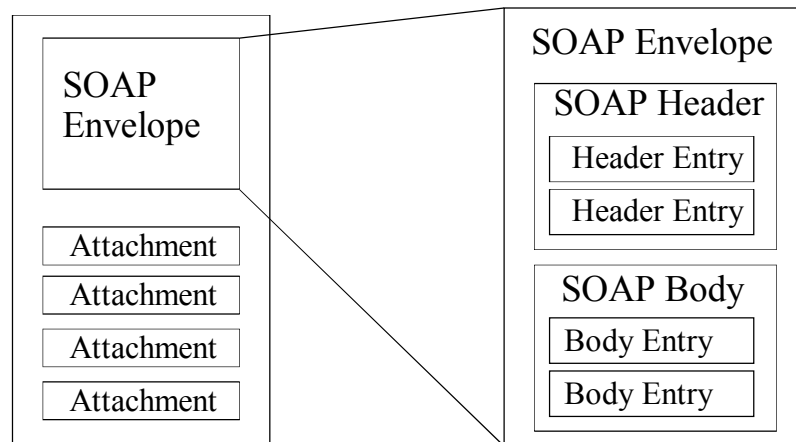




SOAP - Example

SOAP Message structure - Reminder



Communication

- SOAP provides two communication models:
- **SOAP RPC**
 - Synchronous request-response
 - Request encodes method & arguments
 - Response encodes result value or fault
- **SOAP Messaging (document)**
 - Document-driven: XML
 - Normal XML description e.g. of products can be sent
 - No reference to operation names
 - Operations must have a single element
 - **Confusion:** Synchronous and/or asynchronous messaging

Data encoding

- **Literals:** XML fragments, defined in XML Schema
 - Commonly used in XML messaging scenarios
- **Encoded values:** defined in SOAP Encoding
 - A set of rules for representing data types
 - Commonly used in RPC scenarios
- Defines standard XML encoding for commonly observed programming language types
 - Simple types, Enumerations
 - Compound types, e.g. structs, objects
 - Arrays, References
- Leads to the following combinations: RPC literal, RPC SOAP encoding, Document literal
- Let's start off with the Hello World Example from the 1st lab.

Basic Example (Hello World)

```
<?xml version='1.0' encoding='UTF-8' ?>
<definitions xmlns:wsdl="http://schemas.xmlsoap.org/wsdl/" xmlns:ns="http://ws.apache.org/axis2" xmlns:wsam="http://www.w3.org/2006/05/addressing/wsdl"
xmlns:mime="http://schemas.xmlsoap.org/wsdl/mime/" xmlns:http="http://schemas.xmlsoap.org/wsdl/http/" xmlns:xsd="http://www.w3.org/2001/XMLSchema"
xmlns:soap12="http://schemas.xmlsoap.org/wsdl/soap12/" xmlns:ns1="http://org.apache.axis2/xsd" xmlns:soap="http://schemas.xmlsoap.org/wsdl/soap/"
targetNamespace="http://ws.apache.org/axis2">
  <documentation>This is a first Hello World Service.</documentation>
  <types>
    <xsd:schema attributeFormDefault="qualified" elementFormDefault="qualified" targetNamespace="http://ws.apache.org/axis2">
      <xsd:element name="echoMsg">
        <xsd:complexType>
          <xsd:sequence>
            <xsd:element minOccurs="0" name="arg" nillable="true" type="xsd:string"/>
          </xsd:sequence>
        </xsd:complexType>
      </xsd:element>
      <xsd:element name="echoMsgResponse">
        <xsd:complexType>
          <xsd:sequence>
            <xsd:element minOccurs="0" name="return" nillable="true" type="xsd:string"/>
          </xsd:sequence>
        </xsd:complexType>
      </xsd:element>
    </xsd:schema>
  </types>
  <message name="echoMsgRequest">
    <part name="parameters" element="ns:echoMsg"/>
  </message>
  <message name="echoMsgResponse">
    <part name="parameters" element="ns:echoMsgResponse"/>
  </message>
  <portType name="helloWorldSoap11Biding" type="ns:helloWorldSoap11Biding">
    <operation name="echoMsg">
      <input message="ns:echoMsgRequest" wsaw:Action="urn:echoMsg"/>
      <output message="ns:echoMsgResponse" wsaw:Action="urn:echoMsgResponse"/>
    </operation>
  </portType>
  <binding name="helloWorldSoap11Biding" type="ns:helloWorldSoap11Biding">
    <soap:binding transport="http://schemas.xmlsoap.org/soap/http" style="document"/>
    <operation soapAction="urn:echoMsg" style="document">
      <input>
        <soap:body use="literal"/>
      </input>
    </operation>
  </binding>
</definitions>
```

```
public class SimpleHelloService {

    public String echoMsg(String arg) {
        return arg.toUpperCase();
    }
}
```

Request Message

POST /axis2/services/helloWorldWS.helloWorldWSHttpSoap12Endpoint/HTTP/1.1
 Content-Type: application/soap+xml; charset=UTF-8; action="urn:echoMsg"
 User-Agent: Axis2
 Host: 139.153.254.167:8080
 Transfer-Encoding: chunked

```
<?xml version='1.0' encoding='UTF-8' ?>
<soapenv:Envelope xmlns:soapenv="http://www.w3.org/2003/05/soap-envelope">
  <soapenv:Header/>
  <soapenv:Body>
    <ns1:echoMsg xmlns:ns1="http://ws.apache.org/axis2">
      <ns1:arg> Hello my world!! </ns1:arg>
    </ns1:echoMsg>
  </soapenv:Body>
</soapenv:Envelope>
```

SOAP Envelope

- <Envelope> is the root element of a SOAP message
 - Declared using the namespace:
<http://www.w3.org/2003/05/soap-envelope>
 - Identifies that this is a SOAP message
- If <Envelope> is not the root element, or the namespace is not correct, a SOAP application will generate a **fault**

SOAP Header & Body

- The <Header> is optional, it may be used to **extend** a SOAP message for application specific reasons
- If present, the <Header> must be the first child of <Envelope>
- The <Header> can contain one or more entries, typical uses include:
 - Authentication/Security
 - Transaction management
- There is exactly one <Body>, a child of SOAP <Envelope>
- These are the “payload” of the message
 - RPC method and its parameters
 - Target application (receiver) specific data
 - SOAP fault for reporting errors/status

The Response

HTTP/1.1 200 OK
Server: Apache-Coyote/1.1
Content-Type: application/soap+xml; action="urn:echoMsgResponse"; charset=UTF-8
Transfer-Encoding: chunked
Date: Sun, 24 Jan 2016 11:23:45 GMT\

```
<?xml version="1.0" encoding="UTF-8" ?>
<soapenv:Envelope xmlns:soapenv="http://www.w3.org/2003/05/soap-envelope">
  <soapenv:Body>
    <ns:echoMsgResponse xmlns:ns="http://ws.apache.org/axis2">
      <ns:return>
        HELLO MY WORLD!!
      </ns:return>
    </ns:echoMsgResponse>
  </soapenv:Body>
</soapenv:Envelope>
```

AddTwoNumbers examples

- Possible implementations for the Web service “AddTwoNumbers”
- All examples show SOAP messages transferred by HTTP (SOAP over HTTP)
- In each example the **semantics** of the messages are the same, but the implementation differs in:
 - The SOAP communication model used
 - The data type encoded used.
- Communication model: RPC; Data type encoding: Literal

RPC/literal

```
POST /axis/services/AddNumbersServer HTTP/1.0
Content-Type: text/xml; charset=utf-8
Accept: application/soap+xml, application/dime
User-Agent: Axis/1.4
Host: localhost:8090
Cache-Control: no-cache
SOAPAction: ""
Content-Length: 362

<?xml version="1.0" encoding="UTF-8" ?>
<soapenv:Envelope
  xmlns:soapenv="http://schemas.xmlsoap.org/soap/envelope/"
  <soapenv:Body>
    <ns1:addTwoNumbersOperation xmlns:ns1="http://localhost:8080/axis/AddTwoNumbers">
      <a>4.0</a>
      <b>3.0</b>
    </ns1:addTwoNumbersOperation>
  </soapenv:Body>
</soapenv:Envelope>
```

RPC/literal -Response

```
HTTP/1.1 200 OK
Cache-Control: no-cache
Content-Type: text/xml; charset=iso-8859-1
Content-Length: 365
Server: Jetty(6.1.5)

<?xml version="1.0" encoding="UTF-8" ?>
<soapenv:Envelope
  xmlns:soapenv="http://schemas.xmlsoap.org/soap/envelope/"
  <soapenv:Body>
    <ns1:AddTwoNumbersOperationResponse xmlns:ns1="http://localhost:8080/axis/AddTwoNumbers">
      <answer>7.0</answer>
    </ns1:AddTwoNumbersOperationResponse>
  </soapenv:Body>
</soapenv:Envelope>
```

RPC/encoded

- Behaviour is the same but data types are encoded using SOAP encoding instead of literal encoding
- Communication model: RPC
- Data type encoding: SOAP encoding
- Type info is included in the message

Request – Payload – Version 1

```
<?xml version="1.0" encoding="UTF-8" ?>
<soapenv:Envelope
  xmlns:soapenv="http://schemas.xmlsoap.org/soap/envelope/"
  <soapenv:Body>
    <ns1:addTwoNumbersOperation soapenv:encodingStyle="http://schemas.xmlsoap.org/soap/encoding/"
      xmlns:ns1=" http://localhost:8080/axis/AddTwoNumbers ">
      <a xsi:type="xsd:float">1.0</a>
      <b xsi:type="xsd:float">2.0</b>
    </ns1:addTwoNumbersOperation>
  </soapenv:Body>
</soapenv:Envelope>
```

Request – Payload –Version 2

```
<?xml version="1.0" encoding="UTF-8" ?>
<soapenv:Envelope
  xmlns:soapenv="http://schemas.xmlsoap.org/soap/envelope/"
  xmlns:xsd="http://www.w3.org/2001/XMLSchema"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">
  <soapenv:Body>
    <ns1:addTwoNumbersOperation soapenv:encodingStyle="http://schemas.xmlsoap.org/soap/encoding/"
      xmlns:ns1="http://localhost:8080/axis/AddTwoNumbers">
      <a href="#id0" />
      <b href="#id1" />
    </ns1:addTwoNumbersOperation>
    <multiRef id="id0" soapenc:root="0"
      soapenv:encodingStyle="http://schemas.xmlsoap.org/soap/encoding/"
      xsi:type="xsd:float"
      xmlns:soapenc="http://schemas.xmlsoap.org/soap/encoding/">1.0
    </multiRef>
    <multiRef id="id1" soapenc:root="0"
      soapenv:encodingStyle="http://schemas.xmlsoap.org/soap/encoding/"
      xsi:type="xsd:float"
      xmlns:soapenc="http://schemas.xmlsoap.org/soap/encoding/">2.0
    </multiRef>
  </soapenv:Body>
</soapenv:Envelope>
```



Response - Payload

```
<?xml version="1.0" encoding="utf-8" ?>
<soapenv:Envelope
  xmlns:soapenv="http://schemas.xmlsoap.org/soap/envelope/"
  xmlns:xsd="http://www.w3.org/2001/XMLSchema"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">
  <soapenv:Body>
    <ns1:addTwoNumbersOperationResponse
      soapenv:encodingStyle="http://schemas.xmlsoap.org/soap/encoding/"
      xmlns:ns1="http://localhost:8080/axis/AddTwoNumbers">
      <answer xsi:type="xsd:float">
        3.0
      </answer>
    </ns1:addTwoNumbersOperationResponse>
  </soapenv:Body>
</soapenv:Envelope>
```



Document/Literal

- Operation name specified in WSDL does not appear in the SOAP request. The operation is implied by the document being submitted.

Request Message

```
<?xml version="1.0" encoding="UTF-8" ?>
<soapenv:Envelope
  xmlns:soapenv="http://schemas.xmlsoap.org/soap/envelope/"
  <soapenv:Body>
    <ns1:addMessage xmlns:ns1="http://ws.apache.org/axis2">
      <ns1:a>4.0</ns1:a>
      <ns1:b>5.0</ns1:b>
    </ns1:addMessage>
  </soapenv:Body>
</soapenv:Envelope>
```

Response

```
<?xml version="1.0" encoding="utf-8" ?>
<soapenv:Envelope
  xmlns:soapenv="http://schemas.xmlsoap.org/soap/envelope/"
  <soapenv:Body>
    <ns1:answer xmlns:ns1="http://ws.apache.org/axis2">
      9.0
    </ns1:answer>
  </soapenv:Body>
</soapenv:Envelope>
```