Training: Capstone Courseware
564 Developing Java Web Services

TRAINING GOALS:

A comprehensive look at the state of the art in developing interoperable web services on the Java EE 6 platform. Students learn the key standards for both SOAP-based and RESTful services, and the Java architectures that have evolved to build interoperable services and clients.

We begin with an introductory module that covers both SOAP-based and RESTful services, and therefore both JAX-WS and JAX-RS. We then discuss JAXB, as this highly useful XML API is integral to both.

The remainder of the course is split between two larger modules, each of which falls on one side of the fence: either SOAP services with JAX-WS, or RESTful services with JAX-RS. We cover SOAP, WSDL, and both WSDL-driven and Java-driven development paths for JAX-WS, as well as client-side development. Then students work with the Jersey implementation of JAX-RS to create RESTful services, from simple single-value interactions to more sophisticated services that manage CRUD (create/retrieve/update/delete) operations on more complex data types, using JAXB to marshal and unmarshal data over the wire.

(For groups that have already made more of a commitment to one approach or the other, consider one of our more dedicated courses: Course 561 for **SOAP/WSDL/JAX-WS**, or Course 563 for **REST/JAX-RS**.)

CONSPECT:

- Chapter 1. Overview of Web Services
  - Why Web Services?
  - Service-Oriented Architecture
  - HTTP and XML
  - SOAP
  - WSDL
  - The SOAP Vision
  - The REST Vision
  - UDDI
  - The WS-I Basic Profile
  - Security

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ul. Tatarska 5, 30-103 Kraków, tel.: (12) 298 47 77
ul. Bielska 17, 02-394 Warszawa, tel.: (22) 417 41 70

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- Chapter 2. Web Services for Java EE
  - Hosting Web Services: Scenarios
  - Web Services for Java EE
  - JAX-WS and JAXB
  - Web-Services Metadata
  - WSDL-to-Java and Java-to-WSDL Paths
  - Provider and Dispatch APIs
  - SAAJ and JAXP
  - JAX-RS for RESTful Services
  - JAXR
- Chapter 3. The Java API for XML Binding
  - The Need for Data Binding
  - XML Schema
  - Two Paths
  - JAXB Compilation
  - Mapping Schema Types to Java
  - Java-to-XML Mapping Using Annotations
  - Marshaling and Unmarshaling
  - Working with JAXB Object Models
- Chapter 4. The Simple Object Access Protocol
  - Messaging Model
  - Namespaces
  - SOAP over HTTP
  - The SOAP Envelope
  - The Message Header
  - The Message Body
  - SOAP Faults
  - Attachments
- Chapter 5. Web Services Description Language
  - Web Services as Component-Based Software
  - The Need for an IDL
  - Web Services Description Language
  - WSDL Information Model
  - The Abstract Model -- Service Semantics
  - Message Description
  - Messaging Styles

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- The Concrete Model -- Ports, Services, Locations
- Extending WSDL -- Bindings
- Service Description
- Chapter 6. The Java API for XML-Based Web Services
  - Two Paths
  - How It Works: Build Time and Runtime
  - The Service Endpoint Interface
  - Working from WSDL
  - Working from Java
  - RPC and Document Styles
  - One-Way Messaging
  - Binary Protocols
- Chapter 7. WSDL-to-Java Development
  - The @WebService Annotation
  - Generated Code
  - Scope of Code Generation
  - Parameter Order
  - More JAXB: Mapping Collections
  - More JAXB: Mapping Enumerations
  - Applying JAXB Customizations
- Chapter 8. Client-Side Development
  - Stubs and Proxies
  - Generated Code
  - Locating a Service
  - Invoking a Service
  - The @WebServiceRef Annotation
- Chapter 9. Java-to-WSDL Development
  - Generating the WSDL and Schema
  - The @WebMethod, @XmlParam, and Related Annotations
  - More JAXB: Mapping Inheritance
  - Controlling the XML Model
  - Controlling the WSDL Description
  - JAXB Customizations with @XmlJavaTypeAdapter
- Chapter 10. The Java API for RESTful Services
  - Applications
  - Resources

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- Sub-Resources
- Providers
- Scanning and @ApplicationPath

- Chapter 11. Dispatching Requests to Methods
  - The Application Path
  - The @Path Annotation
  - The HTTP Method Annotations
  - Sub-Resource Locators
  - Annotation Inheritance and overriding
- Chapter 12. Parameter and Return Types
  - Simple Parameter Types
  - @Consumes and @Produces Annotations
  - @XXXParam Annotations
  - The @DefaultValue Annotation
  - Return Types
  - Binary Content
  - Delivering a File
- Chapter 13. Entities and Complex Content
  - Entity Providers
  - Built-In Entity Providers
  - Working with XML
  - Driving XML Representations from Schema
- Chapter 14. Context and Lifecycle
  - Reading Web Resources
  - Finding Java EE Components
  - Finding Databases
  - Security Contexts

Appendix A. Course Tools and Utilities

Appendix B. Handy Guide to Web-Services Acronyms

REQUIREMENTS:

- Strong **Java programming** skills are essential - Course 103 is excellent preparation.
- Students must be able to read **XML** documents and to write well-formed XML by hand - consider Course 501.
- Knowledge of **XML Schema** will be helpful, too, but is not a strict prerequisite - consider Course

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517.

- Experience with other **Java EE** standards, especially servlets and JSP, will be very helpful in class, but is not strictly required.

Difficulty level

CERTIFICATE:

The participants will obtain certificates signed by Capstone Courseware.

TRAINER:

Authorized Capstone Courseware Trainer.

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