

This course shows experienced Java programmers how to build RESTful web services using the Java API for RESTful Web Services, or JAX-RS. We develop a clear sense of the key concepts of REST -- ultimately the thorough and thoughtful use of URLs, HTTP methods, and media types to design and implement scalable and maintainable enterprise services. Then we dive into the elegant JAX-RS standard for building RESTful services, learning how to manage URLs and URL patterns and methods, how to bind input and control response production, and how to manage HTTP entities in popular content types such as XML and JSON.

From here students investigate intermediate features including dependency injection, error handling, and JSR-303 validation, and use Java generics to implement patterns for common operations over an application's domain classes. We explore the JAX-RS client API, and filters and interceptors, before closing with a summary chapter on REST security that includes implementations of HTTP BASIC security and HMAC signatures

Course Objectives:

- Understand the advantages of the REST architecture for web services.
- Use JAX-RS to develop simple RESTful services.
- Control dispatching to service methods based on URL patterns and HTTP methods.
- Bind request values to method parameters when expressed as HTTP query parameters, form values, headers, cookies, and more.
- Manage XML and JSON content using XML Schema and JAXB -- or without JAXB using leading JAX-RS providers and Reflection-driven entity providers such as MOXy and Jackson.
- Handle error conditions by producing appropriate HTTP responses.
- Use JSR-303 validation for request parameters, headers, and entities.
- Use Java generics to implement REST API patterns for various domain classes.
- Take advantage of lifecycle and context services available to JAX-RS services.
- Implement REST clients using the JAX-RS standard API.
- Build filters and interceptors to adapt service endpoint behavior.

Audience: Experienced Java programmers.

Prerequisites: Java programming experience is required and experience with other Java EE standards would be helpful.

Number of Days: 5 days

1 Overview of REST and JAX-RS The REST Vision Use of HTTP Use of URIs Use of Content Types CRUD Operations and Business Operations HATEOAS and the Richardson Maturity Model JAX-RS



Applications, Resources, and Providers **Configuration and Lifecycle** 2 The JAX-RS Application XML Configuration Annotation-Driven Configuration Applications **Root Resource Classes** Per-Request vs. Singleton Lifecycle Providers 3 **Dispatching Requests** The Application Path The @Path Annotation The HTTP Method Annotations Sub-Resource Locators Annotation Inheritance and overriding @XXXParam Annotations The @DefaultValue Annotation Parameter Types Parameter Converters **Handling Requests** 4 The Application Path The @Path Annotation The HTTP Method Annotations Sub-Resource Locators Annotation Inheritance and overriding **@XXXParam Annotations** The @DefaultValue Annotation Parameter Types Parameter Converters 5 **Producing Responses** Supported Return Types The Response Class **Response Entities Binary Content** Delivering a File **Entity Translation** 6 Entity Parameter and Return Type Entity Providers @Consumes and @Produces Annotations **Built-In Entity Providers Custom Entity Provider** 7 Working with XML and JSON The JAXB Entity Provider Driving XML Representations from Schema

Driving JSON Representations with JAXB JSON without JAXB: Jackson, MOXy, etc. **CRUD** Patterns Error Handling Sub-Resources 8 **Dependency Injection** The @Context Annotation Injectable Types The Application Subclass Servlet Configuration and Context **Impact of Lifecycle Policies Context Providers** Using CDI Validation and Error Handling 9 Using Response Throwing WebApplicationException **Exception Mapping Providers** Selection of Exception Mappers Support for JSR-303 **Annotating Method Parameters** Annotating Entity Classes Error Reporting 10 **Generic Services Generic Entities Generic Entity Providers** ParameterizedType **Reflection-Driven Entity Providers** Annotation Inheritance **CRUD** Patterns, II Serialization, Recursion, and Scope **Dynamic Sub-Resources** Working with Databases 11 **Persistence Services** The Java Persistence API JPA Support for JSR-303 Handling IDs and Keys Cascading Caching Error Handling Hypermedia Challenges The Client API 12 The Builder Pattern Client WebTarget



	Invocation
	Basic Usage
	Managing Content Types and Entities
	Error Handling
	Registering Providers
	The Service Locator Pattern
	Generic Clients
13	Filters and Interceptors
	The Filter Interfaces
	Processing Pattern
	The Request and Response Context
	Interfaces
	Aborting a Request
	The Interceptor Interfaces
	Adaptive Streams
	Filters on the Client Side
	Interceptor Strategy for Hypermedia
14	Security
	Concerns for RESTful Services
	Authentication and Authorization
	HTTP BASIC and DIGEST
	HTTPS
	Programmatic Security
	SQL Injection
	Cross-Site Request Forgery
	Message-Level Security
15	HMACS
15	The Java API for AML Binding
	The Need for Data Binding
	AIVIL Schema Two Daths
	I WO Pauls
	JAAD Compilation Manning Sahama Tunas to Java
	Lave to XML Mapping Using
	Appotations
	Marshalling and Un-marshalling
	Working with IAXB Object Models
	working with JAAD Object woulds