ’In’, ’Out’). The purpose of an Interface Message Reference [p.32] component is to associate an actual message element (XML element declaration or some other declaration (see **3.2 Using Other Schema Languages** [p.78])) with a message in the pattern, as identified by its message label. Later, when the message exchange pattern is instantiated, messages corresponding to that particular label will follow the element assignment made by the Interface Message Reference [p.32] component.

The properties of the Interface Message Reference component are as follows:

- {message label} REQUIRED. An *xs:NCName*. This property identifies the role this message plays in the {message exchange pattern [p.26] } of the Interface Operation [p.26] component this message is contained within. The value of this property MUST match the name of a placeholder message defined by the message exchange pattern.
- {direction} REQUIRED. An *xs:token* with one of the values *in* or *out*, indicating whether the message is coming to the service or going from the service, respectively. The direction MUST be the same as the direction of the message identified by the {message label [p.32] } property in the {message exchange pattern [p.26] } of the Interface Operation [p.26] component this is contained within.
- {message content model} REQUIRED. An *xs:token* with one of the values *#any*, *#none*, *#other*, or *#element*. A value of *#any* indicates that the message content is any single element. A value of *#none* indicates there is no message content. A value of *#other* indicates that the message content is described by some other extension property that references a declaration in a non-XML extension type system. A value of *#element* indicates that the message consists of a single element described by the global element declaration referenced by the {element declaration [p.32] } property. This property is used only when the message is described using an XML based data model.
- {element declaration} OPTIONAL. A reference to an XML element declaration in the {element declarations [p.14] } property of the Description component. This element represents the content or “payload” of the message. When the {message content model [p.32] } property has the value *#any* or *#none* the {element declaration [p.32] } property MUST be empty.
- {features} OPTIONAL. A set of Feature [p.40] components.
- {properties} OPTIONAL. A set of Property [p.44] components.
- {parent} REQUIRED. The Interface Operation [p.26] component that contains this component in its {interface message references [p.26] } property.

For each Interface Message Reference [p.32] component in the {interface message references [p.26] } property of an Interface Operation [p.26] component, its {message label [p.32] } property MUST be unique.

If a type system not based upon the XML Infoset is in use (as considered in **3.2 Using Other Schema Languages** [p.78]) then additional properties would need to be added to the Interface Message Reference [p.32] component (along with extensibility attributes to its XML representation) to allow associating such message types with the message reference.

2.5.2 XML Representation of Interface Message Reference Component

```
<description>
  <interface>
    <operation>
      <input
            messageLabel="xs:NCName"?
```

```
            element="union of xs:QName, xs:token"? >
        <documentation />*
        [ <feature /> | <property /> ]*
      </input>
      <output
            messageLabel="xs:NCName"?
            element="union of xs:QName, xs:token"? >
        <documentation />*
        [ <feature /> | <property /> ]*
      </output>
    </operation>
  </interface>
</description>
```

The XML representation for an Interface Message Reference [p.32] component is an *element information item* with the following Infoset properties:

- A [local name] of `input` or `output`
- A [namespace name] of "http://www.w3.org/2006/01/wsdl"
- Zero or more *attribute information items* amongst its [attributes] as follows:
    - An OPTIONAL `messageLabel` *attribute information item* as described below in **2.5.2.1 messageLabel attribute information item with input or output [owner element]** [p.34] .
    - An OPTIONAL `element` *attribute information item* as described below in **2.5.2.2 element attribute information item with input or output [owner element]** [p.34] .
    - Zero or more namespace qualified *attribute information items* whose [namespace name] is NOT "http://www.w3.org/2006/01/wsdl".
- Zero or more *element information item* amongst its [children], in order, as follows:
    1. Zero or more `documentation` *element information items* (see **5. Documentation** [p.84]).
    2. Zero or more *element information items* from among the following, in any order:
        - Zero or more `feature` *element information items* **2.7.2 XML Representation of Feature Component** [p.43]
        - Zero or more `property` *element information items* **2.8.2 XML Representation of Property Component** [p.47]
        - Zero or more namespace-qualified *element information items* whose [namespace name] is NOT "http://www.w3.org/2006/01/wsdl".

2.5.2.1 `messageLabel` *attribute information item* with `input` or `output` [owner element]

The `messageLabel` *attribute information item* identifies the role of this message in the message exchange pattern of the given `operation` *element information item*.

The `messageLabel` *attribute information item* has the following Infoset properties:

- A [local name] of `messageLabel`
- A [namespace name] which has no value

The type of the `messageLabel` *attribute information item* is *xs:NCName*.

2.5.2.2 `element` *attribute information item* with `input` or `output` [owner element]

The `element` *attribute information item* has the following Infoset properties:

- A [local name] of `element` .
- A [namespace name] which has no value.

The type of the `element` *attribute information item* is a union of *xs:QName* and *xs:token* where the allowed token values are *#any*, *#none*, or *#other*.

2.5.3 Mapping Interface Message Reference's XML Representation to Component Properties

The mapping from the XML Representation of the interface message reference *element information item* (see **2.5.2 XML Representation of Interface Message Reference Component** [p.32]) to the properties of the Interface Message Reference [p.32] component (see **2.5.1 The Interface Message Reference Component** [p.31]) is as described in Table 2-5 [p.35] .

Define the *message exchange pattern* of the *element information item* to be the {message exchange pattern [p.26] } of the parent Interface Operation [p.26] component.

Define the *message direction* of the *element information item* to be *in* if its local name is `input` and *out* if its local name is `output` .

The `messageLabel` *attribute information item* of an interface message reference *element information item* MUST be present if the message exchange pattern has more than one placeholder message with {direction} equal to the message direction.

If the `messageLabel` *attribute information item* of an interface message reference *element information item* is present then its actual value MUST match the {message label} of some placeholder message with {direction} equal to the message direction.

If the `messageLabel` *attribute information item* of an interface message reference *element information item* is absent then there MUST be a unique placeholder message with {direction} equal to the message direction.

Define the *effective message label* of an interface message reference *element information item* to be either the actual value of the `messageLabel` *attribute information item* if it is present, or the {message label} of the unique placeholder message with {direction} equal to the message direction if the *attribute information item* is absent.

Table 2-5. Mapping from XML Representation to Interface Message Reference Component Properties

Property	Value
{message label [p.32] }	The effective message label.
{direction [p.32] }	The message direction.
{message content model [p.32] }	If the `element` *attribute information item* is present and its value is a QName, then *#element*: otherwise the actual value of the `element` *attribute information item*, if any; otherwise *#other*.
{element declaration [p.32] }	If the `element` *attribute information item* is present and its value is a QName, then the Element Declaration [p.14] component from the {element declarations [p.14] } property of the Description [p.14] component resolved to by the value of the `element` *attribute information item* (see **2.19 QName resolution** [p.72]); otherwise empty. It is an error for the `element` *attribute information item* to have a value and for it to NOT resolve to an Element Declaration [p.14] from the {element declarations [p.14] } property of the Description [p.14] .
{features [p.32] }	The set of Feature [p.40] components corresponding to the `feature` *element information items* in [children], if any.
{properties [p.32] }	The set of Property [p.44] components corresponding to the `property` *element information items* in [children], if any.
{parent [p.32] }	The Interface Operation [p.26] component corresponding to the `interface` *element information item* in [parent].

2.6 Interface Fault Reference

2.6.1 The Interface Fault Reference Component

An Interface Fault Reference [p.36] component associates a defined type, specified by an Interface Fault [p.22] component, to a fault message exchanged in an operation.

A message exchange pattern defines a set of placeholder messages that participate in the pattern and assigns them unique message labels within the pattern (e.g. ’In’, ’Out’). The purpose of an Interface Fault Reference [p.36] component is to associate an actual message type (XML element declaration or some other declaration (see **3.2 Using Other Schema Languages** [p.78]) for message content, as specified by an Interface Fault [p.22] component) with a fault message occurring in the pattern. In order to identify the fault message it describes, the Interface Fault Reference [p.36] component uses the message label of the message the fault is associated with as a key.

The companion specification [*WSDL 2.0 Adjuncts [p.92]*] defines several *fault propagation rulesets* that a given message exchange pattern may use. For the ruleset *fault-replaces-message*, the message that the fault relates to identifies the message *in place of which* the declared fault message will occur. Thus, the fault message will travel in the *same* direction as the message it replaces in the pattern. For the ruleset *message-triggers-fault*, the message that the fault relates to identifies the message after which the indicated fault may occur, in the opposite direction of the referred to message. That is, the fault message will travel in the *opposite* direction of the message it comes after in the message exchange pattern.

The properties of the Interface Fault Reference component are as follows:

- {interface fault} REQUIRED. An Interface Fault [p.22] component in the {interface faults [p.18] } property of the [parent] Interface Operation [p.26] component's [parent] Interface [p.18] component, or an Interface [p.18] component that it directly or indirectly extends. Identifying the Interface Fault [p.22] component therefore indirectly defines the actual content or payload of the fault message.
- {message label} REQUIRED. An *xs:NCName*. This property identifies the message this fault relates to among those defined in the {message exchange pattern [p.26] } property of the Interface Operation [p.26] component it is contained within. The value of this property MUST match the name of a placeholder message defined by the message exchange pattern.
- {direction} REQUIRED. A *xs:token* with one of the values *in* or *out*, indicating whether the fault is coming to the service or going from the service, respectively. The direction MUST be consistent with the direction implied by the fault propagation ruleset used in the message exchange pattern of the operation. For example, if the ruleset *fault-replaces-message* is used, then a fault that refers to an outgoing message would have a {direction [p.36] } property value of *out*. On the other hand, if the ruleset *message-triggers-fault* is used, then a fault that refers to an outgoing message would have a {direction [p.36] } property value of *in* as the fault travels in the opposite direction of the message.
- {features} OPTIONAL. A set of Feature [p.40] components.
- {properties} OPTIONAL. A set of Property [p.44] components.
- {parent} REQUIRED. The Interface Operation [p.26] component that contains this component in its {interface fault references [p.26] } property.

For each Interface Fault Reference [p.36] component in the {interface fault references [p.26] } property of an Interface Operation [p.26] component, the combination of its {interface fault [p.36] } and {message label [p.36] } properties MUST be unique.

2.6.2 XML Representation of Interface Fault Reference

```
<description>
  <interface>
    <operation>
      <infault
            ref="xs:QName"
            messageLabel="xs:NCName"? >
        <documentation />*
        [ <feature /> | <property /> ]*
      </infault>*
```

```
      <outfault
            ref="xs:QName"
            messageLabel="xs:NCName"? >
        <documentation />*
        [ <feature /> | <property /> ]*
      </outfault>*
    </operation>
  </interface>
</description>
```

The XML representation for a Interface Fault Reference [p.36] component is an *element information item* with the following Infoset properties:

- A [local name] of `infault` or `outfault`
- A [namespace name] of "http://www.w3.org/2006/01/wsdl"
- One or more *attribute information items* amongst its [attributes] as follows:
    - A REQUIRED `ref` *attribute information item* as described below in **2.6.2.1 ref attribute information item with infault, or outfault [owner element]** [p.37] .
    - An OPTIONAL `messageLabel` *attribute information item* as described below in **2.6.2.2 messageLabel attribute information item with infault, or outfault [owner element]** [p.38] .
    - Zero or more namespace qualified *attribute information items* whose [namespace name] is NOT "http://www.w3.org/2006/01/wsdl".
- Zero or more *element information item* amongst its [children], in order, as follows:
    1. Zero or more `documentation` *element information items* (see **5. Documentation** [p.84]).
    2. Zero or more *element information items* from among the following, in any order:
        - Zero or more `feature` *element information items* **2.7.2 XML Representation of Feature Component** [p.43]
        - Zero or more `property` *element information items* **2.8.2 XML Representation of Property Component** [p.47]
        - Zero or more namespace-qualified *element information items* whose [namespace name] is NOT "http://www.w3.org/2006/01/wsdl".

2.6.2.1 `ref` *attribute information item* with `infault` , or `outfault` [owner element]

The `ref` *attribute information item* refers to a fault component.

The `ref` *attribute information item* has the following Infoset properties:

- A [local name] of `ref`
- A [namespace name] which has no value

The type of the `ref` *attribute information item* is *xs:QName*.

2.6.2.2 `messageLabel` *attribute information item* with `infault` , or `outfault` [owner element]

The `messageLabel` *attribute information item* identifies the message in the message exchange pattern of the given `operation` *element information item* that is associated with this fault.

The `messageLabel` *attribute information item* has the following Infoset properties:

- A [local name] of `messageLabel`
- A [namespace name] which has no value

The type of the `messageLabel` *attribute information item* is *xs:NCName*.

The `messageLabel` *attribute information item* MUST be present in the XML representation of an Interface Fault Reference [p.36] component with a given {direction [p.36] } if the {message exchange pattern [p.26] } of the parent Interface Operation [p.26] component has more than one fault with that direction. Recall that the *fault propagation ruleset* of the {message exchange pattern [p.26] } specifies the relation between faults and messages. For example, the *fault-replaces-message* ruleset specifies that the faults have the same direction as the messages, while the *message-triggers-fault* ruleset specifies that the faults have the opposite direction from the messages.

2.6.3 Mapping Interface Fault Reference's XML Representation to Component Properties

The mapping from the XML Representation of the message reference *element information item* (see **2.6.2 XML Representation of Interface Fault Reference** [p.36]) to the properties of the Interface Fault Reference component (see **2.6.1 The Interface Fault Reference Component** [p.35]) is as described in Table 2-6 [p.39] .

Define the *message exchange pattern* of the *element information item* to be the {message exchange pattern [p.26] } of the parent Interface Operation [p.26] component.

Define the *fault direction* of the *element information item* to be *in* if its local name is `infault` and *out* if its local name is `outfault` .

Define the *message direction* of the *element information item* to be the {direction} of the placeholder message associated with the fault as specifed by the fault propagation ruleset of the message exchange pattern.

The `messageLabel` *attribute information item* of an interface fault reference *element information item* MUST be present if the message exchange pattern has more than one placeholder message with {direction} equal to the message direction.

If the `messageLabel` *attribute information item* of an interface fault reference *element information item* is present then its actual value MUST match the {message label} of some placeholder message with {direction} equal to the message direction.

If the `messageLabel` *attribute information item* of an interface fault reference *element information item* is absent then there MUST be a unique placeholder message with {direction} equal to the message direction.

Define the *effective message label* of an interface fault reference *element information item* to be either the actual value of the `messageLabel` *attribute information item* if it is present, or the {message label} of the unique placeholder message whose {direction} is equal to the message direction if the *attribute information item* is absent.

Table 2-6. Mapping from XML Representation to Interface Fault Reference Component Properties

Property	Value
{interface fault [p.36] }	The Interface Fault [p.22] component from {interface faults [p.18] } property of the parent Interface [p.18] component, or an Interface [p.18] component that it directly or indirectly extends, with {name [p.22] } equal to the actual value of the `ref` *attribute information item*.
{message label [p.36] }	The effective message label.
{direction [p.36] }	The fault direction.
{features [p.36] }	The set of Feature [p.40] components corresponding to the `feature` *element information item*s in [children], if any.
{properties [p.36] }	The set of Property [p.44] components corresponding to the `property` *element information item*s in [children], if any.
{parent [p.36] }	The Interface Operation [p.26] component corresponding to the `interface` *element information item* in [parent].

2.7 Feature

2.7.1 The Feature Component

A Feature [p.40] component describes an abstract piece of functionality typically associated with the exchange of messages between communicating parties. Although WSDL 2.0 imposes no constraints on the potential scope of such features, examples might include “reliability”, “security”, “correlation”, and “routing”. The presence of a Feature [p.40] component in a WSDL 2.0 description indicates that the service supports the feature and may require that a client that interacts with the service use that feature.

Each Feature [p.40] is identified by its IRI.

WSDL 2.0's Feature [p.40] concept is derived from SOAP 1.2's abstract feature concept ([*SOAP 1.2 Part 1: Messaging Framework [p.93]*]). Every SOAP 1.2 abstract feature is therefore also a WSDL 2.0 Feature [p.40] . There is no need to define a separate WSDL 2.0 Feature [p.40] in order to use a particular SOAP 1.2 feature. The SOAP 1.2 feature can be used directly.

The properties of the Feature component are as follows:

- {ref} REQUIRED. An *xs:anyURI*. This *xs:anyURI* MUST be an absolute IRI as defined by [*IETF RFC 3987 [p.92]*]. This IRI SHOULD be dereferenceable to a document that directly or indirectly defines the meaning and use of the Feature [p.40] that it identifies.
- {required} REQUIRED. An *xs:boolean*. If the value of this property is *true*, then the client MUST use the Feature [p.40] that is identified by the {ref [p.40] } IRI. Otherwise, the client MAY use the Feature [p.40] that is identified by the {ref [p.40] } IRI. In either case, if the client does use the Feature that is identified by the {ref [p.40] } IRI, then the client MUST obey all semantics implied by the definition of that Feature [p.40] .
- {parent} REQUIRED. The component that contains this component in its {features [p.40] } property.

The {ref [p.40] } property of a Feature [p.40] component MUST be unique within the {features [p.40] } property of an Interface [p.18] , Interface Fault [p.22] , Interface Operation [p.26] , Interface Message Reference [p.32] , Interface Fault Reference [p.36] , Binding [p.50] , Binding Fault [p.53] , Binding Operation [p.56] , Binding Message Reference [p.59] , Binding Fault Reference [p.62] , Service [p.65] , or Endpoint [p.68] component.

2.7.1.1 Feature Composition Model

The set of features which are required or available for a given component consists of the combined set of ALL feature declarations applicable to that component. A feature is applicable to a component if:

- it is asserted directly within that component, or
- it is asserted in a containing component, or
- it is asserted in a component referred to by the current component.

Many of the component types in the component model contain a {features} property, which is a set of Feature [p.40] components. We refer to these as the *declared features* of the component. Furthermore, the {features [p.40] } property is itself a subset of Feature [p.40] components that are required or available for the given component as determined by the Feature Composition Model. We refer to these as the *in-scope features* of the component.

Following these rules, the set of features applicable at each component are as follows:

- Interface [p.18] component: all features asserted within the Interface [p.18] component and those with any extended Interface [p.18] components.
- Interface Fault [p.22] component: all features asserted within the Interface Fault [p.22] component and those within the parent Interface [p.18] component.
- Interface Operation [p.26] component: all features asserted within the Interface Operation [p.26] component and those within the parent Interface [p.18] component.
- Interface Message Reference [p.32] component: all features asserted within the Interface Message Reference [p.32] component, those within the parent Interface Operation [p.26] component and those within its parent Interface [p.18] component.
- Interface Fault Reference [p.36] component: all features asserted within the Interface Fault Reference [p.36] component, those within the parent Interface Operation [p.26] component and those within its parent Interface [p.18] component.
- Binding [p.50] component: all features asserted within the Binding [p.50] component and those within the Interface [p.18] component referred to by the Binding [p.50] component (if any).
- Binding Fault [p.53] component: all features asserted within the Binding Fault [p.53] component, those within the parent Binding [p.50] component, those within the corresponding Interface Fault [p.22] component, and those within the Interface [p.18] component referred to by the Binding [p.50] component.
- Binding Operation [p.56] component: all features asserted within the Binding Operation [p.56] component, those within the parent Binding [p.50] component, those within the corresponding Interface Operation [p.26] component, and those within the Interface [p.18] component referred to by the Binding [p.50] component.
- Binding Message Reference [p.59] component: all features asserted within the Binding Message Reference [p.59] component, those within the parent Binding [p.50] operation component, those within its parent Binding [p.50] component, those within the corresponding Interface Message Reference [p.32] component, and those within the Interface [p.18] component referred to by the Binding [p.50] component.
- Binding Fault Reference [p.62] component: all features asserted within the Binding Fault Reference [p.62] component, those within the parent Binding Operation [p.56] component, those within its parent Binding [p.50] component, those within the corresponding Interface Fault Reference [p.36] component, and those within the Interface [p.18] component referred to by the Binding [p.50] component.
- Service [p.65] component: all features asserted within the Service [p.65] component and those within the Interface [p.18] implemented by the Service [p.65] component.
- Endpoint [p.68] component: all features asserted within the Endpoint [p.68] component, whose within the Binding [p.50] component implemented by the Endpoint [p.68] component, and those within the parent Service [p.65] component.

If a given feature is asserted at multiple locations, then the value of that feature at a particular component is determined by the conjunction of all the constraints implied by its asserted values. If a feature is not required then it may or may not be engaged, but if a feature is required then it must be engaged. Therefore, the conjunction of a required value and a non-required value is a required value. A composed feature is required if and only if at least one of its asserted values is required. This rule may be summarized as "true trumps".

2.7.1.1.1 Example of Feature Composition Model

In the following example, the `depositFunds` operation on the `BankService` has to be used with the `ISO9001` , the `notarization` and the `secure-channel` features; they are all in scope. The fact that the `notarization` feature is declared both in the operation and in the binding has no effect.

```
<description targetNamespace="http://example.com/bank"
     xmlns=http://www.w3.org/2006/01/wsdl
     xmlns:ns1="http://example.com/bank">
  <interface name="ns1:Bank">
    <!-- All implementations of this interface must be secure -->
    <feature ref="http://example.com/secure-channel"
             required="true"/>
    <operation name="withdrawFunds">
      <!-- This operation must have ACID properties -->
      <feature ref="http://example.com/transaction"
               required="true"/>
      ...
    </operation>
    <operation name="depositFunds">
      <!-- This operation requires notarization -->
      <feature ref="http://example.com/notarization"
               required="true"/>
      ...
    </operation>
  </interface>

  <binding name="ns1:BankSOAPBinding">
    <!-- This particular binding requires ISO9001
         compliance to be verifiable -->
    <feature ref="http://example.com/ISO9001"
             required="true"/>
    <!-- This binding also requires notarization -->
    <feature ref="http://example.com/notarization"
             required="true"/>
  </binding>

  <service name="ns1:BankService"
           interface="tns:Bank">
    <endpoint binding="ns1:BankSOAPBinding">
      ...
    </endpoint>
  </service>
</description>
```

2.7.2 XML Representation of Feature Component

```
<feature
      ref="xs:anyURI"
      required="xs:boolean"? >
  <documentation />*
</feature>
```

The XML representation for a Feature [p.40] component is an *element information item* with the following Infoset properties:

- A [local name] of `feature`
- A [namespace name] of "http://www.w3.org/2006/01/wsdl"
- One or more *attribute information items* amongst its [attributes] as follows:
  - A REQUIRED `ref` *attribute information item* as described below in **2.7.2.1 ref attribute information item with feature [owner element]** [p.43] .
  - An OPTIONAL `required` *attribute information item* as described below in **2.7.2.2 required attribute information item with feature [owner element]** [p.43] .
  - Zero or more namespace qualified *attribute information items* whose [namespace name] is NOT "http://www.w3.org/2006/01/wsdl".
- Zero or more *element information items* amongst its [children], in order as follows:
  1. Zero or more `documentation` *element information items* (see **5. Documentation** [p.84]).
  2. Zero or more namespace-qualified *element information items* whose [namespace name] is NOT "http://www.w3.org/2006/01/wsdl".

2.7.2.1 `ref` *attribute information item* with `feature` [owner element]

The `ref` *attribute information item* specifies the IRI of the feature.

The `ref` *attribute information item* has the following Infoset properties:

- A [local name] of `ref`
- A [namespace name] which has no value

The type of the `ref` *attribute information item* is `xs:anyURI` .

2.7.2.2 `required` *attribute information item* with `feature` [owner element]

The `required` *attribute information item* specifies whether the use of the feature is mandatory or optional.

The `required` *attribute information item* has the following Infoset properties:

- A [local name] of `required`
- A [namespace name] which has no value

The type of the `required` *attribute information item* is `xs:boolean` .

2.7.3 Mapping Feature’s XML Representation to Component Properties

The mapping from the XML Representation of the `feature` *element information item* (see **2.7.2 XML Representation of Feature Component** [p.43]) to the properties of the Feature [p.40] component (see **2.7.1 The Feature Component** [p.39]) is as described in Table 2-7 [p.44] .

Table 2-7. Mapping from XML Representation to Feature Component Properties

Property	Value
{ref [p.40] }	The actual value of the `ref` *attribute information item*.
{required [p.40] }	The actual value of the `required` *attribute information item*, if present, otherwise "false".
{parent [p.40] }	The component corresponding to the *element information item* in [parent].

2.8 Property

2.8.1 The Property Component

A “property” in the Features and Properties architecture represents a named runtime value which affects the behavior of some aspect of a Web service interaction, much like an environment variable. For example, a reliable messaging SOAP module may specify a property to control the number of retries in the case of network failure. WSDL 2.0 documents may specify the value constraints for these properties by referring to a Schema type, or by specifying a particular value. Properties, and hence property values, can be shared amongst features/bindings/modules, and are named with IRIs precisely to allow this type of sharing.

The properties of the Property component are as follows:

- {ref} REQUIRED. An *xs:anyURI*. This *xs:anyURI* MUST be an absolute IRI as defined by [*IETF RFC 3987 [p.92]*]. This IRI SHOULD be dereferenceable to a document that directly or indirectly defines the meaning and use of the Property that it identifies.
- {value constraint} OPTIONAL. A reference to a Type Definition [p.14] component in the {type definitions [p.14] } property of the Description [p.14] component constraining the value of the Property [p.44] , or the token *#value* if the {value [p.45] } property is not empty.

- {value} OPTIONAL. The value of the Property, an ordered list of child information items, as specified by the [children] property of *element information item*s in [*XML Information Set [p.92]*].
- {parent} REQUIRED. The component that contains this component in its {properties [p.45] } property.

The {ref [p.44] } property of a Property [p.44] component MUST be unique within the {properties [p.45] } property of an Interface [p.18] , Interface Fault [p.22] , Interface Operation [p.26] , Interface Message Reference [p.32] , Interface Fault Reference [p.36] , Binding [p.50] , Binding Fault [p.53] , Binding Operation [p.56] , Binding Message Reference [p.59] , Binding Fault Reference [p.62] , Service [p.65] , or Endpoint [p.68] component.

If a type system not based upon the XML Infoset is in use (as considered in **3.2 Using Other Schema Languages** [p.78]) then additional properties would need to be added to the Property [p.44] component (along with extensibility attributes to its XML representation) to allow using such a type system to describe values and constraints for properties.

2.8.1.1 Property Composition Model

At runtime, the behavior of features, (SOAP) modules and bindings may be affected by the values of in-scope properties. Properties combine into a virtual "execution context" which maps property names (IRIs) to constraints. Each property IRI MAY therefore be associated with AT MOST one property constraint for a given interaction.

The set of properties which are required or available for a given component consists of the combined set of ALL property declarations applicable to that component. A property is applicable to a component if:

- it is asserted directly within that component, or
- it is asserted in a containing component, or
- it is asserted in a component referred to by the current component.

Many of the component types in the component model contain a {properties} property, which is a set of Property [p.44] components. We refer to these as the *declared properties* of the component. Furthermore, the {properties [p.45] } property is itself a subset of Property [p.44] components that are required or available for the given component as determined by the Property Composition Model. We refer to these as the *in-scope properties* of the component.

Following these rules, the set of properties applicable at each component are as follows:

- Interface [p.18] component: all properties asserted within the Interface [p.18] component and those with any extended Interface [p.18] components.
- Interface Fault [p.22] component: all properties asserted within the Interface Fault [p.22] component and those within the parent Interface [p.18] component.

- Interface Operation [p.26] component: all properties asserted within the Interface Operation [p.26] component and those within the parent Interface [p.18] component.
- Interface Message Reference [p.32] component: all properties asserted within the Interface Message Reference [p.32] component, those within the parent Interface Operation [p.26] component and those within its parent Interface [p.18] component.
- Binding [p.50] component: all properties asserted within the Binding [p.50] component and those within the Interface [p.18] component referred to by the Binding [p.50] component (if any).
- Binding Fault [p.53] component: all properties asserted within the Binding Fault [p.53] component, those within the parent Binding [p.50] component, those within the corresponding Interface Fault [p.22] component, and those within the Interface [p.18] component referred to by the Binding [p.50] component.
- Binding Operation [p.56] component: all properties asserted within the Binding Operation [p.56] component, those within the parent Binding [p.50] component, those within the corresponding Interface Operation [p.26] component, and those within the Interface [p.18] component referred to by the Binding [p.50] component.
- Binding Message Reference [p.59] component: all properties asserted within the Binding Message Reference [p.59] component, those within the parent Binding Operation [p.56] component, those within its parent Binding [p.50] component, those within the corresponding Interface Message Reference [p.32] component, and those within the Interface [p.18] component referred to by the Binding [p.50] component.
- Binding Fault Reference [p.62] component: all properties asserted within the Binding Fault Reference [p.62] component, those within the parent Binding Operation [p.56] component, those within its parent Binding [p.50] component, those within the corresponding Interface Fault Reference [p.36] component, and those within the Interface [p.18] component referred to by the Binding [p.50] component.
- Service [p.65] component: all properties asserted within the Service [p.65] component and those within the Interface [p.18] implemented by the Service [p.65] component.
- Endpoint [p.68] component: all properties asserted within the Endpoint [p.68] component, whose within the Binding [p.50] component implemented by the Endpoint [p.68] component, and those within the parent Service [p.65] component.

Note that, in the text above, “property constraint” (or, simply, “constraint”) is used to mean EITHER a `constraint` inside a Property [p.44] component OR a `value` , since `value` may be considered a special case of `constraint` .

If a given Property is asserted at multiple locations, then the value of that Property at a particular component is determined by the conjunction of all the constraints of its in-scope Property [p.44] components. A Property constraint asserts that, for a given interaction, the value of a Property is either a specified value or belongs to a specified set of values. A specified value may be regarded as a singleton set, so in both cases a Property constraint corresponds to an assertion that the Property value belongs to some set. The conjunction of all the constraints associated with the in-scope properties is an assertion that the property value belongs to each of the associated sets, or equivalently, that the value belongs to the intersection of all the associated sets. If the intersection of the associated sets is empty, then the property constraints are mutually incompatible, and the composition is invalid. Therefore, the intersection of the associated sets SHOULD NOT be empty.

Note:

The reason that we phrase the requirement for a non-empty intersection as SHOULD rather than MUST, is that in general, it may be computationally difficult to determine by inspection of the type definitions that the intersection of two or more value sets is empty. Therefore, it is not a strict validity requirement that the intersection of the value sets be non-empty. An empty intersection will always result in failure of the service at run-time.

However, it is in general feasible to test specified values for either equality or membership in value sets. All specified values MUST be equal and belong to each specified value set.

2.8.2 XML Representation of Property Component

```
<property
      ref="xs:anyURI" >
  <documentation />*
  [ <value /> | <constraint /> ]?
</property>
```

The XML representation for a Property [p.44] component is an *element information item* with the following Infoset properties:

- A [local name] of `property`
- A [namespace name] of "http://www.w3.org/2006/01/wsdl"
- One or more *attribute information items* amongst its [attributes] as follows:
    - A REQUIRED `ref` *attribute information item* as described below in **2.8.2.1 ref attribute information item with property [owner element]** [p.48] .
    - Zero or more namespace qualified *attribute information items* whose [namespace name] is NOT "http://www.w3.org/2006/01/wsdl".
- Zero or more *element information items* amongst its [children], in order as follows:
    1. Zero or more `documentation` *element information items* (see **5. Documentation** [p.84]).
    2. One OPTIONAL *element information item* from among the following:
        - A `value` *element information item* as described in **2.8.2.2 value element information item with property [parent]** [p.48]

- A `constraint` *element information item* as described in **2.8.2.3 constraint element information item with property [parent]** [p.48]

3. Zero or more namespace-qualified *element information items* whose [namespace name] is NOT "http://www.w3.org/2006/01/wsdl".

2.8.2.1 `ref` *attribute information item* with `property` [owner element]

The `ref` *attribute information item* specifies the IRI of the property. It has the following Infoset properties:

- A [local name] of `ref`
- A [namespace name] which has no value

The type of the `ref` *attribute information item* is `xs:anyURI` .

2.8.2.2 `value` *element information item* with `property` [parent]

```
<property>
  <value>
    xs:anyType
  </value>
</property>
```

The `value` *element information item* specifies the value of the property. It has the following Infoset properties:

- A [local name] of `value`
- A [namespace name] of "http://www.w3.org/2006/01/wsdl"

The type of the `value` *element information item* is `xs:anyType` .

2.8.2.3 `constraint` *element information item* with `property` [parent]

```
<property>
  <constraint>
    xs:QName
  </constraint>
</property>
```

The `constraint` *element information item* specifies a constraint on the value of the property. It has the following Infoset properties:

- A [local name] of `constraint`
- A [namespace name] of "http://www.w3.org/2006/01/wsdl"

The type of the `constraint` *attribute information item* is `xs:QName` .

2.8.3 Mapping Property's XML Representation to Component Properties

The mapping from the XML Representation of the `property` *element information item* (see **2.8.2 XML Representation of Property Component** [p.47]) to the properties of the Property [p.44] component (see **2.8.1 The Property Component** [p.44]) is as described in Table 2-8 [p.49] .

Table 2-8. Mapping from XML Representation to Property Component Properties

Property	Value
{ref [p.44] }	The actual value of the `ref` *attribute information item*.
{value constraint [p.44] }	If the `constraint` *element information item* is present, the Type Definition [p.14] component from the {type definitions [p.14] } property of the Description [p.14] component resolved to by the value of the `constraint` *element information item* (see **2.19 QName resolution** [p.72]); otherwise, if the `value` *element information item* is present, the token *#value*; otherwise empty.
{value [p.45] }	The value of the [children] property of the `value` *element information item*, if that element is present, otherwise empty.
{parent [p.45] }	The component corresponding to the *element information item* in [parent].

2.9 Binding

2.9.1 The Binding Component

A Binding [p.50] component describes a concrete message format and transmission protocol which may be used to define an endpoint (see **2.15 Endpoint** [p.68]). That is, a Binding [p.50] component defines the implementation details necessary to access the service.

Binding [p.50] components can be used to describe such information in a reusable manner for any interface or specifically for a given interface. Furthermore, binding information MAY be specified on a per-operation basis (see **2.11.1 The Binding Operation Component** [p.56]) within an interface in addition to across all operations of an interface.

If a Binding [p.50] component specifies any operation-specific binding details (by including Binding Operation [p.56] components) or any fault binding details (by including Binding Fault [p.53] components) then it MUST specify an interface the Binding [p.50] component applies to, so as to indicate which interface the operations come from.

Conversely, a Binding [p.50] component which omits any operation-specific binding details and any fault binding details MAY omit specifying an interface. Binding [p.50] components that do not specify an interface MAY be used to specify operation-independent binding details for Service [p.65] components with different interfaces. That is, such Binding [p.50] components are reusable across one or more interfaces.

No concrete binding details are given in this specification. The companion specification, *WSDL (Version 2.0): Adjuncts* [*WSDL 2.0 Adjuncts [p.92]*] defines such bindings for SOAP 1.2 [*SOAP 1.2 Part 1: Messaging Framework [p.93]*] and HTTP [*IETF RFC 2616 [p.93]*]. Other specifications MAY define additional binding details. Such specifications are expected to annotate the Binding [p.50] component (and its sub-components) with additional properties and specify the mapping from the XML representation to those properties.

A Binding [p.50] component that defines bindings for an Interface [p.18] component MUST define bindings for all the operations of that Interface [p.18] component. The bindings may occur via defaulting rules which allow one to specify default bindings for all operations (see, for example [*WSDL 2.0 Adjuncts [p.92]*]) or by directly listing each Interface Operation [p.26] component of the Interface [p.18] component and defining bindings for them. Thus, it is an error for a Binding [p.50] component to not define bindings for all the Interface Operation [p.26] components of the Interface [p.18] component for which the Binding [p.50] component purportedly defines bindings for.

Bindings are named constructs and can be referred to by QName (see **2.19 QName resolution** [p.72]). For instance, Endpoint [p.68] components refer to bindings in this way.

The properties of the Binding component are as follows:

- {name} REQUIRED. An *xs:QName*.
- {interface} OPTIONAL. An Interface [p.18] component indicating the interface for which binding information is being specified.
- {type} REQUIRED. An *xs:anyURI*. This *xs:anyURI* MUST be an absolute IRI as defined by [*IETF RFC 3987 [p.92]*]. The value of this IRI indicates what kind of concrete binding details are contained within this Binding [p.50] component. Specifications (such as [*WSDL 2.0 Adjuncts [p.92]*]) that define such concrete binding details MUST specify appropriate values for this property. The value of this property MAY be the namespace name of the extension elements or attributes which define those concrete binding details.
- {binding faults} OPTIONAL. A set of Binding Fault [p.53] components.
- {binding operations} OPTIONAL. A set of Binding Operation [p.56] components.
- {features} OPTIONAL. A set of Feature [p.40] components.
- {properties} OPTIONAL. A set of Property [p.44] components.

For each Binding [p.50] component in the {bindings [p.14] } property of a Description [p.14] component, the {name [p.50] } property MUST be unique.

2.9.2 XML Representation of Binding Component

```
<description>
  <binding
        name="xs:NCName"
        interface="xs:QName"?
        type="xs:anyURI" >
```

```
    <documentation />*
    [ <fault /> | <operation /> | <feature /> | <property /> ]*
  </binding>
</description>
```

The XML representation for a Binding [p.50] component is an *element information item* with the following Infoset properties:

- A [local name] of `binding`
- A [namespace name] of "http://www.w3.org/2006/01/wsdl"
- Two or more *attribute information items* amongst its [attributes] as follows:
  - A REQUIRED `name` *attribute information item* as described below in **2.9.2.1 name attribute information item with binding [owner element]** [p.52] .
  - An OPTIONAL `interface` *attribute information item* as described below in **2.9.2.2 interface attribute information item with binding [owner element]** [p.52] .
  - An REQUIRED `type` *attribute information item* as described below in **2.9.2.3 type attribute information item with binding [owner element]** [p.52] .
  - Zero or more namespace qualified *attribute information items* whose [namespace name] is NOT "http://www.w3.org/2006/01/wsdl".
- Zero or more *element information items* amongst its [children], in order, as follows:
  1. Zero or more `documentation` *element information items* (see **5. Documentation** [p.84]).
  2. Zero or more *element information items* from among the following, in any order:
     - Zero or more `fault` *element information items* (see **2.10.2 XML Representation of Binding Fault Component** [p.54]).
     - Zero or more `operation` *element information items* (see **2.11.2 XML Representation of Binding Operation Component** [p.57]).
     - Zero or more `feature` *element information items* (see **2.7.2 XML Representation of Feature Component** [p.43]).
     - Zero or more `property` *element information items* (see **2.8.2 XML Representation of Property Component** [p.47]).
     - Zero or more namespace-qualified *element information items* whose [namespace name] is NOT "http://www.w3.org/2006/01/wsdl". Such *element information items* are considered to be binding extension elements(see **2.9.2.4 Binding extension elements** [p.52]).

2.9.2.1 `name` *attribute information item* with `binding` [owner element]

The `name` *attribute information item* together with the `targetNamespace` *attribute information item* of the `description` *element information item* forms the QName of the binding.

The `name` *attribute information item* has the following Infoset properties:

- A [local name] of `name`
- A [namespace name] which has no value

The type of the `name` *attribute information item* is *xs:NCName*.

2.9.2.2 `interface` *attribute information item* with `binding` [owner element]

The `interface` *attribute information item* refers, by QName, to an Interface [p.18] component.

The `interface` *attribute information item* has the following Infoset properties:

- A [local name] of `interface`
- A [namespace name] which has no value

The type of the `interface` *attribute information item* is *xs:QName*.

2.9.2.3 `type` *attribute information item* with `binding` [owner element]

The `type` *attribute information item* identifies the kind of binding details contained in the Binding [p.50] component.

The `type` *attribute information item* has the following Infoset properties:

- A [local name] of `type`
- A [namespace name] which has no value

The type of the `type` *attribute information item* is *xs:anyURI*.

2.9.2.4 Binding extension elements

Binding extension elements are used to provide information specific to a particular binding. The semantics of such *element information items* are defined by the specification for those *element information items*. Such specifications are expected to annotate the Binding [p.50] component with additional properties and specify the mapping from the XML representation to those properties.

2.9.3 Mapping Binding's XML Representation to Component Properties

The mapping from the XML Representation of the `binding` *element information item* (see **2.9.2 XML Representation of Binding Component** [p.50]) to the properties of the Binding [p.50] component (see **2.9.1 The Binding Component** [p.49]) is as described in Table 2-9 [p.53] .

Table 2-9. Mapping from XML Representation to Binding Component Properties

Property	Value
{name [p.50] }	The QName whose local name is the actual value of the `name` *attribute information item* and whose namespace name is the actual value of the `targetNamespace` *attribute information item* of the [parent] `description` *element information item*.
{interface [p.50] }	The Interface [p.18] component resolved to by the actual value of the `interface` *attribute information item* (see **2.19 QName resolution** [p.72]), if any.
{type [p.50] }	The actual value of the `type` *attribute information item*.
{binding faults [p.50] }	The set of Binding Fault [p.53] components corresponding to the `fault` *element information item*s in [children], if any.
{binding operations [p.50] }	The set of Binding Operation [p.56] components corresponding to the `operation` *element information item*s in [children], if any.
{features [p.50] }	The set of Feature [p.40] components corresponding to the `feature` *element information item*s in [children], if any.
{properties [p.50] }	The set of Property [p.44] components corresponding to the `property` *element information item*s in [children], if any.

2.10 Binding Fault

2.10.1 The Binding Fault Component

A Binding Fault [p.53] component describes a concrete binding of a particular fault within an interface to a particular concrete message format. A particular fault of an interface is uniquely identified by its {name [p.22] } property.

Note that the fault does not occur by itself - it occurs as part of a message exchange as defined by an Interface Operation [p.26] component (and its binding counterpart the Binding Operation [p.56] component). Thus, the fault binding information specified in a Binding Fault [p.53] component describes how faults that occur within a message exchange of an operation will be formatted and carried in the transport.

The properties of the Binding Fault component are as follows:

- {interface fault} REQUIRED. An Interface Fault [p.22] component in the {interface faults [p.18] } property of the Interface [p.18] component identified by the {interface [p.50] } property of the parent Binding [p.50] component, or an Interface [p.18] component that that Interface [p.18] component directly or indirectly extends. This is the Interface Fault [p.22] component for which binding information is being specified.
- {features} OPTIONAL. A set of Feature [p.40] components.
- {properties} OPTIONAL. A set of Property [p.44] components.
- {parent} REQUIRED. The Binding [p.50] component that contains this component in its {binding faults [p.50] } property.

For each Binding Fault [p.53] component in the {binding faults [p.50] } property of a Binding [p.50] component, the {interface fault [p.54] } property MUST be unique. That is, one cannot define multiple bindings for the same fault within a given Binding [p.50] component.

2.10.2 XML Representation of Binding Fault Component

```
<description>
  <binding>
    <fault
          ref="xs:QName" >
      <documentation />*
      [ <feature /> | <property /> ]*
    </fault>
  </binding>
</description>
```

The XML representation for a Binding Fault [p.53] component is an *element information item* with the following Infoset properties:

- A [local name] of `fault`
- A [namespace name] of "http://www.w3.org/2006/01/wsdl"
- One or more *attribute information item*s amongst its [attributes] as follows:
    - A REQUIRED `ref` *attribute information item* as described below in **2.10.2.1 ref attribute information item with fault [owner element]** [p.55] .
    - Zero or more namespace qualified *attribute information item*s whose [namespace name] is NOT "http://www.w3.org/2006/01/wsdl".
- Zero or more *element information item* amongst its [children], in order, as follows:
    1. Zero or more `documentation` *element information item*s (see **5. Documentation** [p.84]).

2. Zero or more *element information item*s from among the following, in any order:

   - Zero or more `feature` *element information item*s **2.7.2 XML Representation of Feature Component** [p.43]

   - Zero or more `property` *element information item*s **2.8.2 XML Representation of Property Component** [p.47]

   - Zero or more namespace-qualified *element information item*s whose [namespace name] is NOT "http://www.w3.org/2006/01/wsdl". Such *element information item*s are considered to be binding fault extension elements as described below (see **2.10.2.2 Binding Fault extension elements** [p.55]).

2.10.2.1 `ref` *attribute information item* with `fault` [owner element]

The `ref` *attribute information item* has the following Infoset properties:

- A [local name] of `ref`

- A [namespace name] which has no value

The type of the `ref` *attribute information item* is *xs:QName*.

2.10.2.2 Binding Fault extension elements

Binding Fault extension elements are used to provide information specific to a particular fault in a binding. The semantics of such *element information item*s are defined by the specification for those *element information item*s. Such specifications are expected to annotate the Binding Fault [p.53] component with additional properties and specify the mapping from the XML representation to those properties.

2.10.3 Mapping Binding Fault's XML Representation to Component Properties

The mapping from the XML Representation of the `fault` *element information item* (see **2.10.2 XML Representation of Binding Fault Component** [p.54]) to the properties of the Binding Fault [p.53] component (see **2.10.1 The Binding Fault Component** [p.53]) is as described in Table 2-10 [p.55] .

Table 2-10. Mapping from XML Representation to Binding Fault Component Properties

Property	Value
{interface fault [p.54] }	The Interface Fault [p.22] Component corresponding to the actual value of the `ref` *attribute information item*.
{features [p.54] }	The set of Feature [p.40] components corresponding to the `feature` *element information item*s in [children], if any.
{properties [p.54] }	The set of Property [p.44] components corresponding to the `property` *element information item*s in [children], if any.
{parent [p.54] }	The Binding [p.50] component corresponding to the `binding` *element information item* in [parent].

2.11 Binding Operation

2.11.1 The Binding Operation Component

The Binding Operation [p.56] component describes the concrete message format(s) and protocol interaction(s) associated with a particular interface operation for a given endpoint. A particular operation of an interface is uniquely identified by its {name [p.26] } property.

The properties of the Binding Operation component are as follows:

- {interface operation} REQUIRED. An Interface Operation component in the {interface operations [p.18] } property of the Interface [p.18] component identified by the {interface [p.50] } property of the [parent] Binding [p.50] component, or an Interface component that that Interface [p.18] component directly or indirectly extends. This is the Interface Operation [p.26] component for which binding information is being specified.
- {binding message references} OPTIONAL. A set of Binding Message Reference [p.59] components.
- {binding fault references} OPTIONAL. A set of Binding Fault Reference [p.62] components.
- {features} OPTIONAL. A set of Feature [p.40] components.
- {properties} OPTIONAL. A set of Property [p.44] components.
- {parent} REQUIRED. The Binding [p.50] component that contains this component in its {binding operations [p.50] } property.

For each Binding Operation [p.56] component in the {binding operations [p.50] } property of a Binding [p.50] component, the {interface operation [p.56] } property MUST be unique. That is, one cannot define multiple bindings for the same operation within a given Binding [p.50] component.

2.11.2 XML Representation of Binding Operation Component

```
<description>
  <binding>
    <operation
          ref="xs:QName" >
      <documentation />*
      [ <input /> | <output /> | <infault /> | <outfault /> | <feature /> | <property /> ]*
    </operation>
  </binding>
</description>
```

The XML representation for a Binding Operation [p.56] component is an *element information item* with the following Infoset properties:

- A [local name] of `operation`
- A [namespace name] of "http://www.w3.org/2006/01/wsdl"
- One or more *attribute information items* amongst its [attributes] as follows:
  - A REQUIRED `ref` *attribute information item* as described below in **2.11.2.1 ref attribute information item with operation [owner element]** [p.58] .
  - Zero or more namespace qualified *attribute information items* whose [namespace name] is NOT "http://www.w3.org/2006/01/wsdl".
- Zero or more *element information items* amongst its [children], in order, as follows:
  1. Zero or more `documentation` *element information items* (see **5. Documentation** [p.84]).
  2. Zero or more *element information items* from among the following, in any order:
     - Zero or more `input` *element information items* (see **2.12 Binding Message Reference** [p.59])
     - Zero or more `output` *element information items* (see **2.12 Binding Message Reference** [p.59])
     - Zero or more `infault` *element information items* (see **2.13 Binding Fault Reference** [p.62])
     - Zero or more `outfault` *element information items* (see **2.13 Binding Fault Reference** [p.62])
     - Zero or more `feature` *element information items* (see **2.7.2 XML Representation of Feature Component** [p.43])
     - Zero or more `property` *element information items* (see **2.7.2 XML Representation of Feature Component** [p.43])

- Zero or more namespace-qualified *element information item* whose [namespace name] is NOT " http://www.w3.org/2006/01/wsdl ". Such *element information items* are considered to be binding operation extension elements as described below (see **2.11.2.2 Binding Operation extension elements** [p.58]).

2.11.2.1 `ref` *attribute information item* with `operation` [owner element]

The `ref` *attribute information item* has the following Infoset properties:

- A [local name] of `ref`
- A [namespace name] which has no value

The type of the `ref` *attribute information item* is *xs:QName*.

2.11.2.2 Binding Operation extension elements

Binding Operation extension elements are used to provide information specific to a particular operation in a binding. The semantics of such *element information items* are defined by the specification for those *element information items*. Such specifications are expected to annotate the Binding Operation [p.56] component with additional properties and specify the mapping from the XML representation to those properties.

2.11.3 Mapping Binding Operation's XML Representation to Component Properties

The mapping from the XML Representation of the `operation` *element information item* (see **2.11.2 XML Representation of Binding Operation Component** [p.57]) to the properties of the Binding Operation [p.56] component is as described in Table 2-11 [p.58] .

Table 2-11. Mapping from XML Representation to Binding Operation Component Properties

Property	Value
{interface operation [p.56] }	The Interface Operation [p.26] component corresponding to the actual value of the `ref` *attribute information item*.
{binding message references [p.56] }	The set of Binding Message Reference [p.59] components corresponding to the `input` and `output` *element information items* in [children], if any.
{binding fault references [p.56] }	The set of Binding Fault Reference [p.62] components corresponding to the `infault` and `outfault` *element information items* in [children], if any.
{features [p.56] }	The set of Feature [p.40] components corresponding to the `feature` *element information items* in [children], if any.
{properties [p.56] }	The set of Property [p.44] components corresponding to the `property` *element information items* in [children], if any.
{parent [p.56] }	The Binding [p.50] component corresponding to the `binding` *element information item* in [parent].

2.12 Binding Message Reference

2.12.1 The Binding Message Reference Component

A Binding Message Reference [p.59] component describes a concrete binding of a particular message participating in an operation to a particular concrete message format.

The properties of the Binding Message Reference component are as follows:

- {interface message reference} REQUIRED. An Interface Message Reference [p.32] component among those in the {interface message references [p.26] } property of the Interface Operation [p.26] component being bound by the containing Binding Operation [p.56] component.
- {features} OPTIONAL. A set of Feature [p.40] components.
- {properties} OPTIONAL. A set of Property [p.44] components.
- {parent} REQUIRED. The Binding Operation [p.56] component that contains this component in its {binding message references [p.56] } property.

For each Binding Message Reference [p.59] component in the {binding message references [p.56] } property of a Binding Operation [p.56] component, the {interface message reference [p.59] } property MUST be unique. That is, the same message cannot be bound twice within the same operation.

2.12.2 XML Representation of Binding Message Reference Component

```
<description>
  <binding>
    <operation>
      <input
            messageLabel="xs:NCName"? >
        <documentation />*
        [ <feature /> | <property /> ]*
      </input>
      <output
            messageLabel="xs:NCName"? >
        <documentation />*
        [ <feature /> | <property /> ]*
      </output>
    </operation>
  </binding>
</description>
```

The XML representation for a Binding Message Reference [p.59] component is an *element information item* with the following Infoset properties:

- A [local name] of `input` or `output` .
- A [namespace name] of "http://www.w3.org/2006/01/wsdl".

- Zero or more *attribute information items* amongst its [attributes] as follows:
  - An OPTIONAL `messageLabel` *attribute information item* as described below in **2.12.2.1 messageLabel attribute information item with input or output [owner element]** [p.60] .
  - Zero or more namespace qualified *attribute information items* whose [namespace name] is NOT "http://www.w3.org/2006/01/wsdl".
- Zero or more *element information item* amongst its [children], in order, as follows:
  1. Zero or more `documentation` *element information items* (see **5. Documentation** [p.84]).
  2. Zero or more *element information items* from among the following, in any order:
     - Zero or more `feature` *element information items* **2.7.2 XML Representation of Feature Component** [p.43]
     - Zero or more `property` *element information items* **2.8.2 XML Representation of Property Component** [p.47]
     - Zero or more namespace-qualified *element information items* whose [namespace name] is NOT "http://www.w3.org/2006/01/wsdl". Such *element information items* are considered to be binding message reference extension elements as described below (see **2.12.2.2 Binding Message Reference extension elements** [p.60]).

2.12.2.1 `messageLabel` *attribute information item* with `input` or `output` [owner element]

The `messageLabel` *attribute information item* has the following Infoset properties:

- A [local name] of `messageLabel` .
- A [namespace name] which has no value.

The type of the `messageLabel` *attribute information item* is *xs:NCName*.

2.12.2.2 Binding Message Reference extension elements

Binding Message Reference extension elements are used to provide information specific to a particular message in an operation. The semantics of such *element information items* are defined by the specification for those *element information items*. Such specifications are expected to annotate the Binding Message Reference [p.59] component with additional properties and specify the mapping from the XML representation to those properties..

2.12.3 Mapping Binding Message Reference's XML Representation to Component Properties

The mapping from the XML Representation of the `binding` *element information item* (see **2.12.2 XML Representation of Binding Message Reference Component** [p.59]) to the properties of the Binding Message Reference [p.59] component is as described in Table 2-12 [p.61] .

Define the *message exchange pattern* of the *element information item* to be the {message exchange pattern [p.26] } of the Interface Operation [p.26] component being bound.

Define the *message direction* of the *element information item* to be *in* if its local name is `input` and *out* if its local name is `output` .

The `messageLabel` *attribute information item* of a binding message reference *element information item* MUST be present if the message exchange pattern has more than one placeholder message with {direction} equal to the message direction.

If the `messageLabel` *attribute information item* of a binding message reference *element information item* is present then its actual value MUST match the {message label} of some placeholder message with {direction} equal to the message direction.

If the `messageLabel` *attribute information item* of a binding message reference *element information item* is absent then there MUST be a unique placeholder message with {direction} equal to the message direction.

Define the *effective message label* of a binding message reference *element information item* to be either the actual value of the `messageLabel` *attribute information item* if it is present, or the {message label} of the unique placeholder message with {direction} equal to the message direction if the *attribute information item* is absent.

Table 2-12. Mapping from XML Representation to Binding Message Reference Component Properties

Property	Value
{interface message reference [p.59] }	The Interface Message Reference [p.32] component in the {interface message references [p.26] } of the Interface Operation [p.26] component being bound with {message label [p.32] } equal to the effective message label.
{features}	The set of Feature [p.40] components corresponding to the `feature` *element information item*s in [children], if any.
{properties}	The set of Property [p.44] components corresponding to the `property` *element information item*s in [children], if any.
{parent}	The Binding Operation [p.56] component corresponding to the `operation` *element information item* in [parent].

2.13 Binding Fault Reference

2.13.1 The Binding Fault Reference Component

A Binding Fault Reference [p.62] component describes a concrete binding of a particular fault participating in an operation to a particular concrete message format.

The properties of the Binding Fault Reference component are as follows:

- {interface fault reference} REQUIRED. An Interface Fault Reference [p.36] component among those in the {interface fault references [p.26] } property of the Interface Operation [p.26] component being bound by the parent Binding Operation [p.56] component.
- {features} OPTIONAL. A set of Feature [p.40] components.
- {properties} OPTIONAL. A set of Property [p.44] components.
- {parent} REQUIRED. The Binding Operation [p.56] component that contains this component in its {binding fault references [p.56] } property.

For each Binding Fault Reference [p.62] component in the {binding fault references [p.56] } property of a Binding Operation [p.56] component, the {interface fault reference [p.62] } property MUST be unique. That is, the same fault cannot be bound twice within the same operation.

2.13.2 XML Representation of Binding Fault Reference Component

```
<description>
  <binding>
    <operation>
      <infault
            ref="xs:QName"
            messageLabel="xs:NCName"?>
        <documentation />*
        [ <feature /> | <property /> ]*
      </infault>
      <outfault
            ref="xs:QName"
            messageLabel="xs:NCName"?>
        <documentation />*
        [ <feature /> | <property /> ]*
      </outfault>
    </operation>
  </binding>
</description>
```

The XML representation for a Binding Fault Reference [p.62] component is an *element information item* with the following Infoset properties:

- A [local name] of `infault` or `outfault` .

- A [namespace name] of "http://www.w3.org/2006/01/wsdl".
- One or more *attribute information items* amongst its [attributes] as follows:
  - A REQUIRED `ref` *attribute information item* as described below in **2.13.2.1 ref attribute information item with infault or outfault [owner element]** [p.63] .

    An OPTIONAL `messageLabel` *attribute information item* as described below in **2.13.2.2 messageLabel attribute information item with infault or outfault [owner element]** [p.63] .
  - Zero or more namespace qualified *attribute information items* whose [namespace name] is NOT "http://www.w3.org/2006/01/wsdl".
- Zero or more *element information item* amongst its [children], in order, as follows:
  1. Zero or more `documentation` *element information items* (see **5. Documentation** [p.84]).
  2. Zero or more *element information items* from among the following, in any order:
     - Zero or more `feature` *element information items* **2.7.2 XML Representation of Feature Component** [p.43]
     - Zero or more `property` *element information items* **2.8.2 XML Representation of Property Component** [p.47]
     - Zero or more namespace-qualified *element information items* whose [namespace name] is NOT "http://www.w3.org/2006/01/wsdl". Such *element information items* are considered to be binding fault reference extension elements as described below (see **2.13.2.3 Binding Fault Reference extension elements** [p.64]).

2.13.2.1 `ref` *attribute information item* with `infault` or `outfault` [owner element]

The `ref` *attribute information item* has the following Infoset properties:

- A [local name] of `ref` .
- A [namespace name] which has no value.

The type of the `ref` *attribute information item* is *xs:QName*.

2.13.2.2 `messageLabel` *attribute information item* with `infault` or `outfault` [owner element]

The `messageLabel` *attribute information item* has the following Infoset properties:

- A [local name] of `messageLabel` .

- A [namespace name] which has no value.

The type of the `messageLabel` *attribute information item* is *xs:NCName*.

2.13.2.3 Binding Fault Reference extension elements

Binding Fault Reference extension elements are used to provide information specific to a particular fault in an operation. The semantics of such *element information item*s are defined by the specification for those *element information item*s. Such specifications are expected to annotate the Binding Fault Reference [p.62] component with additional properties and specify the mapping from the XML representation to those properties..

2.13.3 Mapping Binding Fault Reference's XML Representation to Component Properties

The mapping from the XML Representation of the `binding` *element information item* (see **2.13.2 XML Representation of Binding Fault Reference Component** [p.62]) to the properties of the Binding Fault Reference [p.62] component is as described in Table 2-13 [p.65] .

Define the *message exchange pattern* of the *element information item* to be the {message exchange pattern [p.26] } of the Interface Operation [p.26] component being bound.

Define the *fault direction* of the *element information item* to be *in* if its local name is `infault` and *out* if its local name is `outfault` .

Define the *message direction* of the *element information item* to be the {direction} of the placeholder message associated with the fault as specifed by the fault propagation ruleset of the message exchange pattern.

The `messageLabel` *attribute information item* of a binding fault reference *element information item* MUST be present if the message exchange pattern has more than one placeholder message with {direction} equal to the message direction.

If the `messageLabel` *attribute information item* of a binding fault reference *element information item* is present then its actual value MUST match the {message label} of some placeholder message with {direction} equal to the message direction.

If the `messageLabel` *attribute information item* of a binding fault reference *element information item* is absent then there MUST be a unique placeholder message with {direction} equal to the message direction.

Define the *effective message label* of a binding fault reference *element information item* to be either the actual value of the `messageLabel` *attribute information item* if it is present, or the {message label} of the unique placeholder message with {direction} equal to the message direction if the *attribute information item* is absent.

There MUST be an Interface Fault Reference [p.36] component in the {interface fault references [p.26] } of the Interface Operation [p.26] being bound with {message label [p.36] } equal to the effective message label and with {interface fault [p.36] } equal to an Interface Fault [p.22] component with {name [p.22] } equal to the actual value of the `ref` *attribute information item*.

Table 2-13. Mapping from XML Representation to Binding Fault Reference Component Properties

Property	Value
{interface fault reference [p.62] }	The Interface Fault Reference [p.36] component in the {interface fault references [p.26] } of the Interface Operation [p.26] being bound with {message label [p.36] } equal to the effective message label and with {interface fault [p.36] } equal to an Interface Fault [p.22] component with {name [p.22] } equal to the actual value of the `ref` *attribute information item*.
{features}	The set of Feature [p.40] components corresponding to the `feature` *element information item*s in [children], if any.
{properties}	The set of Property [p.44] components corresponding to the `property` *element information item*s in [children], if any.
{parent}	The Binding Operation [p.56] component corresponding to the `operation` *element information item* in [parent].

2.14 Service

2.14.1 The Service Component

A Service [p.65] component describes a set of endpoints (see **2.15 Endpoint** [p.68]) at which a particular deployed implementation of the service is provided. The endpoints thus are in effect alternate places at which the service is provided.

Services are named constructs and can be referred to by QName (see **2.19 QName resolution** [p.72]).

The properties of the Service component are as follows:

- {name} REQUIRED. An *xs:QName*.
- {interface} REQUIRED. An Interface [p.18] component.
- {endpoints} REQUIRED. A non-empty set of Endpoint [p.68] components.
- {features} OPTIONAL. A set of Feature [p.40] components.
- {properties} OPTIONAL. A set of Property [p.44] components.

For each Service [p.65] component in the {services [p.14] } property of a Description component, the {name [p.65] } property MUST be unique.

2.14.2 XML Representation of Service Component

```
<description>
  <service
        name="xs:NCName"
        interface="xs:QName" >
    <documentation />*
    <endpoint />+
    [ <feature /> | <property /> ]*
  </service>
</description>
```

The XML representation for a Service [p.65] component is an *element information item* with the following Infoset properties:

- A [local name] of `service`
- A [namespace name] of "http://www.w3.org/2006/01/wsdl"
- Two or more *attribute information items* amongst its [attributes] as follows:
    - A REQUIRED `name` *attribute information item* as described below in **2.14.2.1 name attribute information item with service [owner element]** [p.67] .
    - A REQUIRED `interface` *attribute information item* as described below in **2.14.2.2 interface attribute information item with service [owner element]** [p.67] .
    - Zero or more namespace qualified *attribute information items* whose [namespace name] is NOT "http://www.w3.org/2006/01/wsdl".
- One or more *element information item* amongst its [children], in order, as follows:
    1. Zero or more `documentation` *element information items* (see **5. Documentation** [p.84]).
    2. One or more *element information items* from among the following, in any order:
        - One or more `endpoint` *element information items* (see **2.15.2 XML Representation of Endpoint Component** [p.69]
        - Zero or more `feature` and/or `property` *element information items* (see **2.7.2 XML Representation of Feature Component** [p.43] and **2.8.2 XML Representation of Property Component** [p.47] , respectively).
        - Zero or more namespace-qualified *element information items* whose [namespace name] is NOT "http://www.w3.org/2006/01/wsdl".

2.14.2.1 `name` *attribute information item* with `service` [owner element]

The `name` *attribute information item* together with the `targetNamespace` *attribute information item* of the `description` *element information item* forms the QName of the service.

The `name` *attribute information item* has the following Infoset properties:

- A [local name] of `name`
- A [namespace name] which has no value

The type of the `name` *attribute information item* is *xs:NCName*.

2.14.2.2 `interface` *attribute information item* with `service` [owner element]

The `interface` *attribute information item* identifies the interface that the service is an instance of.

The `interface` *attribute information item* has the following Infoset properties:

- A [local name] of `interface`
- A [namespace name] which has no value

The type of the `interface` *attribute information item* is *xs:QName.*.

2.14.3 Mapping Service's XML Representation to Component Properties

The mapping from the XML Representation of the `service` *element information item* (see **2.14.2 XML Representation of Service Component** [p.66]) to the properties of the Service [p.65] component is as described in Table 2-14 [p.67] .

Table 2-14. Mapping from XML Representation to Service Component Properties

Property	Value
{name [p.65] }	The QName whose local name is the actual value of the `name` *attribute information item* and whose namespace name is the actual value of the `targetNamespace` *attribute information item* of the [parent] `description` *element information item*.
{interface [p.65] }	The Interface [p.18] component resolved to by the actual value of the `interface` *attribute information item* (see **2.19 QName resolution** [p.72]).
{endpoints [p.65] }	The Endpoint [p.68] components corresponding to the `endpoint` *element information items* in [children].
{features [p.65] }	The set of Feature [p.40] components corresponding to the `feature` *element information items* in [children], if any.

{properties [p.65] }	The set of Property [p.44] components corresponding to the `property` *element information items* in [children], if any.

2.15 Endpoint

2.15.1 The Endpoint Component

An Endpoint [p.68] component defines the particulars of a specific endpoint at which a given service is available.

Endpoint [p.68] components are local to a given Service [p.65] component; they cannot be referred to by QName (see **A.2 Fragment Identifiers** [p.96]).

The {address [p.68] } property is optional to allow for means other than IRIs to be used, e.g. a WS-Addressing Endpoint Reference [*WSA 1.0 Core [p.93]*]. It is also possible that in certain scenarios an address will not be required, in which case this property may not be present.

The properties of the Endpoint component are as follows:

- {name} REQUIRED. An *xs:NCName*.
- {binding} REQUIRED. A Binding [p.50] component.
- {address} OPTIONAL. An *xs:anyURI*. This *xs:anyURI* MUST be an absolute IRI as defined by [*IETF RFC 3987 [p.92]*]. If present, the value of this attribute represents the network address at which the service indicated by the parent Service [p.65] component's {interface [p.65] } property is offered via the binding referred to by the {binding [p.68] } property.
- {features} OPTIONAL. A set of Feature [p.40] components.
- {properties} OPTIONAL. A set of Property [p.44] components.
- {parent} REQUIRED. The Service [p.65] component that contains this component in its {endpoints [p.65] } property.

For each Endpoint [p.68] component in the {endpoints [p.65] } property of a Service [p.65] component, the {name [p.68] } property MUST be unique.

For each Endpoint [p.68] component in the {endpoints [p.65] } property of a Service [p.65] component, the {binding [p.68] } property MUST either be a Binding [p.50] component with an unspecified {interface [p.50] } property or a Binding [p.50] component with an {interface [p.50] } property equal to the {interface [p.65] } property of the Service [p.65] component.

2.15.2 XML Representation of Endpoint Component

```
<description>
  <service>
    <endpoint
          name="xs:NCName"
          binding="xs:QName"
          address="xs:anyURI"? >
      <documentation />*
      [ <feature /> | <property /> ]*
    </endpoint>+
  </service>
</description>
```

The XML representation for a Endpoint [p.68] component is an *element information item* with the following Infoset properties:

- A [local name] of `endpoint` .
- A [namespace name] of "http://www.w3.org/2006/01/wsdl".
- Two or more *attribute information items* amongst its [attributes] as follows:
  - A REQUIRED `name` *attribute information item* as described below in **2.15.2.1 name attribute information item with endpoint [owner element]** [p.70] .
  - A REQUIRED `binding` *attribute information item* as described below in **2.15.2.2 binding attribute information item with endpoint [owner element]** [p.70] .
  - An OPTIONAL `address` *attribute information item* as described below in **2.15.2.3 address attribute information item with endpoint [owner element]** [p.70] .
  - Zero or more namespace qualified *attribute information items* whose [namespace name] is NOT "http://www.w3.org/2006/01/wsdl".
- Zero or more *element information item* amongst its [children], in order, as follows:
  1. Zero or more `documentation` *element information items* (see **5. Documentation** [p.84]).
  2. Zero or more *element information items* from among the following, in any order:
     - Zero or more `feature` *element information items* **2.7.2 XML Representation of Feature Component** [p.43]
     - Zero or more `property` *element information items* **2.8.2 XML Representation of Property Component** [p.47]
     - Zero or more namespace-qualified *element information items* whose [namespace name] is NOT "http://www.w3.org/2006/01/wsdl". Such *element information items* are considered to be endpoint extension elements as described below (see **2.15.2.4 Endpoint extension elements** [p.70]).

2.15.2.1 `name` *attribute information item* with `endpoint` [owner element]

The `name` *attribute information item* together with the `targetNamespace` *attribute information item* of the `description` *element information item* forms the QName of the endpoint.

The `name` *attribute information item* has the following Infoset properties:

- A [local name] of `name` .
- A [namespace name] which has no value.

The type of the `name` *attribute information item* is *xs:NCName*.

2.15.2.2 `binding` *attribute information item* with `endpoint` [owner element]

The `binding` *attribute information item* refers, by QName, to a Binding [p.50] component

The `binding` *attribute information item* has the following Infoset properties:

- A [local name] of `binding`
- A [namespace name] which has no value

The type of the `binding` *attribute information item* is *xs:QName*.

2.15.2.3 `address` *attribute information item* with `endpoint` [owner element]

The `address` *attribute information item* specifies the address of the endpoint.

The `address` *attribute information item* has the following Infoset properties:

- A [local name] of `address`
- A [namespace name] which has no value

The type of the `address` *attribute information item* is *xs:anyURI*.

2.15.2.4 Endpoint extension elements

Endpoint extension elements are used to provide information specific to a particular endpoint in a server. The semantics of such *element information item*s are defined by the specification for those *element information item*s. Such specifications are expected to annotate the Endpoint [p.68] component with additional properties and specify the mapping from the XML representation to those properties.

2.15.3 Mapping Endpoint's XML Representation to Component Properties

The mapping from the XML Representation of the `endpoint` *element information item* (see **2.15.2 XML Representation of Endpoint Component** [p.69]) to the properties of the Endpoint [p.68] component is as described in Table 2-15 [p.71] .

Table 2-15. Mapping from XML Representation to Endpoint Component Properties

Property	Value
{name [p.68] }	The actual value of the `name` *attribute information item*.
{binding [p.68] }	The Binding [p.50] component resolved to by the actual value of the `binding` *attribute information item* (see **2.19 QName resolution** [p.72]).
{address [p.68] }	The actual value of the `address` *attribute information item* if present, otherwise empty.
{features [p.68] }	The set of Feature [p.40] components corresponding to the `feature` *element information item*s in [children], if any.
{properties [p.68] }	The set of Property [p.44] components corresponding to the `property` *element information item*s in [children], if any.
{parent [p.68] }	The Service [p.65] component corresponding to the `service` *element information item* in [parent].

2.16 XML Schema 1.0 Simple Types Used in the Component Model

The XML Schema 1.0 simple types [*XML Schema: Datatypes [p.92]*] used in this specification are:

- *xs:token*
- *xs:NCName*
- *xs:anyURI*
- *xs:QName*
- *xs:boolean*

2.17 Equivalence of Components

Two component instances of the same type are considered equivalent if, for each property of the first component, there is a corresponding property with an equivalent value on the second component, and vice versa.

Instances of properties of the same type are considered equivalent if their values are equivalent.

- For values of a simple type (see **2.16 XML Schema 1.0 Simple Types Used in the Component Model** [p.71]) this means that they contain the same values. For instance, two string values are equivalent if they contain the same sequence of Unicode characters, as described in [*Character Model for the WWW [p.92]*]

- Values which are references to other components are considered equivalent when they refer to equivalent components (as determined above).
- List-based values are considered equivalent if they have the same length and their elements at corresponding positions are equivalent.
- Finally, set-based values are considered equivalent if for each value in the first, there is an equivalent value in the second, and vice versa.

Extension properties which are not string values, sets of strings or references MUST describe their values' equivalence rules.

Because different top-level components (e.g., Interface [p.18] , Binding [p.50] , and Service [p.65]) are required to have different names, it is possible to determine whether two top-level components of a given type are equivalent by examining their {name} property.

2.18 Symbol Spaces

This specification defines three symbol spaces, one for each top-level component type (Interface [p.18] , Binding [p.50] and Service [p.65]).

Within a symbol space, all qualified names (that is, the {name} property) are unique. Between symbol spaces, the names need not be unique. Thus it is perfectly coherent to have, for example, a binding and an interface that have the same name.

When XML Schema is being used as one of the type systems for a WSDL 2.0 description, then six other symbol spaces also exist, one for each of: global element declarations, global attribute declarations, named model groups, named attribute groups, type definitions and key constraints, as defined by [*XML Schema: Structures [p.92]*]. Other type systems may define additional symbol spaces.

2.19 QName resolution

In its serialized form WSDL 2.0 makes significant use of references between components. Such references are made using the Qualified Name, or QName, of the component being referred to. QNames are a tuple, consisting of two parts; a namespace name and a local name. The namespace name for a component is represented by the value of the `targetNamespace` *attribute information item* of the [parent] `description` *element information item* and the local name is represented by the {name [p.72] } property of the component.

QName references are resolved by looking in the appropriate property of the Description [p.14] component. For example, to resolve a QName of an interface (as referred to by the `interface` *attribute information item* on a binding), the {interfaces [p.14] } property of the Description [p.14] component would be inspected.

If the appropriate property of the Description [p.14] component does not contain a component with the required QName then the reference is a broken reference. It is an error for a Description [p.14] component to have such broken references.

2.20 Comparing URIs and IRIs

This specification uses absolute URIs and IRIs to identify several components (for example, features and properties) and components characteristics (for example, operation message exchange patterns and styles). When such absolute URIs and IRIs are being compared to determine equivalence (see **2.17 Equivalence of Components** [p.71]) they MUST be compared character-by-character as indicated in [*IETF RFC 3987 [p.92]*].

3. Types

```
<description>
  <types>
    <documentation />*
    [ <xs:import namespace="xs:anyURI" schemaLocation="xs:anyURI"? /> |
      <xs:schema targetNamespace="xs:anyURI" /> |
      other extension elements ]*
  </types>
</description>
```

The content of messages and faults may be constrained using type system components. These constraints are based upon a specific data model, and expressed using a particular schema language.

Although a variety of data models can be accommodated (through WSDL 2.0 extensions), this specification only defines a means of expressing constraints based upon the XML Infoset [*XML Information Set [p.92]*]. Furthermore, although a number of alternate schema languages can be used to constrain the XML Infoset (as long as they support the semantics of either inlining or importing schema), this specification only defines the use of XML Schema [*XML Schema: Structures [p.92]*], [*XML Schema: Datatypes [p.92]*].

Specifically, the {element declarations [p.14] } and {type definitions [p.14] } properties of the Description [p.14] component are collections of imported and inlined schema components that describe Infoset *element information item*s.

When extensions are used to enable the use of a non-Infoset data model, or a non-Schema constraint language, the `wsdl:required` attribute information item MAY be used to require support for that extension.

Note:

Support for the W3C XML Schema [*XML Schema: Structures [p.92]*], [*XML Schema: Datatypes [p.92]*] is included in the conformance criteria for WSDL 2.0 documents (see **3.1 Using W3C XML Schema Description Language** [p.74]).

The schema components contained in the {element declarations [p.14] } property of the Description [p.14] component provide the type system used for Interface Message Reference [p.32] and Interface Fault [p.22] components. Interface Message Reference [p.32] components indicate their structure and content by using the standard *attribute information item*s `element` , or for alternate schema languages in which these concepts do not map well, by using alternative *attribute information item* extensions. Interface Fault [p.22] components behave similarly. Such extensions should define how they reference type system components.

Such type system components MAY appear in additional collection properties on the Description [p.14] component.

The schema components contained in the {type definitions [p.14] } property of the Description [p.14] component provide the type system used for constraining the values of properties described by Property [p.44] components. Extensions in the form of *attribute information item*s can be used to refer to constraints (type definitions or analogous constructs) described using other schema languages or type systems. Such components MAY appear in additional collection properties on the Description [p.14] component.

The `types` *element information item* encloses data type definitions, based upon the XML Infoset, used to define messages and has the following Infoset properties:

- A [local name] of `types` .
- A [namespace name] of "http://www.w3.org/2006/01/wsdl".
- Zero or more namespace qualified *attribute information item*s whose [namespace name] is NOT http://www.w3.org/2006/01/wsdl
- Zero or more *element information item*s amongst its [children] as follows:
  - Zero or more `documentation` *element information item*s (see **5. Documentation** [p.84]) in its [children] property.
  - Zero or more *element information item*s from among the following, in any order:
    - `xs:import` *element information item*s
    - `xs:schema` *element information item*s
    - Other namespace qualified *element information item*s whose namespace is NOT http://www.w3.org/2006/01/wsdl

3.1 Using W3C XML Schema Description Language

XML Schema MAY be used as the schema language via import or inlining.

A WSDL 2.0 document MUST NOT refer to XML Schema components in a given namespace unless an `xs:import` or `xs:schema` *element information item* for that namespace is present or the namespace is the XML Schema namespace which contains built-in types as defined in XML Schema Part 2: Datatypes Second Edition [*XML Schema: Datatypes [p.92]*]. That is, using the `xs:import` or `xs:schema` *element information item* is a necessary condition for making XML Schema components, other than the built-in components, referenceable within a WSDL 2.0 document.

Table 3-1 [p.75] summarizes the referenceability of schema components.

Table 3-1. Referenceability of schema components

	XML Representation	Referenceability of XML Schema Components
Including description	description/include	XML Schema components in the included Description [p.14] component's {element declarations [p.14] } and {type definitions [p.14] } properties are referenceable.
Importing description	description/import	None of the XML Schema Components in the imported Description [p.14] component are referenceable.
Importing XML Schema	description/types/xs:import	Element Declaration [p.14] and Type Definition [p.14] components in the imported namespace are referenceable.
Inlined XML Schema	description/types/xs:schema	Element Declaration [p.14] and Type Definition [p.14] components in the inlined XML Schema are referenceable.

3.1.1 Importing XML Schema

Importing an XML Schema uses the syntax and semantics of the `xs:import` mechanism defined by XML Schema [*XML Schema: Structures [p.92]*], [*XML Schema: Datatypes [p.92]*], with the differences defined in this and the following section. The schema components defined in the imported namespace are referenceable by QName (see **2.19 QName resolution** [p.72]). Only components in the imported namespace are referenceable in the WSDL 2.0 document.

A child *element information item* of the `types` *element information item* is defined with the Infoset properties as follows:

- A [local name] of "import".
- A [namespace name] of "http://www.w3.org/2001/XMLSchema".
- One or two *attribute information items* as follows:
  - A REQUIRED `namespace` *attribute information item* as described below.
  - An OPTIONAL `schemaLocation` *attribute information item* as described below.

3.1.1.1 `namespace` *attribute information item*

The `namespace` *attribute information item* defines the namespace of the element declarations and type definitions imported from the referenced schema. The referenced schema MUST contain a `targetNamespace` *attribute information item* on its `xs:schema` *element information item*. The value of the `targetNamespace` *attribute information item* of the `xs:schema` *element information item* of an imported schema MUST equal the value of the `namespace` of the `import` *element information item* in the importing WSDL 2.0 document. Note that a WSDL 2.0 document must not import a schema that does not have a `targetNamespace` *attribute information item* on its `xs:schema` *element information item*. Such schemas must first be included (using `xs:include`) in a schema that contains a `targetNamespace` *attribute information item* on its `xs:schema` *element information item*, which can then be either imported or inlined in the WSDL 2.0 document.

The `namespace` *attribute information item* has the following Infoset properties:

- A [local name] of namespace
- A [namespace name] which has no value.

The type of the `namespace` *attribute information item* is *xs:anyURI*.

3.1.1.2 `schemaLocation` *attribute information item*

The `schemaLocation` *attribute information item*, if present, provides a hint to the XML Schema processor as to where the schema may be located. Caching and cataloging technologies may provide better information than this hint. The `schemaLocation` *attribute information item* has the following Infoset properties:

- A [local name] of schemaLocation.
- A [namespace name] which has no value.

The type of the `schemaLocation` *attribute information item* is *xs:anyURI.*

It is an error if a QName is not resolved (see **2.19 QName resolution** [p.72]). When resolving QNames references for schema definitions, the namespace MUST be imported by the referring WSDL 2.0 document. If the namespace so referenced is contained in an inline schema, it MAY be imported without a `schemaLocation` attribute, so long as the inline schema has been resolved in the current component model.

3.1.2 Inlining XML Schema

Inlining an XML schema uses the existing top-level `xs:schema` *element information item* defined by XML Schema [*XML Schema: Structures [p.92]*]. It may be viewed as simply cutting and pasting an existing schema document to a location inside the types *element information item*.

The schema components defined and declared in the inlined schema document are referenceable by QName (see **2.19 QName resolution** [p.72]). Only components defined and declared in the schema itself and components included by it via xs:include are referenceable. Specifically components that the schema imports via xs:import are NOT referenceable.

Similarly, components defined in an inlined XML schema are NOT automatically referenceable within WSDL 2.0 document that imported (using `wsdl:import`) the WSDL 2.0 document that inlines the schema (see **4.2 Importing Descriptions** [p.82] for more details). For this reason, it is recommended that XML schema documents intended to be shared across several WSDL 2.0 documents be placed in separate XML schema documents and imported using `xs:import` , rather than inlined inside a WSDL 2.0 document.

Inside an inlined XML schema, the `xs:import` and `xs:include` *element information item*s MAY be used to refer to other XML schemas inlined in the same or other WSDL 2.0 document, provided that an appropriate value, such as a fragment identifier (see [*XML Schema: Structures [p.92]*] 4.3.1) is specified for their `schemaLocation` *attribute information item*s. For `xs:import` , the `schemaLocation` attribute is not required so long as the namespace has been resolved in the current component model. The semantics of such *element information item*s are governed solely by the XML Schema specification [*XML Schema: Structures [p.92]*].

A WSDL 2.0 document MAY inline two or more schemas from the same `targetNamespace` . For example, two or more inlined schemas may have the same `targetNamespace` provided that they do not define the same elements or types. A WSDL 2.0 document MUST NOT define the same element or type in more than one inlined schema. Note that it is the responsibility of the underlying XML Schema processor to sort out a coherent set of schema components.

The `xs:schema` *element information item* has the following Infoset properties:

- A [local name] of schema.
- A [namespace name] of "http://www.w3.org/2001/XMLSchema".
- A REQUIRED `targetNamespace` *attribute information item*, amongst its [attributes] as described below.
- Additional OPTIONAL *attribute information item*s as specified for the `xs:schema` *element information item* by the XML Schema specification.
- Zero or more child *element information item*s as specified for the `xs:schema` *element information item* by the XML Schema specification.

3.1.2.1 `targetNamespace` *attribute information item*

The `targetNamespace` *attribute information item* defines the namespace of the element declarations and type definitions inlined in its [owner element] `xs:schema` *element information item*. WSDL 2.0 modifies the XML Schema definition of the `xs:schema` *element information item* to make this *attribute information item* required. The `xs:schema` *element information item* MUST contain a `targetNamespace` *attribute information item*. The `targetNamespace` *attribute information item* has the following

Infoset properties:

- A [local name] of targetNamespace.
- A [namespace name] which has no value.

The type of the `targetNamespace` *attribute information item* is *xs:anyURI*.

3.1.3 References to Element Declarations and Type Definitions

Whether inlined or imported, the element declarations present in a schema are referenceable from an Interface Message Reference [p.32] or Interface Fault [p.22] component. Similarly, regardless of whether they are inlined or imported, the type definitions present in a schema are referenceable from a Property [p.44] component.

A named, global `xs:element` declaration is referenceable from the `element` *attribute information item* of an `input` , `output` or `fault` *element information item*. The QName is constructed from the `targetNamespace` of the schema and the value of the `name` *attribute information item* of the `xs:element` *element information item*. An `element` *attribute information item* MUST NOT refer to a global `xs:simpleType` or `xs:complexType` definition.

A named, global `xs:simpleType` or `xs:complexType` declaration is referenceable from the `constraint` *attribute information item* of `property` *element information item*. The QName is constructed from the `targetNamespace` of the schema and the value of the `name` *attribute information item* of the `xs:simpleType` or `xs:complexType` *element information item*. A `constraint` *attribute information item* MUST NOT refer to a global `xs:element` definition.

3.2 Using Other Schema Languages

Since it is unreasonable to expect that a single schema language can be used to describe all possible Interface Message Reference [p.32] , Interface Fault [p.22] and Property [p.44] component contents and their constraints, WSDL 2.0 allows alternate schema languages to be specified via extensibility elements. An extensibility *element information item* MAY appear under the `types` *element information item* to identify the schema language employed, and to locate the schema instance defining the grammar for Interface Message Reference [p.32] and Interface Fault [p.22] components or the constraint for Property [p.44] components. Depending upon the schema language used, an *element information item* MAY be defined to allow inlining, if and only if the schema language can be expressed in XML.

A specification of extension syntax for an alternative schema language MUST include the declaration of an *element information item*, intended to appear as a child of the `wsdl:types` *element information item*, which references, names, and locates the schema instance (an “import” *element information item*). The extension specification SHOULD, if necessary, define additional properties of the Description [p.14] component (and extensibility attributes) to hold the components of the referenced type system. It is expected that additional extensibility attributes for Interface Message Reference [p.32] , Interface Fault [p.22] and Property [p.44] components will also be defined, along with a mechanism for resolving the values of those attributes to a particular imported type system component.

A specification of extension syntax for an alternative schema language MUST use a namespace that is different than the namespace of XML Schema. The namespace of the alternative schema language is used for *element information item*s that are children of the `wsdl:types` *element information item* and for any extensibility *attribute information item*s that appear on other components. The namespace used for an alternate schema language MUST be an absolute IRI.

See [*Alternative Schema Languages Support [p.93]*] for examples of using other schema languages. These examples reuse the {element declarations [p.14] } property of the Description [p.14] component and the `element` *attribute information item*s of the `wsdl:input` , `wsdl:output` and `wsdl:fault` *element information item*s.

Note:

This specification does not define the behavior of a WSDL 2.0 document that uses multiple schema languages for describing type system components simultaneously.

3.3 Describing Messages that Refer to Services and Endpoints

Web services may exchange messages that refer to other Web services or Web service endpoints. If the interface or binding of these referenced services or endpoints are known at description time, then it may be useful to include this information in the WSDL 2.0 document that describes the Web service. WSDL 2.0 provides two global *attribute information item*s, `wsdlx:interface` and `wsdlx:binding` that may be used to annotate XML Schema components or components from other type description languages.

WSDL 2.0 defines the use of these global *attribute information item*s to annotate XML Schema components that use the `xs:anyURI` simple type in an *element information item* or *attribute information item* for endpoint addresses that correspond to the {address [p.68] } property of the Endpoint [p.68] component. However, the use of these global *attribute information item*s is not limited to simple types based on `xs:anyURI` . They may be used for any other types that are used to refer to Web services or Web service endpoints, e.g. a WS-Addressing Endpoint Reference [*WSA 1.0 Core [p.93]*]. See the primer [*WSDL 2.0 Primer [p.93]*] for more information and examples.

3.3.1 `wsdlx:interface` *attribute information item*

WSDL 2.0 provides a global *attribute information item* with the following Infoset properties:

- A [local name] of `interface` .
- A [namespace name] of " http://www.w3.org/2006/01/wsdl-extensions ".

The type of the `wsdlx:interface` *attribute information item* is an *xs:QName* that specifies the {name [p.18] } property of an Interface [p.18] component.

3.3.2 `wsdlx:binding` *attribute information item*

WSDL 2.0 provides a global *attribute information item* with the following Infoset properties:

- A [local name] of `binding` .
- A [namespace name] of " http://www.w3.org/2006/01/wsdl-extensions ".

The type of the `wsdlx:binding` *attribute information item* is an *xs:QName* that specifies the {name [p.50] } property of an Binding [p.50] component.

3.3.3 `wsdlx:interface` and `wsdlx:binding` Consistency

The `wsdlx:interface` and `wsdlx:binding` attributes may be used either independently or together. If `wsdlx:interface` and `wsdlx:binding` are used together then they MUST satisfy the same consistency rules that apply to the {interface [p.65] } property of a Service [p.65] component and the {binding [p.68] } property of a nested Endpoint [p.68] component, that is either the binding refers the interface of the service or the binding refers to no interface.

3.3.4 Use of `wsdlx:interface` and `wsdlx:binding` with `xs:anyURI`

`wsdlx:interface` and `wsdlx:binding` may be used to describe *element information item*s and *attribute information item*s whose type is `xs:anyURI` or a restriction of it, to describe messages that contain the {address [p.68] } property of an Endpoint [p.68] . This is accomplished by including the `wsdlx:interface` and/or `wsdlx:binding` *attribute information item* in the `xs:element` , `xs:simpleType` , or `xs:attribute` *element information item* of the corresponding XML Schema component.

4. Modularizing WSDL 2.0 descriptions

This specification provides two mechanisms, described in this section, for modularizing WSDL 2.0 descriptions. These mechanisms help to make WSDL 2.0 descriptions clearer by allowing separation of the various components of a description. Such separation could be performed according to the level of abstraction of a given set of components, or according to the namespace affiliation required of a given set of components or according to some other grouping such as application applicability.

Both mechanisms work at the level of WSDL 2.0 components and NOT at the level of XML Information Sets or XML 1.0 serializations.

4.1 Including Descriptions

```
<description>
  <include
        location="xs:anyURI" >
    <documentation />*
  </include>
</description>
```

The WSDL 2.0 `include` *element information item* allows for the separation of different components of a service definition, belonging to the same target namespace, into independent WSDL 2.0 documents.

The WSDL 2.0 `include` *element information item* is modeled after the XML Schema `include` *element information item* (see [*XML Schema: Structures [p.92]*], section 4.2.3 "References to schema components in the same namespace"). Specifically, it can be used to include components from WSDL 2.0 descriptions that share a target namespace with the including description. Components in the transitive closure of the included WSDL 2.0 documents become part of the Description [p.14] component of the including WSDL 2.0 document. The included components can be referenced by QName. Note that because all WSDL 2.0 descriptions have a target namespace, no-namespace includes (sometimes known as “chameleon includes”) never occur in WSDL 2.0.

A mutual include is direct inclusion by one WSDL 2.0 document of another WSDL 2.0 document which includes the first. A circular include achieves the same effect with greater indirection (A s B includes C includes A, for instance). Multiple inclusion of a single WSDL 2.0 document resolves to a single set of components. Mutual, multiple, and circular includes are explicitly permitted, and do not represent multiple redefinitions of the same components. Multiple inclusion of a single WSDL 2.0 document has the same meaning as including it only once.

The `include` *element information item* has:

- A [local name] of `include` .
- A [namespace name] of "http://www.w3.org/2006/01/wsdl".
- One or more *attribute information item*s amongst its [attributes] as follows:
  - A REQUIRED `location` *attribute information item* as described below in **4.1.1 location attribute information item with include [owner element]** [p.81] .
  - Zero or more namespace qualified *attribute information item*s whose [namespace name] is NOT "http://www.w3.org/2006/01/wsdl".
- Zero or more *element information item* amongst its [children], as follows:
  - Zero or more `documentation` *element information item*s (see **5. Documentation** [p.84]).
  - Zero or more namespace-qualified *element information item*s whose [namespace name] is NOT "http://www.w3.org/2006/01/wsdl".

4.1.1 `location` *attribute information item* with `include` [owner element]

The `location` *attribute information item* has the following Infoset properties:

- A [local name] of `location` .
- A [namespace name] which has no value.

A location *attribute information item* is of type xs:anyURI . Its actual value is the location of some information about the namespace identified by the targetNamespace *attribute information item* of the containing description *element information item*.

It is an error if the IRI indicated by location does not resolve to a WSDL 2.0 document.

The actual value of the targetNamespace *attribute information item* of the included WSDL 2.0 document MUST match the actual value of the targetNamespace *attribute information item* of the description *element information item* which is the [parent] of the include *element information item*.

4.2 Importing Descriptions

```
<description>
  <import
        namespace="xs:anyURI" location="xs:anyURI"? >
    <documentation />*
  </import>
</description>
```

Every top-level WSDL 2.0 component is associated with a target namespace. On its wsdl:description *element information item*, a WSDL 2.0 document carries a targetNamespace *attribute information item* that associates the document with a target namespace. This section describes the syntax and mechanisms by which references may be made from within a WSDL 2.0 document to components not within the document's target namespace. In addition to this syntax, there is an optional facility for suggesting the IRI of a WSDL 2.0 document containing definition components from that foreign target namespace.

The WSDL 2.0 import *element information item* is modeled after the XML Schema import *element information item* (see [*XML Schema: Structures [p.92]*], section 4.2.3 "References to schema components across namespaces"). Specifically, it can be used to import components from WSDL descriptions that do not share a target namespace with the importing document. The WSDL 2.0 import *element information item* identifies namespaces used in foreign references. The existence of the WSDL 2.0 import *element information item* signals that the WSDL 2.0 document may contain references to foreign components. The wsdl:import *element information item* is therefore like a forward declaration for other namespaces.

As with XML schema, each WSDL 2.0 document making references to components in a given (foreign) namespace MUST have a wsdl:import *element information item* for that namespace (but not necessarily providing a location *attribute information item* identifying the WSDL 2.0 document in which the referenced component is declared). In other respects, the visibility of components is pervasive; if two WSDL 2.0 documents import the same namespace then they will have access to the same components from the imported namespace (i.e. regardless of which, if any, location *attribute information item* values are provided on the respective wsdl:import *element information item*s.)

Using the wsdl:import *element information item* is a necessary condition for making components from another namespace available to a WSDL 2.0 document. That is, a WSDL 2.0 document can only refer to components in a namespace other than its own target namespace if the WSDL 2.0 document contains an wsdl:import *element information item* for that foreign namespace.

This specification does not preclude repeating the `wsdl:import` *element information item* for the same value of the `namespace` *attribute information item* as long as they provide different values for the `location` *attribute information item*. Repeating the `wsdl:import` *element information item* for the same `namespace` value MAY be used as a way to provide alternate locations to find information about a given namespace.

Furthermore, this specification DOES NOT require the `location` *attribute information item* to be dereferenceable. If it is not dereferenceable then no information about the imported namespace is provided by that `wsdl:import` *element information item*. It is possible that such lack of information can cause QNames in other parts of a WSDL 2.0 Description [p.14] component to become broken references (see **2.19 QName resolution** [p.72]). Such broken references are not errors of the `wsdl:import` *element information item* but rather QName resolution errors which must be detected as described in **2.19 QName resolution** [p.72] .

The `import` *element information item* has the following Infoset properties:

- A [local name] of `import` .
- A [namespace name] of "http://www.w3.org/2006/01/wsdl".
- One or more *attribute information items* amongst its [attributes] as follows:
  - A REQUIRED `namespace` *attribute information item* as described below in **4.2.1 namespace attribute information item** [p.83] .
  - An OPTIONAL `location` *attribute information item* as described below in **4.2.2 location attribute information item with import [owner element]** [p.84] .
  - Zero or more namespace qualified *attribute information items* whose [namespace name] is NOT "http://www.w3.org/2006/01/wsdl".
- Zero or more *element information items* amongst its [children], as follows:
  - Zero or more `documentation` *element information items* (see **5. Documentation** [p.84]).
  - Zero or more namespace-qualified *element information items* whose [namespace name] is NOT "http://www.w3.org/2006/01/wsdl".

4.2.1 `namespace` *attribute information item*

The `namespace` *attribute information item* has the following Infoset properties:

- A [local name] of `namespace` .
- A [namespace name] which has no value.

The `namespace` *attribute information item* is of type `xs:anyURI` . Its actual value indicates that the containing WSDL 2.0 document MAY contain qualified references to WSDL 2.0 definitions in that namespace (via one or more prefixes declared with namespace declarations in the normal way). This value

MUST NOT match the actual value of `targetNamespace` *attribute information item* in the enclosing WSDL 2.0 document. If the location attribute in the `import` *element information item* references a WSDL 2.0 document, then the actual value of the `namespace` *attribute information item* MUST be identical to the actual value of the `targetNamespace` *attribute information item* in the referenced WSDL 2.0 document.

4.2.2 `location` *attribute information item* with `import` [owner element]

The `location` *attribute information item* has the following Infoset properties:

- A [local name] of `location` .
- A [namespace name] which has no value.

The `location` *attribute information item* is of type `xs:anyURI` . Its actual value, if present, gives a hint as to where a serialization of a WSDL 2.0 document with definitions for the imported namespace can be found.

The `location` *attribute information item* is optional. This allows WSDL 2.0 components to be constructed from information other than serialized XML 1.0 or a WSDL 2.0 document. It also allows the development of WSDL 2.0 processors that have *a prior* (i.e., built-in) knowledge of certain namespaces.

5. Documentation

```
<documentation>
  [extension elements]*
</documentation>
```

WSDL 2.0 uses the optional `documentation` *element information item* as a container for human readable and/or machine processable documentation. The content of the *element information item* is arbitrary *character information items* and *element information items* ("mixed" content in XML Schema[*XML Schema: Structures [p.92]*]). The `documentation` *element information item* is allowed inside any WSDL 2.0 *element information item*.

Like other *element information items* in the "http://www.w3.org/2006/01/wsdl" namespace, the `documentation` *element information item* allows qualified *attribute information items* whose [namespace name] is not "http://www.w3.org/2006/01/wsdl". The `xml:lang` attribute (see [*XML 1.0 [p.92]*]) MAY be used to indicate the language used in the contents of the `documentation` *element information item*.

The `documentation` *element information item* has:

- A [local name] of `documentation` .
- A [namespace name] of "http://www.w3.org/2006/01/wsdl".
- Zero or more *attribute information items* in its [attributes] property.

- Zero or more child *element information item*s in its [children] property.
- Zero or more *character information item*s in its [children] property.

6. Language Extensibility

In addition to extensibility implied by the Feature [p.40] and Property [p.44] components described above, the schema for WSDL 2.0 has a two-part extensibility model based on namespace-qualified elements and attributes. An extension is identified by the QName consisting of its namespace IRI and its element name. The meaning of an extension SHOULD be defined (directly or indirectly) in a document that is available at its namespace IRI.

6.1 Element based Extensibility

WSDL 2.0 allows extensions to be defined in terms of *element information item*s. Where indicated herein, WSDL 2.0 allows namespace-qualified *element information item*s whose [namespace name] is NOT "http://www.w3.org/2006/01/wsdl" to appear among the [children] of specific *element information item*s whose [namespace name] is "http://www.w3.org/2006/01/wsdl". Such *element information item*s MAY be used to annotate WSDL 2.0 constructs such as interface, operation, etc.

It is expected that extensions will want to add to the existing properties of components in the component model. The specification for an extension *element information item* should include definitions of any such properties and the mapping from the XML representation of the extension to the properties in the component model.

The WSDL 2.0 schema also defines a base type for use by extensibility elements. Example 6-1 [p.85] shows the type definition. The use of this type as a base type is optional. The element declarations which serve as the heads of the defined substitution groups are all of type "xs:anyType".

Extensibility elements are commonly used to specify some technology-specific binding. They allow innovation in the area of network and message protocols without having to revise the base WSDL 2.0 specification. WSDL 2.0 recommends that specifications defining such protocols also define any necessary WSDL 2.0 extensions used to describe those protocols or formats.

Example 6-1. Base type for extensibility elements

```
<xs:complexType name='ExtensibilityElement' abstract='true' >
  <xs:attribute ref='wsdl:required' use='optional' />
</xs:complexType>
```

6.1.1 Mandatory extensions

Extension elements can be marked as mandatory by annotating them with a `wsdl:required` *attribute information item* (see **6.1.2 required attribute information item** [p.87]) with a value of "true". A mandatory extension is an extension that MAY change the meaning of the element to which it is attached, such that the meaning of that element is no longer governed by this specification. Instead, the meaning of an element containing a mandatory extension is governed by the meaning of that extension. Thus, the definition of the element's meaning is *delegated* to the specification that defines the extension.

An extension that is NOT marked as mandatory MUST NOT invalidate the meaning of any part of the WSDL 2.0 document. Thus, a NON-mandatory extension merely provides additional description of capabilities of the service. This specification does not provide a mechanism to mark extension attributes as being required. Therefore, all extension attributes are NON-mandatory.

Note:

A mandatory extension is considered mandatory because it has the ability to change the meaning of the element to which it is attached. Thus, the meaning of the element may not be fully understood without understanding the attached extension. A NON-mandatory extension, on the other hand, can be safely ignored without danger of misunderstanding the rest of the WSDL 2.0 document.

If a WSDL 2.0 document declares an extension, Feature or Property as optional (i.e., NON-mandatory), then the Web service MUST NOT assume that the client supports that extension, Feature or Property, *unless* the Web service knows (through some other means) that the client has in fact elected to engage and support that extension, Feature or Property.

Note:

A key purpose of an extension is to formally indicate (i.e., in a machine-processable way) that a particular feature or convention is supported or required. This enables toolkits that understand the extension to engage it automatically, while toolkits that do not yet understand a required extension may be able to flag it to an operator for manual support.

If a Web service requires the client to follow a particular convention that is likely to be automatable in WSDL 2.0 toolkits, then that convention SHOULD be indicated in the WSDL 2.0 document as a wsdl:required extension, rather than just being conveyed out of band, even if that convention is not currently implemented in WSDL 2.0 toolkits.

This practice will help prevent interoperability problems that could arise if one toolkit requires a particular convention that is not indicated in the WSDL 2.0 document, while another toolkit does not realize that that convention is required. It will also help facilitate future automatic processing by WSDL 2.0 toolkits.

On the other hand, a client MAY engage an extension, Feature or Property that is declared as optional in the WSDL 2.0 document. Therefore, the Web service MUST support every extension, Feature or Property that is declared as optional in the WSDL 2.0 document, in addition to supporting every extension, Feature or Property that is declared as mandatory.

Note:

If finer-grain, direction-sensitive control of extensions, Features or Properties is desired, then such extensions, Features or Properties may be designed in a direction-sensitive manner (from the client or from the Web service) so that either direction may be separately marked required or optional. For example, instead of defining a single extension that governs both directions, two extensions could be defined -- one for each direction.

6.1.2 `required` *attribute information item*

WSDL 2.0 provides a global *attribute information item* with the following Infoset properties:

- A [local name] of `required`.
- A [namespace name] of "http://www.w3.org/2006/01/wsdl".

The type of the `required` *attribute information item* is *xs:boolean*. Its default value is "false" (hence extensions are NOT required by default).

6.2 Attribute-based Extensibility

WSDL 2.0 allows qualified *attribute information items* whose [namespace name] is NOT "http://www.w3.org/2006/01/wsdl" to appear on any *element information item* whose namespace name IS "http://www.w3.org/2006/01/wsdl". Such *attribute information items* can be used to annotate WSDL 2.0 constructs such as interfaces, bindings, etc.

WSDL 2.0 does not provide a mechanism for marking extension *attribute information items* as mandatory.

6.3 Extensibility Semantics

As indicated above, it is expected that the presence of extensibility elements and attributes will result in additional properties appearing in the component model.

The presence of an optional extensibility element or attribute MAY therefore augment the semantics of a WSDL 2.0 document in ways that do not invalidate the existing semantics. However, the presence of a mandatory extensibility element MAY alter the semantics of a WSDL 2.0 document in ways that invalidate the existing semantics.

Extensibility elements SHOULD NOT alter the existing semantics in ways that are likely to confuse users.

Note:

However, once the client and service both know that an optional feature has been engaged (because the service has received a message explicitly engaging that feature, for example), then the semantics of that feature supersede what the WSDL 2.0 document indicated. For example, the WSDL 2.0 document may have specified an XML message schema to be used, but also indicated an optional security feature that encrypts the messages. If the security feature is engaged, then the encrypted messages will no longer conform to the specified message schema (until they are decrypted).

Note:

Authors of extensibility elements should make sure to include in the specification for such elements a clear statement of the requirements for document conformance (see **1.2 Document Conformance** [p.8]).

7. Locating WSDL 2.0 Documents

As an XML vocabulary, WSDL documents, WSDL fragments or references to WSDL components -via QNames- MAY appear within other XML documents. This specification defines a global attribute, `wsdl-Location` , to help with QName resolution (see **2.19 QName resolution** [p.72]). This attribute allows an element that contains such references to be annotated to indicate where the WSDL for a namespace (or set of namespaces) can be found. In particular, this attribute is expected to be useful when using service references in message exchanges.

The `wsdlLocation` global attribute is defined in the namespace "http://www.w3.org/2006/01/wsdl-instance" (hereafter referred to as "wsdli:wsdlLocation", for brevity). This attribute MAY appear on any XML element which allows attributes from other namespaces to occur. It MUST NOT appear on a `wsdl:description` element or any of its children/descendants.

A normative XML Schema [*XML Schema: Structures [p.92]*], [*XML Schema: Datatypes [p.92]*] document for the "http://www.w3.org/2006/01/wsdl-instance" namespace can be found at http://www.w3.org/2006/01/wsdl-instance.

7.1 `wsdli:wsdlLocation` *attribute information item*

WSDL 2.0 provides a global *attribute information item* with the following Infoset properties:

- A [local name] of `wsdlLocation` .
- A [namespace name] of "http://www.w3.org/2006/01/wsdl-instance".

The type of the `wsdlLocation` *attribute information item* is a list *xs:anyURI* (of even length). Its actual value MUST be a list of pairs of IRIs; where the first IRI of a pair, which MUST be an absolute IRI as defined in [*IETF RFC 3987 [p.92]*], indicates a WSDL 2.0 (or 1.1) namespace name, and, the second a hint as to the location of a WSDL 2.0 document defining WSDL 2.0 components (or WSDL 1.1 elements [*WSDL 1.1 [p.93]*]) for that namespace name. The second IRI of a pair MAY be absolute or relative.

8. Conformance

This sections describes how this specification conforms to other specifications. At present, only one other specification, XML Information Set, is included here. Refer to **1.2 Document Conformance** [p.8] for a description of the criteria that Web service description documents must satisfy in order to conform to this specification.

8.1 XML Information Set Conformance

This specification conforms to the [*XML Information Set [p.92]*]. The following information items MUST be present in the input Infosets to enable correct processing of WSDL 2.0 documents:

- *Document Information Items* with [*children*] and [*base URI*] properties.
- *Element Information Items* with [*namespace name*], [*local name*], [*children*], [*attributes*], [*base URI*] and [*parent*] properties.
- *Attribute Information Items* with [*namespace name*], [*local name*] and [*normalized value*] properties.
- *Character Information Items* with [*character code*], [*element content whitespace*] and [*parent*] properties.

9. XML Syntax Summary (Non-Normative)

```
<description targetNamespace="xs:anyURI" >
  <documentation />?

  <import namespace="xs:anyURI" location="xs:anyURI"? >
    <documentation />*
  </import>*

  <include location="xs:anyURI" >
    <documentation />*
  </include>*

  <types>
    <documentation />*

      [ <xs:import namespace="xs:anyURI" schemaLocation="xs:anyURI"? /> |
        <xs:schema targetNamespace="xs:anyURI" /> |
        other extension elements ]*
  </types>

  <interface name="xs:NCName" extends="list of xs:QName"? styleDefault="list of xs:anyURI"? >
    <documentation />*

    <fault name="xs:NCName" element="xs:QName"? >
      <documentation />*

      <feature ... />*

      <property ... />*
    </fault>*

    <operation name="xs:NCName" pattern="xs:anyURI" style="list of xs:anyURI"? >
      <documentation />*

      <input messageLabel="xs:NCName"? element="union of xs:QName, xs:token"? >
        <documentation />*

        <feature ... />*

        <property ... />*
      </input>*

      <output messageLabel="xs:NCName"? element="union of xs:QName, xs:token"? >
        <documentation />*

        <feature ... />*
```

```
      <property ... />*
    </output>*

    <infault ref="xs:QName" messageLabel="xs:NCName"? >
      <documentation />*

      <feature ... />*

      <property ... />*
    </infault>*

    <outfault ref="xs:QName" messageLabel="xs:NCName"? >
      <documentation />*

      <feature ... />*

      <property ... />*
    </outfault>*

    <feature ... />*

    <property ... />*
  </operation>*

  <feature ref="xs:anyURI" required="xs:boolean"? >
    <documentation />*
  </feature>*

  <property ref="xs:anyURI" >
    <documentation />*

    <value> xs:anyType </value>?

    <constraint> xs:QName </constraint>?
  </property>*
</interface>*

<binding name="xs:NCName" interface="xs:QName"? type="xs:anyURI" >
  <documentation />*

  <fault ref="xs:QName" >
    <documentation />*

    <feature ... />*

    <property ... />*
  </fault>*

  <operation ref="xs:QName" >
    <documentation />*

    <input messageLabel="xs:NCName"? >
      <documentation />*

      <feature ... />*

      <property ... />*
    </input>*

    <output messageLabel="xs:NCName"? >
```

```
        <documentation />*

        <feature ... />*

        <property ... />*
      </output>*

      <infault ref="xs:QName" messageLabel="xs:NCName"? >
        <documentation />*

        <feature ... />*

        <property ... />*
      </infault>*

      <outfault ref="xs:QName" messageLabel="xs:NCName"? >
        <documentation />*

        <feature ... />*

        <property ... />*
      </outfault>*

      <feature ... />*

      <property ... />*
    </operation>*

    <feature ... />*

    <property ... />*
  </binding>*

  <service name="xs:NCName" interface="xs:QName" >
    <documentation />*

    <endpoint name="xs:NCName" binding="xs:QName" address="xs:anyURI"? >
      <documentation />*

      <feature ... />*

      <property ... />*
    </endpoint>*

    <feature ... />*

    <property ... />*
  </service>*
</description>
```

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A. The application/wsdl+xml Media Type

This appendix defines the "application/wsdl+xml" media type which can be used to describe WSDL 2.0 documents serialized as XML.

A.1 Registration

MIME media type name:

application

MIME subtype name:

wsdl+xml

Required parameters:

none

Optional parameters:
charset

This parameter has identical semantics to the charset parameter of the "application/xml" media type as specified in [*RFC 3023 [p.92]*].

Encoding considerations:

Identical to those of "application/xml" as described in [*RFC 3023 [p.92]*], section 3.2, as applied to the WSDL document Infoset.

Security considerations:

See section **A.3 Security considerations** [p.101] .

Interoperability considerations:

There are no known interoperability issues.

Published specifications:

This document and [*WSDL 2.0 Adjuncts [p.92]*].

Applications which use this media type:

No known applications currently use this media type.

Additional information:
File extension:

wsdl

Fragment identifiers:

Either a syntax identical to that of "application/xml" as described in [*RFC 3023 [p.92]*], section 5 or the syntax defined in **A.2 Fragment Identifiers** [p.96] .

Base URI:

As specified in [*RFC 3023 [p.92]*], section 6.

Macintosh File Type code:

WSDL

Person and email address to contact for further information:

World Wide Web Consortium <web-human@w3.org>

Intended usage:

COMMON

Author/Change controller:

The WSDL 2.0 specification set is a work product of the World Wide Web Consortium's Web Service Description Working Group. The W3C has change control over these specifications.

A.2 Fragment Identifiers

This section defines a fragment identifier syntax for identifying components of a WSDL 2.0 document. This fragment identifier syntax is compliant with the [*XPointer Framework [p.94]*].

A WSDL 2.0 fragment identifier consists of zero or more `xmlns` pointer parts followed by a WSDL 2.0 pointer part as defined below. The pointer parts have a scheme name that corresponds to one of the standard WSDL 2.0 component types, and scheme data that is a path composed of names that identify the components. The scheme names all begin with the prefix "wsdl." to avoid name conflicts with other schemes. The names in the path are of type either QName, NCName, IRI, URI, or Pointer Part depending on the context. The scheme data for extension components is defined by the corresponding extension specification.

For QNames, any prefix MUST be defined by a preceding xmlns pointer part. If a QName does not have a prefix then its namespace name is the target namespace of the WSDL 2.0 document.

The fragment identifier is typically constructed from the {name [p.72] } property of the component and the {name [p.72] } properties of its ancestors as a path according to Table A-1 [p.96] . The first column of this table gives the name of the WSDL 2.0 component. Columns labeled 1 through 4 specify the identifiers that uniquely identify the component within its context. Identifiers are typically formed from the {name [p.72] } property, although in several cases references to other components are used. These identifiers are then used to construct the pointer part in the last column.

Table A-1. Rules for determining pointer parts for WSDL 2.0 components

Component	1	2	3	4	Pointer Part
Description [p.14]	n/a	n/a	n/a	n/a	`wsdl.description [p.97] ()`
Element Declaration [p.14]	*element* QName	n/a	n/a	n/a	`wsdl.elementDeclaration [p.98] (`*element*`)`
Element Declaration [p.14]	*element* QName	*system* IRI	n/a	n/a	`wsdl.elementDeclaration [p.98] (`*element*`,`*system*`)`
Type Definition [p.14]	*type* QName	n/a	n/a	n/a	`wsdl.typeDefinition [p.98] (`*type*`)`
Type Definition [p.14]	*type* QName	*system* IRI	n/a	n/a	`wsdl.typeDefinition [p.98] (`*type*`,`*system*`)`
Interface [p.18]	*interface* NCName	n/a	n/a	n/a	`wsdl.interface [p.98] (`*interface*`)`
Interface Fault [p.22]	*interface* NCName	*fault* NCName	n/a	n/a	`wsdl.interfaceFault [p.98] (`*interface/fault*`)`

Interface Operation [p.26]	*interface* NCName	*operation* NCName	n/a	n/a	`wsdl.interfaceOperation` [p.98] (*interface*/*operation*)
Interface Message Reference [p.32]	*interface* NCName	*operation* NCName	*message* NCName	n/a	`wsdl.interfaceMessageReference` [p.99] (*interface*/*operation*/*message*)
Interface Fault Reference [p.36]	*interface* NCName	*operation* NCName	*message* NCName	*fault* QName	`wsdl.interfaceFaultReference` [p.99] (*interface*/*operation*/*message*/*fault*)
Binding [p.50]	*binding* NCName	n/a	n/a	n/a	`wsdl.binding` [p.99] (*binding*)
Binding Fault [p.53]	*binding* NCName	*fault* QName	n/a	n/a	`wsdl.bindingFault` [p.99] (*binding*/*fault*)
Binding Operation [p.56]	*binding* NCName	*operation* QName	n/a	n/a	`wsdl.bindingOperation` [p.99] (*binding*/*operation*)
Binding Message Reference [p.59]	*binding* NCName	*operation* QName	*message* NCName	n/a	`wsdl.bindingMessageReference` [p.100] (*binding*/*operation*/*message*)
Binding Fault Reference [p.62]	*binding* NCName	*operation* QName	*message* NCName	*fault* QName	`wsdl.bindingFaultReference` [p.100] (*binding*/*operation*/*message*/*fault*)
Service [p.65]	*service* NCName	n/a	n/a	n/a	`wsdl.service` [p.100] (*service*)
Endpoint [p.68]	*service* NCName	*endpoint* NCName	n/a	n/a	`wsdl.endpoint` [p.100] (*service*/*endpoint*)
Feature [p.40]	*parent* Pointer Part	*feature* IRI	n/a	n/a	`wsdl.feature` [p.101] (*parent*/*feature*)
Property [p.44]	*parent* Pointer Part	*property* IRI	n/a	n/a	`wsdl.property` [p.101] (*parent*/*property*)
Extensions [p.13]	*namespace* URI	*identifier* extension-specific-syntax	n/a	n/a	`wsdl.extension` [p.101] (*namespace*,*identifier*)

Note that the above rules are defined in terms of component properties rather than the XML Infoset representation of the component model. The following sections specify in detail how the pointer parts are constructed from the component model.

A.2.1 The Description Component

```
wsdl.description()
```

A.2.2 The Element Declaration Component

`wsdl.elementDeclaration(`*`element`*`)`

`wsdl.elementDeclaration(`*`element`*`,`*`system`*`)`

1. *`element`* is the {name [p.14] } property of the Element Declaration [p.14] component.

2. *`system`* is the namespace absolute IRI of the extension type system used for the Element Declaration [p.14] component (see **3.2 Using Other Schema Languages** [p.78]). This parameter is absent if XML Schema is the type system.

A.2.3 The Type Definition Component

`wsdl.typeDefinition(`*`type`*`)`

`wsdl.typeDefinition(`*`type`*`,`*`system`*`)`

1. *`type`* is the {name [p.14] } property of the Type Definition [p.14] component.

2. *`system`* is the namespace absolute IRI of the extension type system used for the Type Definition [p.14] component (see **3.2 Using Other Schema Languages** [p.78]). This parameter is absent if XML Schema is the type system.

A.2.4 The Interface Component

`wsdl.interface(`*`interface`*`)`

1. *`interface`* is the local name of the {name [p.18] } property of the Interface [p.18] component.

A.2.5 The Interface Fault Component

`wsdl.interfaceFault(`*`interface`*`/`*`fault`*`)`

1. *`interface`* is the local name of the {name [p.18] } property of the parent Interface [p.18] component.

2. *`fault`* is the local name of the {name [p.22] } property of the Interface Fault [p.22] component.

A.2.6 The Interface Operation Component

`wsdl.interfaceOperation(`*`interface`*`/`*`operation`*`)`

1. *`interface`* is the local name of the {name [p.18] } property of the parent Interface [p.18] component.

2. *`operation`* is the local name of the {name [p.26] } property of the Interface Operation [p.26] component.

A.2.7 The Interface Message Reference Component

`wsdl.interfaceMessageReference(`*`interface`*`/`*`operation`*`/`*`message`*`)`

1. *`interface`* is the local name of the {name [p.18] } property of the grandparent Interface [p.18] component.
2. *`operation`* is the local name of the {name [p.26] } property of the parent Interface Operation [p.26] component.
3. *`message`* is the {message label [p.32] } property of the Interface Message Reference [p.32] component.

A.2.8 The Interface Fault Reference Component

`wsdl.interfaceFaultReference(`*`interface`*`/`*`operation`*`/`*`message`*`/`*`fault`*`)`

1. *`interface`* is the local name of the {name [p.18] } property of the grandparent Interface [p.18] component.
2. *`operation`* is the local name of the {name [p.26] } property of the parent Interface Operation [p.26] component.
3. *`message`* is the {message label [p.36] } property of the Interface Fault Reference [p.36] component.
4. *`fault`* is the {name [p.22] } property of the Interface Fault [p.22] component referred to by the {interface fault [p.36] } property of the Interface Fault Reference [p.36] component.

A.2.9 The Binding Component

`wsdl.binding(`*`binding`*`)`

1. *`binding`* is the local name of the {name [p.50] } property of the Binding [p.50] component.

A.2.10 The Binding Fault Component

`wsdl.bindingFault(`*`binding`*`/`*`fault`*`)`

1. *`binding`* is the local name of the {name [p.50] } property of the parent Binding [p.50] component.
2. *`fault`* is the {name [p.22] } property of the Interface Fault [p.22] component referred to by the {interface fault [p.54] } property of the Binding Fault [p.53] component.

A.2.11 The Binding Operation Component

`wsdl.bindingOperation(`*`binding`*`/`*`operation`*`)`

1. `binding` is the local name of the {name [p.50] } property of the parent Binding [p.50] component.

2. `operation` is the {name [p.26] } property of the Interface Operation [p.26] component referred to by the {interface operation [p.56] } property of the Binding Operation [p.56] component.

A.2.12 The Binding Message Reference Component

`wsdl.bindingMessageReference(`*`binding`*`/`*`operation`*`/`*`message`*`)`

1. `binding` is the local name of the {name [p.50] } property of the grandparent Binding [p.50] component.

2. `operation` is the {name [p.26] } property of the Interface Operation [p.26] component referred to by the {interface operation [p.56] } property of the parent Binding Operation [p.56] component.

3. `message` is the {message label [p.32] } property of the Interface Message Reference [p.32] component referred to by the {interface message reference [p.59] } property of the Binding Message Reference [p.59] component.

A.2.13 The Binding Fault Reference Component

`wsdl.bindingFaultReference(`*`binding`*`/`*`operation`*`/`*`message`*`/`*`fault`*`)`

1. `binding` is the local name of the {name [p.50] } property of the grandparent Binding [p.50] component.

2. `operation` is the {name [p.26] } property of the Interface Operation [p.26] component referred to by the {interface operation [p.56] } property of the parent Binding Operation [p.56] component.

3. `message` is the {message label [p.36] } property of the Interface Fault Reference [p.36] component referred to by the {interface fault reference [p.62] } property of the Binding Fault Reference [p.62] component.

4. `fault` is the {name [p.22] } property of the Interface Fault [p.22] component referred to by the {interface fault [p.36] } property of the Interface Fault Reference [p.36] component referred to by the {interface fault reference [p.62] } property of the Binding Fault Reference [p.62] component.

A.2.14 The Service Component

`wsdl.service(`*`service`*`)`

1. `service` is the local name of the {name [p.65] } property of the Service [p.65] component.

A.2.15 The Endpoint Component

`wsdl.endpoint(`*`service`*`/`*`endpoint`*`)`

1. `service` is the local name of the {name [p.65] } property of the parent Service [p.65] component.
2. `endpoint` is the {name [p.68] } property of the Endpoint [p.68] component.

A.2.16 The Feature Component

wsdl.feature(*parent*/*feature*)

1. `parent` is the pointer part of the parent component.
2. `feature` is the {ref [p.40] } property of the Feature [p.40] component.

A.2.17 The Property Component

wsdl.property(*parent*/*property*)

1. `parent` is the pointer part of the parent component.
2. `property` is the {ref [p.44] } property of the Property [p.44] component.

A.2.18 Extension Components

WSDL 2.0 is extensible and it is possible for an extension to define new components types. The XPointer Framework scheme for extension components is:

wsdl.extension(*namespace*, *identifier*)

1. `namespace` is the namespace URI that identifies the extension, e.g. for the WSDL 2.0 SOAP 1.2 Binding the namespace is http://www.w3.org/2006/01/wsdl/soap.
2. `identifier` is defined by the extension using a syntax specific to the extension. The owner of the extension must define any components contributed by the extension and a syntax for identifying them.

A.3 Security considerations

This media type uses the "+xml" convention, it shares the same security considerations as described in [*RFC 3023 [p.92]*], section 10.

B. Acknowledgements (Non-Normative)

This document is the work of the W3C Web Service Description Working Group.

Members of the Working Group are (at the time of writing, and by alphabetical order): Charlton Barreto (Adobe Systems Inc.), Allen Brookes (Rogue Wave Softwave), Dave Chappell (Sonic Software), Helen Chen (Agfa-Gevaert N. V.), Roberto Chinnici (Sun Microsystems), Kendall Clark (University of Maryland), Glen Daniels (Sonic Software), Paul Downey (British Telecommunications), Youenn Fablet (Canon), Hugo Haas (W3C), Tom Jordahl (Macromedia), Anish Karmarkar (Oracle Corporation), Jacek

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C. IRI-References for WSDL 2.0 Components (Non-Normative)

This appendix provides a syntax for IRI-references for all components found in a WSDL 2.0 document. The IRI-references are easy to understand and compare, while imposing no burden on the WSDL 2.0 author.

C.1 WSDL 2.0 IRIs

There are two main cases for WSDL 2.0 IRIs:

- the IRI of a WSDL 2.0 document
- the IRI of a WSDL 2.0 namespace

The IRI of a WSDL 2.0 document can be dereferenced to give a resource representation that contributes component definitions to a single WSDL 2.0 namespace. If the media type is set to the WSDL 2.0 media type, then the fragment identifiers can be used to identify the main components that are defined in the document.

However, in keeping with the recommendation in **2.1.1 The Description Component** [p.13] that the namespace URI be dereferencible to a WSDL 2.0 document, this appendix specifies the use of the namespace IRI with the WSDL 2.0 fragment identifiers to form an IRI-reference.

The IRI in an IRI-reference for a WSDL 2.0 component is the namespace name of the {name [p.72] } property of either the component itself, in the case of Interface [p.18] , Binding [p.50] , and Service [p.65] components, or the {name [p.72] } property of the ancestor top-level component. The IRI provided by the namespace name of the {name [p.72] } property is combined with a fragment identifier as defined in **A.2 Fragment Identifiers** [p.96] .

C.2 Example

Consider the following WSDL 2.0 document located at http://example.org/TicketAgent.wsdl:

Example C-1. IRI-References - Example WSDL 2.0 Document

```
<?xml version="1.0" encoding="UTF-8"?>
<wsdl:description
    targetNamespace="http://example.org/TicketAgent.wsdl20"
    xmlns:xsTicketAgent="http://example.org/TicketAgent.xsd"
    xmlns:wsdl="http://www.w3.org/2006/01/wsdl"
    xmlns:xs="http://www.w3.org/2001/XMLSchema"
    xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
    xsi:schemaLocation="http://www.w3.org/2006/01/wsdl http://www.w3.org/2006/01/wsdl/wsdl20.xsd">

    <wsdl:types>
        <xs:import schemaLocation="TicketAgent.xsd"
                   namespace="http://example.org/TicketAgent.xsd" />
    </wsdl:types>

    <wsdl:interface name="TicketAgent">
        <feature ref="http://example.com/secure-channel"
                 required="true"/>

        <wsdl:operation name="listFlights"
                        pattern="http://www.w3.org/2006/01/wsdl/in-out">
            <wsdl:input element="xsTicketAgent:listFlightsRequest"/>
            <wsdl:output element="xsTicketAgent:listFlightsResponse"/>
        </wsdl:operation>

        <wsdl:operation name="reserveFlight"
                        pattern="http://www.w3.org/2006/01/wsdl/in-out">
            <wsdl:input element="xsTicketAgent:reserveFlightRequest"/>
            <wsdl:output element="xsTicketAgent:reserveFlightResponse"/>
        </wsdl:operation>
    </wsdl:interface>
</wsdl:description>
```

Its components have the following IRI-references:

Example C-2. IRI-References - Example IRIs

```
http://example.org/TicketAgent.wsdl20#
  wsdl.description()

http://example.org/TicketAgent.wsdl20#
  xmlns(xsTicketAgent=http://example.org/TicketAgent.xsd)
  wsdl.elementDeclaration(xsTicketAgent:listFlightsRequest)

http://example.org/TicketAgent.wsdl20#
  xmlns(xsTicketAgent=http://example.org/TicketAgent.xsd)
  wsdl.elementDeclaration(xsTicketAgent:listFlightsResponse)

http://example.org/TicketAgent.wsdl20#
  xmlns(xsTicketAgent=http://example.org/TicketAgent.xsd)
  wsdl.elementDeclaration(xsTicketAgent:reserveFlightRequest)

http://example.org/TicketAgent.wsdl20#
  xmlns(xsTicketAgent=http://example.org/TicketAgent.xsd)
  wsdl.elementDeclaration(xsTicketAgent:reserveFlightResponse)

http://example.org/TicketAgent.wsdl20#
  wsdl.interface(TicketAgent)

http://example.org/TicketAgent.wsdl20#
  wsdl.feature(
  wsdl.interface(TicketAgent)/http://example.com/secure-channel)

http://example.org/TicketAgent.wsdl20#
  wsdl.interfaceOperation(TicketAgent/listFlights)

http://example.org/TicketAgent.wsdl20#
  wsdl.interfaceMessageReference(TicketAgent/listFlights/In)

http://example.org/TicketAgent.wsdl20#
  wsdl.interfaceMessageReference(TicketAgent/listFlights/Out)

http://example.org/TicketAgent.wsdl20#
  wsdl.interfaceOperation(TicketAgent/reserveFlight)

http://example.org/TicketAgent.wsdl20#
  wsdl.interfaceMessageReference(TicketAgent/reserveFlight/In)

http://example.org/TicketAgent.wsdl20#
  wsdl.interfaceMessageReference(TicketAgent/reserveFlight/Out)
```

D. Component Summary (Non-Normative)

Table D-1 [p.105] lists all the components in the WSDL 2.0 abstract Component Model, and all their properties.

Table D-1. Summary of WSDL 2.0 Components and their Properties

Component	Defined Properties
-	{features [p.40] }, {name [p.72] }, {parent [p.14] }, {properties [p.45] }
Binding [p.50]	{binding faults [p.50] }, {binding operations [p.50] }, {features [p.50] }, {interface [p.50] }, {name [p.50] }, {properties [p.50] }, {type [p.50] }
Binding Fault [p.53]	{interface fault [p.54] }, {features [p.54] }, {parent [p.54] }, {properties [p.54] }
Binding Fault Reference [p.62]	{features [p.62] }, {interface fault reference [p.62] }, {parent [p.62] }, {properties [p.62] }
Binding Message Reference [p.59]	{features [p.59] }, {interface message reference [p.59] }, {parent [p.59] }, {properties [p.59] }
Binding Operation [p.56]	{binding fault references [p.56] }, {binding message references [p.56] }, {interface operation [p.56] }, {features [p.56] }, {parent [p.56] }, {properties [p.56] }
Description [p.14]	{bindings [p.14] }, {element declarations [p.14] }, {interfaces [p.14] }, {services [p.14] }, {type definitions [p.14] }
Element Declaration [p.14]	{name [p.14] }, {system [p.14] }
Endpoint [p.68]	{address [p.68] }, {binding [p.68] }, {features [p.68] }, {name [p.68] }, {parent [p.68] }, {properties [p.68] }
Feature [p.40]	{parent [p.40] }, {ref [p.40] }, {required [p.40] }
Interface [p.18]	{extended interfaces [p.18] }, {features [p.18] }, {interface faults [p.18] }, {interface operations [p.18] }, {name [p.18] }, {properties [p.18] }
Interface Fault [p.22]	{element declaration [p.22] }, {features [p.22] }, {name [p.22] }, {parent [p.22] }, {properties [p.22] }
Interface Fault Reference [p.36]	{direction [p.36] }, {features [p.36] }, {interface fault [p.36] }, {message label [p.36] }, {parent [p.36] }, {properties [p.36] }
Interface Message Reference [p.32]	{direction [p.32] }, {element declaration [p.32] }, {features [p.32] }, {message content model [p.32] }, {message label [p.32] }, {parent [p.32] }, {properties [p.32] }
Interface Operation [p.26]	{features [p.26] }, {interface fault references [p.26] }, {interface message references [p.26] }, {message exchange pattern [p.26] }, {name [p.26] }, {parent [p.26] }, {properties [p.26] }, {style [p.26] }
Property [p.44]	{parent [p.45] }, {ref [p.44] }, {value [p.45] }, {value constraint [p.44] }

Service [p.65]	{endpoints [p.65] }, {features [p.65] }, {interface [p.65] }, {name [p.65] }, {properties [p.65] }
Type Definition [p.14]	{name [p.14] }, {system [p.14] }
Property	**Where Defined**
address	Endpoint.{address [p.68] }
binding	Endpoint.{binding [p.68] }
binding faults	Binding.{binding faults [p.50] }
binding operations	Binding.{binding operations [p.50] }
bindings	Description.{bindings [p.14] }
direction	Interface Fault Reference.{direction [p.36] }, Interface Message Reference.{direction [p.32] }
element declaration	Interface Fault.{element declaration [p.22] }, Interface Message Reference.{element declaration [p.32] }
element declarations	Description.{element declarations [p.14] }
endpoints	Service.{endpoints [p.65] }
extended interfaces	Interface.{extended interfaces [p.18] }
features	.{features [p.40] }, Binding.{features [p.50] }, Binding Fault.{features [p.54] }, Binding Fault Reference.{features [p.62] }, Binding Message Reference.{features [p.59] }, Binding Operation.{features [p.56] }, Endpoint.{features [p.68] }, Interface.{features [p.18] }, Interface Fault.{features [p.22] }, Interface Fault Reference.{features [p.36] }, Interface Message Reference.{features [p.32] }, Interface Operation.{features [p.26] }, Service.{features [p.65] }
interface	Binding.{interface [p.50] }, Service.{interface [p.65] }
interface fault	Binding Fault.{interface fault [p.54] }, Interface Fault Reference.{interface fault [p.36] }
interface fault references	Interface Operation.{interface fault references [p.26] }
interface faults	Interface.{interface faults [p.18] }
interface message references	Interface Operation.{interface message references [p.26] }
interface operations	Interface.{interface operations [p.18] }

interfaces	Description.{interfaces [p.14] }
message content model	Interface Message Reference.{message content model [p.32] }
message exchange pattern	Interface Operation.{message exchange pattern [p.26] }
message label	Interface Fault Reference.{message label [p.36] }, Interface Message Reference.{message label [p.32] }
name	.{name [p.72] }, Binding.{name [p.50] }, Element Declaration.{name [p.14] }, Endpoint.{name [p.68] }, Interface.{name [p.18] }, Interface Fault.{name [p.22] }, Interface Operation.{name [p.26] }, Service.{name [p.65] }, Type Definition.{name [p.14] }
parent	.{parent [p.14] }, Binding Fault.{parent [p.54] }, Binding Fault Reference.{parent [p.62] }, Binding Message Reference.{parent [p.59] }, Binding Operation.{parent [p.56] }, Endpoint.{parent [p.68] }, Feature.{parent [p.40] }, Interface Fault.{parent [p.22] }, Interface Fault Reference.{parent [p.36] }, Interface Message Reference.{parent [p.32] }, Interface Operation.{parent [p.26] }, Property.{parent [p.45] }
properties	.{properties [p.45] }, Binding.{properties [p.50] }, Binding Fault.{properties [p.54] }, Binding Fault Reference.{properties [p.62] }, Binding Message Reference.{properties [p.59] }, Binding Operation.{properties [p.56] }, Endpoint.{properties [p.68] }, Interface.{properties [p.18] }, Interface Fault.{properties [p.22] }, Interface Fault Reference.{properties [p.36] }, Interface Message Reference.{properties [p.32] }, Interface Operation.{properties [p.26] }, Service.{properties [p.65] }
ref	Feature.{ref [p.40] }, Property.{ref [p.44] }
required	Feature.{required [p.40] }
services	Description.{services [p.14] }
style	Interface Operation.{style [p.26] }
system	Element Declaration.{system [p.14] }, Type Definition.{system [p.14] }
type	Binding.{type [p.50] }
type definitions	Description.{type definitions [p.14] }
value	Property.{value [p.45] }
value constraint	Property.{value constraint [p.44] }

E. Part 1 Change Log (Non-Normative)

E.1 WSDL 2.0 Specification Changes

Table E-1. Summary of WSDL 2.0 Specification Changes

Date	Author	Description
20051121	AGR	Added assertions posted to mailing list: "types, description, interface, feature, and property assertions", Lawrence Mandel, 2005-11-17.
20051118	AGR	Added assertions posted to mailing list: "types assertions", Lawrence Mandel, 2005-11-15.
20051118	AGR	Simiplified Z Notation for fragment identifiers and updated Example IRIs [p.104] .
20051117	AGR	LC344 : Reviewed use of "Note that" throughout and removed usages where they would be incorrectly interpreted as non-normative. Implemented resolutions of #1, #2, #6, #10, and #14.
20051117	AGR	Fixed typos posted to mailing list: WSDL 2.0 spec typos, Lawrence Mandel, 2005-11-16.
20051117	JJM	LC358 : fixed formatting in example C.2.
20051117	JJM	LC356 : fixed contradiction between sections 2.1.2 and 2.2.1.
20051117	JJM	LC302 : point to RFC3987 instead of the draft TAG finding.
20051117	JJM	LC355 : fixed section 2.10.3, table had error, "interface fault component".
20051116	AGR	Added Z Notation for fragment identifiers and component designators for Description, Feature, Property, and Extension components in Appendix A - Fragment Identifiers [p.96] .
20051115	AGR	Added Z Notation for fragment identifiers and component designators for Element Declaration and Type Definition components in Appendix A - Fragment Identifiers [p.96] .
20051113	AGR	Added Z Notation for fragment identifiers and component designators for Interface, Binding, and Service component families in Appendix A - Fragment Identifiers [p.96] .
20051112	AGR	Corrected order of arguments in fragment identifier for Binding Fault Reference [p.100] to match that in Interface Fault Reference.
20051112	AGR	LC361 : Defined what should be declared as a fault [p.21] .
20051112	AGR	LC344#5 : Allow an operation style to constrain faults [p.28] as per the resolution at the Yokohama F2F.

20051112	AGR	LC350 : Corrected Introduction [p.7] .
20051112	AGR	LC336 : Soften statement about use of xs:anyURI and refer to WS-Addressing Endpoint Reference [p.79] .
20051112	AGR	LC305 : Aligned BNF notational conventions with WS-Addressing, Pseudo schemas do not include extensibility points for brevity [p.12] .
20051110	AGR	LC353 : Added definition of a valid WSDL 2.0 component model [p.12] .
20051110	JJM	LC360 : What should be declared as a fault, as per Tokyo f2f.
20051110	JJM	LC357 : Added anyURI-IRI warning, as per Tokyo f2f.
20051110	JJM	LC344#5 : Incorporated text regarding mutually exclusive operation styles, as per Tokyo f2f.
20051103	AGR	LC344#12 : Completed editorial improvements to message label rules. Moved long definitions out of tables.
20051101	AGR	Added Z Notation for message exchange pattern, placeholder message, and fault propagation ruleset in **2.4.1.1 Message Exchange Pattern** [p.27] . Replaced the term *fault pattern* with *fault propagation ruleset* throughout for consistency and agreement with Part 2.
20051027	AGR	Added bidirectional linking between assertions and the summary table, and added a section on notation, **1.4.10 Assertions** [p.12] .
20051027	AGR	Updated **3.1 Using W3C XML Schema Description Language** [p.74] as per proposal How to Treat Built-In Schema Types.
20051027	AGR	LC344#12 : Editorial improvements to message label rules. Added precise definitions of message exchange pattern, placeholder message, and fault propagation ruleset in **2.4.1.1 Message Exchange Pattern** [p.27] .
20051020	AGR	LC344#6 : Editorial improvements to 2.7.1 The Feature Component [p.39] .
20051016	AGR	LC328 : Added introductory paragraph to **8. Conformance** [p.88] in response to comment #2.
20050924	AGR	Added initial markup for assertions.
20050914	AGR	LC311: Clarified that the URI associated with alternative schema languages for defining other type systems is the namespace used for its extension elements and attributes and that it is an absolute IRI.
20050914	AGR	LC309: Replaced the list of operation style definitions with a general reference to Part 2.
20050914	AGR	LC308: Added references to Fragment Identifier appendix to show how Interface Fault and Interface Operation can be uniquely identified.

20050901	RRC	LC310: Removed uses of undefined "ws:" prefix and made use of prefixes in section 4.2 more regular.
20050730	AGR	Removed obsolete editorial notes.
20050727	AGR	LC96 : Added clarification to section 4.2 stating that imported WSDL components are pervasive like in XML Schema as per resolution agreed to at F2F.
20050727	AGR	LC91 : Added clarification to section 3.1.1 stating that some differences to xs:import apply as per resolution agreed to at F2F.
20050727	AGR	Corrected typo in section 3.1.2 on inlining two or more schemas that have the same namespace.
20050719	AGR	Added xs:import and xs:schema to XML Syntax Summary for types.
20050711	AGR	Updated Example C-2. IRI-References - Example IRIs to match Appendix A.
20050616	AGR	Corrected Feature and Property composition rules for Interface, Service, and Endpoint.
20050615	AGR	LC117: Removed Service References and Endpoint References and added wsdlx:interface and wsdlx:binding.
20050613	RRC	LC74c: changed `wsdl:documentation` element cardinality to zero or more and adding sentence on use of `xml:lang` .
20050613	RRC	LC74a: changed URIs to IRIs except in Feature and Property Components.
20050613	AGR	LC75v: Removed any text that discussed conformance for WSDL 2.0 processors.
20050613	JJM	LC131: added pseudo-schema comment.
20050613	JJM	LC70: reiterated behavior is undefined when several schema languages used simultaneously.
20050613	JJM	LC70: moved appendix D (other schema languages) to a separate specification.
20050612	AGR	Finshed first pass at adding markup for WSDL component and property definitions and references.
20050610	AGR	Added table of components and their properties, courtesy of JM.
20050608	AGR	Added markup for WSDL component and property definitions and references.
20050602	HH	LC75c: moved safety to Part 2.
20050601	JJM	LC75x: removed appendix "migrating from WSDL 1.1 to WSDL 2.0".
20050531	JJM	LC82: removed ONMR section (transfer to primer).
20050531	JJM	LC71: added default value for pattern attribute (".../inout").

20050526	AGR	LC64: Added fragment identifiers for Description [p.14] , Element Declaration [p.14] , and Type Definition [p.14] components.
20050525	AGR	Added final ComponentModel to Z Notation.
20050523	AGR	Reordered some paragraphs to improve consistency.
20050522	AGR	Added consistency and key constraints to the Z notation.
20050520	JJM	LC129: wsdlLocation can now also point to WSDL 1.1 documents.
20050520	JJM	LC126: Added default value for wsdl:required (false).
20050520	JJM	Fixed typo in 2.14.1.1.
20050519	JJM	LC97: Uniformized setting default values. Fixed typos along the way.
20050518	AGR	Added parent and integrity constraints to the Z notation.
20050513	JJM	LC18: Fixed the SOAP 1.2/WSDL 2.0 feature text. Wordsmithed the introduction.
20050513	JJM	LC127: Fixed wsld:include description, which is not about merging.
20050512	JJM	LC75o: Remove "if any" from Service/{endpoints}, since there is always one.
20050511	AGR	LC121: Distinguished between wsdl:import and xs:import, and wsdl:include and xs:include in Description [p.14] component mapping table.
20050504	JJM	Rewrote the "Operation Name Mapping Requirement" section to make it best practice.
20050504	JJM	Removed empty subsections in "XML Schema 1.0 Simple..."
20050504	JJM	Rewrote the "Single Interface" section, as per editorial AI dated 2005-01-19.
20050503	JJM	Rewrote the ONMR as Best practice.
20050503	JJM	LC112: Implemented resolution for issue LC112.
20050503	JJM	Completed editorial action LC78.
20050501	AGR	LC120: Clarified description of include and import, removed contradictions, and added references to QName resolution.
20050501	AGR	LC116: Clarified that `schemaLocation` is not required if the namespace has been resolved in the component model. Replaced the term "embedded schema" with "inlined schema" throughout.
20050501	AGR	LC89m: Made all top-level components behave the same under include and import.
20050501	AGR	LC89f: Added statement on XML document conformance.
20050501	AGR	LC74: Refer to WSDL 2.0 explicitly throughout. In particular, only imports and includes of WSDL 2.0 documents are allowed.

20050501	AGR	LC99: Added #other to {message content model} property of Interface Message Reference [p.32] component, and to WSDL schema.
20050501	AGR	LC125: Renamed components Fault Reference -> Interface Fault Reference [p.36] , Message Reference -> Interface Message Reference [p.32] , and the corresponding properties.
20050430	AGR	LC117: Added use of EndpointType for endpoint references.
20050429	AV	LC96 and LC120: Modified section 4.2 to align wsdl:import with xs:import.
20050429	RRC	LC75w: Removed "is not dereferenceable or" from section 4.1.1 and removed references to a WSDL processor.
20050429	RRC	Added clarification that an operation style MAY affect only input or only output messages (or any other combination).
20050421	AGR	LC81 : Added constraints to ensure the component model can be serialized as a WSDL 2.0 XML Infoset. In the Interface component, the declared Interface Faults and Operations MUST have the same namespace as the Interface.
20050418	RRC	LC115: Moved document conformance section after 1.1.
20050418	RRC	LC89g: Replaced incorrect references to the [owner] Infoset property with the correct [owner element].
20050417	AGR	LC107 : Use a consistent naming convention for properties that refer to components. Make the property name match the component name as follows: • Interface.{faults} -> {interface faults} • Interface.{operations} -> {interface operations} • InterfaceFault.{element} -> {element declaration} • MessageReference.{element} -> {element declaration} • FaultReference.{fault reference} -> {interface fault} • Binding.{faults} -> {binding faults} • Binding.{operations} -> {binding operations} • BindingFault.{fault reference} -> {interface fault} • BindingOperation.{operation reference} -> {interface operation} • BindingOperation.{message references} -> {binding message references} • BindingOperation.{fault references} ->{binding fault references}

20050417	AGR	LC34b : Added the constraint that the {uri} property of a Feature or Property [p.44] component within a {features} or {properties} property MUST be unique.
20050416	AGR	LC105 : Added {parent} property to nested components.
20050416	AGR	Moved the fragment identifier [p.96] definition into the media registration appendix.
20050414	JJM	Fixed XML Schema P1/P2 version listed in the bibliography section.
20050413	AGR	LC87 : Improved clarity of the decription of Component Designators in Appendix C.
20050407	JJM	Reworded the introduction for wsdlLocation, as per LC26 resolution.
20050407	JJM	Moved paragraphs 6-9 of section 2.1.1 into 2.1.2.
20050331	AGR	LC113 : In the Feature and Property Composition sections, the in-scope components for Binding Operation, Binding Fault, Binding Message Reference, and Binding Fault Reference should include those of the corresponding Interface Operation, Interface Fault, Message Reference, and Fault Reference, respectively. Also updated specification references use Part 2: Adjuncts, and corrected validation errors.
20050320	AGR	LC104: The operations, faults, features, and properties of an Interface [p.18] component are those defined directly on the component and do not include those from the extended interfaces.
20050320	AGR	Rename Z Notation versions as wsdl20-z.html and wsdl20-z-ie-html.
20050315	AGR	Hide Z Notation in the Normative version of the spec.
20050314	AGR	Removed section on RPC Style so it can be included in Adjuncts.
20050310	AGR	Fixed minor Binding Operation errors introduced by addition of Binding Message Reference.
20050310	JJM	Replaced schema visibility table with Asir’s revised version.
20050309	AGR	Fixed minor Z typechecking errors introduced by addition of Binding Message Reference. Kudos to RRC for updating the Z Notation!
20050301	RRC	LC55: added Binding Fault Reference [p.62] component and updated the definition of the Binding Message Reference [p.59] component to be in sync with it, per issue resolution.
20050301	RRC	LC51: added Fault Reference component to the feature composition section; added mapping of {type definitions} property of the Description [p.14] component from the XML representation.
20050301	RRC	LC48a, LC49: implemented resolutions.

20050228	JJM	X and Y: Added note clarifying extensibility semantics.
20050228	JJM	X: Added note clarifying extensibility semantics.
20050228	JJM	X: Added text on the meaning of a service description.
20050218	RRC	Replaced "provider agent" with "Web service" and "requester agent" with "client" (resolution of LC30).
20050218	RRC	Moved section on the operation name mapping requirement to section 2.13 (resolution of LC8).
20050218	RRC	Implemented resolution of LC5h.
20050220	AGR	Refactored Feature and Property Z Notation in preparation for formalization of composition model.
20050220	AGR	LC27: Partial Resolution from 2005-01-19: value sets intersect. Resolve Property Composition Edge Cases by requiring the conjunction of all constraints to apply. The composed value of a Property is intersection of the value set of each in-scope Property.
20050220	AGR	LC20: Partial Resolution from 2005-01-19: "true" trumps. Resolve Feature Composition Edge Cases by requiring the conjunction of all constraints to apply. The composed value of a Feature is "true" if and only if at least one in-scope value of the Feature is "true".
20050220	AGR	LC75i: At least one of the [children] of an Operation MUST be an "input" or "output". Agree to remove "infault" and "outfault" from the list since it does not make sense to have an Operation with only faults.
20050220	AGR	Completed Action Item - 2005-02-10: DBooth to mail Arthur change to wording on media type registration, Arthur to incorporate.
20050217	JJM	LC75s: Add table indicating the visibility of schema components.
20050217	JJM	LC52a: Indicate included components also belong to the same target namespace, as per Jacek original suggestion.
20050216	JJM	LC60: Indicate it is OK to embed 2 schemas from the same targetNS.
20050216	JJM	LC75t: Remove the restriction that wsdl:include cannot be transitive.
20050216	JJM	LC91: Fixed wording regarding importing schema and effect on WSDL components.
20050211	AGR	email: Added an informative reference to WS-Addressing and referred to it from the Operation Name Mapping Requirement.
20050210	AGR	email: Corrected WSDL Media Type Registration as per David Booth’s email.

20050209	AGR	Editorial: Combine {name} NCName and {target namespace} URI properties into a single {name} QName property.
20050121	AGR	LC75l LC103: Make {message label} property of Binding Message Reference [p.59] component REQUIRED and fix up XML mapping table. />.
20050121	AGR	LC75 LC89b LC89c: Drop support for XML 1.1, drop wsdls types, and use XSD 1.0 types. />.
20050120	AGR	LC73 LC75n: Added "single_interface_per_service".
20050119	AGR	Editorial improvements to Z Notation. Added referential integrity constraints.
20050118	AGR	Edited Notational Conventions and References sections. Added character entity references for accented characters.
20050117	AGR	Edited table markup to simplify PDF generation.
20041231	AGR	Added reference to non-normative IE version of the specification.
20041227	AGR	Added reference to non-normative DHTML version of the specification.
20041218	AGR	LC34a: Refer to "Appendix C - URI References for WSDL Components" whenever a component cannot be referred to by QName .
20041126	AGR	LC43: Rename <definitions> to <description>.
20041102	HH	LC38: Using real URI for DTD import
20041024	AGR	Added initial Z Notation for component model.
20040930	AGR	LC6d: Revised Appendix C, URI References.
20040929	AGR	LC34b, LC34c, LC34d: Revised Appendix C, URI References.
20040802	RRC	Removed paragraph added per resolution of issue 211 (undone per action item 5 of the 2004-07-29 concall).
20040802	RRC	Added clarification on the meaning of required language extensions.
20040802	RRC	Added operation name requirement to the Interface [p.18] component section.
20040802	RRC	Added introductory text for the Property Component (per action item 2 of the 2004-07-29 concall).
20040727	RRC	Made the Property [p.44] component independent of XML Schema (issue 248).
20040727	SW	Issue 243 text
20040727	SW	Incorporated Paul’s words for issue 235
20040727	SW	Added MarkN’s text for issue 211

20040727	SW	Added note to processor conf rules for optional extensions and features about what optional means.
20040727	SW	Removed contentious area ed note thing per decision to do those via minority opinions.
20040722	HH	Defined wsdls:int for http:code.
20040721	RRC	Made almost all set-valued properties optional and added a rule to default them to the empty set, per agenda item 7 of 2004-07-15 concall.
20040715	RRC	Marked the {message label} property of the Message Reference and Fault Reference components as required.
20040715	RRC	Made the {style} property into a set of xs:anyURI.
20040714	RRC	Added definition of simple types used by the component model (issue 177).
20040713	RRC	Added clarification to interface extensions per issue 220.
20040713	RRC	Added clarification to Binding Operation section (issue 227).
20040713	RRC	Fixed references to Interface Fault [p.22] components in the Fault Reference component section.
20040713	RRC	Added description of pseudo-schema syntax.
20040714	SW	Made f&p allowed in the remaining places and updated composition rules
20040713	SW	Added negative conformance criteria: not required to process XML1.1 etc.
20040713	SW	Corrected reference to frag ID syntax to for issue 209
20040713	SW	Implemented Jonathan’s proposal for issue 160.
20040713	SW	Put ednote in contentious areas asking for extra feedback.
20040712	RRC	Marked all component model properties as REQUIRED or OPTIONAL (issue 213).
20040712	RRC	Added definition for equivalence of list-typed values.
20040712	RRC	Clarified RPC style rules for one-way operations (issue 215).
20040708	JJM	Finished adding clarifications for non-XML type system extensibility.
20040708	JJM	Include the definition of "actual value" from XML Schema (Issue 219).
20040708	JJM	Added resolution to issue 218 (2004Jun/0276.html, including Mark’s amendment).
20040708	JJM	Component equivalence (2004Jun/0195.html, 2004Jun/0199.html and ref to the charmod [Issue 210]).
20040706	RRC	Added clarifications for non-XML type system extensibility.

20040706	RRC	Expanded component model definition.
20040706	RRC	Added clarification to section 2.1.1 per resolution of issue 222.
20040706	RRC	Made it possible to use rpc style with schema languages other than XML Schema.
20040702	SW	Made operation/@style be a list of URIs.
20040702	SW	Had forgotten to map to the {type} property of binding.
20040625	SW	Allowed F&P *nearly* everywhere. Sigh.
20040618	SW	Changed F&P composition model to nearest enclosing scope.
20040618	SW	Incorporated Jacek's purpose of bindings text as appropriate.
20040526	SW	Added @address to /definitions/service/endpoint per F2F decision
20040526	SW	Added @type to /definitions/binding per F2F decision
20040519	SW	Renamed wsoap12: to wsoap:.
20040323	JJM	Commented out the (missing) property example.
20040322	RRC	Added definition of wsdli:wsdlLocation attribute.
20040322	JJM	Added faults to properties and features.
20040319	JJM	Use lowercase "should" in notes.
20040319	JJM	Comment out features at service level. Uniformize scope between features and properties.
20040318	JJM	Moved normative notes into the main body of the document.
20040318	JJM	Incorporated the property text from Glen.
20040318	JJM	Addressed comments from Yuxiao Zhao.
20040318	JJM	Updated the feature description, as per Glen and David Booth's suggestions.
20040317	RRC	Removed redundant {styleDefault} property of the interface component.
20040317	JJM	Include comments from Kevin.
20040315	RRC	Added clarification on embedded XML schemas that refer to siblings.
20040315	RRC	Updated RPC signature extension to use #in/#out/#inout/#return tokens.
20040315	RRC	Added explanatory text to types and modularization sections per resolution of issue #102.
20040315	SW	Change binding/{fault,operation}/@name to @ref
20040312	RRC	Fixed appendix D to take the removal of wsdl:message into account.

20040312	RRC	Added definition of wrpc:signature extension attribute.
20040311	SW	Change fault stuff per decision to make faults first class in interfaces.
20040308	SW	Renamed {message} property to {element} and @message to @element
20040305	SW	Added {safety} property
20040227	MJG	Merged in branch Issue143 containing resolution of issue 143
20040227	SW	Dropped {type definitions} property from definitions; leftover from <message> days.
20040226	SW	Working thru various edtodo items.
20040106	JS	Per 18 Dec 2003 telecon decision, added text re: circular includes.
20031204	JS	Per 4 Dec 2003 telecon decision, removed redundant binding/operation/{infault, outfault}/@messageReference.
20031105	JS	Added point to attributes task force recommendation accepted by the working group.
20031104	JS	Mapping to component model for {message} of Fault Reference component indicated that `message` *attribute information item* was optional, but the pseudo syntax and XML representation indicated it was required. Made uniformly optional to allow other type systems as was previously done for {message} of Message Reference component.
20031104	JS	Renamed interface /operation /{input,output} /@body to ./@message and interface /operation /{infault,outfault} /@details to ./@message per 4 Nov face-to-face decision.
20031104	JS	Made interface /operation /{input,output,infault,outfault} /@messageReference optional per 4 Nov face-to-face decision.
20031104	JS	Removed interface/operation/{input,output}/@header per 4 Nov face-to-face decision.
20031102	SW	Updated fault reference components to indicate that if operation's MEP uses MTF then the fault is in the opposite direction as the referenced message and if it use FRM then its in the same direction. Per 10/30 telecon decision.
20031102	SW	Updated operation styles terminology per message #57 of Oct. and the RPC style rules per message #58 of Oct. per decision on 10/30 telecon to consider those status quo.
20031102	SW	Clarified wording in operation styles discussion to better explain the use of the {style} attribute.
20031102	SW	Clarified wording in XML <-> component model mapping section for message reference components to say that {body} and {headers} may not have a value.

20031102	SW	Made interface/operation/(input|output)/@messageReference REQUIRED per 10/30 telecon decision.
20031028	SW	Renamed to wsdl20.xml and updated contents.
20031028	SW	Updated bindings.
20031025	SW	Updated faults.
20031013	JJM	Moved appendix C to a separate document, as per 24 Sep 2003 meeting in Palo Alto, CA.
20031003	SW	Softened <documentation> wording to allow machine processable documentation.
20031002	SW	Changed binding/operation/@name to QName per edtodo.
20030930	SW	Added placeholders for set-attr/get-attr operation styles.
20030929	SW	Inserted Glen Daniels' feature text.
20030919	RRC	Removed import facility for chameleon schemas and added a description of a workaround.
20030918	JJM	Changed message pattern to message exchange pattern, as per WG resolution on 18 Sep. 2003
20030916	RRC	Added editorial note for the missing RPC encoding style.
20030915	RRC	Yet more updates for REQUIRED, OPTIONAL; updated section 3 to reflect the removal of "wsdl:message".
20030911	RRC	More updates for REQUIRED, OPTIONAL; removed diff markup; fixed example C.4.
20030911	RRC	Renamed message reference "name" attribute and property to "messageReference"; fixed incorrect reference to "fault" element in the binding operation section.
20030910	SW	Fixed message references and added proper use of REQUIRED etc. for the part I've gone through so far.
20030910	SW	Updating spec; fixed up interface operation component more.
20030808	JCS	Fixed errors found by IBM\Arthur.
20030804	JCS	Removed Message component per 30 July-1 Aug meeting.
20030803	JCS	Replaced substitution groups with xs:any namespace='##other' per 3 July, 17 July, and 24 July telecons.
20030801	JCS	Made binding/@interface optional per 31 July meeting.
20030724	JCS	Remove @targetResource per 17 July 2003 telecon.
20030612	JJM	Incorporate revised targetResource definition, as per 12 June 2003 telcon.

20030606	JJM	Refer to the two graphics by ID. Indicate pseudo-schemas are not normative.
20030604	JJM	Fixed figures so they don’t appear as tables. Fixed markup so it validates.
20030603	JCS	Plugged in jmarsh auto-generated schema outlines
20030529	MJG	Fixed various issues with the XmlRep portions of the spec
20030527	MJG	Added text to **2.2.1 The Interface Component** [p.18] and **2.2.3 Mapping Interface’s XML Representation to Component Properties** [p.21] indicating that recursive interface extension is not allowed.
20030523	JJM	Added pseudo-syntax to all but Type and Modularizing sections.
20030523	JJM	Added the "interface" and "targetResource" attribute on <service>.
20030523	JJM	Fixed miscellaneous typos (semi-colon instead of colon, space after parenthesis, etc.).
20030523	JJM	Rewrote the service-resource text and merge it with the introduction.
20030522	JCS	s/set of parts/list of parts/.
20030514	JJM	Updated the service-resource figure, and split the diagram into two.
20030512	JJM	Added service-resource drawing and description.
20030512	JJM	Added syntax summary for the Interface [p.18] component.
20030428	MJG	Various edits to **3. Types** [p.73] , other-schemalang to accommodate other type systems and spell out how extensibility elements/attributes play out in such scenarios.
20030428	MJG	Added text to **1.4 Notational Conventions** [p.8] regarding normative nature of schema and validity of WSDL documents
20030411	JJM	Allowed features and properties at the interface, interface operation, binding and binding operation levels, as agreed at the Boston f2f http://lists.w3.org/Archives/Public/www-ws-desc/2003Mar/0019.html.
20030411	JJM	Incorporate features and properties’ text from separate document and merged change logs
20030313	MJG	Changed title to include ’part 1’
20030313	MJG	Changed port to endpoint
20030313	MJG	Changed type to interface in binding
20030313	MJG	Changed mep to pattern and message exchange pattern to message pattern
20030313	MJG	Added text to ’mig_porttypes’
20030313	MJG	Changed portType to interface

20030407	JJM	Refined and corrected the definitions for features and properties.
20030304	JJM	Filled in blank description of Feature and Property [p.44] component.
20030303	MJG	Skeleton Feature and Property [p.44] components
20030305	MJG	Merged ComponentModelForMEPs branch (1.46.2.5) into main branch (1.54). Below is change log from the branch:
20030220	MJG	ComponentModelForMEPs: Minor wording change at suggestion of JJM
20030212	MJG	ComponentModelForMEPs: Updated component model to include Fault Reference component. Associated changes to Port Type Operation component
20030211	MJG	ComponentModelForMEPs: Changes to component model to support MEPs
20030228	MJG	Updated **4.2 Importing Descriptions** [p.82] to be consistent in layout with other XML rep sections. Detailed that documentation and extensibility attributes are allowed, per schema
20030228	MJG	Updated **4.1 Including Descriptions** [p.80] to be consistent in layout with other XML rep sections. Detailed that documentation and extensibility attributes are allowed, per schema
20030228	MJG	Updated **2.9.2 XML Representation of Binding Component** [p.50] to list type attribute
20030217	MJG	Minor edits to wording in **2.4.1 The Interface Operation Component** [p.25]
20030213	MJG	Added xlink nsdecl to spec element
20030213	MJG	Incorporated text from dbooth's proposal on semantics, per decision 20021031
20030213	MJG	Merged operationnames branch (1.37.2.3) into main branch (1.46). Below is the change log from the branch.
20030130	MJG	operationnames: Updated binding section to match changes to port type section WRT operation names
20030130	MJG	operationnames: Added best practice note on operation names and target namespaces to **2.4.1 The Interface Operation Component** [p.25]
20030122	MJG	operationnames: Started work on making operations have unique names
20030213	MJG	Change name of {message exchange pattern} back to {variety} to consolidate changes due to MEP proposal
20030206	MJG	Updated Appendix A to refer to Appendix C
20030204	MJG	Tidied up appendix C
20030203	MJG	Incorporated resolution to R120

20030124	MJG	Fixed error in **2.5.2 XML Representation of Interface Message Reference Component** [p.32] which had name *attribute information item* on input, output and fault *element information item* being mandatory. Made it optional.
20030123	JJM	Change name of {variety} property to {message exchange pattern}
20030130	MJG	Updated binding section to match changes to port type section WRT operation names
20030130	MJG	Added best practice note on operation names and target namespaces to **2.4.1 The Interface Operation Component** [p.25]
20030122	MJG	Started work on making operations have unique names
20030122	MJG	Added some <emph>, <el>, <att>, &AII;, &EII;, <el> markup
20030120	MJG	Incorporated Relax NG section from Amy's types proposal
20030120	MJG	Incorporated DTD section from Amy's types proposal
2003020	MJG	Incorporated Amy's types proposal except annexes
20030118	MJG	Made some changes related to extensibility
20030118	MJG	Amended content model for operation to disallow fault element children in the input-only and output-only cases
20030118	MJG	Removed {extension} properties from Binding [p.50] components and Port components. Added text relating to how extension elements are expected to annotate the component model.
20030117	MJG	Made further edits related to extensibility model now using substitution groups
20030117	MJG	Added initial draft of section on QName resolution
20030117	MJG	Reworked section on extensibility
20030116	MJG	Added text regarding multiple operations with the same {name} in a single port type
20030116	MJG	Added section on symbol spaces
20030116	MJG	Removed various ednotes
20030116	MJG	Added section on component equivalence
20030116	MJG	More work on include and import
20021201	MJG	Did some work on wsdl:include
20021127	MJG	Added placeholder for wsdl:include
20021127	MJG	Cleaned up language concerning `targetNamespace` *attribute information item* **2.1.2.1 targetNamespace attribute information item** [p.16]

20021127	MJG	changed the language regarding extensibility elements in **2.1.2 XML Representation of Description Component** [p.15] .
20021127	MJG	Moved all issues into issues document (../issues/wsd-issues.xml)
20021127	MJG	Removed name attribute from definitions element
20021127	MJG	Removed 'pseudo-schema'
20021121	JJM	Updated media type draft appendix ednote to match minutes.
20021111	SW	Added appendix to record migration issues.
20021107	JJM	Incorporated and started adapting SOAP's media type draft appendix.
20021010	MJG	Added port type extensions, removed service type.
20020910	MJG	Removed parameterOrder from spec, as decided at September 2002 FTF
20020908	MJG	Updated parameterOrder description, fixed some spelling errors and other types. Added ednote to discussion of message parts
20020715	MJG	AM Rewrite
20020627	JJM	Changed a few remaining <emph> to either <att> or <el>, depending on context.
20020627	SW	Converted portType stuff to be Infoset based and improved doc structure more.
20020627	SW	Converted message stuff to be Infoset based and improved doc structure more.
20020625	SW	Mods to take into account JJM comments.
20020624	JJM	Fixed spec so markup validates.
20020624	JJM	Upgraded the stylesheet and DTD
20020624	JJM	Added sections for references and change log.
20020624	JJM	Removed Jeffrey from authors :-(Added Gudge :-)
20020620	SW	Started adding abstract model
20020406	SW	Created document from WSDL 1.1