4Th Year

# Web Services and Security


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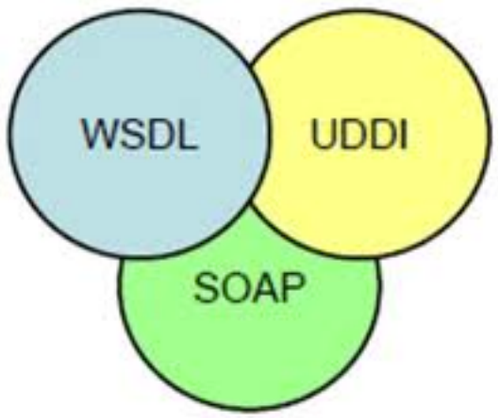
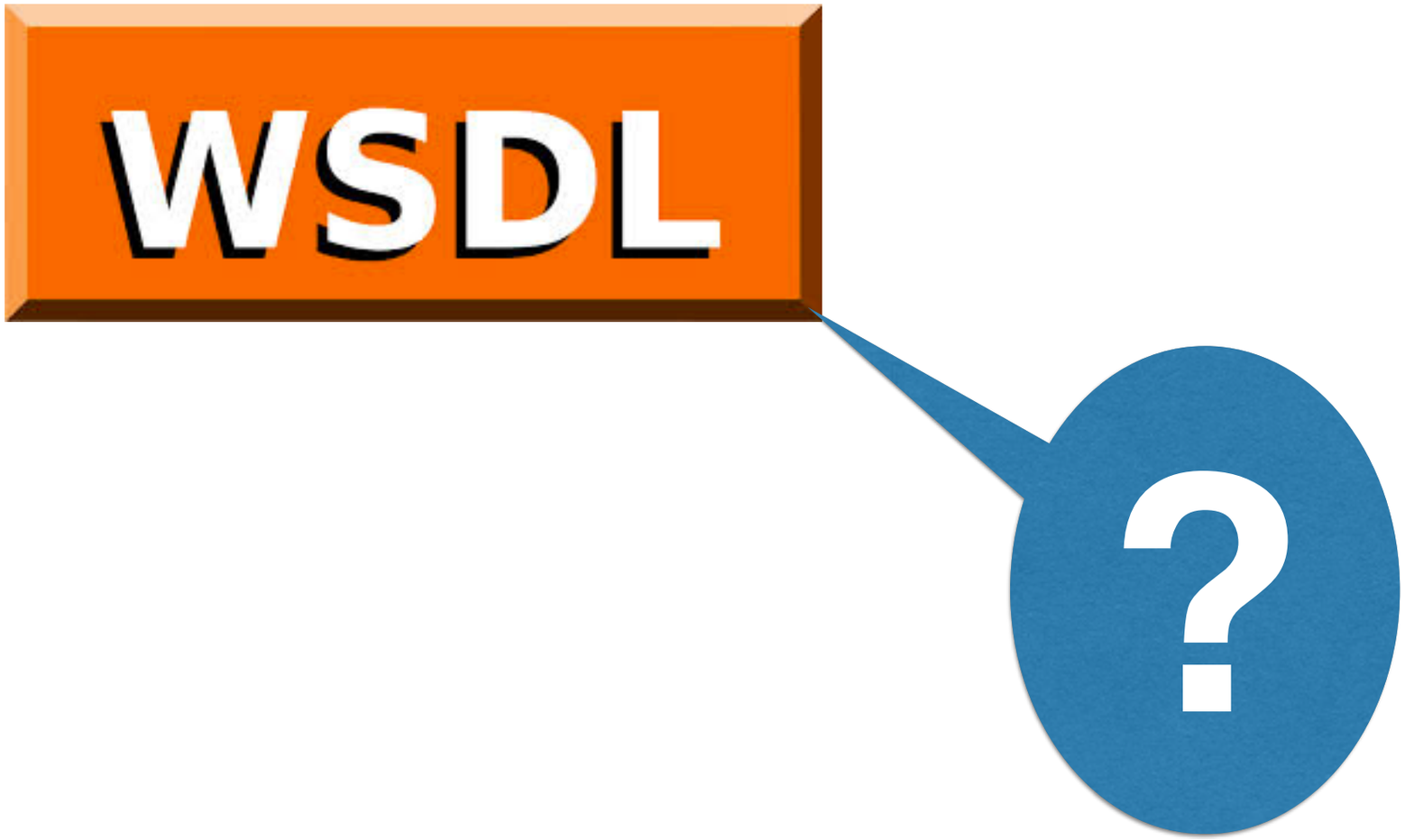
# Web Services Components And Architecture

# Web Services Description Language



# Web Services Description Language

- **WSDL** stands for **W**eb **S**ervices **D**escription **L**anguage.
- The standard format for describing a web service.

Developed jointly By:

Microsoft IBM

# Features of WSDL


- WSDL is an XML-based protocol for information exchange in decentralized and distributed environments.

- WSDL definitions describe how to access a web service and what operations it will perform.

- WSDL is a language for describing how to interface(interact with) with XML-based services.

- WSDL is the language that UDDI uses.

- WSDL is pronounced as 'wiz-dull' and spelled out as 'W-S-D-L'.

# WSDL Usage

Cont….

- WSDL is often used in combination with SOAP and XML Schema to provide web services over the Internet.

- A client program connecting to a web service can read the WSDL to determine what functions are available on the server.

- Any special datatypes used are embedded in the WSDL file in the form of XML Schema.

- The client can then use **SOAP** to actually call one of the functions listed in the WSDL.

# History of WSDL


- WSDL 1.1 was submitted as a W3C Note by IBM, and Microsoft for describing services for the W3C XML Activity on XML Protocols in March 2001.

- WSDL 1.1 has not been endorsed by the World Wide Web Consortium (W3C), however it has just released a draft for version 2.0 that will be a recommendation (an official standard), and thus endorsed by the W3C.

# WSDL - Elements

Cont….

- WSDL breaks down web services into three specific elements that can be combined or reused once defined.

- The three major elements of WSDL that can be defined separately are:
  - Types
  - Operations
  - Binding

# WSDL - Elements

Cont....

- The WSDL Document Structure

```
<definitions>
   <types>
      definition of types........
   </types>

   <message>
      definition of a message....
   </message>

   <portType>
      <operation>
         definition of a operation.......
      </operation>
   </portType>

   <binding>
      definition of a binding....
   </binding>

   <service>
      definition of a service....
   </service>
</definitions>
```

# WSDL - Elements


- **Definition**
  - The root element of all WSDL documents.
  - It defines the name of the web service, declares multiple namespaces used throughout the remainder of the document, and contains all the service elements described here.

```
<definitions name="HelloService"
   targetNamespace="http://www.examples.com/wsdl/HelloService.wsdl"
   xmlns="http://schemas.xmlsoap.org/wsdl/"
   xmlns:soap="http://schemas.xmlsoap.org/wsdl/soap/"
   xmlns:tns="http://www.examples.com/wsdl/HelloService.wsdl"
   xmlns:xsd="http://www.w3.org/2001/XMLSchema">
   ..............................................
</definitions>
```

# WSDL - Elements


- **Definition**
  - A container of all the other elements.
  - Specifies that this document is called HelloService.
  - Specifies numerous namespaces that are used throughout the remainder of the document.

# WSDL - Elements


- **Data types**
  - The data types to be used in the messages are in the form of XML schemas.
  - The types element describes all the data types used between the client and the server.
  - WSDL uses the W3C XML Schema specification as its default choice to define data types.

# WSDL - Elements


- **Data types**
  - If the service uses only XML Schema built-in simple types, such as strings and integers, then types element is not required.
  - WSDL allows the types to be defined in separate elements so that the types are reusable with multiple web services.

# WSDL - Elements


- **Data types**

```
<types>
   <schema targetNamespace="http://example.com/stockquote.xsd"
      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>
</types>
```

# WSDL - Elements


- **Message**

  - Describes the data being exchanged between the web service providers and the consumers.

  - Each Web Service has two messages: input and output.

  - The input describes the parameters for the web service and the output describes the return data from the web service.

# WSDL - Elements

Cont….

- **Message**
  - Each message contains zero or more **<part>** parameters, one for each parameter of the web service function.
  - Each <part> parameter associates with a concrete type defined in the <types> container element.

```
<message name="SayHelloRequest">
   <part name="firstName" type="xsd:string"/>
</message>

<message name="SayHelloResponse">
   <part name="greeting" type="xsd:string"/>
</message>
```

# WSDL - Elements


- **Operation**
  - It is the abstract definition of the operation for a message, such as naming a method, message queue, or business process, that will accept and process the message.

# WSDL - Elements


- **portType**
  - Combines multiple message elements to form a complete one-way or round-trip operation.
  - E.g. (one **portType** can combine one request and one response message into a single request/response operation.
  - This is most commonly used in SOAP services.

```
<portType name="Hello_PortType">
   <operation name="sayHello">
      <input message="tns:SayHelloRequest"/>
      <output message="tns:SayHelloResponse"/>
   </operation>
</portType>
```

# WSDL - Elements

Cont….

- **portType**
  - **Patterns of Operation**
    - WSDL supports four basic patterns of operation:

**One-way:**

- The service receives a message. The operation therefore has a single input element.

```
<wsdl:definitions .... >
   <wsdl:portType .... > *
      <wsdl:operation name="nmtoken">
         <wsdl:input name="nmtoken"? message="qname"/>
      </wsdl:operation>
   </wsdl:portType >
</wsdl:definitions>
```

# WSDL - Elements

Cont….

- **portType**
  - **Request-response**
    - The service receives a message and sends a response.
    - The operation therefore has one input element, followed by one output element.
    - To encapsulate errors, an optional fault element can also be specified.

```
<wsdl:definitions .... >
   <wsdl:portType .... > *
      <wsdl:operation name="nmtoken" parameterOrder="nmtokens">
         <wsdl:input name="nmtoken"? message="qname"/>
         <wsdl:output name="nmtoken"? message="qname"/>
         <wsdl:fault name="nmtoken" message="qname"/>*
      </wsdl:operation>
   </wsdl:portType >
</wsdl:definitions>
```

# WSDL - Elements

Cont....

- **portType**
  - **Notification**
    - The service sends a message. The operation therefore has a single output element.

```
<wsdl:definitions .... >
   <wsdl:portType .... > *
      <wsdl:operation name="nmtoken">
         <wsdl:output name="nmtoken"? message="qname"/>
      </wsdl:operation>
   </wsdl:portType >
</wsdl:definitions>
```

# WSDL - Elements


- **Binding**
  - Provides specific details on how a portType operation will actually be transmitted over the wire.
  - The bindings can be made available via multiple transports including HTTP GET, HTTP POST, or SOAP.
  - The bindings provide concrete information on what protocol is being used to transfer portType operations.
  - The bindings provide information where the service is located.

# WSDL - Elements

Cont….

- **Binding**
  - For SOAP protocol, the binding is <soap:binding>, and the transport is SOAP messages on top of HTTP protocol.
  - You can specify multiple bindings for a single portType.

```
<binding name="Hello_Binding" type="tns:Hello_PortType">
```

Points to the port for binding

# WSDL - Elements


- **Port**
  - Describes the network address that enables a service provider consumer to interact with the services being offered.
  - A port MUST NOT specify more than one address.
  - The <port> and <portType> are linked via a <binding> element.
  - A port MUST NOT specify any binding information other than address information.

# WSDL - Elements


- **Service**
  - Defines the ports supported by the web service.
  - For each of the supported protocols, there is one port element.
  - The <port> and <portType> are linked via a <binding> element.
  - **The service element is a collection of ports.**

# WSDL - Elements


- **Service**
  - **Web service clients can learn the following from the service element:**
    - Where to access the service.
    - Through which port to access the web service.
    - How the communication messages are defined.

# WSDL - Elements


- **Service**
  - The service element includes a documentation element to provide human-readable documentation.

```
<service name="Hello_Service">
   <documentation>WSDL File for HelloService</documentation>
   <port binding="tns:Hello_Binding" name="Hello_Port">
      <soap:address
         location="http://www.examples.com/SayHello/">
   </port>
</service>
```

?