

Web Services

Web Service Description Language

Lecture "XML in Communication Systems"
Chapter 13

Prof. Dr.-Ing. Norbert Luttenberger
Research Group for Communication Systems
Dept. of Computer Science
Christian-Albrechts-University in Kiel



Recommended Reading

- Booth, D. et al.:
Web Services Architecture
<http://www.w3.org/TR/ws-arch/>
- Christensen, E., Curbera, F., Meredith, G., Weerawarana, S.:
Web Services Description Language (WSDL) 1.1
<http://www.w3.org/TR/wsdI>
- Booth, D., Liu, C.K.:
Web Services Description Language (WSDL) Version 2.0 Part 0: Primer
<http://www.w3.org/TR/wsdI20-primer>
- Ballinger, K., Ehnebuske, D., Gudgin, M., Nottingham, M., Yendluri, P.:
Web Services Interoperability Organization Basic Profile Version 1.0
<http://www.ws-i.org/Profiles/BasicProfile-1.0.html>

Overview

Informatik · CAU Kiel

1. Web Service Description Language (WSDL)



Chapter 13.1

Web Service Description Language

Web Service Description

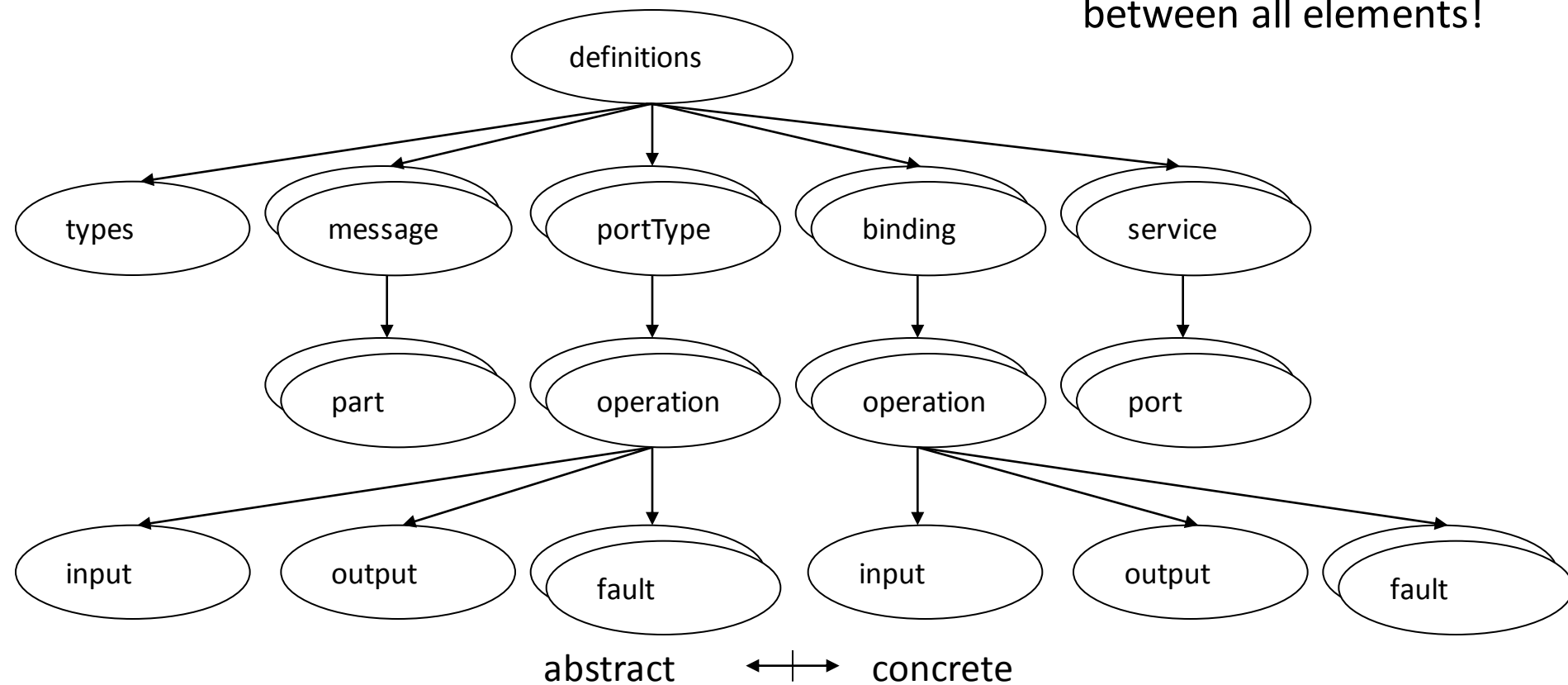
- Service description

The mechanics of the message exchange are documented in a Web service description (WSD). The WSD is a machine-processable specification of the Web service's interface, written in WSDL. It defines the message formats, datatypes, transport protocols, and transport serialization formats that should be used between the requester agent and the provider agent. It also specifies one or more network locations at which a provider agent can be invoked, and may provide some information about the message exchange pattern that is expected. In essence, the service description represents an agreement governing the mechanics of interacting with that service.

Web Service Description

- WSDL overview

Cross-references
between all elements!

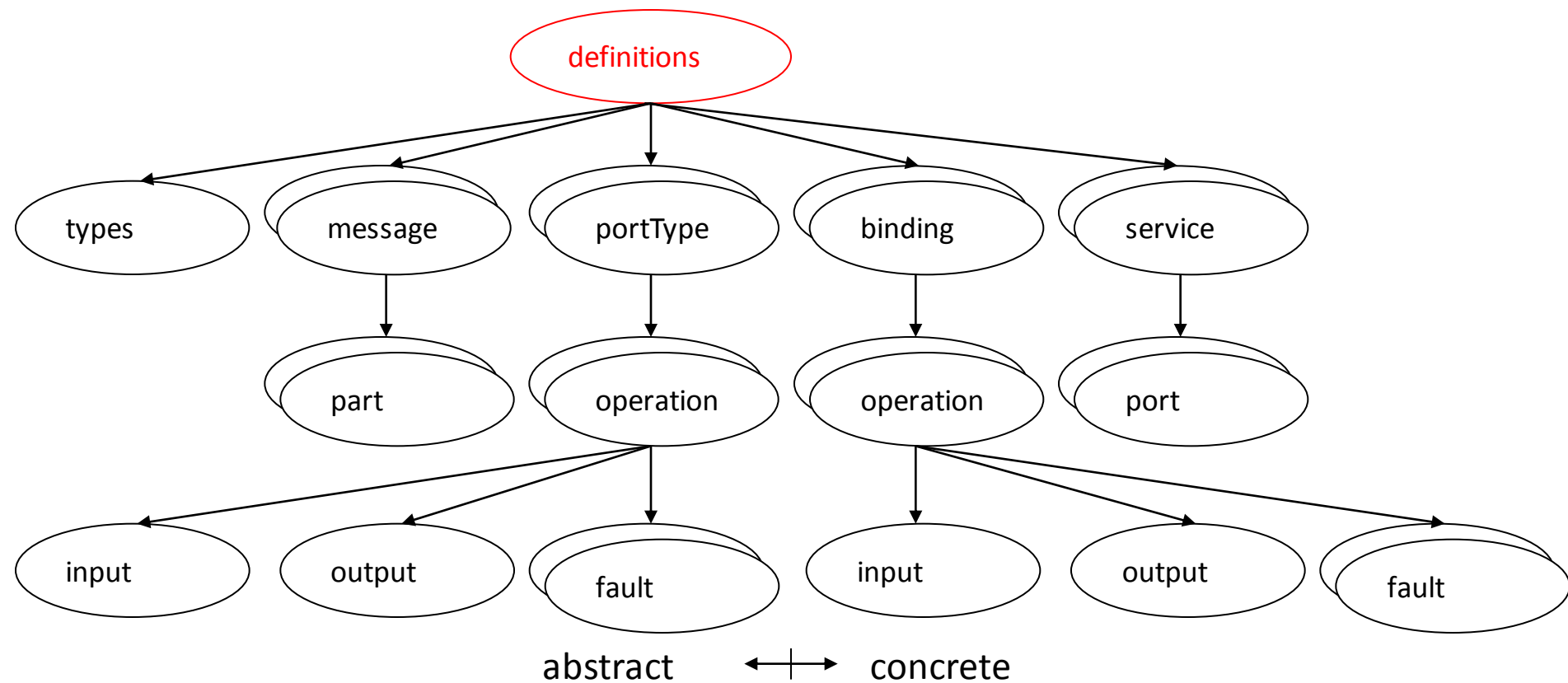


Web Service Description

- "A WSDL document is simply a set of definitions."
 - **types** provides data type definitions used to describe the messages exchanged.
 - **message** represents an abstract definition of the data being transmitted. A message consists of logical parts each of which is associated with a definition within some type system.
 - **portType** is a set of abstract operations. Each operation refers to an input message and output messages.
 - **binding** specifies concrete protocol and data format specifications for the operations and messages defined by a particular portType.
 - **service** is used to aggregate a set of related ports.

Web Service Description

- WSDL overview



Web Service Description

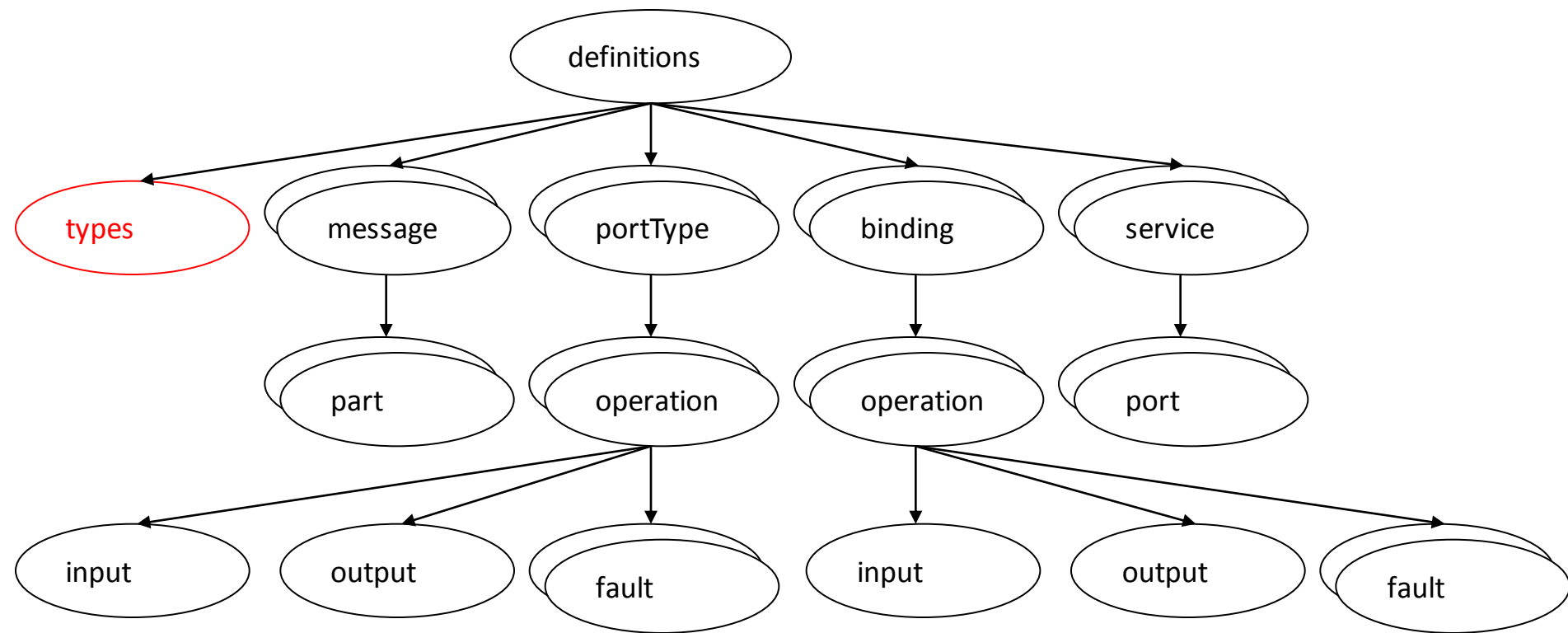
- Sample definitions element

```
<?xml version="1.0" encoding="UTF-8"?>

<wsdl:definitions
  targetNamespace="http://example.org/math/types/"
  xmlns:tns="http://example.org/math/types/"
  xmlns:http="http://schemas.xmlsoap.org/wsdl/http/"
  xmlns:soap="http://schemas.xmlsoap.org/wsdl/soap/"
  xmlns:wsdl="http://schemas.xmlsoap.org/wsdl/"
  xmlns:xs="http://www.w3.org/2001/XMLSchema">
```

Web Service Description

- WSDL types element



Web Service Description

- WSDL types element
 - definition of data types for messages
 - WS-I: data type definition language is W3C XML Schema
 - WS-I: types must "literally" be transformed into wireline encoding (`encoding="literal"`)

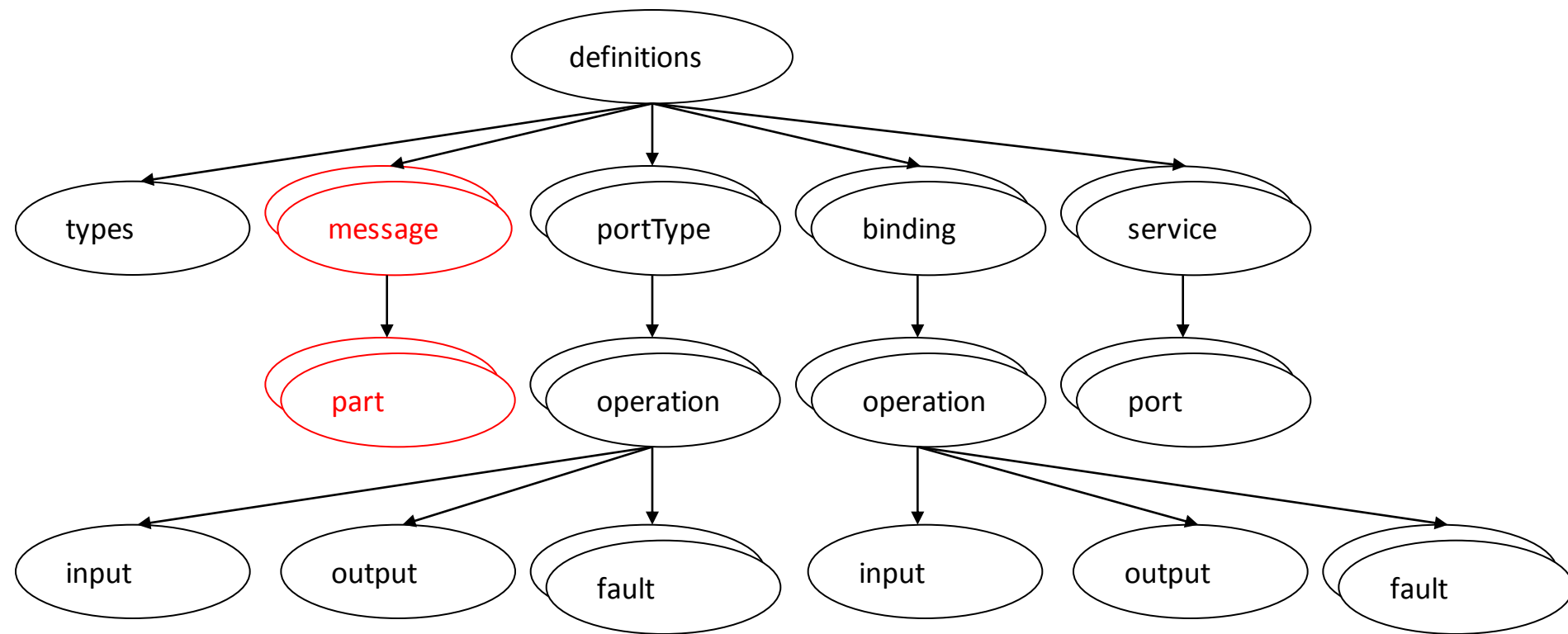
Web Service Description

- Sample types element

```
<wsdl:types>
  <xs:schema
    targetNamespace="http://example.org/math/types/" >
    <xs:complexType name="MathInput"> <xs:sequence>
      <xs:element name="x" type="xs:double"/>
      <xs:element name="y" type="xs:double"/>
    </xs:sequence> </xs:complexType>
    <xs:complexType name="MathOutput"> <xs:sequence>
      <xs:element name="result" type="xs:double"/>
    </xs:sequence> </xs:complexType>
    <xs:element name="AddRequest" type="tns:MathInput"/>
    <xs:element name="AddResult" type="tns:MathOutput"/>
  </xs:schema>
</wsdl:types>
```

Web Service Description

- WSDL message and part elements



Web Service Description

- Message format depends on SOAP binding style :-\
 - document style
 - paradigm: exchange of self-contained documents
 - possibly one-way operation
 - WS description to specify document schema
 - remote procedure call (RPC) style
 - paradigm: WS client passes parameters to procedure, receives result (request/response operation)
 - The body contains an XML representation of a method call, the message parts represent the parameters to the method.
 - WS message must include identification for "method"

Web Service Description

- WSDL message elements
 - composition of messages from parts
 - two mutually exclusive kinds of references to the types element:

Reference to element

→ "document style"

```
<wsdl:message name="AddRequestMessage">
  <wsdl:part name="RequestBody"
    element="tns:AddRequest"/>
</wsdl:message>

<wsdl:message name="AddResultMessage">
  <wsdl:part name="ResultBody"
    element="tns:AddResult"/>
</wsdl:message>
```

Reference to type

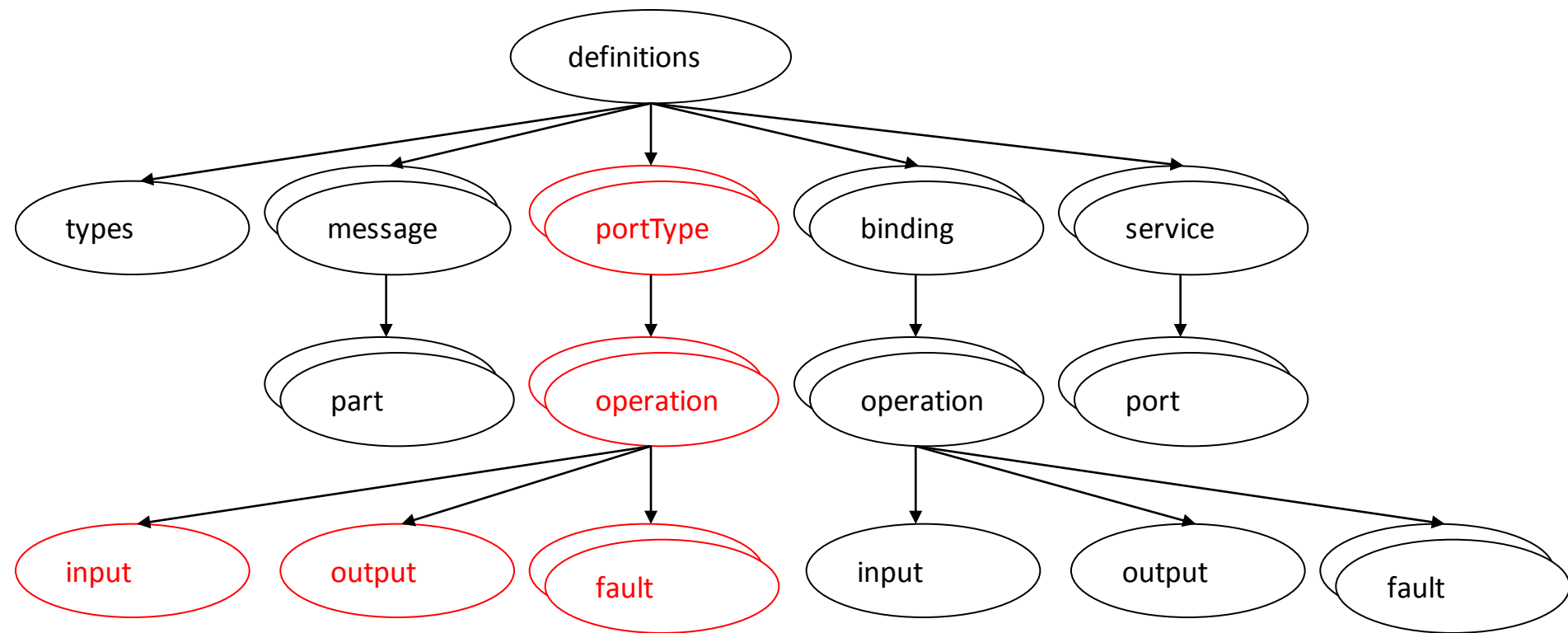
→ "RPC style"

```
<wsdl:message name="AddRequestMessage">
  <wsdl:part name="addInPara"
    type="tns:MathInput"/>
</wsdl:message>

<wsdl:message name="AddResultMessage">
  <wsdl:part name="addOutPara"
    type="tns:MathOutput"/>
</wsdl:message>
```

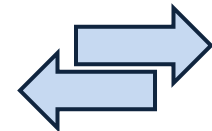
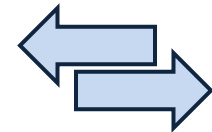
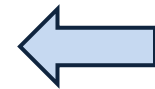
Web Service Description

- WSDL portType element



Web Service Description

- WSDL portType elements
 - "A portType is a named set of **abstract operations** and the abstract messages involved."
 - Four kinds of operations:
 - **One-way**: The endpoint receives a message.
 - **Request-response**: The endpoint receives a message, and sends a correlated message.
 - **Solicit-response**: The endpoint sends a message, and receives a correlated message.
 - **Notification**: The endpoint sends a message.



Web Service Description

- WSDL portType elements

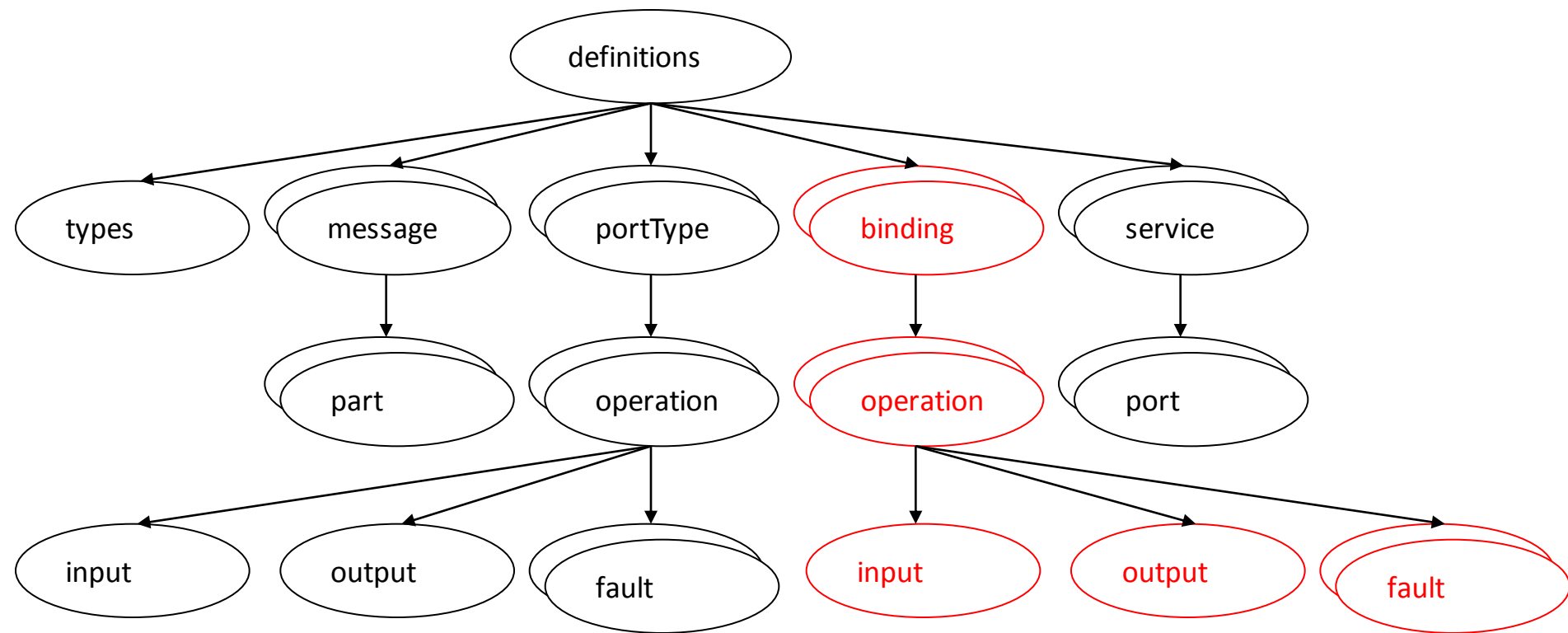
```
<wsdl:portType name="mathPortType">
  <wsdl:operation name="Addition">
    <wsdl:input message="tns:AddRequestMessage"/>
    <wsdl:output message="tns:AddResultMessage"/>
  </wsdl:operation>
</wsdl:portType>
```

Web Service Description

- WSDL portType elements
 - WS-I: only request-response and one-way operations
 - WS-I: only literal encoding, i.e. abstract = concrete operations

Web Service Description

- WSDL binding elements



Web Service Description

- WSDL binding elements
 - A binding defines **message format and protocol details** for operations and messages defined by a particular portType.
 - WSDL binding element required per portType
 - defined bindings:
 - SOAP
 - HTTP
 - MIME
 - There may be any number of bindings for a given portType.
 - discussed here: SOAP-HTTP binding only

Web Service Description

- Example: SOAP binding (WSDL extensibility elements)

```
<wsdl:binding name="SOAPBinding" type="tns:mathPortType">
  <soap:binding style="document"
    transport="http://schemas.xmlsoap.org/soap/http"/>
  <wsdl:operation name="Addition">
    <soap:operation soapAction="Add two numbers!"/>
    <wsdl:input> <soap:body use="literal"/> </wsdl:input>
    <wsdl:output> <soap:body use="literal"/> </wsdl:output>
  </wsdl:operation>
</wsdl:binding>
```

- style="rpc|[document]" identifies message format
- transport="http://..." identifies transport protocol (http-POST)
(other value e.g.: transport="http://schemas.xmlsoap.org/soap/smtp")

Web Service Description

- Example: SOAP binding (WSDL extensibility elements)

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<wsdl:binding name="SOAPBinding" type="tns:mathPortType">
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```

- style="rpc|[document]" identifies message format
- transport="http://..." identifies transport protocol (http-POST)
(other value e.g.: transport="http://schemas.xmlsoap.org/soap/smtp")

Web Service Description

- Resulting messages

- document style message:

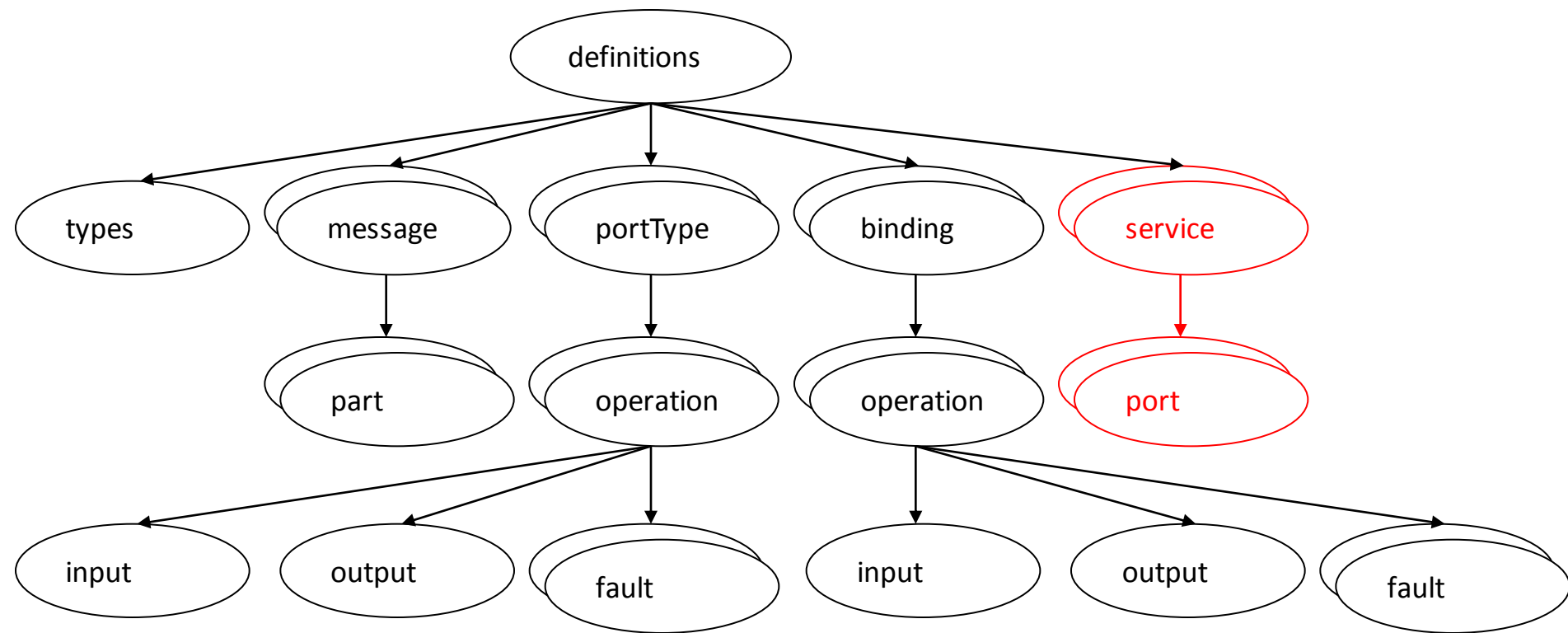
```
<SOAP-ENV:Envelope xmlns:SOAP-ENV="...">
  <SOAP-ENV:Header/>
  <SOAP-ENV:Body>
    <AddRequest xmlns="...">
      <x>3.14</x> <y>3.14</y>
    </AddRequest>
  </SOAP-ENV:Body>
</SOAP-ENV:Envelope>
```

- rpc style message:

```
<SOAP-ENV:Envelope xmlns:SOAP-ENV="...">
  <SOAP-ENV:Header/>
  <SOAP-ENV:Body>
    <oxy:Addition>
      <addInPara>
        <x>3.14</x> <y>3.14</y>
      </addInPara>
    </oxy:Addition>
  </SOAP-ENV:Body>
</SOAP-ENV:Envelope>
```


Web Service Description

- WSDL operation elements



Web Service Description

- WSDL service elements
 - A port is defined as individual endpoint by specifying a single address for a binding.

```
<service name="MathService">  
  <port name="MathEndpoint" binding="mt:SOAPBinding">  
    <soap:address location="http://localhost/math/math"/>  
  </port>  
</service>
```

Feedback for this Chapter

- Well understood –
easy material
- Mostly understood –
material is ok
- Hardly understood –
difficult material

