**Week 4: Exercises**

**New Features introduced in Spring Boot 3**

Spring Boot 3 has introduced several exciting new features and improvements that enhance performance, scalability, and developer experience. Here's a detailed exploration of the key updates:

**1. Java 17 Baseline**

* **Java 17 Compatibility:** Spring Boot 3 requires Java 17 or higher, taking advantage of the latest Java features, performance improvements, and long-term support.
* **Records and Sealed Classes:** Enhanced support for Java 17 features like records and sealed classes, enabling more concise and secure code.

**2. Native Image Support (GraalVM)**

* **Spring Native Integration:** Spring Boot 3 includes built-in support for native images via GraalVM, allowing applications to be compiled into native executables for faster startup times and reduced memory usage.
* **Native Build Tools:** Integrated support for Spring Native and related tools like spring-aot-maven-plugin for building native images.

**3. Observability and Micrometer 2.0**

* **Unified Observability:** Spring Boot 3 introduces a unified observability layer built on Micrometer 2.0, providing consistent metrics, tracing, and logging across the application.
* **OpenTelemetry Integration:** Native support for OpenTelemetry, making it easier to trace and monitor distributed applications.

**4. Jakarta EE 9 and 10 Compatibility**

* **Jakarta Namespace:** Spring Boot 3 aligns with the Jakarta EE 9+ namespace (e.g., javax.\* becomes jakarta.\*). This is crucial for developers using Jakarta EE components within Spring Boot applications.
* **Enhanced Integration:** Improved integration with Jakarta EE features like CDI, JPA, & Servlet API.

**5. New @ConfigurationProperties Enhancements**

* **Immutable Configuration Properties:** Support for immutable configuration properties using constructor binding, improving the safety and clarity of configuration classes.
* **Improved Type Safety:** Enhanced type safety for configuration properties, reducing runtime errors and improving code reliability.

**6. Improved Docker Support**

* **Docker Layered JARs:** Spring Boot 3 enhances Docker image building by generating layered JARs, optimizing Docker image builds and reducing startup times.
* **Spring Boot Docker Compose:** Integrated support for Docker Compose, simplifying the configuration and deployment of multi-container applications.

**7. Security Enhancements**

* **Spring Security 6:** Spring Boot 3 includes Spring Security 6, which provides new features like OAuth 2.1, improved password encoders, and enhanced support for security-related headers.
* **Zero Trust Security Model:** Improved tools and configurations to align with modern security practices, such as Zero Trust security models.

**8. Enhanced Testing Support**

* **Testcontainers Integration:** Spring Boot 3 simplifies the use of Testcontainers, enabling easier integration testing with containers.
* **Improved Test Slicing:** New test slicing capabilities for more focused and faster tests, especially for service and repository layers.

**9. Performance Improvements**

* **Optimized Reflection Usage:** Reduced reliance on reflection, leading to better runtime performance, especially in native images.
* **Lazy Initialization Improvements:** Fine-tuned lazy initialization support, allowing more efficient resource usage and faster application startup.

**10. New Actuator Endpoints**

* **Extended Observability:** New actuator endpoints for enhanced monitoring and management, including endpoints for tracing and custom metrics.
* **Health Check Enhancements:** Improved health check capabilities, providing more granular insights into application health.