

Woden WSDL 2.0 Processor

(Session WE12, 28 June 2006)

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ApacheCon
Europe 06

Agenda

- Background to WSDL 2.0 and Apache Woden
- WSDL 2.0 Overview
- WSDL 1.1 to WSDL 2.0 Comparison
- Woden API Overview
- WSDL 2.0 validation in Woden
- WSDL 2.0 extensibility in Woden
- WSDL4J to Woden Comparison
- WSDL 1.1 to 2.0 Converter
- Woden Roadmap

What is WSDL 2.0?

- Web Services Description Language 2.0
- Emerging W3C standard to supersede WSDL 1.1
- Specification describes:
 - WSDL Component model with XML mappings
 - Syntactic and semantic validation rules
 - Extensibility

What is Apache Woden?

- An Apache incubator project
 - under the Apache Web Services project
 - <http://incubator.apache.org/woden/>
 - <http://wiki.apache.org/ws/FrontPage/Woden>
- A WSDL 2.0 processor
 - Implementation of the W3C WSDL 2.0 spec
 - Originated from WSDL4J, the WSDL 1.1 processor
- Project Goals
 1. Help validate the WSDL 2.0 spec
 - in response to W3C Call for Implementations
 2. Read/create/modify WSDL 2.0 documents
 3. Convert WSDL 1.1 to WSDL 2.0

WSDL 2.0 history (& future)

- W3C Web Services Description Working Group formed - January, 2002
- First Last Call - August, 2003
- Second Last Call - August, 2005
- Candidate Recommendation - March, 2006
 - WSDL 2.0 Interoperability Event July 2006
- Proposed Recommendation - November, 2006 (planned)
- **W3C Recommendation - January, 2007 (planned)**

Apache Woden history

- April 2005 Woden began incubation
 - initial code contribution was WSDL4J
- June 2006 Milestone 5 release
- July 2006 W3C WSDL 2.0 interop event
 - Validate the spec and implementations
- 1.0 release possibly 3Q06

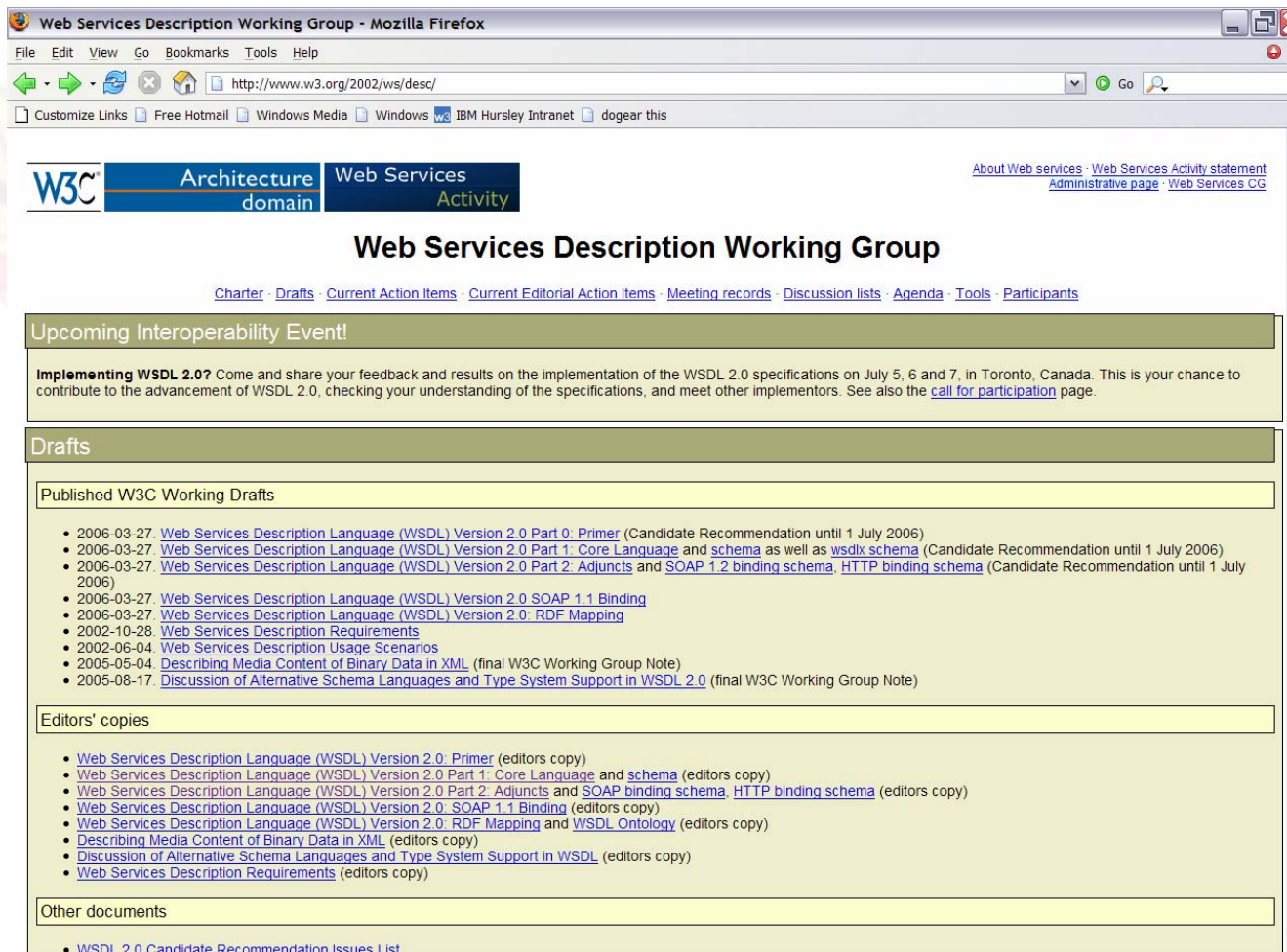
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WSDL 2.0 Specification

- Consists of several documents:
 - Primer (tutorial, non-normative)
 - Part 1: Core Language (Component model)
 - Part 2: Adjuncts (extensions)
 - Others (SOAP 1.1 Binding, RDF mapping, ...)
- <http://www.w3.org/2002/ws/desc/>

Editor's copies are most up-to-date



The screenshot shows a Mozilla Firefox browser window displaying the W3C Web Services Description Working Group website. The browser's address bar shows the URL <http://www.w3.org/2002/ws/desc/>. The website features a navigation menu with links for [Architecture domain](#), [Web Services Activity](#), [About Web services](#), [Web Services Activity statement](#), [Administrative page](#), and [Web Services CG](#). The main heading is **Web Services Description Working Group**, with sub-links for [Charter](#), [Drafts](#), [Current Action Items](#), [Current Editorial Action Items](#), [Meeting records](#), [Discussion lists](#), [Agenda](#), [Tools](#), and [Participants](#).

Upcoming Interoperability Event!

Implementing WSDL 2.0? Come and share your feedback and results on the implementation of the WSDL 2.0 specifications on July 5, 6 and 7, in Toronto, Canada. This is your chance to contribute to the advancement of WSDL 2.0, checking your understanding of the specifications, and meet other implementors. See also the [call for participation](#) page.

Drafts

Published W3C Working Drafts

- 2006-03-27. [Web Services Description Language \(WSDL\) Version 2.0 Part 0: Primer](#) (Candidate Recommendation until 1 July 2006)
- 2006-03-27. [Web Services Description Language \(WSDL\) Version 2.0 Part 1: Core Language and schema](#) as well as [wsdlx schema](#) (Candidate Recommendation until 1 July 2006)
- 2006-03-27. [Web Services Description Language \(WSDL\) Version 2.0 Part 2: Adjuncts and SOAP 1.2 binding schema, HTTP binding schema](#) (Candidate Recommendation until 1 July 2006)
- 2006-03-27. [Web Services Description Language \(WSDL\) Version 2.0 SOAP 1.1 Binding](#)
- 2006-03-27. [Web Services Description Language \(WSDL\) Version 2.0: RDF Mapping](#)
- 2002-10-28. [Web Services Description Requirements](#)
- 2002-06-04. [Web Services Description Usage Scenarios](#)
- 2005-05-04. [Describing Media Content of Binary Data in XML](#) (final W3C Working Group Note)
- 2005-08-17. [Discussion of Alternative Schema Languages and Type System Support in WSDL 2.0](#) (final W3C Working Group Note)

Editors' copies

- [Web Services Description Language \(WSDL\) Version 2.0: Primer](#) (editors copy)
- [Web Services Description Language \(WSDL\) Version 2.0 Part 1: Core Language and schema](#) (editors copy)
- [Web Services Description Language \(WSDL\) Version 2.0 Part 2: Adjuncts and SOAP binding schema, HTTP binding schema](#) (editors copy)
- [Web Services Description Language \(WSDL\) Version 2.0: SOAP 1.1 Binding](#) (editors copy)
- [Web Services Description Language \(WSDL\) Version 2.0: RDF Mapping and WSDL Ontology](#) (editors copy)
- [Describing Media Content of Binary Data in XML](#) (editors copy)
- [Discussion of Alternative Schema Languages and Type System Support in WSDL](#) (editors copy)
- [Web Services Description Requirements](#) (editors copy)

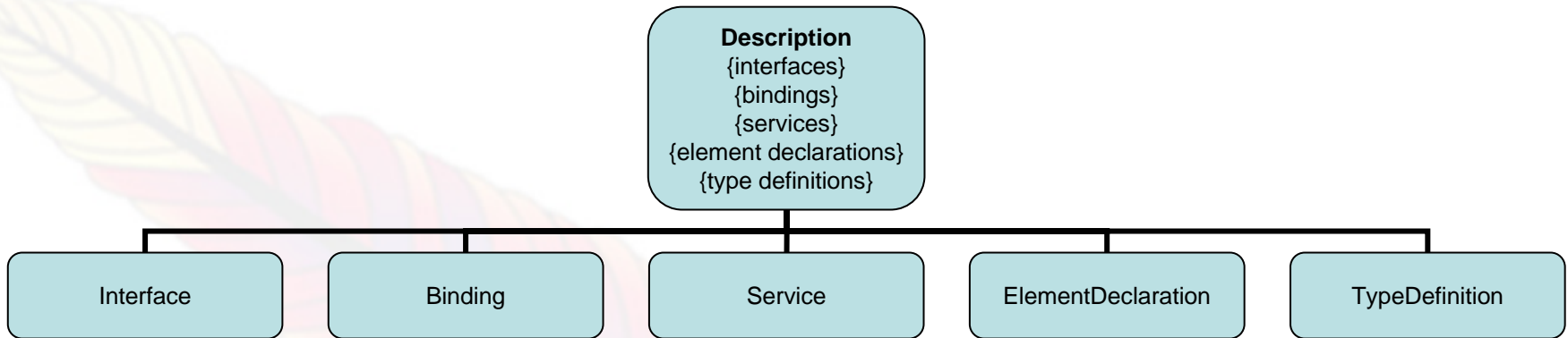
Other documents

- [WSDL 2.0 Candidate Recommendation Issues List](#)

Part 1: Core Language

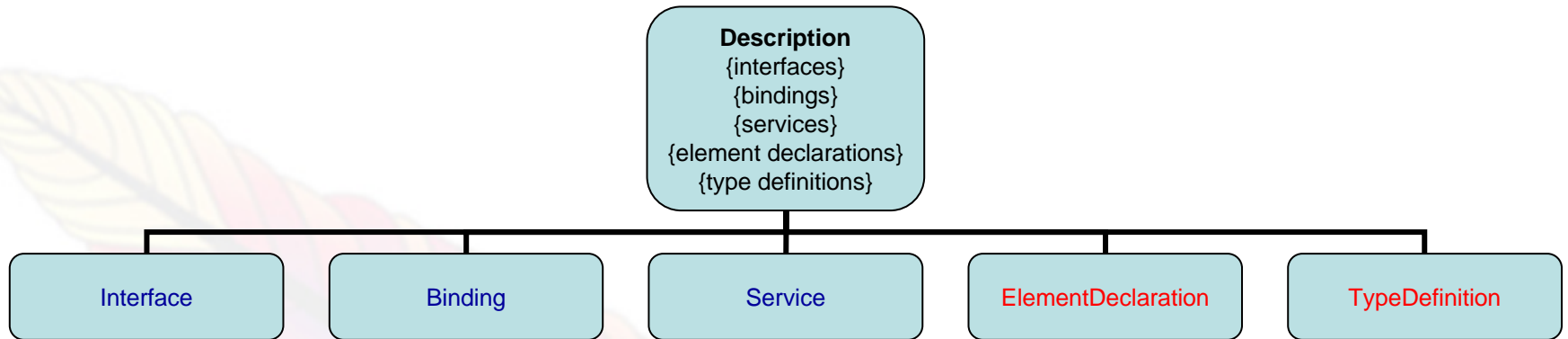
- The WSDL 2.0 “Component Model”
- An abstract view of the WSDL:
 - Focus on the web service information
 - not the XML infoset details
 - Describes WSDL Components and their properties
 - Not WSDL elements and attributes
 - But it does define the XML representation
 - A ‘flattened’ view of the WSDL
 - Importing or including of documents is not exposed
 - Imported or included content is aggregated at ‘top level’

Component Model - Top Level Components



- Description is a container for 2 types of top-level components
 - WSDL components (Interface, Binding, Service)
 - Type system components (ElementDeclaration, TypeDefinition)
- Top-level components:
 - Do not have a parent
 - May contain “nested” components

XML representation - Description



```
<?xml version="1.0" encoding="utf-8" ?>
<description
  targetNamespace=...
  xmlns=http://www.w3.org/2006/01/wsdl ... >

<types>
  <xs:schema ...
    <xs:element name=...
    <xs:complexType name=...
  </xs:schema>
</types>

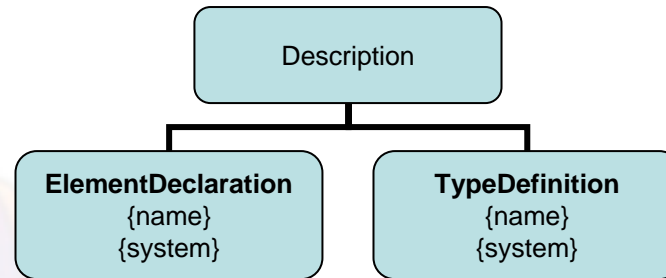
<interface> ... </interface>

<binding> ... </binding>

<service> ... </service>

</description>
```

Component Model - Type system components



- Abstract wrapper for some underlying type system
 - Typically W3C XML Schema
 - Could be some other XML based type system, like RelaxNG
 - Could be a non-XML type system, like DTD
- ElementDeclaration - a global schema element declaration
- TypeDefinition - a global schema type definition

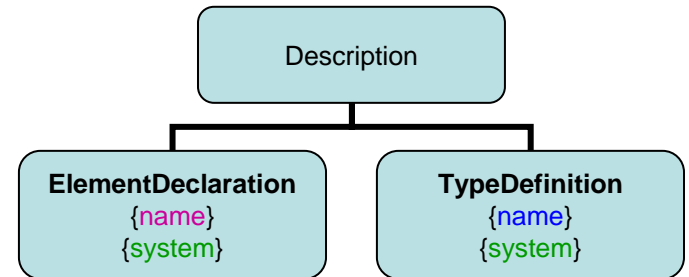
XML representation - Type system components

```
<?xml version="1.0" encoding="utf-8" ?>
<description
  xmlns="http://www.w3.org/2006/01/wsdl"
  targetNamespace= . . . >

<types>
<xs:schema
  xmlns:xs="http://www.w3.org/2001/XMLSchema"
  targetNamespace="http://greath.example.com/2004/schemas/resSvc"
  xmlns="http://greath.example.com/2004/schemas/resSvc">

  <xs:element name="checkAvailability" type="tCheckAvailability"/>
  <xs:complexType name="tCheckAvailability">
    <xs:sequence>
      <xs:element name="checkInDate" type="xs:date"/>
      <xs:element name="checkOutDate" type="xs:date"/>
      <xs:element name="roomType" type="xs:string"/>
    </xs:sequence>
  </xs:complexType>
  <xs:element name="checkAvailabilityResponse" type="xs:double"/>
  <xs:element name="invalidDataError" type="xs:string"/>

</xs:schema>
</types>
. . .
</description>
```

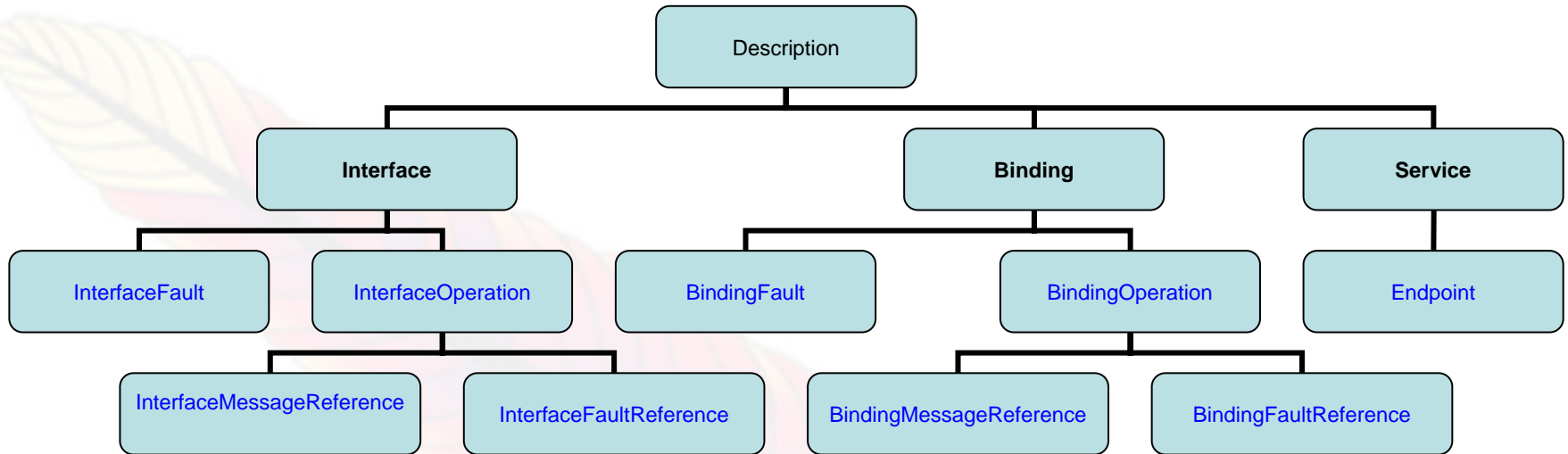


{system} = <http://www.w3.org/2001/XMLSchema>

ElementDeclaration {name} =
{http://greath.example.com/2004/schemas/resSvc}checkAvailability

TypeDefinition {name} =
{http://greath.example.com/2004/schemas/resSvc} tCheckAvailability

Component Model - nested Components



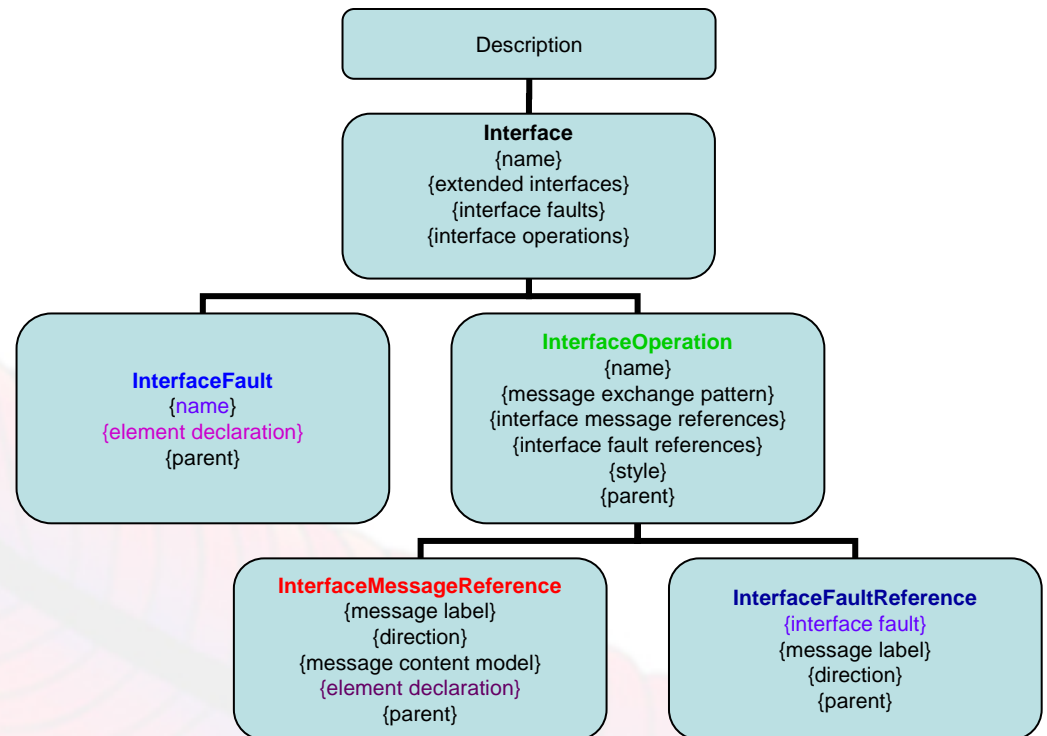
- **Nested components:**
 - Below top-level components (Interface, Binding, Service)
 - Have a parent
 - May contain other nested components
- Note symmetry between Interface and Binding nested components

Interface components - WHAT the service does

```

<?xml version="1.0" encoding="utf-8" ?>
<description targetNamespace=...
  xmlns="http://www.w3.org/2006/01/wsdl" ... >
<types>
<xs:schema ...>
  <xs:element name="invalidDataError" .../>
  <xs:element name="checkAvailability" .../>
  ...
</xs:schema>
</types>
<interface name = "reservationInterface"
  extends=... styleDefault=...>
  <fault name = "invalidDataFault"
    element = "ghns:invalidDataError"/>
  <operation name="opCheckAvailability"
    pattern="http://www.w3.org/2006/01/wsdl/in-out"
    style="http://www.w3.org/2006/01/wsdl/style/iri">
    <input messageLabel="In"
      element="ghns:checkAvailability" />
    <output messageLabel="Out"
      element="ghns:checkAvailabilityResponse" />
    <infault ref="tns:invalidDataFault" messageLabel="In"/>
    <outfault ref="tns:invalidDataFault" messageLabel="Out"/>
  </operation>
</interface>
...
</description>

```



Binding components - HOW to connect

```
<?xml version="1.0" encoding="utf-8" ?>
<description targetNamespace= ...
  xmlns="http://www.w3.org/2006/01/wsdl" ...>

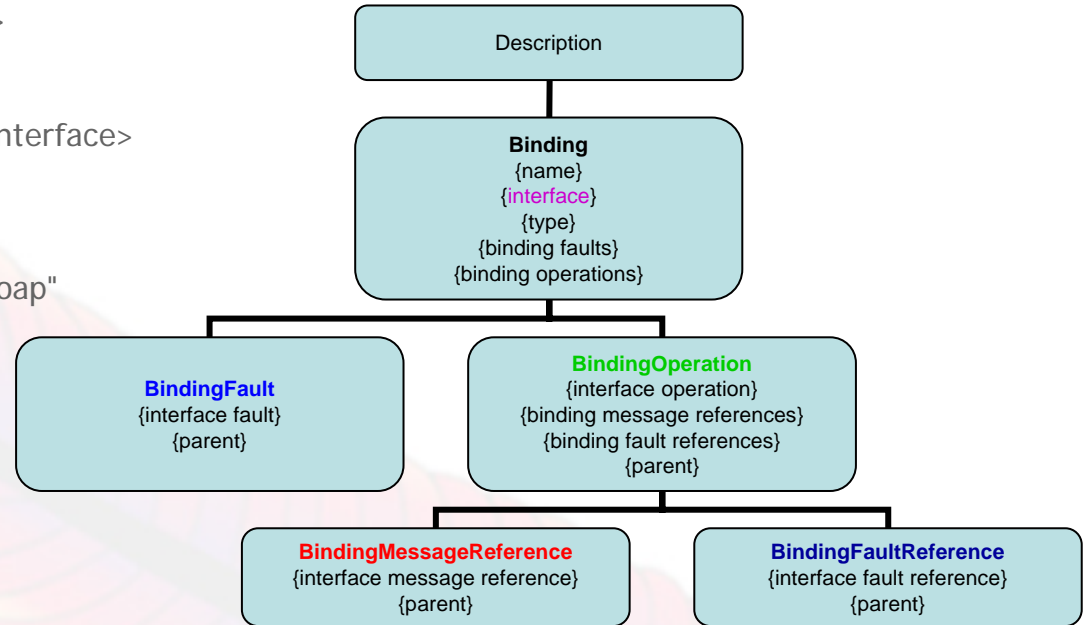
<types> ... </types>
<interface name = "reservationInterface" > ... </interface>

<binding name="reservationSOAPBinding"
  interface="tns:reservationInterface"
  type="http://www.w3.org/2006/01/wsdl/soap"
  ...">

  <fault ref="tns:invalidDataFault"
    wsoap:code="soap:Sender"/>

  <operation ref="tns:opCheckAvailability" ...>
    <input>...</input>
    <output>....</output>
    <infault> .... </infault>
    <outfault> .... </outfault>
  </operation>

</binding>
...
</description>
```



Service components - WHERE to connect

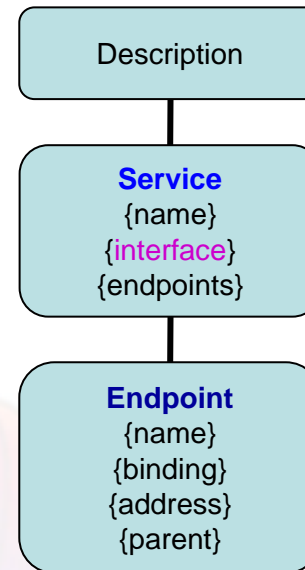
```
<?xml version="1.0" encoding="utf-8" ?>
<description targetNamespace=...
  xmlns="http://www.w3.org/2006/01/wsdl" ...>

<types> ... </types>

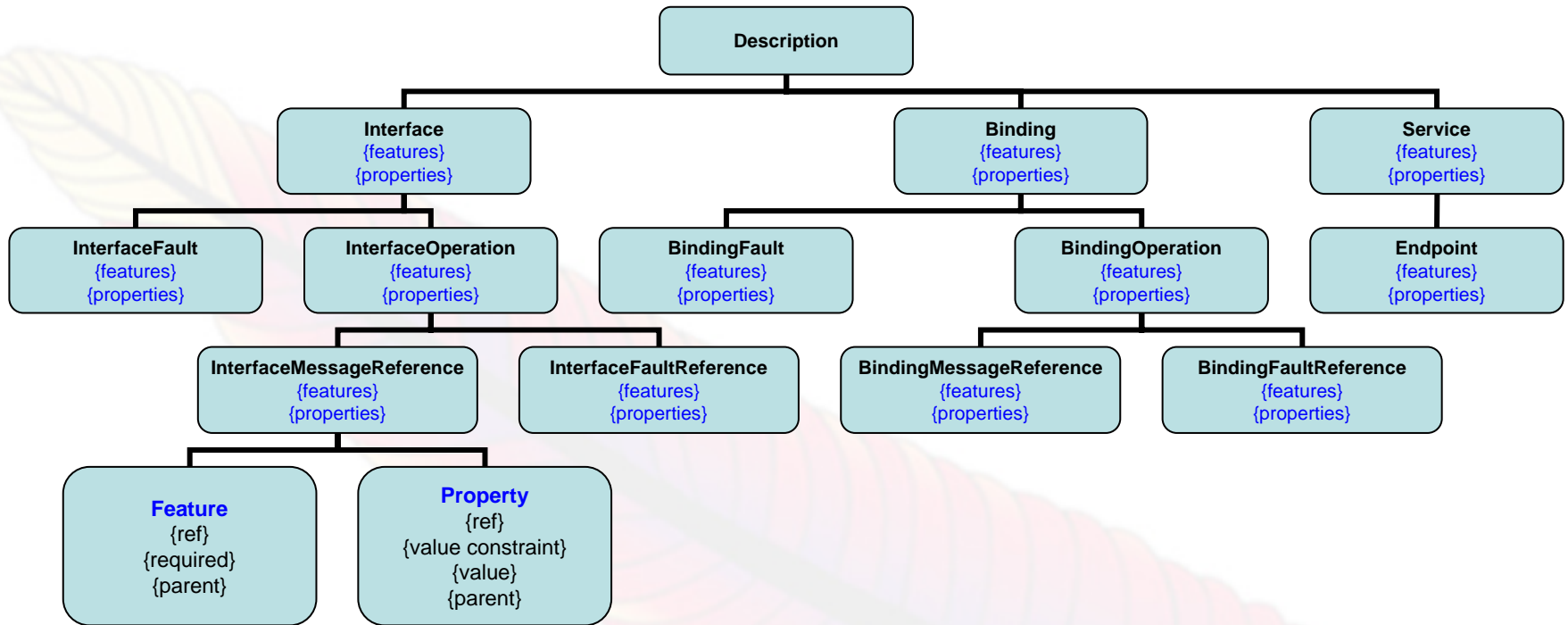
<interface name="reservationInterface" >
  ...
</interface>

<binding name="reservationSOAPBinding"
  interface="tns:reservationInterface"
  ... >
  ...
</binding>

<service name="reservationService"
  interface="tns:reservationInterface">
  <endpoint name="reservationEndpoint"
    binding="tns:reservationSOAPBinding"
    address ="http://greath.example.com/2004/reservation"/>
</service>
</description>
```



Feature & Property - configuration



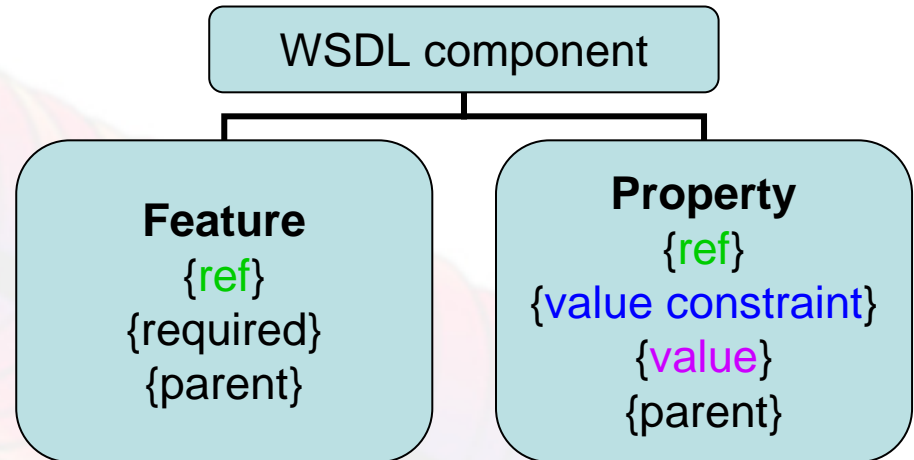
- Every component except Description may have Feature and Property components
- Provide additional processing information for a component
 - Eg: reliability, correlation, routing, retries
- Different to Woden features and properties
 - Those are scoped to WSDLReader or WSDLWriter, not to WSDL components

Feature & Property XML Representation

```
<interface name="reservationInterface">
  <operation name="makeReservation">
    ...
    <feature uri="http://example.com/securityFeature" required="true"/>
  </operation>
</interface>
```

```
<interface name="reservationInterface">
  <operation name="makeReservation">
    <property uri="http://example.com/securityFeature/securityLevel">
      <value>5</value>
    </property>
    ...
  </operation>
</interface>
```

```
<types>
  <schema>
    <simpleType name="securityLevelConstraint">
      ...
    </simpleType>
  </schema>
</types>
...
<binding>
  ...
  <property uri="http://example.com/securityFeature/securityLevel">
    <constraint type="tns:securityLevelConstraint"/>
  </property>
</binding>
```



Message Exchange Patterns

- MEP defines a contract between service and client
- MEP defined as an exchange of messages indicating:
 - sequence and cardinality
 - optionality
 - sender and receiver
 - fault propagation ruleset
 - Fault Replaces Message
 - Message Triggers Fault
 - No Faults
- WSDL 2.0 defines 8 MEPs
 - In-Only, Robust In-Only, In-Out, In-Optional-Out, Out-Only, Robust Out-Only, Out-In, Out-Optional-In

Example MEP: In-Out

In-Out

This pattern consists of exactly two messages, in order, as follows:

1. A message:
indicated by a [Interface Message Reference](#) component whose {[message label](#)} is "In" and {[direction](#)} is "in" received from some node N
2. A message:
indicated by a [Interface Message Reference](#) component whose {[message label](#)} is "Out" and {[direction](#)} is "out" sent to node N

This pattern uses the rule [2.2.1 Fault Replaces Message](#).

An operation using this MEP has a {[message exchange pattern](#)} property with the value "<http://www.w3.org/2006/01/wsdl/in-out>".

[1] [W3C Copyright Notice](#)

```
<operation name="bookTickets"
  pattern="http://www.w3.org/2006/01/wsdl/in-out">
  <input messageLabel="In" element="rsv:booking"/>
  <output messageLabel="Out" element="rsv:confirmation"/>
  <outfault ref="tns:invalidData" messageLabel="Out"/>
</operation>
```

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WSDL 1.1 / 2.0 differences

WSDL 1.1	WSDL 2.0
<definitions>	<description>
<portType>	<interface>
<binding>	<binding>
<types>	<types>
<service>	<service>
<port>	<endpoint>
<message>	Defined within <operation>

GrainOfSandCount diffs

WSDL 1.1
WSDL 2.0

```
<wsdl:definitions targetNamespace="http://grainsofsand.beach"
  xmlns="http://schemas.xmlsoap.org/wsdl/" ...
  <wsdl:types>
  ...
  </wsdl:types>

  <wsdl:message name="getGrainCountRequest">
    <wsdl:part element="tns:getGrainCount" name="parameters" />
  </wsdl:message>

  <wsdl:message name="getGrainCountResponse">
    <wsdl:part element="tns:getGrainCountResponse" name="parameters" />
  </wsdl:message>

  <wsdl:portType name="GrainCount">
    <wsdl:operation name="getGrainCount">
      <wsdl:input message="tns:getGrainCountRequest"
        name="getGrainCountRequest" />
      <wsdl:output message="tns:getGrainCountResponse"
        name="getGrainCountResponse" />
    </wsdl:operation>
  </wsdl:portType>

  <description xmlns="http://www.w3.org/2006/01/wsdl"
    targetNamespace="http://grainsofsand.beach" ...
  <types>
  ...
  </types>
  <interface name="GrainCount">
    <operation name="getGrainCount"
      pattern="http://www.w3.org/2006/01/wsdl/in-out">
      <input messageLabel="In" element="tns:getGrainCount"/>
      <output messageLabel="Out" element="tns:getGrainCountResponse"/>
    </operation>
  </interface>
```

<binding> diffs

WSDL 2.0 WSDL 1.1

```
<wsdl:binding name="GrainCountSoapBinding" type="tns:GrainCount">  
  <wsdlsoap:binding style="document"  
    transport="http://schemas.xmlsoap.org/soap/http" />  
  <wsdl:operation name="getGrainCount">  
    <wsdlsoap:operation soapAction="" />  
    <wsdl:input name="getGrainCountRequest">  
      <wsdlsoap:body use="literal" />  
    </wsdl:input>  
    <wsdl:output name="getGrainCountResponse">  
      <wsdlsoap:body use="literal" />  
    </wsdl:output>  
  </wsdl:operation>  
</wsdl:binding>
```

```
<binding name="GrainCountSoapBinding"  
  interface="tns:GrainCount"  
  type="http://www.w3.org/2006/01/wsdl/soap"  
  wsoap:version="1.1"  
  wsoap:protocol="http://www.w3.org/2006/01/soap11/bindings/HTTP">  
  <operation ref="tns:getGrainCount" wsoap:action="">  
  </operation>  
</binding>
```

<service> diffs

WSDL 2.0 | WSDL 1.1

```
<wsdl:service name="GrainCountService">  
  <wsdl:port name="GrainCount"  
    binding="tns:GrainCountSoapBinding">  
    <wsdlsoap:address  
      location="http://localhost:9080/GrainCount" />  
    </wsdl:port>  
  </wsdl:service>  
</wsdl:definitions>
```

```
<service name="GrainCountService"  
  interface="tns:GrainCount">  
  <endpoint name="GrainCount"  
    binding="tns:GrainCountSoapBinding"  
    address="http://localhost:9080/GrainCount">  
  </endpoint>  
</service>  
</description>
```

WSDL vs WSDL

- Operation overloading

- WSDL 1.1 used names of `<operation>`, `<input>` and `<output>` elements

- WSDL 2.0 must be uniquely named within an `<interface>`

- targetNamespace

- WSDL 1.1 optional. If none no top level elements can be referred to by other WSDLs.

- WSDL 2.0 mandatory

WSDL vs WSDL

- Definition of <service>

WSDL 1.1 <service>s can have multiple <port>s.
Each <port> can be bound to a different
<portType>

WSDL 2.0 <service>s bound to single <interface>

- Ordering of top level elements

WSDL 1.1 children of <definitions> may appear in
any order

WSDL 2.0 order is strictly defined

WSDL vs WSDL

- Definition of faults

- WSDL 1.1 scoped at the `<operation>`

- WSDL 2.0 scoped at the `<interface>` – enables reuse across operations

- Imports

- WSDL 1.1 WSDL `<import>` same or different targetNamespace

- WSDL 2.0 Use `<include>` for the same tns

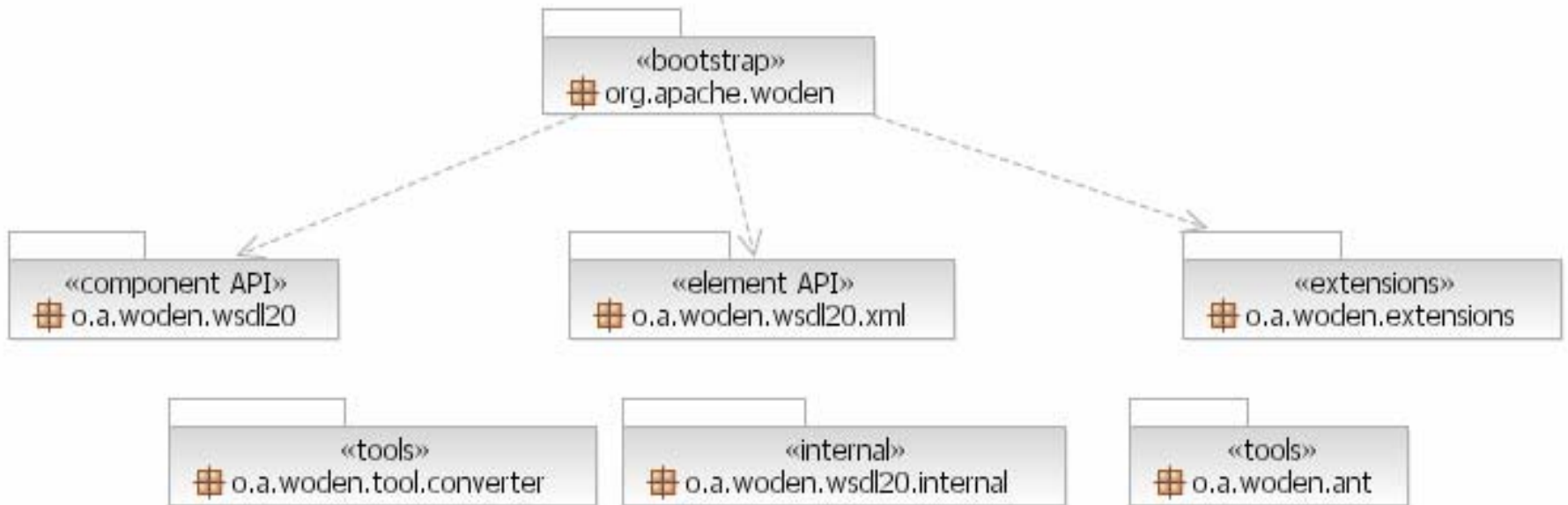
- Use `<import>` for different tns

- Consistent with XML Schema

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Apache Woden packages



Apache Woden WSDL 2.0 processor APIs

- Component model API
 - Mirror the component model of WSDL 2.0
 - Large service descriptions are spread across multiple .wsdl files
 - One root Description object representing a merge of all .wsdl files imported and included
 - Good for applications working at this abstract level e.g wsd2java
 - Read only view (today)
- Element model API
 - Mirror the XML representation of WSDL 2.0
 - And hence the physical (file) representation
 - Read / write

Represent a WSDL 2.0 document(s) in java object form



```
WSDLFactory factory = WSDLFactory.newInstance();
WSDLReader reader = factory.newWSDLReader();

reader.setFeature(WSDLReader.FEATURE_VALIDATION, true);

// Element model
DescriptionElement descElement =
    reader.readWSDL("file:///GrainOfSandCounter-2.wsdl");

// Component model
Description desc = descElement.toComponent();
```

Model Hopping

- `<component model class>.toElement()`
 - Yields the associated Element-model object
- `DescriptionElement.toComponent()`
 - DescriptionElement only
 - Yields everything in scope of the `<description>`
 - Top level and imported/included descriptions
 - Could yield a Description that doesn't validate
 - `toComponent()` on a partially complete description

Example code

```
// Retrieve a particular service component from the description
// component's {services} property. Use the service component's
// {name} property as the key
QName name = new QName("http://grainsofsand.beach",
    "GrainCountService");
Service svc = desc.getService(name);

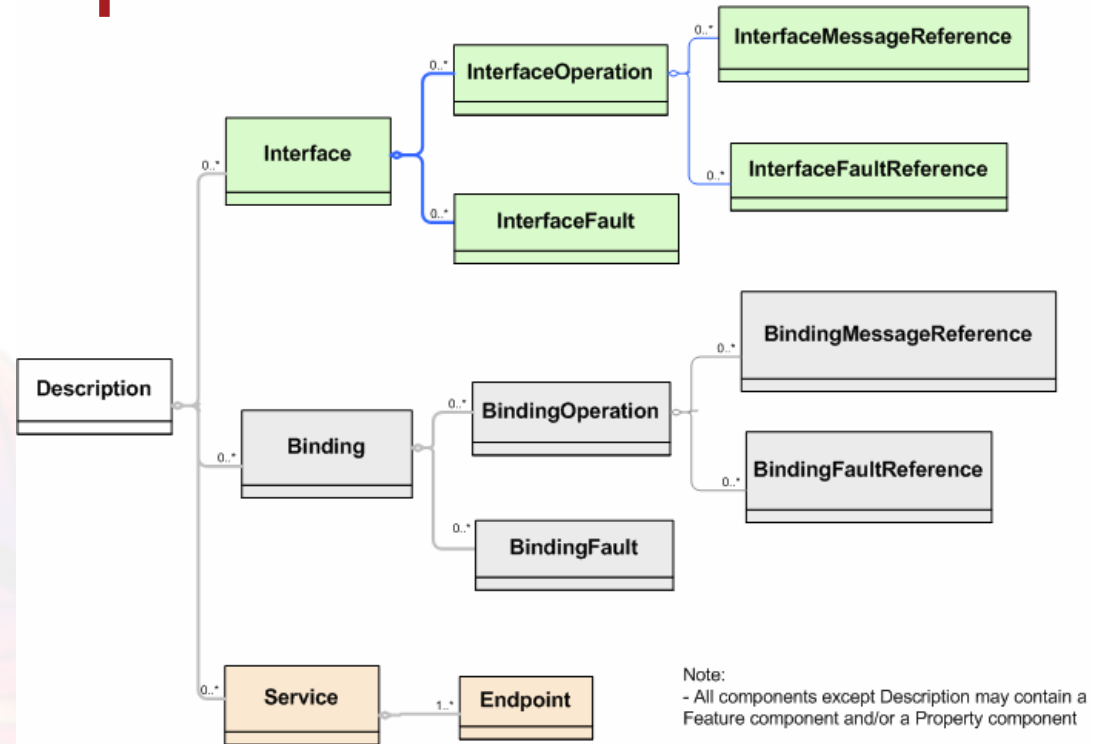
// service component's {interface} property:
Interface iface = svc.getInterface();

// description component's {interfaces} property:
Interface[] ifaces = desc.getInterfaces();

// Change {name} property of an {endpoint} property of the
// service component.
NCName epName = new NCName("GrainCount");
Endpoint epnt = svc.getEndpoint(epName);
NCName newEpName = new NCName("GrainWarehouse");
epnt.toElement().setName(newEpName);
```

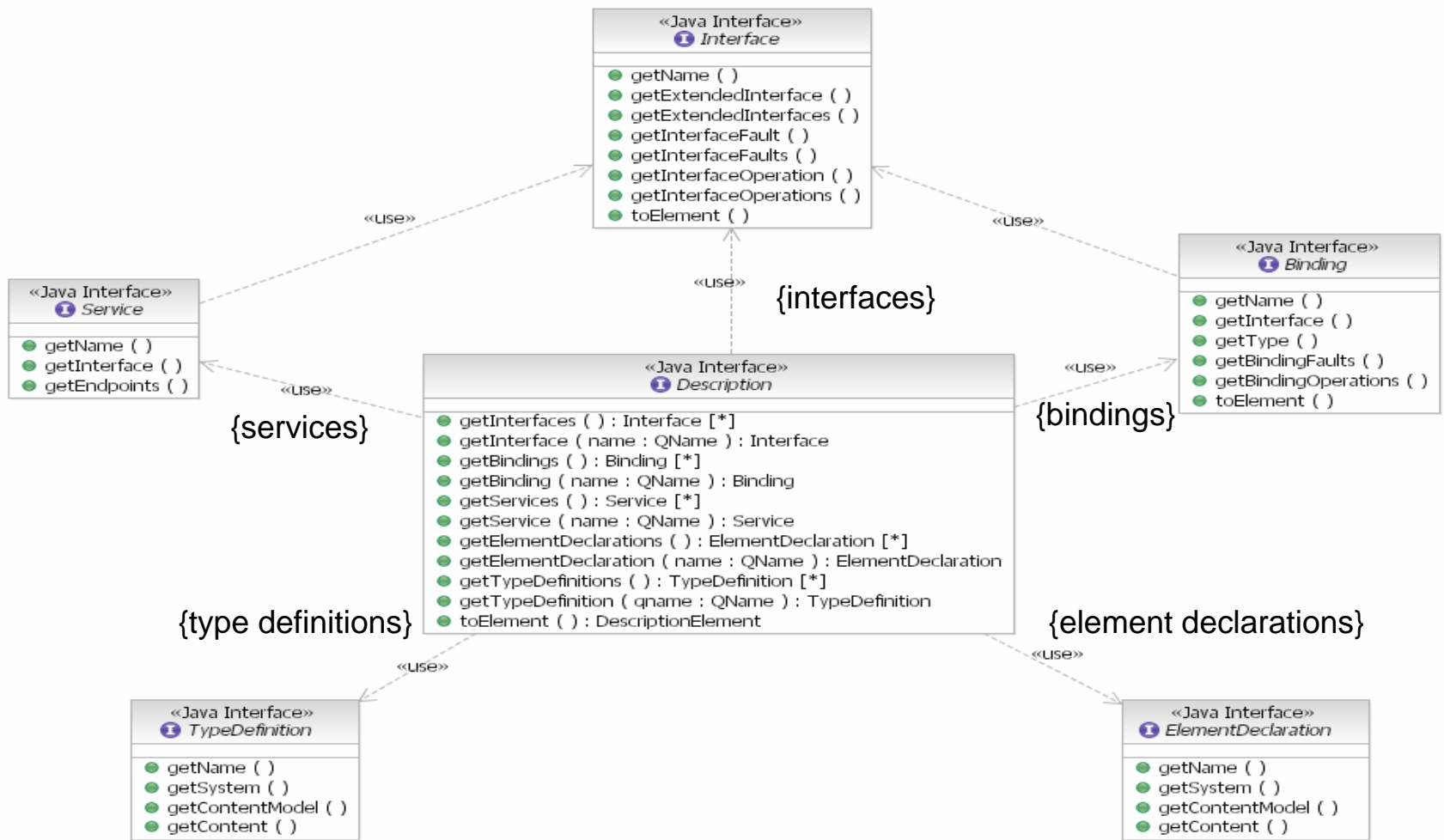
WSDL 2.0 recap

- WSDL 2.0 defines properties of the Description component
 - WSDL 2.0
 - Interface
 - Binding
 - Service
 - Types
 - Element Declaration
 - Type Definition



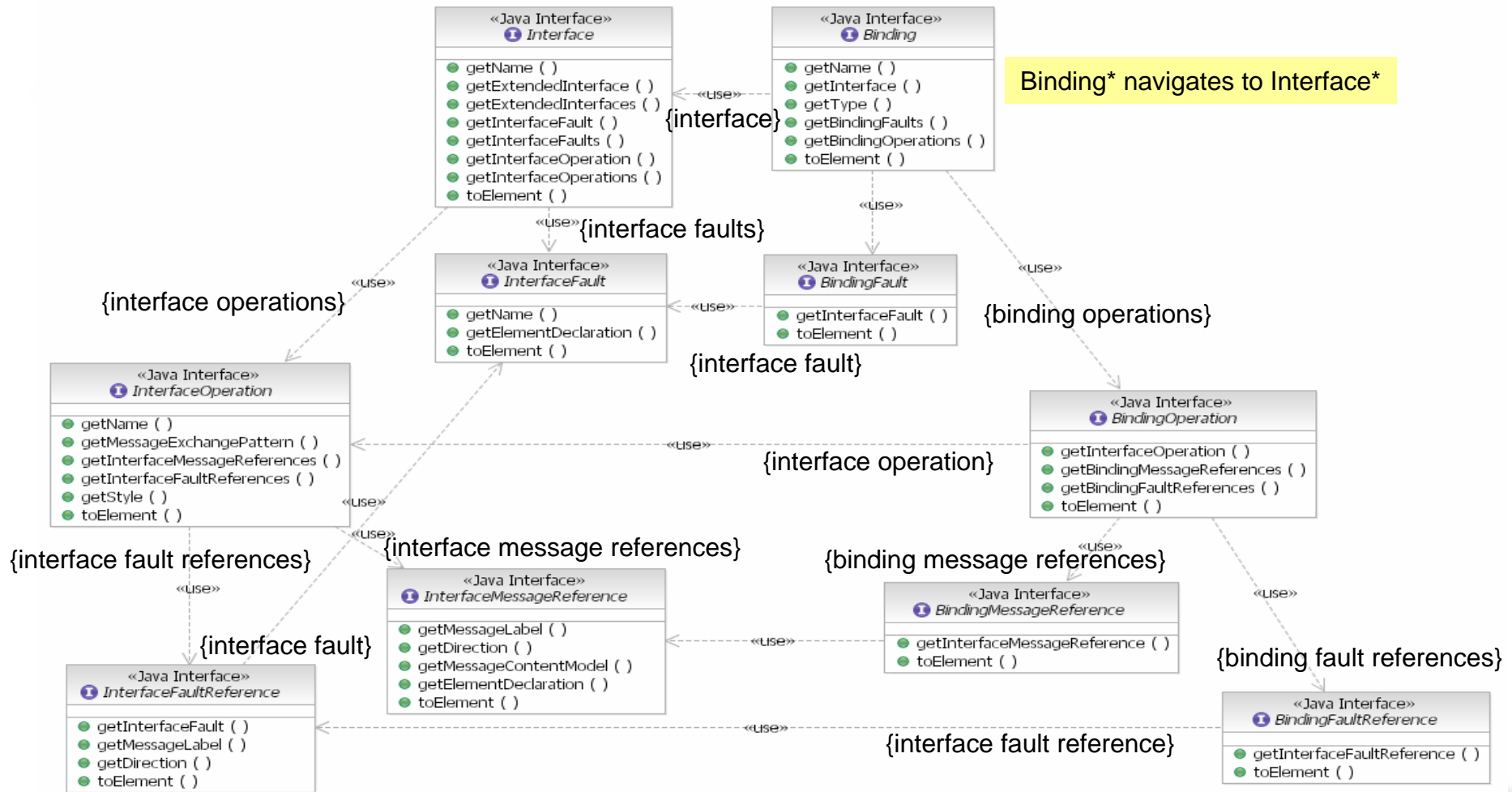
[2] [W3C Copyright Notice](#)

Component model: containment hierarchy

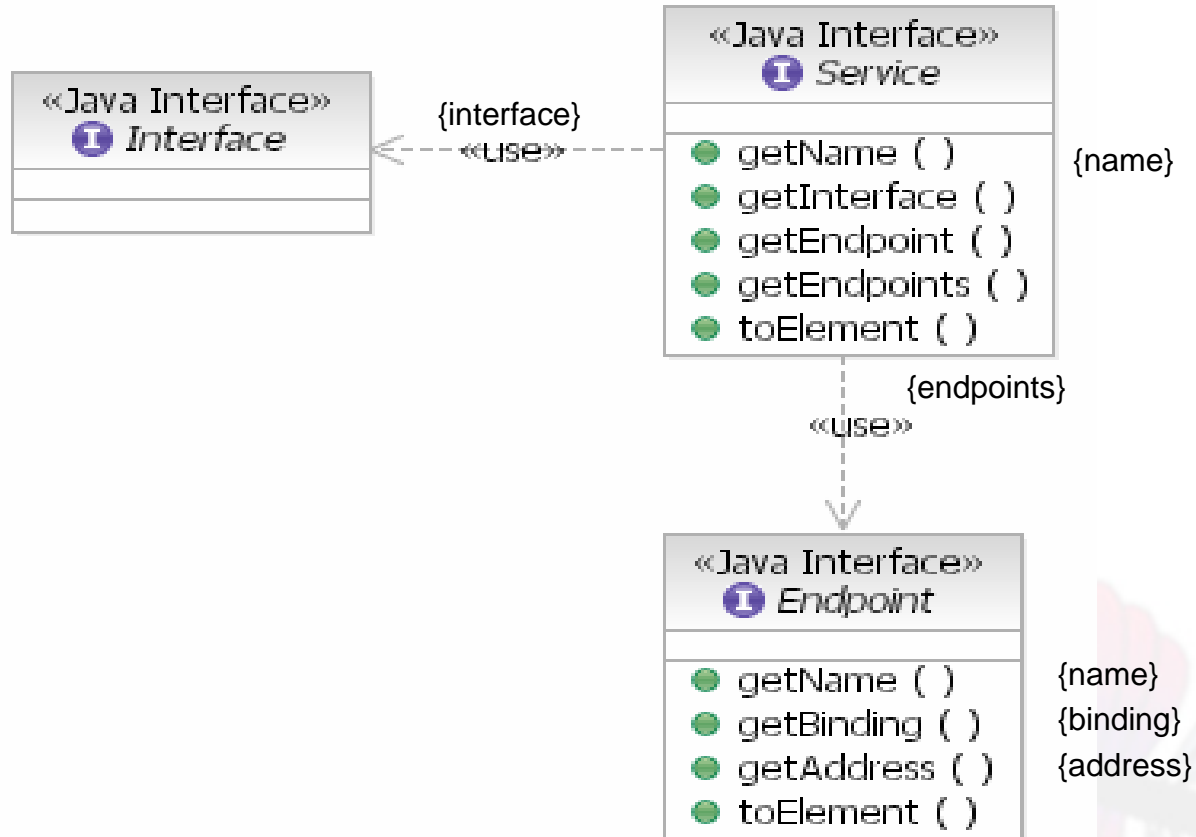


Interface and Binding components

Binding* navigates to Interface*



Service



DescriptionElement

- Container and factory for child elements

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

[\[3\] W3C Copyright Notice](#)

«Java Interface» DescriptionElement	
●	setDocumentBaseURI ()
●	getDocumentBaseURI ()
●	setTargetNamespace ()
●	getTargetNamespace ()
●	addNamespace ()
●	removeNamespace ()
●	getNamespace ()
●	getNamespaces ()
●	createDocumentationElement ()
●	createImportElement ()
●	createIncludeElement ()
●	createTypesElement ()
●	createInterfaceElement ()
●	createInterfaceFaultElement ()
●	createInterfaceOperationElement ()
●	createInterfaceFaultReferenceElement ()
●	createInterfaceMessageReferenceElement ()
●	createBindingElement ()
●	createBindingFaultElement ()
●	createBindingOperationElement ()
●	createBindingFaultReferenceElement ()
●	createBindingMessageReferenceElement ()
●	createFeatureElement ()
●	createServiceElement ()
●	createEndpointElement ()
●	createPropertyElement ()
●	addImportElement ()
●	getImportElements ()
●	addIncludeElement ()
●	getIncludeElements ()
●	setTypesElement ()
●	getTypesElement ()
●	addInterfaceElement ()
●	getInterfaceElements ()
●	addBindingElement ()
●	getBindingElements ()
●	addServiceElement ()
●	getServiceElements ()
●	setExtensionRegistry ()
●	getExtensionRegistry ()
●	toComponent ()

Element model: containment hierarchy



<description

```

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

</description>

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WSDL 2.0 validation rules

- Infoset syntax
 - defined by WSDL 2.0 XML schema
 - <http://www.w3.org/2006/01/wsdl/wsdl20.xsd>
- Semantic rules
 - Defined in the WSDL 2.0 spec as **assertions**
 - Some apply to a WSDL Document (Infoset)
 - QName refs, name scope, import/include visibility, etc
 - Some apply to Component model
 - Model structure, data relationships, scope, etc

WSDL 2.0 assertions

WSDL Document examples:

[InterfaceMessageReference-1205002](#) 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*.

[Schema-0017](#) The referenced schema MUST contain a *targetNamespace attribute information item* on its *xs:schema element information item*.

Component model examples:

[Interface-0030](#) For each [Interface](#) component in the `{interfaces}` property of a [Description](#) component, the `{name}` property MUST be unique.

[InterfaceFaultReference-0043](#) The value of this property MUST match the name of a placeholder message defined by the message exchange pattern.

Woden WSDL Validation

- Validation is 'off' by default.
- Enable validation before reading the WSDL:

```
reader.setFeature(WSDLReader.FEATURE_VALIDATION, true);  
DescriptionElement desc = reader.readWSDL("http://...");
```
- **Schema validation** is done by the XML parser
 - by Xerces in the Woden DOM implementation
- **Semantic validation** is done by Woden
 - on the WSDL object model
 - assertions are checked against the model
- All errors are reported in one pass
 - Woden does not stop-on-first-error like WSDL4J
- The WSDL object model is always returned
 - even if it has errors.

Reporting WSDL Errors

- `ErrorReporter` reports 3 levels of severity
 - Warning, Error, Fatal Error
 - Processing continues after Warning or Error
 - Processing terminates after Fatal Error
- Default `ErrorHandler` prints messages to `System.out`
- Can customize error handling
 - Re-implement `ErrorHandler` with required behaviour
 - Set via `ErrorReporter.setErrorHandler`
- Error messages retrieved from `ResourceBundle`
 - Parameterized for insertion of error details
 - NLS support via 'locale'

WSDL Error vs WSDLException

- WSDL 'warning' or 'error' do not terminate processing
 - Reported as per ErrorHandler implementation
 - Processing continues
- WSDLException terminates processing
 - WSDL 'fatal error'
 - WSDL document not found
 - root element is not <description>
 - Woden config error
 - invalid WSDLReader Feature or Property
 - Extension registration error
 - Wrapper for checked exceptions
 - MalformedURLException, SAXException, etc
 - NOTE: runtime exceptions are NOT wrapped

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WSDL 2.0 Extensibility

- Every WSDL 2.0 element is extensible
 - Via **extension elements** and **extension attributes**
- Every WSDL 2.0 component is extensible
 - Via **extension properties**
- Extension properties are derived from extension elements and attributes
 - But no differentiation in the Component model
- WSDL 2.0 defines extensions for:
 - SOAP bindings
 - HTTP bindings
 - Interface operation 'safety'
 - 'rpc' operation style

Extension Property vs Element and Attribute

Component extension properties do not differentiate extension elements and attributes.

```
<binding name="reservationBinding"
  interface="tns:reservation"
  type="http://www.w3.org/2006/01/wsdl/soap"
  wsoap:version="1.2"
  wsoap:protocol="http://www.w3.org/2003/05/soap/bindings/HTTP"
  wsoap:mepDefault="http://www.w3.org/2003/05/soap/mep/request-response">

  <wsoap:module ref="http://example.org" required="true" />
</wsoap:module>
  ...
</binding>
```

Binding

{type} is SOAP

{soap version}

{soap underlying protocol}

{soap mep default}

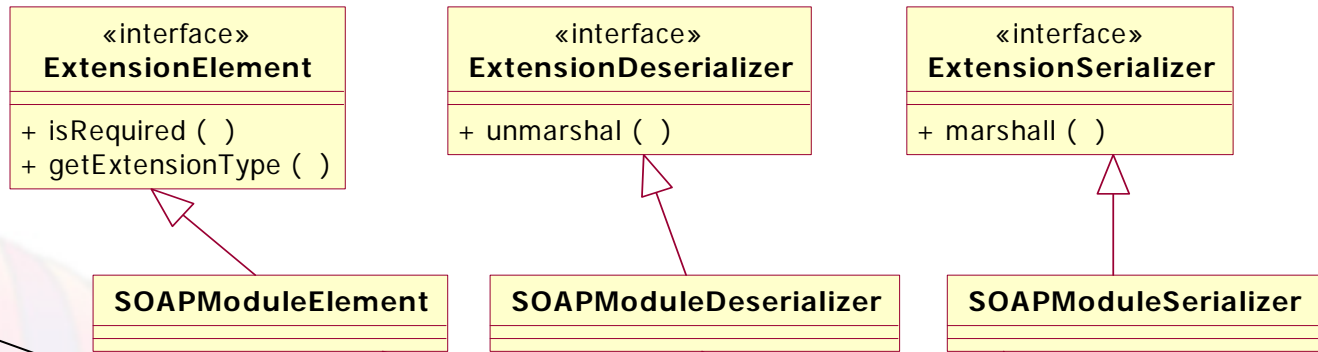
{soap modules}

WSDL extensions in Woden

1. Application developer implements some Woden interfaces
 - to create read/write logic for extension elements and attributes
 - to represent the extension properties of a Component for a particular namespace
2. Application registers these implementations in extension registry
3. Woden will query extension registry and invoke extension-specific logic when extensions are encountered

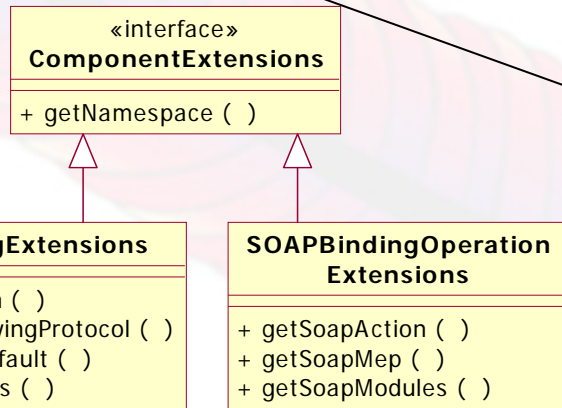
Step 1: Implement extensions

Example:
`<wssoap:module>`
 extension element



These implementations support the `<wssoap:module>` element

Example:
 Binding component extensions
 BindingOperation component extensions



Binding extension properties
 {soap version}, {soap underlying protocol}, {soap mep default} a...

BindingOperation extension properties {soap action}, {soap mep} and {soap modules}

Step 2: Register extensions

- Woden registers extensions for the 4 extension types defined by WSDL 2.0
 - SOAP, HTTP, operation safety, rpc style
- Application registers any application-specific extensions

- Register classes that parse extension elements
 - `registerExtElement`
 - `registerDeserializer`
 - `registerSerializer`
- Register classes parse extension attributes
 - `registerExtAttributeType`
- Register Component extension wrapper classes
 - `registerComponentExtension`

«interface» ExtensionRegistry
+ <code>registerExtElement ()</code> + <code>registerDeserializer ()</code> + <code>registerSerializer ()</code> + <code>registerExtAttributeType ()</code> + <code>registerComponentExtension ()</code> + <code>createExtElement ()</code> + <code>queryDeserializer ()</code> + <code>querySerializer ()</code> + <code>createExtAttribute ()</code> + <code>createComponentExtension ()</code>

Step 3: Invoke extensions

- At read-time or write-time, when Woden encounters an extension (something outside the WSDL namespace) it invokes the registered extension logic to handle it.
- Get objects to parse an extension element
 - `createExtElement`
 - `queryDeserializer`
 - `querySerializer`
- Get objects to parse an extension attribute
 - `createExtAttribute`
- Get a Component extension wrapper object
 - `createComponentExtension`

«interface» ExtensionRegistry
+ <code>registerExtElement ()</code>
+ <code>registerDeserializer ()</code>
+ <code>registerSerializer ()</code>
+ <code>registerExtAttributeType ()</code>
+ <code>registerComponentExtension ()</code>
+ <code>createExtElement ()</code>
+ <code>queryDeserializer ()</code>
+ <code>querySerializer ()</code>
+ <code>createExtAttribute ()</code>
+ <code>createComponentExtension ()</code>

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WSDL4J-Woden comparison (1)

- Similarities:
 - Factory, Reader, Features/Properties, Extension Registry
 - Ideas from WSDL4J have been reused
 - but little code, mainly implementation utility classes
- WSDL object models
 - JWSDL API in WSDL4J (javax.wsdl)
 - Component and Element APIs in Woden
- XML parser strategy
 - JAXP / DOM in WSDL4J
 - Pluggable XML parser in Woden (goal!)
 - DOMWSDLReader based on Xerces/DOM
 - StAXWSDLReader development is underway

WSDL4J-Woden comparison (2)

- Validation
 - WSDL4J:
 - Partial validation at parse-time in the Reader
 - Terminate on error, so report only first error found
 - Woden:
 - Validate entire WSDL object model and report all errors
 - Reader returns the WSDL object model, valid or invalid
- Error handling
 - WSDL4J
 - System.out.println
 - English language message strings embedded in source code
 - Woden
 - Customizable `ErrorHandler` (default behaviour is System.out.println)
 - Messages in ResourceBundle for Internationalization and parameterization
 - 3 levels of error; warning, error, fatal error

WSDL4J-Woden comparison (3)

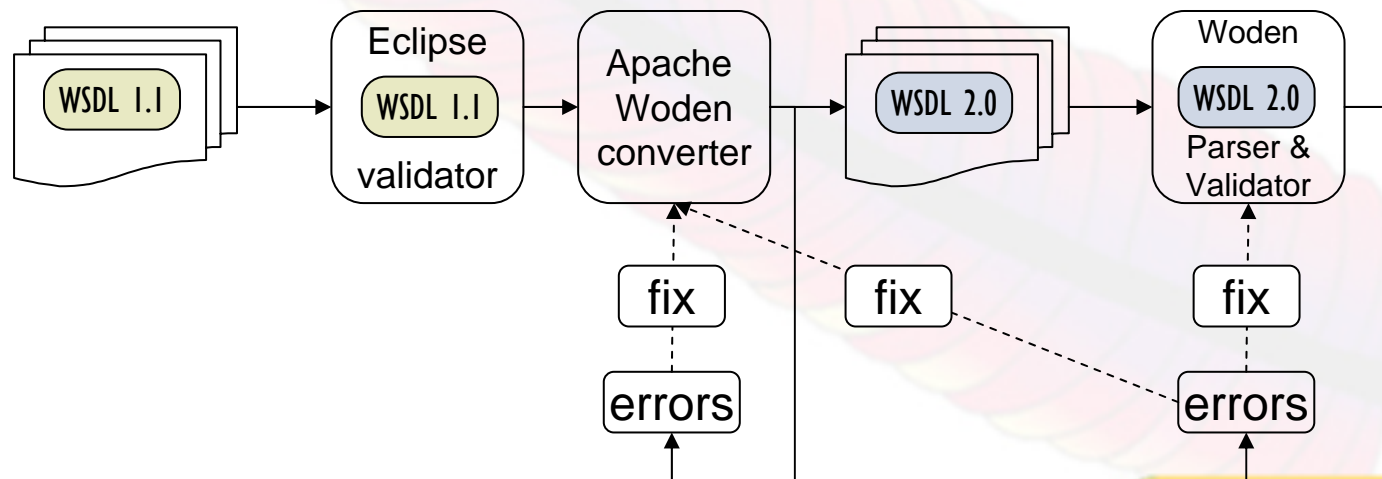
- Extension architecture
 - WSDL4J
 - Supports only extension elements and attributes (WSDL infoSet)
 - Register Deser/Serializer/Type for extension elements
 - Reader/Writer handle extension attributes
 - Woden
 - Supports extension elements and attributes in Element API
 - These map to extension properties in Component API
 - Register 3 things!
 - Deser/Serializer/Type for extension elements
 - XMLAttr subtype for extension attributes
 - ComponentExtensions subtype for extension properties (by Namespace)
- Supported WSDL versions
 - WSDL 1.1 in WSDL4J
 - WSDL 2.0 and (soon) WSDL 1.1 conversion in Woden
 - Read WSDL 1.1 doc, return WSDL 2.0 object model
 - Migration path for existing WSDL4J / WSDL 1.1 applications

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Apache Woden - Converter

- Converts WSDL 1.1 to WSDL 2.0
 - aid to WSDL 2.0 adoption
- Developed independently
- Will evolve to use Woden parser given WSDL 1.1 support in Woden
 - WSDL 2.0 documents -> in memory Woden objects -> serialize to WSDL 2.0 doc
- Basis of (future) test harness



Apache Woden roadmap

Jun 06 Jul 06 Aug 06 Sep 06 Oct 06 Nov 06 Dec 06 Jan 07

WSDL 2.0 spec

Interop event

Proposed recommendation

W3C Recommendation

M5

M6

M..

0.9

*API review +
New function*

1.0

Promotion?

1.1

Apache Woden

ApacheCon
Europe 06

Completing the function

- WSDLWriter
 - Serialize WSDL 2.0 object models to file
- WSDL 1.1 to 2.0 conversion
- Updatable component model
 - Add modifier methods
- Support for other parsers - StAX / SAX
- We need you - users and contributors
 - woden-dev-subscribe@ws.apache.org

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[\[1\] MEP In-Out template](#)

(WSDL 2.0 Part 2 Adjuncts, <http://www.w3.org/TR/2006/CR-wsdl20-adjuncts-20060327/>)

[\[2\] WSDL 2.0 Component model diagram](#)

(WSDL 2.0 Primer, <http://www.w3.org/TR/2006/CR-wsdl20-primer-20060327/>)

[\[3\] Description Component XML representation](#)

(WSDL 2.0 Part1 Core Language, [http://www.w3.org/TR/2006/CR-wsdl20-20060327 /](http://www.w3.org/TR/2006/CR-wsdl20-20060327/))