Building SOA Applications with JAX-WS, JAX-RS, JAXB, and Ajax

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S296157
Learn Powerful Coding Techniques for Building SOA Applications using JAX-WS, JAX-RS, and JAXB and Ajax.

*How to Leverage the Powerful Web Services Technologies Built In to Java™ application environment*
About the Speaker

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- AgileIT Founder

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AgileIT develops the ServiceLayer™ product for ultrafast Web Service enablement of production Java applications.
Agenda

- **Introduction**
- **Java Bindings for Web Services**
  - Java language to XML Schema (JAXB)
  - Java language to WSDL and SOAP (JAX-WS)
  - Java language to HTTP (JAX-RS)
- **Programming Methodologies**
  - Code First
  - Contract First
  - Meet in the Middle
- **Case Study**
  - SOA-Shopper – a universal shopping service integrating eBay, Amazon, and Yahoo! Shopping.
  - Meet in the Middle Architecture
  - Code Snippets
  - Live Demo
Introduction

> Am I Stupid, or is Java Web Services Really Hard?

Dave Podnar’s Five Stages of Dealing with Web Services

1. Denial—It’s Simple Object Access Protocol, right?
2. Over Involvement—OK, I’ll read the SOAP, WSDL, WS-I BP, JAX-RPC, SAAJ, JAX-P, … specs. Next, I’ll check the Wiki and finally follow an example showing service and client sides.
3. Anger—I can’t believe those #$%@’s made it so difficult!
4. Guilt—Everyone is using Web Services, it must be me, I must be missing something.
5. Acceptance—It is what it is, Web Services aren’t simple or easy.
An **Impedance Mismatch** Can Make Web Services Hard

- Java Objects
- **Impedance Mismatch**
- Web Services Documents and Messages

Diagram:
- Mapping
  - XML
  - HTTP
  - WSDL
  - SOAP
Java Bindings for Web Services

➤ Java Binding tools are used to manage the impedance mismatch.

➤ Java platform now provides effective binding tools.
  • JAXB ... binding to XML
  • JAX-WS ... binding to WSDL and SOAP
  • JAX-RS ... binding to HTTP

➤ Effective Java Web Services requires learning to use these tools effectively.
JAXB - Binding Java code to XML Schema

XML Schema

```xml
<complexType name="Foo">
  <sequence>
    <element name="bar" type="FooBar" …/>
    …
  </sequence>
</complexType>
```

Java Code

```java
public class Foo {
  public void getBar() { … }
  public void setBar(FooBar fb) { … }
}
```

```java
public class FooBar {
}
```
JAX-WS - Binding Java code to WSDL

- WSDL
  - types
  - portType
  - operation

- JAXB

- JAX-WS

- Service Endpoint Implementation (SEI)
  + method(…)

- JAX-WS - Binding Java code to WSDL

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JAX-WS - Binding Java code to SOAP

**SOAP**

```xml
<env:Envelope ..>
  <env:Head .../>
  <env:Body ...>
    <submitOrder>
      <order ...>
        <date>20080507</date>
        <itemNum>DW0-88</itemNum>
        ...
      </order>
    </submitOrder>
  </env:Body>
</env:Envelope>
```

**Java**

```java
@WebService
public class OrderManager {
  ...
  public void submitOrder(Order ord) {
    ...
  }
}
```

**JAXB**

```java
OrderManager
```

**JAX-WS**

```
OrderManager
```
JAX-RS - Binding Java code to HTTP

HTTP

POST /somepath/orderManager/ordNum
Host: agileitinc.com

<order ...
  <date>20080507</date>
  <itemNum>DW0-88</itemNum>
  ...
</order>

Java

OrderManager

@Path("/somepath/orderManager")
public class OrderManager {
  ...
  @POST @PATH("/{ordNum}")
  @ConsumeMime("application/xml")
  public void submitOrder(
      @PathParam("ordNum") String ordNum,
      Source order) {
      ...
  }
}
Approaches to Web Services Development

- **Code First**
  - Java
  - WSDL, XML, HTTP

- **Contract First**
  - Java
  - WSDL, XML, HTTP

- **Meet in the Middle**
  - Java
  - WSDL, XML, HTTP
Code First

- Annotate Your Code
- Deploy it in a container that supports JAX-WS, JAX-RS

The JAX-WS runtime will:
  - Generate WSDL.
  - Translate SOAP request to a Java technology-based method invocation.
  - Translate method return into a SOAP response.

The JAX-WS runtime will:
  - Translate HTTP request to a Java technology-based method invocation.
  - Translate method return into HTTP response.
Contract First

➢ “Compile” the WSDL for the service that you would like to deploy.
  • `wsimport` reads the WSDL and generates an interface for each `portType`

➢ Create a class that implements each interface. The business logic of these classes implements your Web services.

➢ Deploy these Service Endpoint Implementation classes to a JAX-WS container.
Code First and Contract First With JAX-WS
JAX-RS

- JAX-RS is more like “Code First” than “Contract First”
- No WSDL contract. However, XML Schema may provide a contract for the XML payload.
- Annotations are used to map Java code to REST endpoints (URIs) and to HTTP operations.

```java
@Path("/somepath/orderManager")
public class OrderManager {

...  
@POST @PATH("/{ordNum}")
@ConsumeMime("application/xml")
public void submitOrder(
    @PathParam("ordNum") String ordNum, 
    Source order) {
    ... 
}

and also to map Java code to HTTP operations
```
Code First With JAX-RS
Meet in the Middle

- Start with WSDL, XML Schema, HTTP structure
- ... AND existing Java classes.
- Two sides of the same problem:
  - Invoke the Web services using your existing Java classes as parameters (e.g., PurchaseOrder).
  - Deploy your existing Java classes to provide Web services that conform to the existing WSDL, XML Schema, HTTP structure
- This is the most common scenario faced by enterprises that are implementing SOA using Java Web Services.
- Programming challenge: How to deal with the complex, ad-hoc, mapping code that must be created and maintained?
Meet in the Middle - Mapping Code Problem

Supplier1 Web Service

Supplier2 Web Service

Supplier2 Web Service

PO1

PO2

PO3

Map1

Map2

Map3

PO

Contact First Classes

Mapping Layer

Code First Classes
Adapter Bindings – Managing the Mapping Code

- Implements “Meet in the Middle”
- Organizes, manages, maintains the mapping code in a library of reusable type mappings.
- Hides the complexity of mapping from business logic programmers.
Meet in the Middle: SOAShopper Example

SOAShopper Technology Stack

Web Browser
- Ajax

SOAP Client

RESTful Services
- JAX-RS

SOAP Services
- JAX-WS

SOAShopper API

SOAShopper Mapping

External Service APIs
- eBay
- Amazon
- Yahoo!

Adapter Bindings

eBay WS
Amazon WS
Yahoo! WS
Adapter Binding Example

```java
public List<Offer> offerSearch(
    String keywords, Category category,
    Price lowprice, Price highprice) {

    ShopperImp binding =
        BindingService.getBinding(
            ShopperImp.class,
            EBayAPIInterface.class);

    return
        binding.offerSearch(keywords,
            category, lowprice, highprice);
}
```
Meet in the Middle – Bridge Pattern (GOF)
SOAShopper – Integrating Yahoo! Shopping, Amazon, and eBay with JAX-WS, JAXB, and JAX-RS
For More Information

- AgileIT web site - http://agileitinc.com
- Jersey (JAX-RS impl.) - https://jersey.dev.java.net/
- Metro (JAX-WS, JAXB impl.) - https://metro.dev.java.net/
- “SOA Using Java Web Services”, Mark Hansen
- “RESTful Web Services”, Leonard Richardson et. al
THANK YOU

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