Service-Oriented Computing Standards

Ira A. Fulton Schools of Engineering
Arizona State University

Lecture Outline

- XML and HTML
- SOAP and HTTP
- WSDL

XML

XML (Extensible Markup Language) is a Meta language :

- Used for defining other languages. Most languages and protocols in SOC paradigm are based on XML
  - BPEL (Business Process Execution Language)
  - RDF, RDF Schema, and OWL
  - SOAP
  - WSDL
  - UDDI
- Similar to html to some extent, but you can define your own tags to quote data
- You can add attributes to each data item for semantic meanings. Data transferred between Web services are often encoded in XML.

HTML versus XML

```
<html>
<h1>International Conference on Software Engineering and applications, November 14-16, 2005, Phoenix, AZ, USA</h1>
<li>Software design and development</li>
<li>Software engineering applications</li>
<li>Software security</li>
</ br>
</html>
```

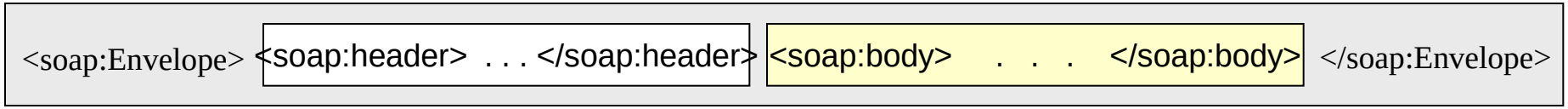
```
<?xml version="1.0">
<conference>
        <title>International Conference on Software Engineering and applications</title>
        <date>November 14-16, 2005</date>
        <location>Phoenix , AZ, USA </location>
        <keyword>Software design and development</keyword>
        <keyword>Software engineering applications</keyword>
        <keyword>Software security</keyword>
</conference>
```

Differences between HTML and XML

	HTML	XML
Purpose of tags	Formatting data for display.	Define tags and attributes on data that can be interpreted by human and machine.
Syntax of tags	Tags may be left open, e.g., , .	All tags must be in pair, e.g., , </br>
Semantics of tags	Tags are predefined with given format meaning. Tags are limited.	The user can choose any tags and the meanings can be defined separately. Assigning meanings to a set of tags defines a vocabulary and thus a new markup language.
Schema	The schema is fix and implied	Need a schema file to define the tags and the structure
Semantics of data	It is difficult for machine to understand. For example, is “Phoenix” a part of the title?	Once the tags are defined, it is easy for the machine to understand. “Phoenix” is a location, not a part of the title.

SOAP: Simple Object Access Protocol

- SOAP is used for transporting messages between Web services and applications
- A SOAP message is an XML document
- Like any communication protocol, a SOAP message consists of wrapper information and payload;
- The format of SOAP message is as follows:

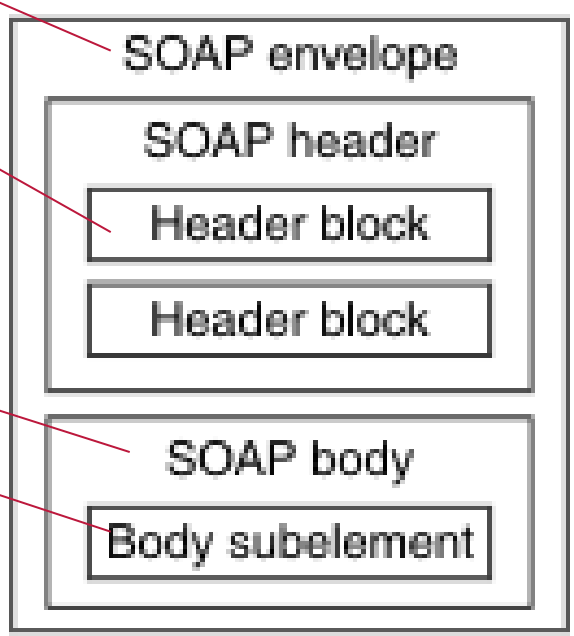


- A SOAP message is often wrapped in an HTTP (Hypertext Transfer Protocol) message and sent as an HTTP packet over the internet:

SOAP Structure and Example

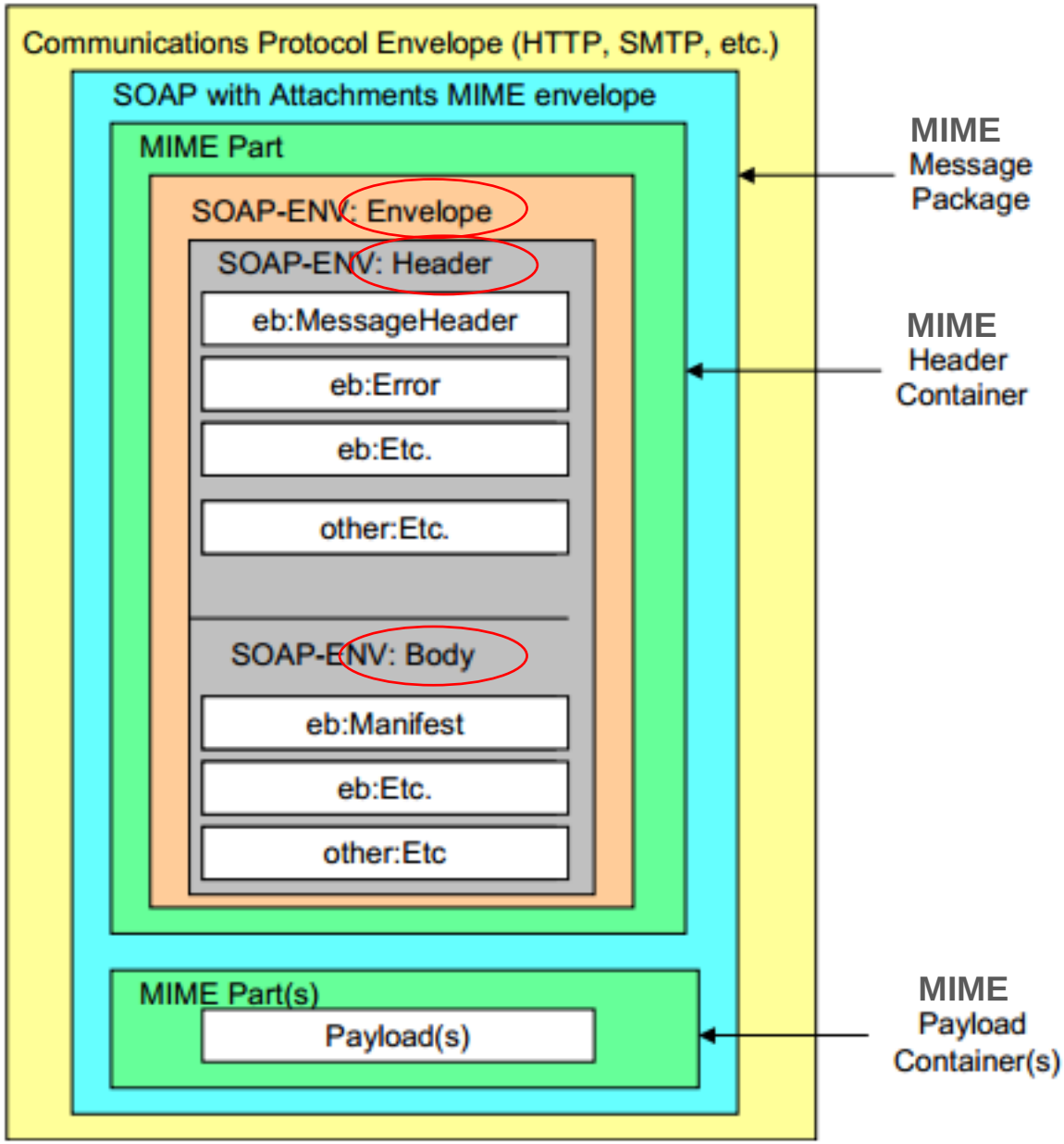
https://www.ibm.com/docs/en/integration-bus/10.0?topic=soap-structure-message

```
<?xml version='1.0' Encoding='UTF-8' ?>
<env:Envelope xmlns:env="http://www.w3.org/2003/05/soap-envelope">
 <env:Header>
  <m:reservation xmlns:m="http://travelcompany.example.org/reservation"
                              env:role="http://www.w3.org/2003/05/soap-envelope/role/next">
   <m:reference>uuid:093a2da1-q345-739r-ba5d-pqff98fe8j7d</m:reference>
   <m:dateAndTime>2007-11-29T13:20:00.000-05:00</m:dateAndTime>
  </m:reservation>
  <n:passenger xmlns:n="http://mycompany.example.com/employees"
                              env:role="http://www.w3.org/2003/05/soap-envelope/role/next">
   <n:name>Fred Bloggs</n:name>
  </n:passenger>
 </env:Header>
 <env:Body>
  <p:itinerary xmlns:p="http://travelcompany.example.org/reservation/travel">
   <p:departure>
    <p:departing>New York</p:departing>
    <p:arriving>Los Angeles</p:arriving>
    <p:departureDate>2007-12-14</p:departureDate>
    <p:departureTime>late afternoon</p:departureTime>
    <p:seatPreference>aisle</p:seatPreference>
   </p:departure>
   <p:return>
    <p:departing>Los Angeles</p:departing>
    <p:arriving>New York</p:arriving>
    <p:departureDate>2007-12-20</p:departureDate>
    <p:departureTime>mid-morning</p:departureTime>
```



Example: SOAP in ebXML Message Structure

https://www.oasis-open.org/committees/ebxml-msg/documents/ebMS_v2_0.pdf



MIME (Multipurpose Internet Mail Extensions) is a standard that extends the format of email to support:

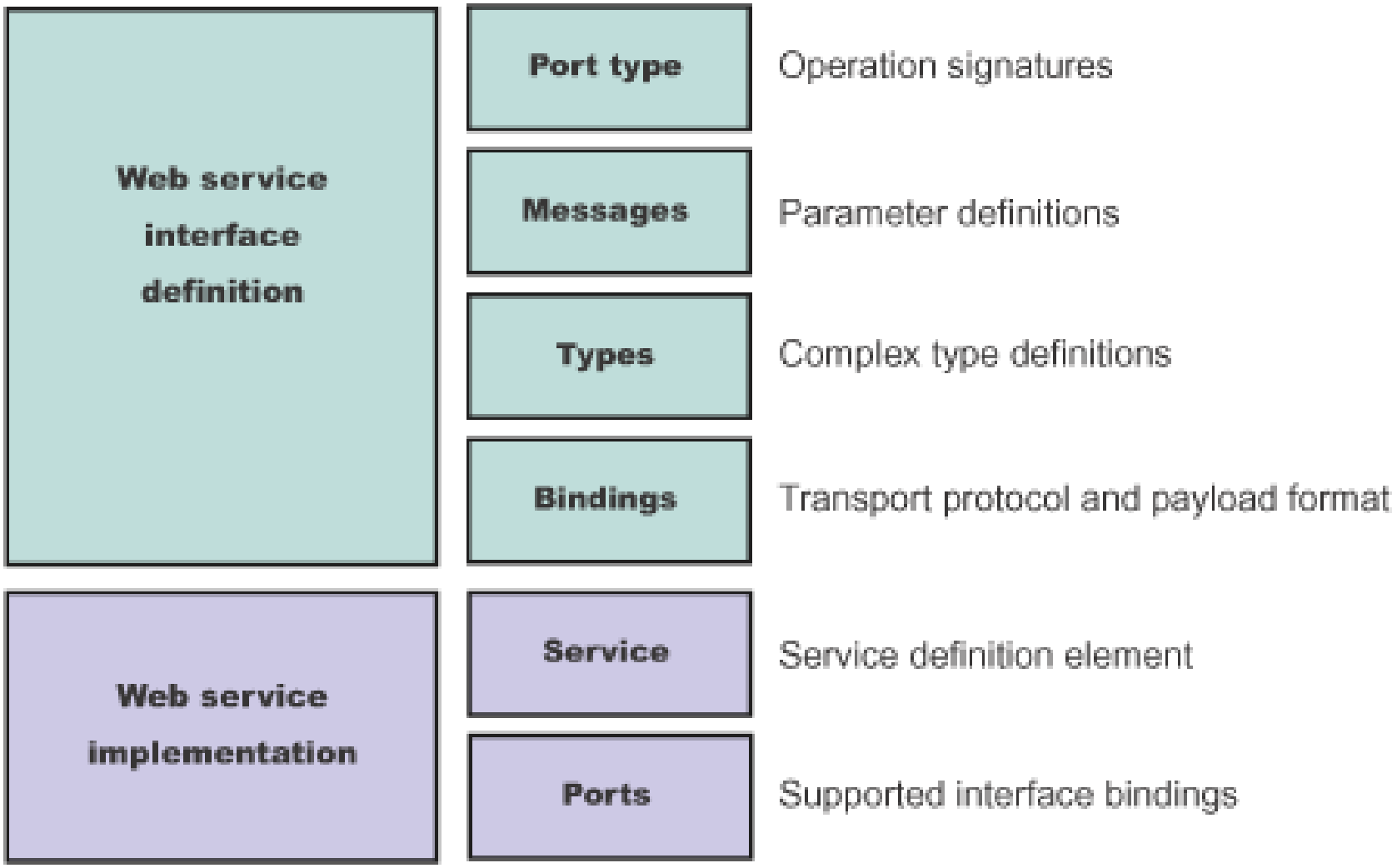
- Text
- Non-text attachments
- Message bodies with multiple parts
- Header information in non-ASCII character sets

WSDL: Web Service Description Language

- WSDL is used for describing Web services (interfaces), including four critical aspects of Web services:
  - Functionality of the services described in standard taxonomy;
  - Data type of each parameter and the return type of the function (service) call;
  - Binding information about the transport protocol to be used, usually, SOAP;
  - Address (URL) for locating the specified service.
- The last three aspects can be automatically generated.
- Web services described in WSDL can be searched, matched, and discovered based on the requirements.
- Web services described in WSDL provides discovery and remote call details.

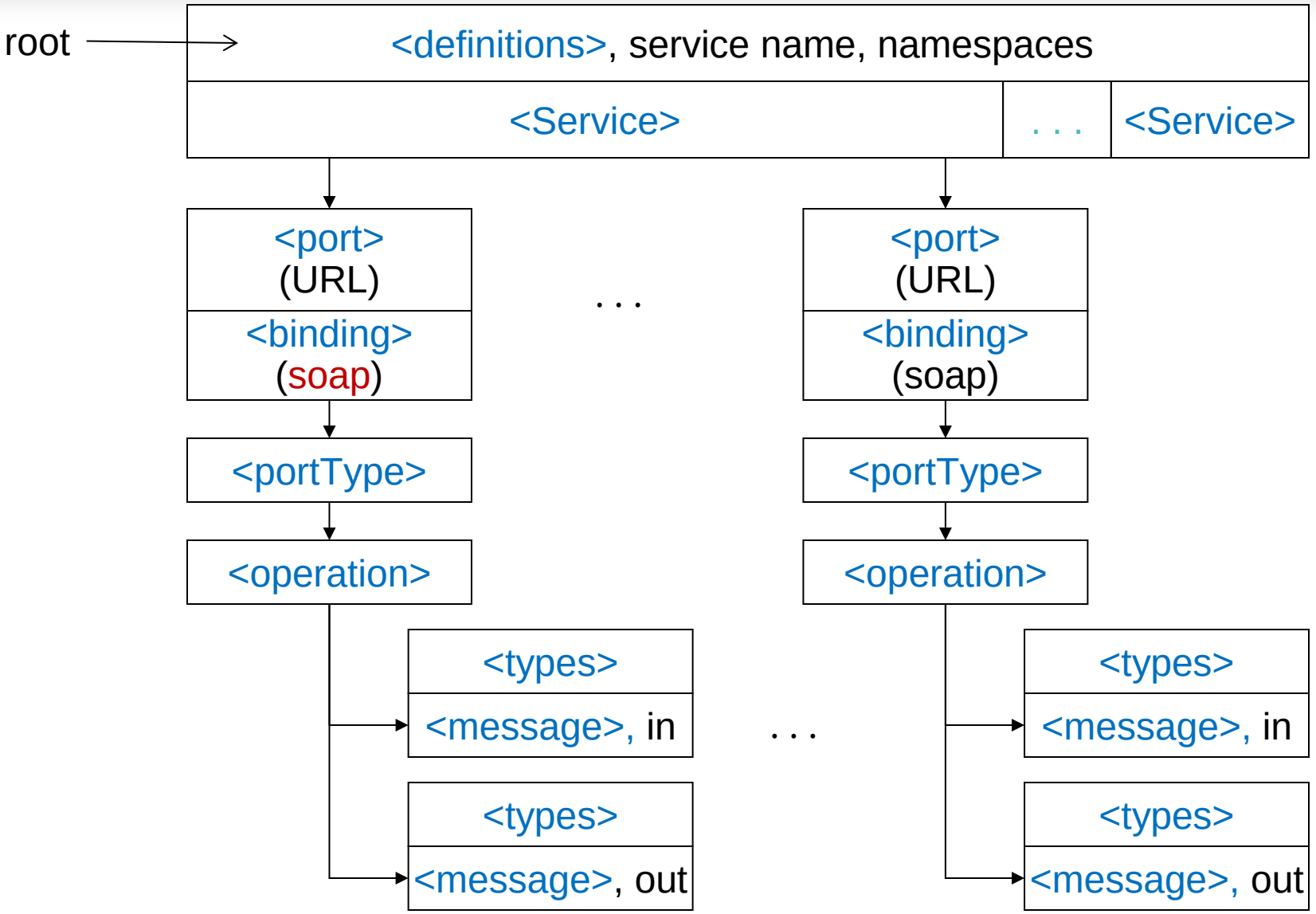
WSDL in IBM WebSphere Application Server

https://www.ibm.com/docs/en/was/9.0.5?topic=services-wsdl



XML-Based WSDL Document's Elements

https://www.w3.org/TR/2001/NOTE-wsdl-20010315



SOC Services vs. OOC Classes

SOAP/WSDL Services

- WSDL interface → Language interface
- Namespace of services → Namespace of classes
- Service → Class/Object
- Operation → Method
- Operation type in → Method parameter
- Operation type out → Method return value
- Binding protocol (SOAP) →
- Service address (URL) →

RESTful Services → Resource → Method

- Service → Resource → Method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