Introduction to Spring 5 and JPA2

Course Summary

Description

This course includes coverage of all the core Spring 5 and JPA 2 capabilities, as well as the integration capabilities provided by Spring. It provides extensive coverage of using Spring and JPA together, as well as using Spring Boot for dependency management and creating JPA-based repositories using Spring Data. All capabilities are practiced via an extensive set of hands-on labs.

Spring 5 provides an evolutionary advance of Spring's powerful capabilities. The course introduces these capabilities, as well as providing guidelines on when and how to use them. It includes coverage of the three main configuration styles: Java-based (@Configuration), annotation-based (@Component), and the traditional XML-based configuration that may still play an important role in existing and new projects. It uses Spring Boot capabilities for dependency management in many of the labs.

The JPA material covers all basic JPA concepts, including mapping persistent classes, and using EntityManager and EntityManagerFactory to access and manipulate persistent entities. Querying with the Java Persistence Query Language (JPQL) is covered in depth, from basic queries to more advanced queries like eager queries using left joins. It also includes coverage of advanced concepts such as collections of value objects, relationships, and inheritance and polymorphic queries.

This course is hands on with labs to reinforce all the important concepts. It will enable you to build working Spring/JPA applications and give you an understanding of the important concepts and technology in a very short time.

Objectives

After taking this course, students will be able to:
- Understand the core principles of Spring, and of Dependency Injection (DI) / Inversion of Control
- Use the Spring Core module and DI to configure and wire application objects (beans) together
- Know the different types of metadata (XML, annotations/@Component, and Java Configuration/@Configuration), and how and when to use them
- Understand and use the complete capabilities of the Core module, such as lifecycle events, bean scopes, and the Spring API
- Use Spring Boot to simplify dependency management and configuration
- Understand the benefits of JPA and the JPA Architecture
- Create JPA based applications
- Work with the ORM (Object-Relational Mapping) module to integrate Spring with JPA.
- Understand and use Spring's transaction support, including the easy-to-use Java annotation support, as well as the tx/aop XML configuration elements
- Understand and use JPA mapping to map persistent objects to the database
- Work with JPA queries and JPQL
- Understand and work with collections and associations (Value and entity types, unidirectional, bidirectional, 1-1, 1-N, N-N
- Use JPA's versioning support
- Map inheritance hierarchies using JPA
- Integrate Spring/JPA with Java EE Web applications
- Use Spring Data to automatically generate JPA-based repositories with auto-generated queries

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Course Summary (cont'd)

Topics

- Introduction to Spring
- Configuration in Depth
- Spring Boot Overview
- Introduction to Java Persistence API (JPA2)
- Spring/JPA Integration
- JPA Updates and Queries

- Spring Transaction (TX) Management
- The JPA Persistence Lifecycle
- Relationships
- Spring Web Integration
- Spring Data Overview
- Additional Topics

Audience

This course is designed for those wanting to build working Spring/JPA applications and gain an understanding of the important concepts and technology in a very short time.

Prerequisites

There are no prerequisites for this course.

Duration

Five days

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Course Outline

I.   Introduction to Spring
  A. Overview of Spring Technology
    1. Motivation for Spring, Spring Architecture
    2. The Spring Framework
  B. Spring Introduction
    1. Declaring and Managing Beans
    2. ApplicationContexts - The Spring Container
    3. XML and @Component/@Named Config
  C. Dependencies and Dependency Injection (DI)
    1. Examining Dependencies
    2. Dependency Inversion / Dependency Injection (DI)
    3. DI in Spring - XML and @Autowired

II.   Configuration in Depth
  A. Java Based Configuration (@Configuration)
    1. Overview, @Configuration, @Bean
    2. Dependency Injection
    3. Resolving Dependencies
  B. Integrating Configuration Types
    1. XML and @Component Pros/Cons
    2. @Configuration Pros/Cons
    3. Choosing a Configuration Style
    4. Integrating with @Import and <import>
  C. Bean Scope and Lifecycle
    1. Singleton, Prototype, and Other Scopes
    2. Configuring Scope
    3. Bean Lifecycle / Callbacks
  D. Externalizing Properties
    1. Properties Files
    2. @PropertySource, property-placeholder
    3. Using @Value
    4. SpEL
  E. Profiles
    1. Overview and Configuration
    2. Activating Profiles

III.   Spring Boot Overview
  A. maven and Spring
  B. Spring Boot Structure
  C. Spring POMs with Boot Parents

  D. Spring Boot Starters
  E. Other Capabilities

IV.   Introduction to Java Persistence API (JPA2)
  A. Overview
    1. Persistence Layers, Object-Relational Mapping (ORM), JDBC
    2. JPA Overview
  B. Mapping with JPA
    1. Entities and @Entity, ids and @Id,
    2. Generated Id Values
    3. Basic Mapping Types
  C. Persistence Unit and EntityManager
    1. Persisting to the DB, the EntityManager API
    2. Persistence Units, Config, Persistence Context
    3. Retrieving Persistent Entities with find()
  D. More About Mappings
    1. Default Mappings, @Basic, @Column
    2. Field vs. Property Access
    3. Temporal (Date/Time) Mappings
    4. Java 8 Data/Time Mapping
  E. equals() and hashCode()
  F. Logging Options (Provider based)

V.   Spring/JPA Integration
  A. Spring's DataSource Support
  B. Managing the EntityManager (EM)
  C. LocalContainerEntityManagerFactoryBean and Container-managed EMs
  D. JEE and JNDI Lookup of the EM
  E. Configuration and Vendor Adaptors
  F. Creating a JPA Repository/DAO Bean - @PersistenceUnit, @PersistenceContext

VI.   JPA Updates and Queries
  A. Inserting Updating, and Deleting Entities
  B. Querying and JPQL
    1. Entity Based Queries, SELECT ,WHERE
    2. Query Interface, Executing Queries, Generic Queries (JPA 2)
    3. JPQL Operators, Expressions, and Parameters

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Course Outline (cont'd)

4. Named Queries
C. Additional Query Capabilities - Projection and Aggregate Query, Embedded Objects

VII. Spring Transaction (TX) Management
A. TX Overview and JPA Transactions
B. Declarative TX Management (REQUIRED, etc.)
C. TX Scope and Propagation
D. Pointcut-based Configuration of Transactions

VIII. The JPA Persistence Lifecycle
A. The Persistence Lifecycle
1. JPA Entity States (New, Managed, Detached, Removed), and Entity State Diagram
2. Persistence Context - Lifespan, Propagation
3. Synchronization to the DB
B. Versioning and Optimistic Locking
1. Overview, Detached Instances
2. Versioning, @Version, Optimistic Locking
C. Lifecycle Callbacks
1. @PrePersist, @PostPersist, etc.
2. Entity Listeners, @EntityListeners

IX. Relationships
A. Relationships Overview: Object Relationships, Participants, Roles, Directionality, Cardinality
B. Relationship Mapping
1. Mapping Overview (1-1, 1-N, N-1, N-N)
2. Unidirectional and Bidirectional
3. @ManyToOne, @OneToMany, @ManyToMany, @OneToOne with Table Structures
4. Relationship Inverse - Owning Side
5. Collection Types (List, Set, etc)
6. Cascading, Lazy and Eager Loading
7. Queries Across Relationships (Inner Joins, Outer Joins, Fetch Joins)

C. Entity Inheritance Mapping
1. Overview
2. Single Table, Joined (Table per Subclass), Table per Concrete Class Mappings
3. Pros and Cons of Mapping Strategies
D. Element Collections (JPA 2)
1. Overview, Collections of Value Objects, @ElementCollection, @CollectionTable
2. Using Element Collections
3. Collections of Embeddables

X. Spring Web Integration
A. Integrating Spring with Java EE Web Apps
1. ContextLoaderListener
2. WebApplicationContext
3. Using Spring beans in Wep app controller logic
B. Open EntityManager in View
1. Lazy Loading Issue in Web Apps
2. Open EntityManager in View Pattern
3. Using Spring's
4. OpenEntityManagerInViewFilter/Interceptor

XI. Spring Data Overview
A. Spring Data Overview
1. Overview and Architecture
2. Configuring Spring Data
3. Repositories and JPA Repositories
4. Using CrudRepository
B. Using Spring Data
1. Naming Conventions for Querying
2. Creating more Complex Queries
3. Query Configuration

XII. Additional Topics
A. Criteria Queries
B. Design Considerations