



Introduction to Web Services

KC Java User's Group

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Overview

- What is a Web Service?
- Web Service Standards
- Java and Web Services
- Apache Axis
- Server and Client Demo
- References & Articles



What is a Web Service?

According to W3C (<http://www.w3.org/TR/ws-arch/>)...

- A Web service is a software system designed to support interoperable machine-to-machine interaction over a network. It has an interface described in a machine-processable format (specifically WSDL). Other systems interact with the Web service in a manner prescribed by its description using SOAP messages, typically conveyed using HTTP with an XML serialization in conjunction with other Web-related standards.



What is a Web Service?

According to Sun (<http://java.sun.com/webservices/>)...

- Web services are Web-based enterprise applications that use open, XML-based standards and transport protocols to exchange data with calling clients. [Java Platform, Enterprise Edition \(Java EE\)](#) provides the APIs and tools you need to create and deploy interoperable Web services and clients.



What is a Web Service?

In simpler terms...

- Software that performs a task.
- Sits on a network so other systems can talk to it (most often SOAP over HTTP).
- Has a defined, published interface (usually via WSDL).
- Is platform and language independent.
- Typically uses XML.



Why Use Them?

- They should play nicely with each other
- Can connect disparate platforms and systems
- Loose-coupling
- Facilitate reuse



Disadvantages

- Poor performance
- Interoperability is still an issue
- Immature technology (e.g. no transactions)



Standards

- XML
- WSDL (Web Services Description Language)
- UDDI (Universal Description, Discovery and Integration)
- XML-RPC
- SOAP (Simple Object Access Protocol)



Standards - UDDI

UDDI (Universal Description, Discovery and Integration)

- “creates a platform-independent, open framework for describing services, discovering businesses, and integrating business services using the Internet.”
- Access via JAXR



Standards - WSDL

WSDL (Web Services Description Language)

- “Interface Definition Language (IDL) service based on XML that defines the service interface and its implementation characteristics.”
- WSDL document contains following (W3C spec):
 - Types— a container for data type definitions using some type system (such as XSD).
 - Message— an abstract, typed definition of the data being communicated.
 - Operation— an abstract description of an action supported by the service.
 - Port Type— an abstract set of operations supported by one or more endpoints.
 - Binding— a concrete protocol and data format specification for a particular port type.
 - Port— a single endpoint defined as a combination of a binding and a network address.
 - Service— a collection of related endpoints.



Standards - SOAP

SOAP (Simple Object Access Protocol)

- “is a lightweight protocol for exchange of information in a decentralized, distributed environment.”
- Allows objects and code to communicate independent of platform and language
- Messages typically sent over HTTP
- Messages have a SOAP envelope which contains a header and body
- RPC or document-based interaction patterns



Standards - SOAP

```
<SOAP-ENV: Envelope
  xmlns:SOAP-ENV="http://schemas.xmlsoap.org/soap/envelope/"
  SOAP-ENV:
    encodingStyle="http://schemas.xmlsoap.org/soap/encoding/">
  <SOAP-ENV:Header>
    <t:Transaction xmlns:t="some-URI">
      SOAP-ENV:mustUnderstand="1"
      5
    </t:Transaction>
  </SOAP-ENV:Header>
  <SOAP-ENV:Body>
    <m:GetLastTradePrice xmlns:m="some-URI">
      <symbol>DEF</Symbol>
    </m: GetLastTradePrice>
  </SOAP-ENV:Body>
</SOAP-Envelope>
```



Web Services Use Case

1. Client contacts UDDI registry to find service.
2. Client retrieves WSDL.
3. Client builds SOAP message.
4. Client sends message to web service.
5. Service optionally sends a SOAP response.



Java and Web Services

Core platform support...

- J2EE 1.4?
 - Servlets, XML API's, EJB's
- JDK 1.4+?
- Java Web Services Developer Pack 2.0
 - JAX-WS 2.0 + JAXB 2.0 + SAAJ 1.3



Java and Web Services – API's

- JAX-RPC - API for XML-based RPC
- JAXR - Java API for XML Registries
- JAXB - Java Architecture for XML Binding
- JAXP – API for XML Processing
- JAXM – API for XML Messaging
- SAAJ - SOAP with Attachments API
- JAX-WS - Java API for XML Web Services



Apache Axis 1.x

- “Apache Axis is an Open Source SOAP server and client.”
- “Axis implements the JAX-RPC API, one of the standard ways to program Java services.”



Apache Axis Service Demo

1. Install Axis 1.3, Tomcat 4.x, JDK 1.4+.
2. Write service method(s).
3. Create Axis deployment descriptor (see EightBall.wsdd).
4. Deploy service class files to Axis webapp directory.
5. Deploy service to Axis via AdminClient.



Apache Axis Client Demo

1. Install Axis 1.3, JDK 1.4+.
2. Create a Service and Call object.
3. Call invoke.



References

- Web service, Wikipedia, http://en.wikipedia.org/wiki/Web_service
- Web Services Architecture, W3C, <http://www.w3.org/TR/ws-arch/>
- Java Technology and Web Services, <http://java.sun.com/webservices/>
- WSDL specification, <http://www.w3.org/TR/wsdl>
- Apache Axis, <http://ws.apache.org/axis/>



Articles

- Web Services Essentials, Sun Developer Network, <http://developers.sun.com/techttopics/webservices/essentials.html>
- Ask the magic eight ball, IBM developerWorks, <http://www-128.ibm.com/developerworks/webservices/library/ws-eight/>
- Implement a Web Service using Axis, Ant and Tomcat, <http://www.luciano.fiandesio.com/javatales/axant.html>