WSDL Basics

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"Learning is fun!"



Agenda

- What and Why WSDL?
- Example WSDL Document
- WSDL Document Elements
- Importing & authoring style
- Application design & Tools
- WSDL 1.2



What is and Why WSDL?

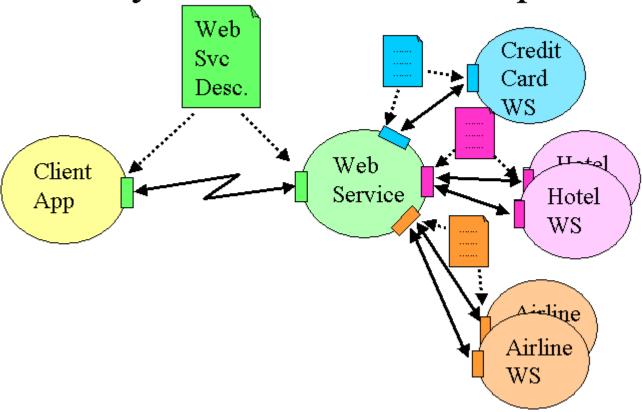


What is WSDL?

- XML language for describing web services
- Web service is described as
 - A set of communication endpoints (ports)
- Endpoint is made of two parts
 - Abstract definitions of operations and messages
 - Concrete binding to networking protocol (and corresponding endpoint address) and message encoding
- Why this separation?
 - Enhance reusability (of the abstract part, for example)

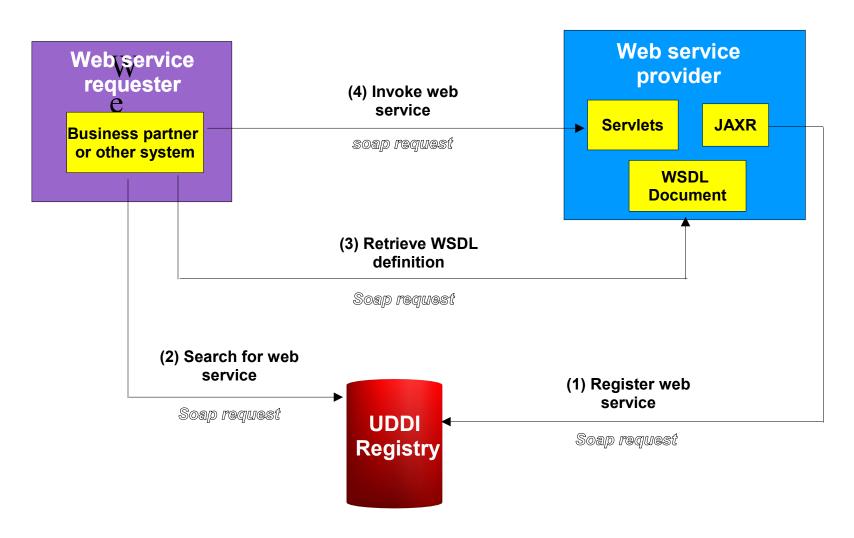
What is WSDL?

Many Web Service Descriptions



source: WSDL 1.2 primer

Where is WSDL Used?



Why WSDL?

- Enables automation of communication details between communicating partners
 - Machines can read WSDL
 - Machines can invoke a service defined in WSDL
- Arbitration
 - 3rd party can verify if communication conforms to WSDL



WSDL Document Structure



WSDL Document Structure

```
<wsdl:definitions xmlns:wsdl="http://schemas.xmlsoap.org/wsdl"</pre>
            targetNamespace="your namespace here"
            xmlns:tns="your namespace here"
            xmlns:soapbind="http://schemas.xmlsoap.org/wsdl/soap">
    <wsdl:types>
        <xs:schema targetNamespace="your namespace here (could be another) "</pre>
            xmlns:xsd="http://www.w3.org/2001/XMLSchema"
            <!-- Define types and possibly elements here -->
        </schema>
    </wsdl:types>
    <wsdl:message name="some operation input">
        <!-- part(s) here -->
    </wsdl:message>
    <wsdl:message name="some operation output">
        <!-- part(s) here -->
    </wsdl:message>
    <wsdl:portType name="your type name">
        <!-- define operations here in terms of their messages -->
    </wsdl:portType>
    <wsdl:binding name="your binding name" type="tns:port type name above">
        <!-- define style and transport in general and use per operation -->
    </wsdl:binding>
    <wsdl:service>
        <!-- define a port using the above binding and a URL -->
    </wsdl:service>
</wsdl:definitions>
```

WSDL Namespaces

- http://schemas.xmlsoap.org/wsdl
- http://schemas.xmlsoap.org/wsdl/soap
- http://www.w3.org/2001/XMLSchema



Example WSDL Document



WSDL Document Example

- Simple service providing stock quotes
- A single operation called GetLastTradePrice
- Deployed using SOAP 1.1 over HTTP
- Request takes a ticker symbol of type string
- Response returns price as a float

WSDL Elements

- Types
- Message
- Operation
- Port Type
- Binding
- Port
- Service

WSDL Elements

Types

- Data type definitions
- Used to describe exchanged messages
- Uses W3C XML Schema as canonical type system

WSDL Example: Types

```
<definitions name="StockQuote"</pre>
   targetNamespace="http://example.com/stockquote.wsdl"
             xmlns:tns="http://example.com/stockquote.wsdl"
             xmlns:xsd1="http://example.com/stockquote.xsd"
             xmlns:soap="http://schemas.xmlsoap.org/wsdl/soap/"
             xmlns="http://schemas.xmlsoap.org/wsdl/">
   <types>
       <schema targetNamespace="http://example.com/stockquote.xsd"</pre>
              xmlns="http://www.w3.org/2000/10/XMLSchema">
           <element name="TradePriceRequest">
              <complexType>
                  <a11>
                      <element name="tickerSymbol" type="string"/>
                  </all>
              </complexType>
           </element>
           <element name="TradePrice">
              <complexType>
                  <a11>
                      <element name="price" type="float"/>
                  </all>
              </complexType>
           </element>
       </schema>
   </types>
```

WSDL Elements

- Messages
 - Abstract, typed definitions of data being exchanged
- Operations
 - Abstract description of an action
 - Refers to an input and/or output messages
- Port type
 - Collection of operations
 - Abstract definition of a service

Example: Messages, Operation, Port type

```
<message name="GetLastTradePriceInput">
    <part name="body" element="xsd1:TradePriceRequest"/>
</message>
<message name="GetLastTradePriceOutput">
    <part name="body" element="xsd1:TradePrice"/>
</message>
<portType name="StockQuotePortType">
    <operation name="GetLastTradePrice">
       <input message="tns:GetLastTradePriceInput"/>
       <output message="tns:GetLastTradePriceOutput"/>
    </operation>
    <!-- More operations -->
</portType>
```

WSDL Elements

Binding

- Concrete protocol and data format (encoding) for a particular Port type
 - Protocol examples: SOAP 1.1 over HTTP or SOAP 1.1 over SMTP
 - Encoding examples: SOAP encoding, RDF encoding

Port

- Defines a single communication endpoint
- Endpoint address for binding
- URL for HTTP, email address for SMTP

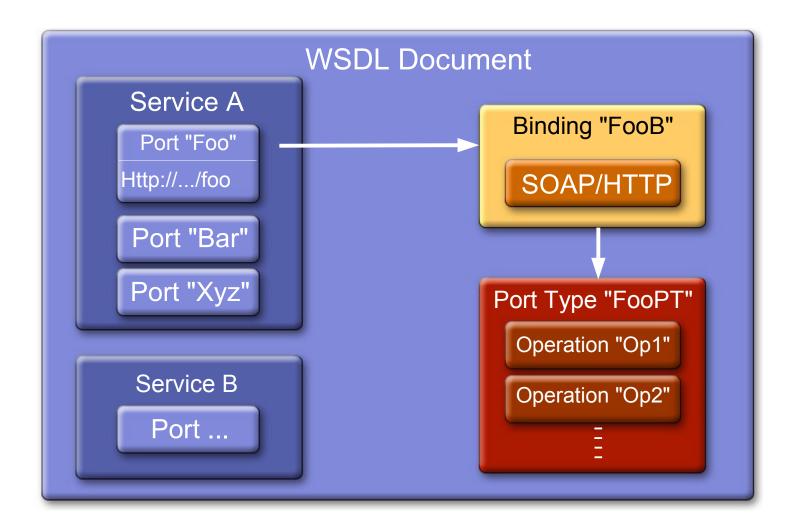
Service

Aggregate set of related ports

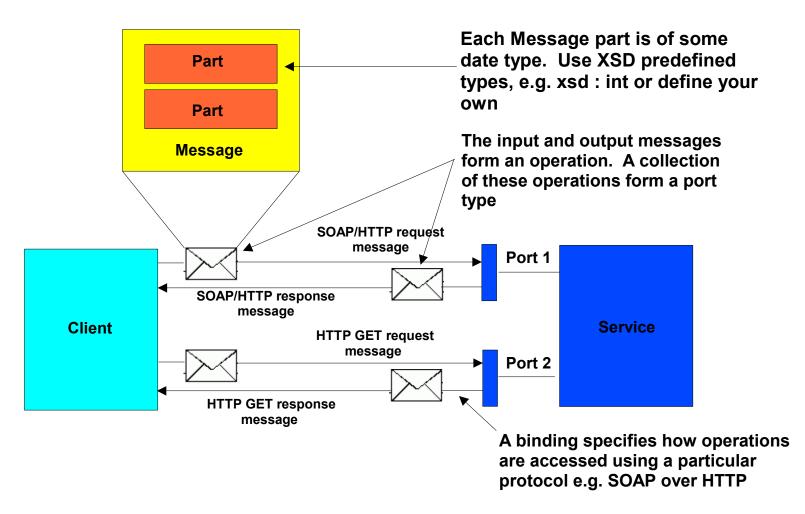
Example: Binding, Port, Service

```
<binding name="StockQuoteSoapBinding" type="tns:StockQuotePortType">
   <soap:binding style="document"</pre>
         transport="http://schemas.xmlsoap.org/soap/http"/>
   <operation name="GetLastTradePrice">
      <soap:operation</pre>
            soapAction="http://example.com/GetLastTradePrice"/>
        <input> <soap:body use="literal" />
        </input>
        <output> <soap:body use="literal" />
        </output>
   </operation>
</binding>
<service name="StockOuoteService">
   <documentation>My first service</documentation>
   <port name="StockQuotePort" binding="tns:StockQuoteSoapBinding">
       <soap:address location="http://example.com/stockquote"/>
   </port>
</service>
```

WSDL View of a Web Service



Web Service Invocation





More Detailed Description on WSDL Elements



Message Element

- Consist of one or more logical parts
- Syntax

```
<definitions .... >
    <message name="nmtoken"> *
        <part name="nmtoken" element="qname"? type="qname"?/> *
        </message>
</definitions>
```

- element attribute refers to an XSD element using a QName
- type attribute refers to an XSD simpleType or complexType using a QName

Example: Message Element

```
<definitions .... >
  <types>
    <schema .... >
     <element name="PO" type="tns:POType"/>
     <complexType name="POType">
       <all>
          <element name="id" type="string/>
          <element name="name" type="string"/>
          <element name="items">
            <complexType>
              <all>
                <element name="item" type="tns:Item" minOckurs="0" maxOccurs="unbounded"/>
              </all>
            </complexType>
          </element>
       </all>
     </complexType>
     <complexType name="Item">
       <all>
          <element name="quantity" type="int"/>
          <element name="product" type="string"/>
       </all>
     </complexType>
     <element name="Invoice" type="tns:InvoiceType"/>
     <complexType name="InvoiceType">
       <all>
          <element name="id" type="string"/>
       </all>
     </complexType>
    </schema>
  </types>
  <message name="PO">
    <part name="po" element="tns:PO"/>
    <part name="invoice" element="tns:Invoice"/>
  </message>
</definitions>
```

Types of Operations

- One-way
 - The endpoint receives a message
- Request/response
 - The endpoint receives a message, and sends a correlated message
- Notification
 - The endpoint sends a message
- Solicit/response
 - The endpoint sends a message, and receives a correlated message

One-way Operation

```
<operation name="submitPurchase">
     <input message="purchase"/>
     </operation>
```

Request/Response Operation

```
<operation name="submitPurchase">
  <input message="purchase"/>
  <output message="confirmation"/>
</operation>
<operation name="submitPurchase">
  <input message="purchase"/>
  <output message="confirmation"/>
  <fault message="faultMessage"/>
```

Notification Operation

```
<operation name="deliveryStatus">
     <output message="trackingInformation"/>
</operation>
```

Solicit/Response Operation



Importing & Authoring Style

Authoring Style Recommendation

- Reusability and maintainability
- Maintain WSDL document in 3 separate parts
 - Data type definitions
 - Abstract definitions
 - Specific service bindings
- Use "import" element to import necessary part of WSDL document

Example7A:

http://example.com/stockquote/stockquote.xsd

```
<?xml version="1.0"?>
<schema targetNamespace="http://example.com/stockquote/schemas"
   xmlns="http://www.w3.org/2000/10/XMLSchema">
  <element name="TradePriceRequest">
    <complexType>
      <all>
        <element name="tickerSymbol" type="string"/>
      </all>
    </complexType>
  </element>
  <element name="TradePrice">
    <complexType>
      <all>
        <element name="price" type="float"/>
      </all>
    </complexType>
  </element>
</schema>
```

Example7B:

http://example.com/stockquote/stockquote.wsdl

```
<?xml version="1.0"?>
<definitions name="StockQuote"
targetNamespace="http://example.com/stockquote/definitions"
     xmlns:tns="http://example.com/stockquote/definitions"
     xmlns:xsd1="http://example.com/stockquote/schemas"
     xmlns:soap="http://schemas.xmlsoap.org/wsdl/soap/"
     xmlns="http://schemas.xmlsoap.org/wsdl/">
 <import namespace="http://example.com/stockquote/schemas"</pre>
     location="http://example.com/stockquote/stockquote.xsd"/>
  <message name="GetLastTradePriceInput">
    <part name="body" element="xsd1:TradePriceRequest"/>
  </message>
  <message name="GetLastTradePriceOutput">
    <part name="body" element="xsd1:TradePrice"/>
  </message>
  <portType name="StockQuotePortType">
    <operation name="GetLastTradePrice">
      <input message="tns:GetLastTradePriceInput"/>
      <output message="tns:GetLastTradePriceOutput"/>
    </portType>
</definitions>
```

Example7C:

http://example.com/stockquote/stockquoteservice.wsdl

```
<?xml version="1.0"?>
<definitions name="StockQuote"
targetNamespace="http://example.com/stockguote/service"
     xmlns:tns="http://example.com/stockquote/service"
     xmlns:soap="http://schemas.xmlsoap.org/wsdl/soap/"
     xmlns:defs="http://example.com/stockquote/definitions"
     xmlns="http://schemas.xmlsoap.org/wsdl/">
 <import namespace="http://example.com/stockquote/definitions"</p>
      location="http://example.com/stockguote/stockguote.wsdl"/>
  <binding name="StockQuoteSoapBinding" type="defs:StockQuotePortType">
    <soap:binding style="document" transport="http://schemas.xmlsoap.org/soap/http"/>
    <operation name="GetLastTradePrice">
      <soap:operation soapAction="http://example.com/GetLastTradePrice"/>
      <input><soap:body use="literal"/> </input>
      <output><soap:body use="literal"/></output>
    </binding>
  <service name="StockQuoteService">
    <documentation>My first service</documentation>
    <port name="StockQuotePort" binding="tns:StockQuoteBinding">
      <soap:address location="http://example.com/stockquote"/>
    </port>
  </service>
```



WSDL 1.2

WSDL 1.2

- Described in XML Information set
- Aligned with SOAP 1.2
 - Changes are mostly about SOAP binding
- MEP (Message Exchange Pattern)

Thank you!

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