SOAP Web Services

Laboratory of Service Design and Engineering

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Outline

- What is SOAP?
- Web Services with SOAP
- WSDL
- Client Implementation
- Exercise

Simple Object Access Protocol

What is SOAP?

1. SOAP stands for Simple Object Access Protocol
2. SOAP is essentially an XML-based protocol for invoking remote methods.
3. SOAP is a protocol for accessing a Web Service.
4. SOAP is a format for sending messages
5. SOAP communicates via Internet
6. SOAP is platform independent
7. SOAP is language independent

Simple Object Access Protocol

- A SOAP message is an ordinary XML document containing the following elements:
  - An Envelope element that identifies the XML document as a SOAP message
  - A Header element that contains header information
  - A Body element that contains call and response information
  - A Fault element containing errors and status information

Skeleton SOAP Message

```
<?xml version="1.0"?>
<soap:Envelope
xmlns:soap="http://www.w3.org/2001/12/soap-envelope"
soap:encodingStyle="http://www.w3.org/2001/12/soap-encoding">

<soap:Header>
...
</soap:Header>

<soap:Body>
...
  <soap:Fault>
  ...
  </soap:Fault>
</soap:Body>

</soap:Envelope>
```

A SOAP Request Example

SOAP Request

```
<?xml version="1.0"?>
<soap:Envelope
xmlns:soap="http://www.w3.org/2001/12/soap-envelope"
soap:encodingStyle="http://www.w3.org/2001/12/soap-encoding">

<soap:Body xmlns:m="http://www.example.org/stock">
  <m:GetStockPrice>
    <m:StockName>IBM</m:StockName>
  </m:GetStockPrice>
</soap:Body>

</soap:Envelope>
```

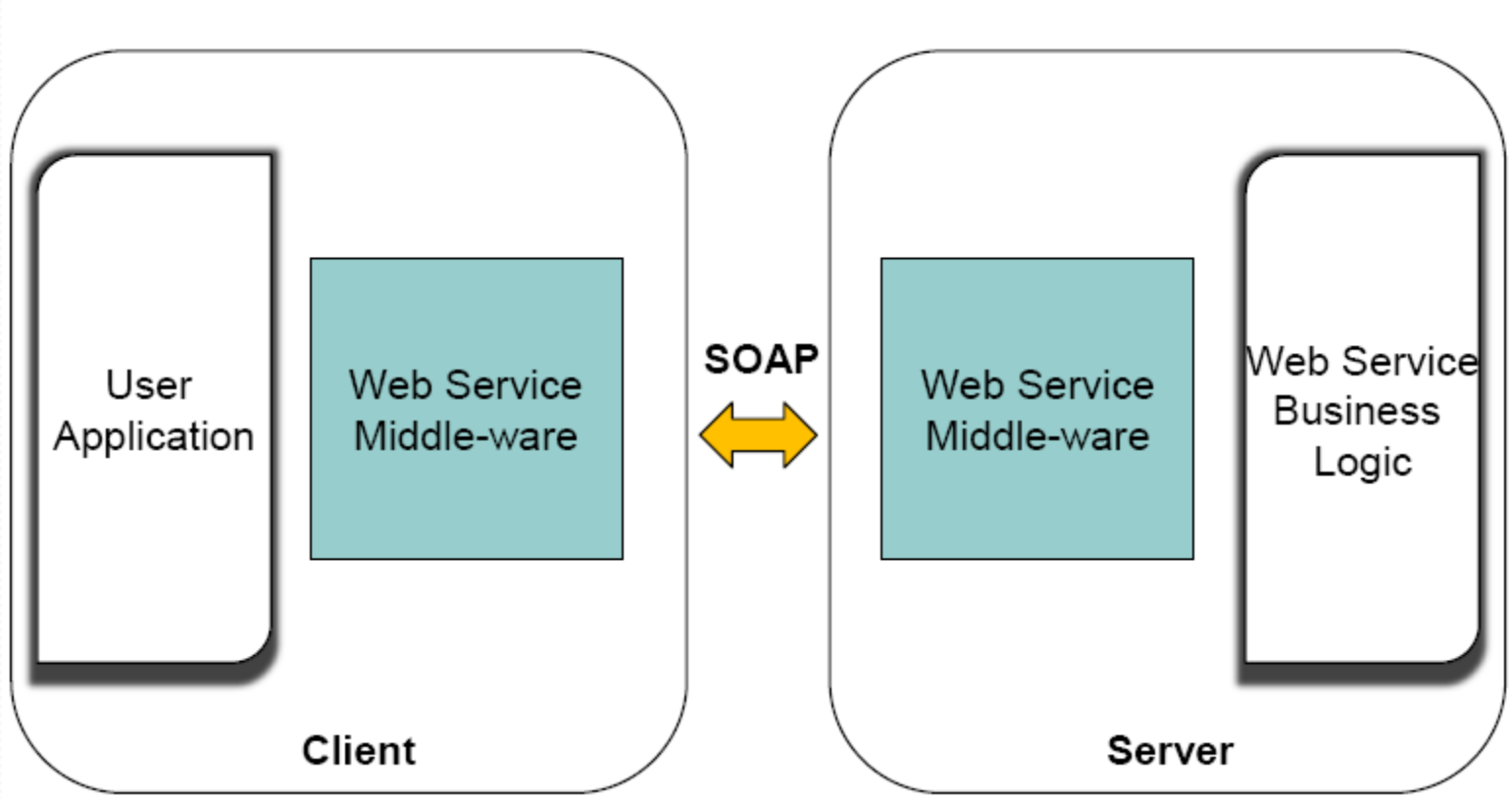
SOAP Response Example

```
<?xml version="1.0"?>
<soap:Envelope
xmlns:soap="http://www.w3.org/2001/12/soap-envelope"
soap:encodingStyle="http://www.w3.org/2001/12/soap-encoding">

<soap:Body xmlns:m="http://www.example.org/stock">
  <m:GetStockPriceResponse>
    <m:Price>34.5</m:Price>
  </m:GetStockPriceResponse>
</soap:Body>

</soap:Envelope>
```

Web Service Middle-Ware



Invoking JWS Service

- Two options
  - Using Dynamic Invocation Interface (DII)
  - Using Stubs generated from service WSDL description

Client Code: DII Method

```
import org.apache.axis.client.Service;
import org.apache.axis.client.Call;
import javax.xml.namespace.QName;

public class TestAddFunction {
  public static void main(String[] args) {
    try {
       String endpoint = "http://localhost:8080/axis/AddFunction.jws";
       Service service = new Service();
       Call call = (Call) service.createCall();
       call.setOperationName(new QName(endpoint, "addInt"));
       call.setTargetEndpointAddress(new java.net.URL(endpoint));
       Integer ret = (Integer) call.invoke(new Object[] { new
Integer(5), new Integer(6) });
       System.out.println("addInt(5, 6) = " + ret);
    } catch (Exception e) {
       System.err.println("Execution failed. Exception: " + e);
    }
  }
}
```

Web Service Description Language

WSDL

- WSDL stands for Web Services Description Language.
- WSDL is a document written in XML.
- The document describes a Web service.
- It specifies the location of the service and the operations (or methods) the service exposes.

WSDL

- A WSDL document describes a web service using these major elements:
- **<types>**
  - The data types used by the web service
- **<message>**
  - The messages used by the web service
- **<portType>**
  - The operations performed by the web service
- **<binding>**
  - The communication protocols used by the web service

WSDL Example

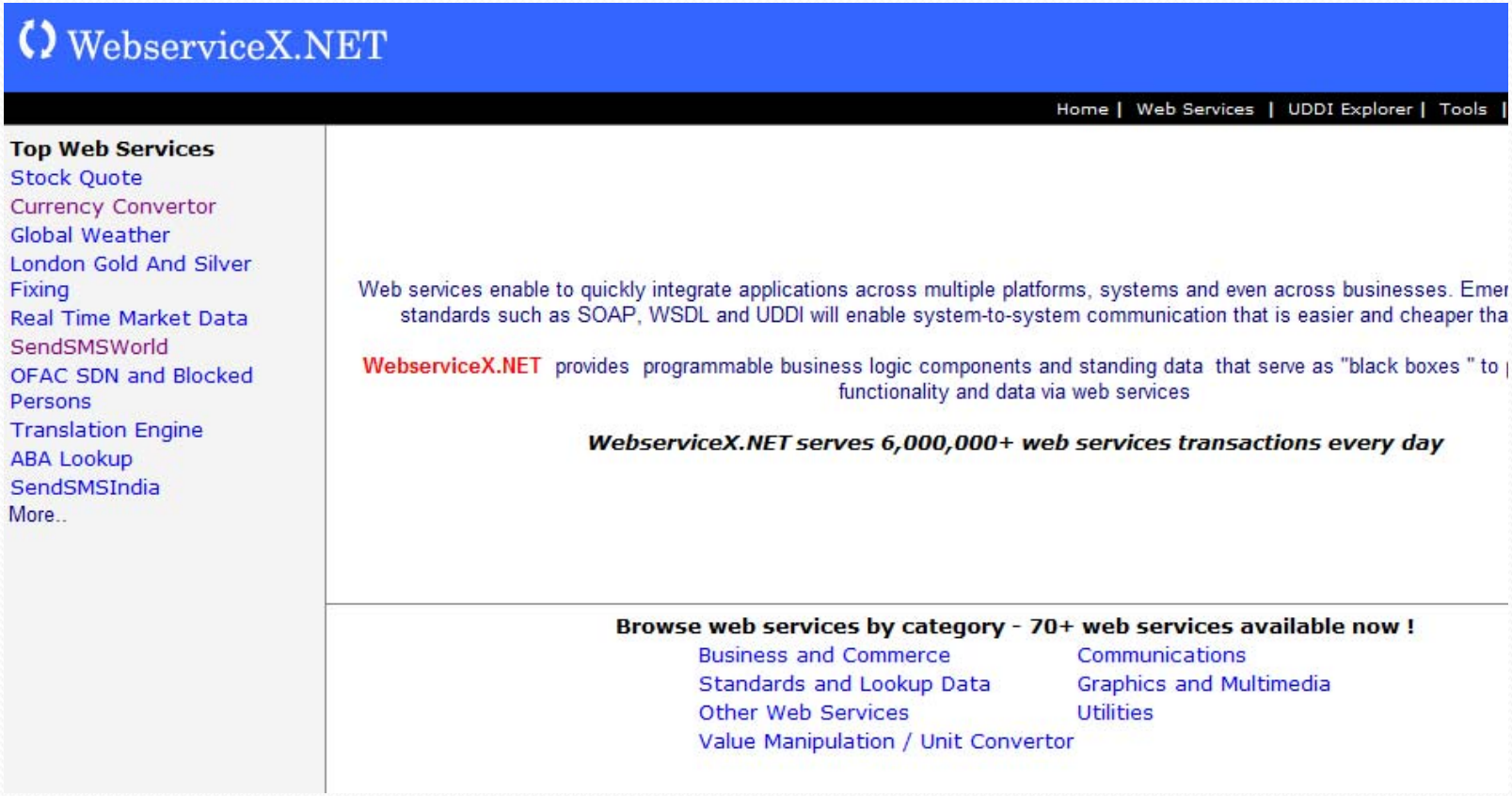
```
<message name="getTermRequest">
  <part name="term" type="xs:string"/>
</message>

<message name="getTermResponse">
  <part name="value" type="xs:string"/>
</message>

<portType name="glossaryTerms">
  <operation name="getTerm">
    <input message="getTermRequest"/>
    <output message="getTermResponse"/>
  </operation>
</portType>
```

Example Service

- Length Convertor Service



Length Convertor

- What we need
  - A service (Already implemented at webservicex.net)
  - Service WSDL
    - Download it http://www.webservicex.net/length.asmx?WSDL
  - Stubs
    - Generate stubs from WSDL
  - Write client using stubs
  - Access the service (pass parameter and get results)

Lets do it

Exercise

- Access the Currency Convertor Service
  - Download WSDL file from
  - http://www.webservicex.net/CurrencyConvertor.asmx?WSDL
- Generate stubs using WSDL file.
  - Use given build.xml
- Create Client using stubs.
- Convert any currency to other currency type.