

# Developing Web Services with Java

## (5 Days)

### Custom Training Institute

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### Developing Web Services with Java (CTI 264)

*Students will learn how to develop Web Services using the Java Software Development Kit (JDK), a Java Integrated Development Environment (IDE) such as Eclipse, and standards such as SOAP, WSDL and JAX-RPC. This course covers the basics of XML and includes all the techniques needed to program Web Services.*

Prerequisites: *Familiarity with the Java language, JavaBeans, and web application architecture and concepts. Successful completion of course CTI 238, "Enterprise Java Programming Using Rational Application Developer," satisfies these requirements.*

Minimum software requirements: *Microsoft Windows 2000 Professional (SP 3 or later) or Windows XP (SP 1 or later). Eclipse, Rational Application Developer, or other Java Integrated Development Environment (IDE). Java-compatible browser, J2SE 5.0 SDK.*

Minimum hardware requirements: *Pentium III at 1 GHz; minimum of 1 Gb RAM; 3.5 Gb free disk space, plus additional space for development; Internet connection.*

Microsoft PowerPoint on instructor's workstation for presentation purposes.

#### Module 1: The Web Services Architecture

- Evolution of Web Services
- Motivation for Web Services
- HTTP and XML
- Interoperability Stacks
- The Wire Stack
- Simple Object Access Protocol (SOAP)
- The Description Stack
- Web Service Description Language (WSDL)
- The Discovery Stack
- Universal Description, Discovery and Integration (UDDI)
- Hosting Web Services: Scenarios
- Observing SOAP Traffic

#### Module 2: Creating and Hosting Web Services

- Scenarios for Hosting Web Services
- Service Descriptions
- Building Services and Clients from WSDL
- Publishing and Discovery
- Web Service Development Process

#### Module 3: Java and Web Services

- Java and Web Services
- Web Services and the J2EE
- The Java API for XML Processing (JAXP)
- The Java API for XML Binding (JAXB)
- The SOAP With Attachments API for Java (SAAJ)
- The Java API for XML Messaging (JAXM)
- Low-Level Messaging (SAAJ)
- The Java API for XML-Based RPC (JAX-RPC)
- High-Level Messaging (JAX-RPC)
- WSDL-to-Java vs. Java-to-WSDL
- The Java API for XML Registries (JAXR)

#### Module 4: The Simple Object Access Protocol (SOAP)

- SOAP Messaging Model
- SOAP Namespaces
- SOAP over HTTP
- The SOAP Envelope
- The Message Header
- The Message Body
- SOAP Faults
- Attachments
- XML Schema
- Validating Message Content
- The SOAP "Section 5" Encoding Arrays
- Avoiding Redundant Serialization

## Developing Web Services with Java (CTI 264) - continued

### Module 5: The Java APIs for SOAP Messaging (SAAJ)

- The SAAJ Object Model
- Parsing a SOAP Message
- Reading Message Content
- Bridges to JAXP
- Working with Namespaces
- Creating a Message
- Setting Message Content
- Bugs and Limitations

### Module 6: SAAJ Web Services

- Messaging Scenarios
- Point-to-Point Messaging
- SAAJ Services Using JAX-RPC
- Creating a JAXM Connection
- Sending a Message

### Module 7: Web Services Description Language (WSDL)

- Web Services as Component-Based Software
- The Need for an IDL
- Web Services Description Language
- WSDL Description Model
- The Abstract Model – Service Semantics
- Message Description
- Messaging Styles
- The Concrete Model – Ports, Services, Locations
- Extending WSDL – Bindings
- SOAP Style and Use Attributes
- Service Description

### Module 8: The Java API for XML-Based RPC (JAX-RPC)

- The Java Web Services Architecture
- Two Paths
- How It Works - Build Time and Runtime
- Mapping Between WSDL/XML and Java
- Generating Java from WSDL
- What Gets Generated
- What the Application Sees
- Generating WSDL from Java
- Which Way to Go?
- Passing Objects
- Another CORBA?

### Module 9: Generating Web Services from Java Code

- The Java-to-XML Mapping
- Primitive Types and Standard Classes
- Value Types and JavaBeans
- The Java-to-WSDL Mapping
- Service Endpoint Interface
- Scope of Code Generation
- Inheritance Support
- JAX-RPC: Bugs and Limitations
- Multi-Tier Application Design
- Analyzing the Domain
- web-services.xml
- When Things Don't Fit
- Polymorphism
- Extensible Type Mapping

### Module 10: Generating Java Web Services from WSDL

- The XML-to-Java Mapping
- Simple and Complex Types
- Enumerations
- Arrays
- The WSDL-to-Java Mapping
- Mapping Operation Inputs and Outputs
- Building a Service Client
- Locating a Service
- Client-Side Validation
- Interoperability Under Java-to-WSDL
- Creating a Web Service
- Mid-Level Ant Tasks
- XML and WSDL Design Guidelines
- Deploying the Service
- Interoperability Under WSDL-to-Java
- Controlling Names and URIs

### Module 11: Web Services and EJB

- Enterprise JavaBeans
- Three Tiers for J2EE
- EJB 2.1 and JAX-RPC
- Session Beans as Web Service Endpoints
- How It Works – Build Time and Runtime
- The Bean's Service Endpoint Interface
- SOAP as an RMI Transport
- Adding a SOAP Interface to a Session Bean

### Module 12: Message Context and Message Handlers

- Handling SOAP Headers
- Servlet Endpoint Context
- EJB Endpoint Context
- Using SAAJ
- JAX-RPC Message Handlers
- Handler Chains
- Processing Model and Patterns

## **Developing Web Services with Java (CTI 264) - continued**

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### **Module 13: SOAP Attachments**

- SOAP Support for Attachments
- SAAJ Object Model, Revisited
- The SOAPMessage Class
- MIME
- The Java Activation Framework
- The MimeHeaders Class
- The AttachmentPart Class
- Adding SOAP Attachments
- Identifying Attachments
- Reading Attachments

### **Module 14: Web Services and JMS**

- Asynchronous Messaging
- The Java Message Service
- Queues and Topics
- Message Types
- Message-Driven Beans
- Asynchronous Web Services
- Message Queues as Web Services

### **Module 15: Security**

- Web Services and Security
- Threats
- Technology and Techniques
- Public Key Encryption
- Digital Signature
- J2EE Techniques
- Securing Web-Service URIs
- HTTPS
- XML and SOAP Solutions
- XML Encryption and Signature
- WS-Security
- SAML
- XACML
- Securing a Service's Messages
- Key Pairs and Keystores
- Enhancing the Client