Durgesh Kumar Tiwari

LIVE BATCH

Spring Boot and Microservices

Prerequisite

- Laptop with Good Internet Connection.
- Good Command on Core Java
- Specially
    - OOPS
    - Collection Framework
    - Java 8 Features
    - Exception. Handling
    - String Handling

Week 1: Introduction to Spring Boot

- Introduction to Spring Boot
- Feature and benefits of Spring Boot
- Comparison with Spring Framework.
- Development Environment Setup.
    - Installing Java, IntelliJ, STS, NetBeans as per requirements.
    - Creating Spring Boot Application
        - Using Spring Initializer
        - Using IntelliJ
        - Using STS
    - Understanding Project Structure
    - Running Application
        - Using IntelliJ
        - Running Jar files

Week 2: Spring Boot Core Concepts

- **Inversion of Control (IoC)**: Understanding IoC and the role of the Spring Container.
- **Dependency Injection (DI)**: Constructor injection, setter injection, and field injection.
- Loose and Tight Coupling with Example
- **Bean Lifecycle**: Bean creation, initialization, destruction.
- **Bean Scopes**: Singleton, prototype, request, session, application.
- **@Component, @Service, @Bean, @Configurations, @ComponentScan**: Stereotype annotations.
- **Java-based Configuration**: @Configuration and @Bean.

- **XML-based Configuration**: Basics of configuring beans using XML (less common in Spring Boot).
- **Introduction to AOP**: Concepts of cross-cutting concerns.
- **AspectJ Annotations**: @Aspect, @Before, @After, @Around.
- **Pointcuts and Advices**: Defining and applying aspects.
- How Spring Boot solves problems.

Week 3: Spring Data Access

- Introduction to Spring Data JDBC
- Working with Spring Data JDBC
- **Introduction to Spring Data JPA**
    - Setting Up spring data jpa
    - Configurations
    - Entity Mapping
        - One to One
        - One to many
        - Many to Many
    - Repositories
    - JPQL and Native Queries
    - Working with parameterize queries.
    - Pagination and Sorting
    - Criteria API
    - Transactions
    - Advance Operations like Entity Lifecycle events.

Week 4: Spring MVC/ API Building Section

- Introduction to Spring MVC/ MVC Architecture
- Role of Dispatcher Servlet
- Setting up spring mvc
- Controllers
- Handling request with
    - @Controller, @RestController
    - @RequestMapping, @GetMapping, @PostMapping, @PutMapping, @DeleteMapping
- Using @PathVariable and @RequestParam
- Returning Data[JSON] and View
- Data Binding and Validation
    - Validating Data using @Valid and Bean Validator
    - How we can use Regular Expression for validation
    - Writing Custom Validators
- Exception Handling

    - Handling controller level exceptions
    - Handling Global Exceptions
    - Returning Custom Error Response.
- Interceptors
- File Upload
- **Project : We learn all above concepts using Project like**
    - To-do Applications
    - Student Management System
    - Simple E-Commerce Product CatLog.

Week 5: Spring Security in Detail

- Introduction to Security
- Authentication & Authorization
- Understanding Spring Security Flow using Debugging
- Implementing Spring Security @SecurityFilterChain
- Formbased and Basic authentication
- Managing Users
- Token based authentication [JWT authentication]
- Implementing in Project
- OAuth using Keyclock

Week 6: Microservices

- Introduction to Microservices
- Understanding Microservices Architecture
- Benefits and Challenges
- Setting up spring boot microservices
- Breaking Existing Project intro microspecies / Creating different micorservcies.
- Understanding Spring Cloud Projects
- Interservice Communication
    - Rest Template
        - Sync Commutation using RestTemplate
        - Web Client
        - Feign Client
            - Declarative REST client for simplifying HTTP API calls
- Service Registration and Discovery
    - Eureka Server and Client
    - Service Discovery and load balancing with Eureka .
- API Gateway
    - Setting up spring cloud gateway
    - Routing and filtering

- About Zuul

Week 7: Config Servers and Flatulence

- Config Server
  - Externalizing Configurations of Each Services.
  - Managing configuration across environments.
- Resilience4j
  - Setting up Resilience4j for fault tolerance
  - Configuring circuit breakers, retries, and rate limiters
  - Hystrix

Week 7: Distributed Tracing and Monitoring

- Spring Boot Actuator
  - Exposing operational information about the running application
  - Customizing Actuator endpoints
- Zipkin/Jaeger
  - Exposing operational information about the running application
  - Customizing Actuator endpoints

Week 8: Message and Event-Driven Architecture

- Introduction to Event Driven Architecture
- Event Driven Microservices using Apache Kafka
- Setting up message brokers (RabbitMQ, Kafka)
- Implementing Event Driven Microspecies in Project.

Week 9: Securing Microservices

- OAuth2 for securing microservices
- Securing inter-service communication using Spring Cloud Security.

Week 10: Deployment and Containerization

- Docker
  - Containerizing Spring Boot applications
  - Creating Docker images and containers
  - Docker Compose
  - Pushing to Docker hub
  - Deployment.

Project:

- While learning the concepts we will creates projects
- **Mini projects**
  - Simple Inventory Management System
  - User Management System
  - Store Management.
- **Major Project**

- **Online Learning Platform**
  - Course management, user management, payment processing
  - Multiple microservices for different functionalities
  - Spring Cloud Gateway for API Gateway
  - Circuit breaker with Resilience4j
  - Distributed tracing with Zipkin
  - Event-driven communication with Kafka
  - Centralized configuration with Spring Cloud Config
  - Security with OAuth2 and JWT
  - Containerization with Docker and deployments.