Spring + JPA

Agenda

- Presentation
  - Introduction
  - Spring (Boot)
  - Jakarta Persistence
  - Spring Architecture & How to use
- Workshop

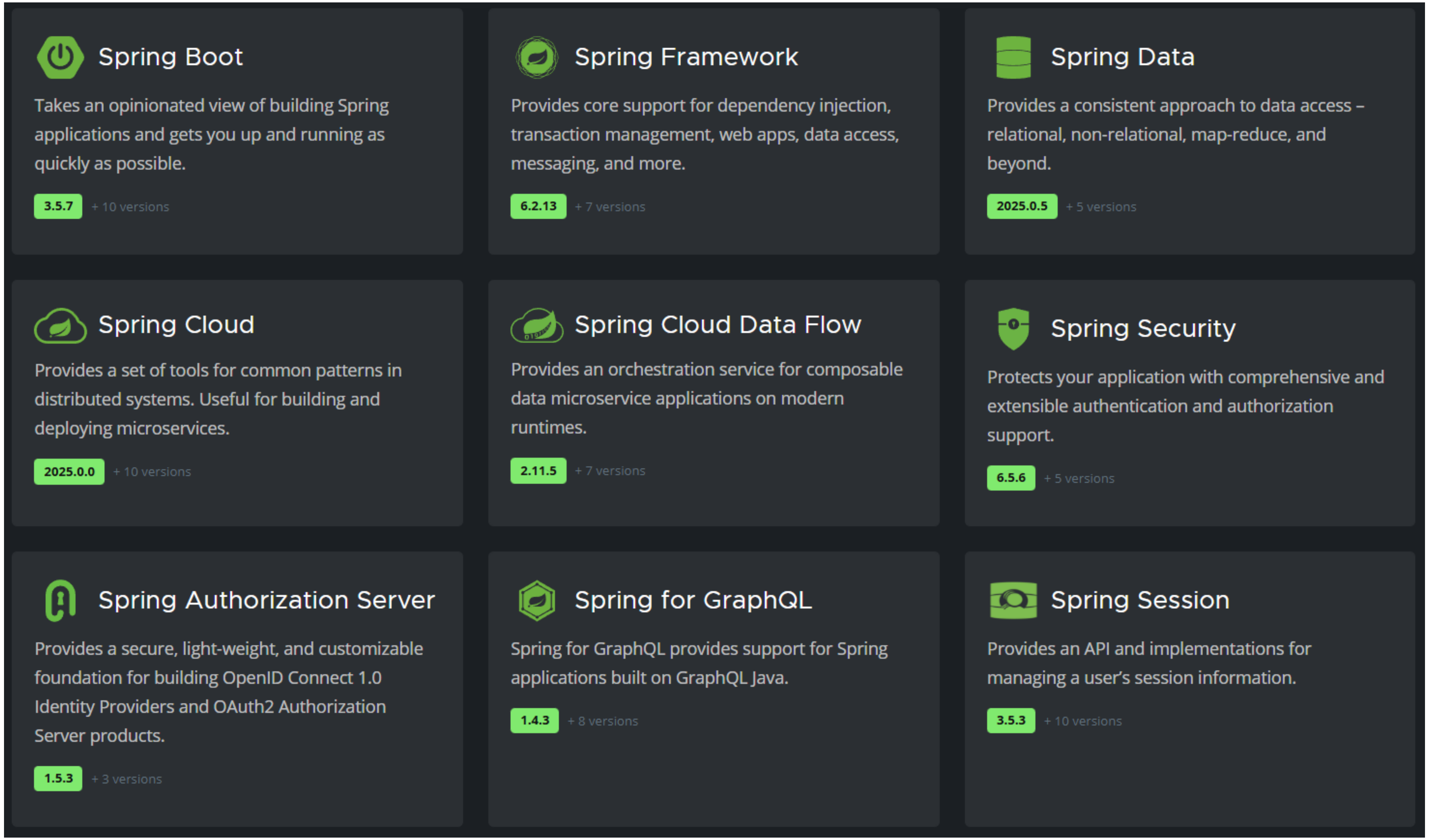
Introduction

- How our topic changed
- Spring & JPA with a bit of Boot and Hibernate

Spring – General Information

- Java Framework
- Created in 2003 to solve complexity issues of Jakarta EE (formerly Java Enterprise Edition) by Rod Johnson
- Java, Kotlin & Groovy
- Maven or Gradle
- Significantly reduces Boilerplate
- Industry standard/unifies approaches

Spring – What is offers



Spring Boot

Takes an opinionated view of building Spring applications and gets you up and running as quickly as possible.

3.5.7 + 10 versions

Spring Framework

Provides core support for dependency injection, transaction management, web apps, data access, messaging, and more.

6.2.13 + 7 versions

Spring Data

Provides a consistent approach to data access – relational, non-relational, map-reduce, and beyond.

2025.0.5 + 5 versions

Spring Cloud

Provides a set of tools for common patterns in distributed systems. Useful for building and deploying microservices.

2025.0.0 + 10 versions

Spring Cloud Data Flow

Provides an orchestration service for composable data microservice applications on modern runtimes.

2.11.5 + 7 versions

Spring Security

Protects your application with comprehensive and extensible authentication and authorization support.

6.5.6 + 5 versions

Spring Authorization Server

Provides a secure, light-weight, and customizable foundation for building OpenID Connect 1.0 Identity Providers and OAuth2 Authorization Server products.

1.5.3 + 3 versions

Spring for GraphQL

Spring for GraphQL provides support for Spring applications built on GraphQL Java.

1.4.3 + 8 versions

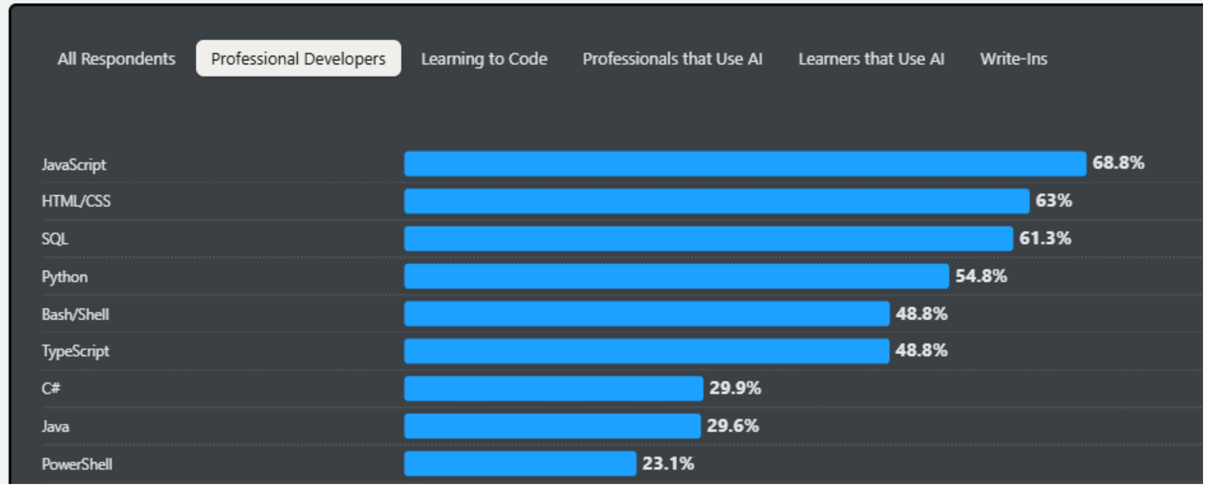
Spring Session

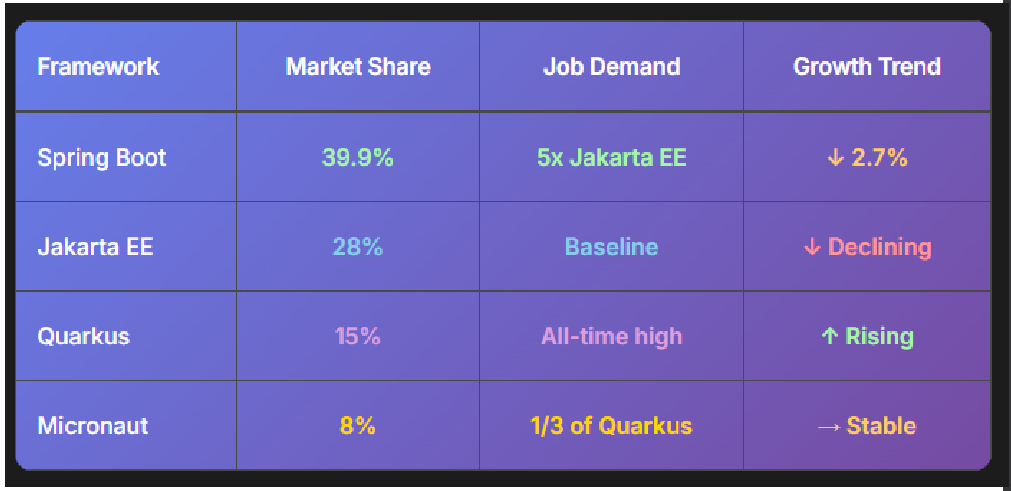
Provides an API and implementations for managing a user's session information.

3.5.3 + 10 versions

Spring – Relevance

- Netflix, Amazon, PayPal, Ebay, Capgemini, MasterCard, CGI





Framework	Market Share	Job Demand	Growth Trend
Spring Boot	39.9%	5x Jakarta EE	↓ 2.7%
Jakarta EE	28%	Baseline	↓ Declining
Quarkus	15%	All-time high	↑ Rising
Micronaut	8%	1/3 of Quarkus	→ Stable

Spring – Alternatives

- Micronaut
  - Lighter than Spring
  - Faster starup time
  - Smaller ecosystem
- Quarkus
  - Faster startup time and low memory usage
  - Strong kubernetes integration
  - Less mature ecosystem
  - Steeper learning curve

Spring – When and why to use

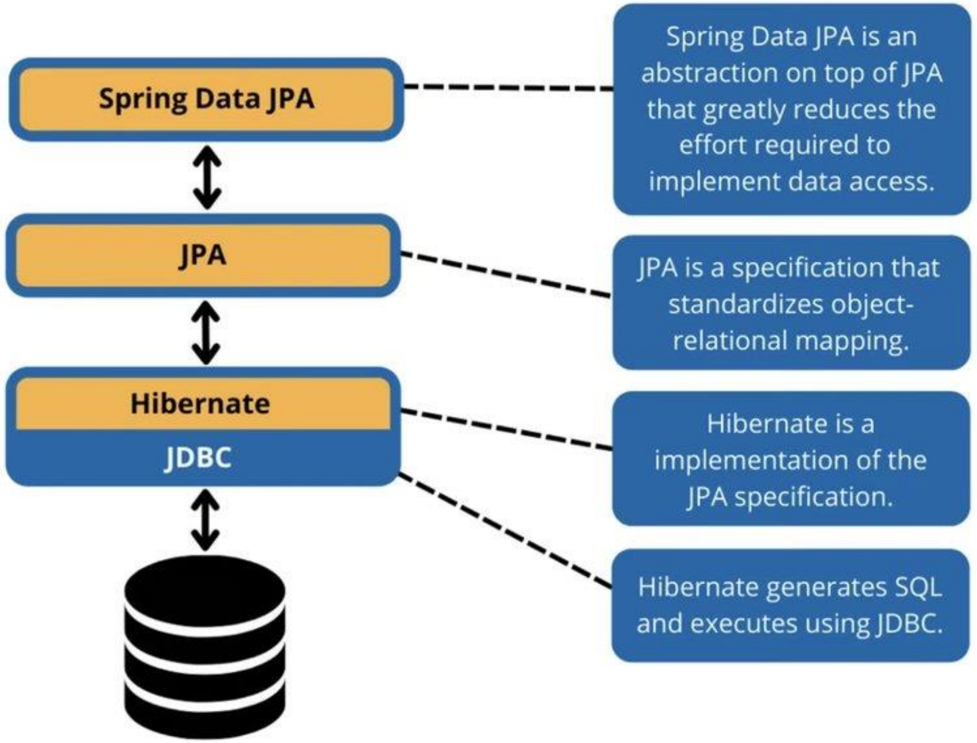
- Large-scale enterprise applications
- Microservice architectures
- Scalability and easy of development/deployment
- Well-documented and proven ecosystem
- Out-of-the-box solution availability

Spring – When and why not to use

- For small projects or with low complexity
  - Complexity Creep
  - Complexity of Spring and Boot
- Microservice architectures
- You have experience with a different framework that is suited for your problem as well

Jakarta Persistence (JPA) – General Information

- ORM (JDBC abstraction)
- Interface
- Hibernate, EclipseLink
- Atleast 75% of Spring Boot applications use JPA in some form



Spring Data JPA is an abstraction on top of JPA that greatly reduces the effort required to implement data access.

JPA is a specification that standardizes object-relational mapping.

Hibernate is a implementation of the JPA specification.

Hibernate generates SQL and executes using JDBC.

JPA – Alternatives

- Non-JPA ORMS (Ebean ORM & Apache Cayenne)
- SQL Mappers / Query Builders (JDBI & jOOQ)
- Low Level APIs (JDBC & R2DBC)
- Non-Relational Persistence (Spring Data MongoDB/Redis)

JPA – Strengths

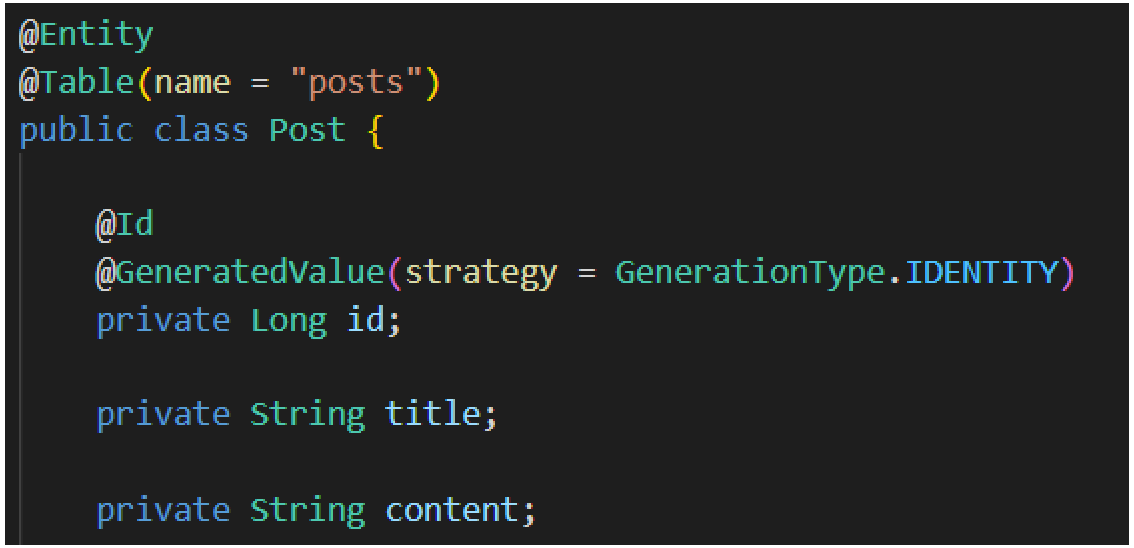
- Automatic Object Mapping
- Schema Evolution
- Vendor Independences
- Caching and Lifecycle Management

JPA – Weaknesses

- Non-Relational Data
- Startup Time and Overhead
- Efficiency
- Outside of Spring Boot

JPA – How to Use

- Database Connection & JPA provider
- Entities
- Interacting with the Database



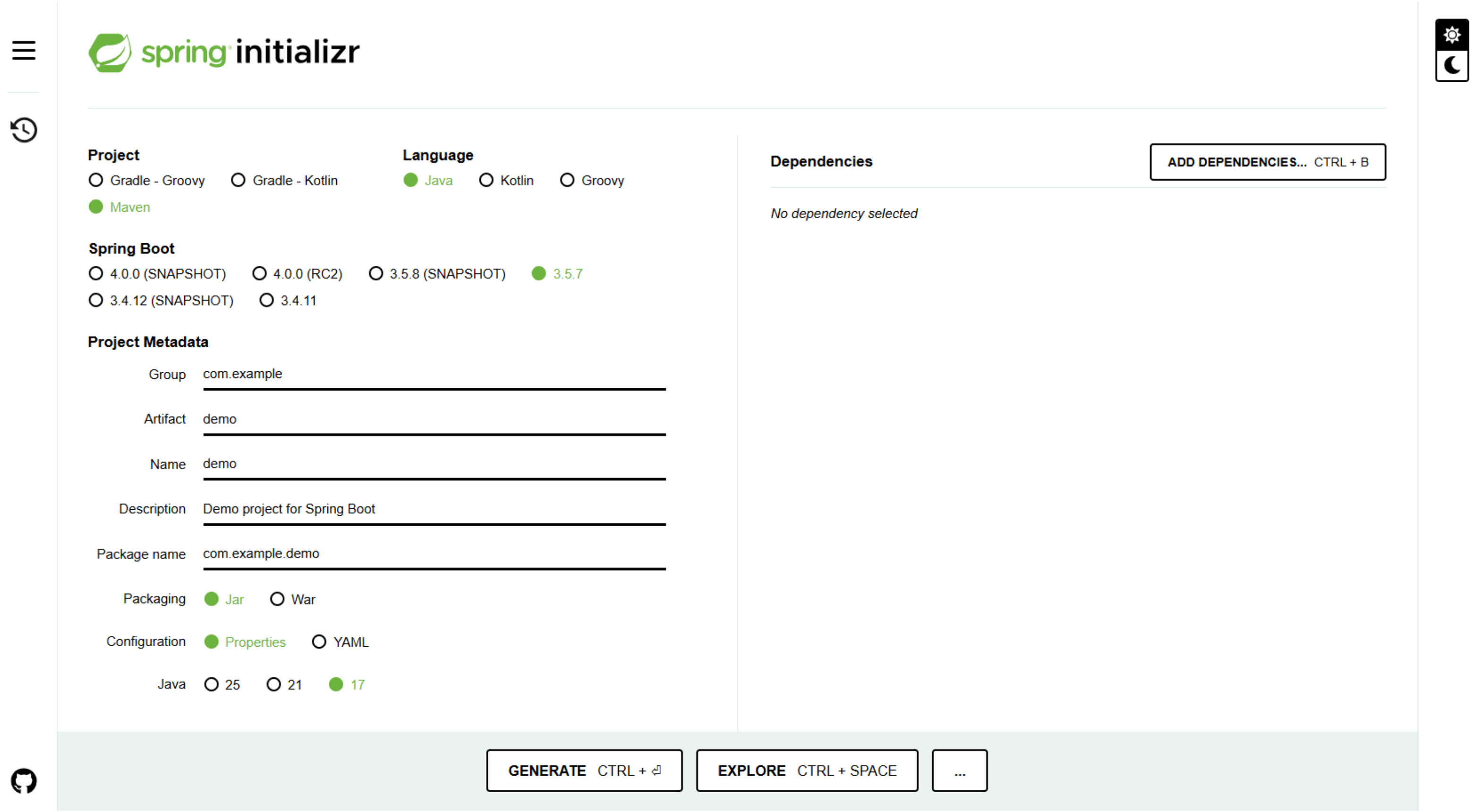
```java
@Entity
@Table(name = "posts")
public class Post {

    @Id
    @GeneratedValue(strategy = GenerationType.IDENTITY)
    private Long id;

    private String title;

    private String content;
```

Spring – Initializr



spring initializr

Project

○ Gradle - Groovy ○ Gradle - Kotlin
● Maven

Language

● Java ○ Kotlin ○ Groovy

Spring Boot

○ 4.0.0 (SNAPSHOT) ○ 4.0.0 (RC2) ○ 3.5.8 (SNAPSHOT) ● 3.5.7
○ 3.4.12 (SNAPSHOT) ○ 3.4.11

Project Metadata

Group com.example

Artifact demo

Name demo

Description Demo project for Spring Boot

Package name com.example.demo

Packaging ● Jar ○ War

Configuration ● Properties ○ YAML

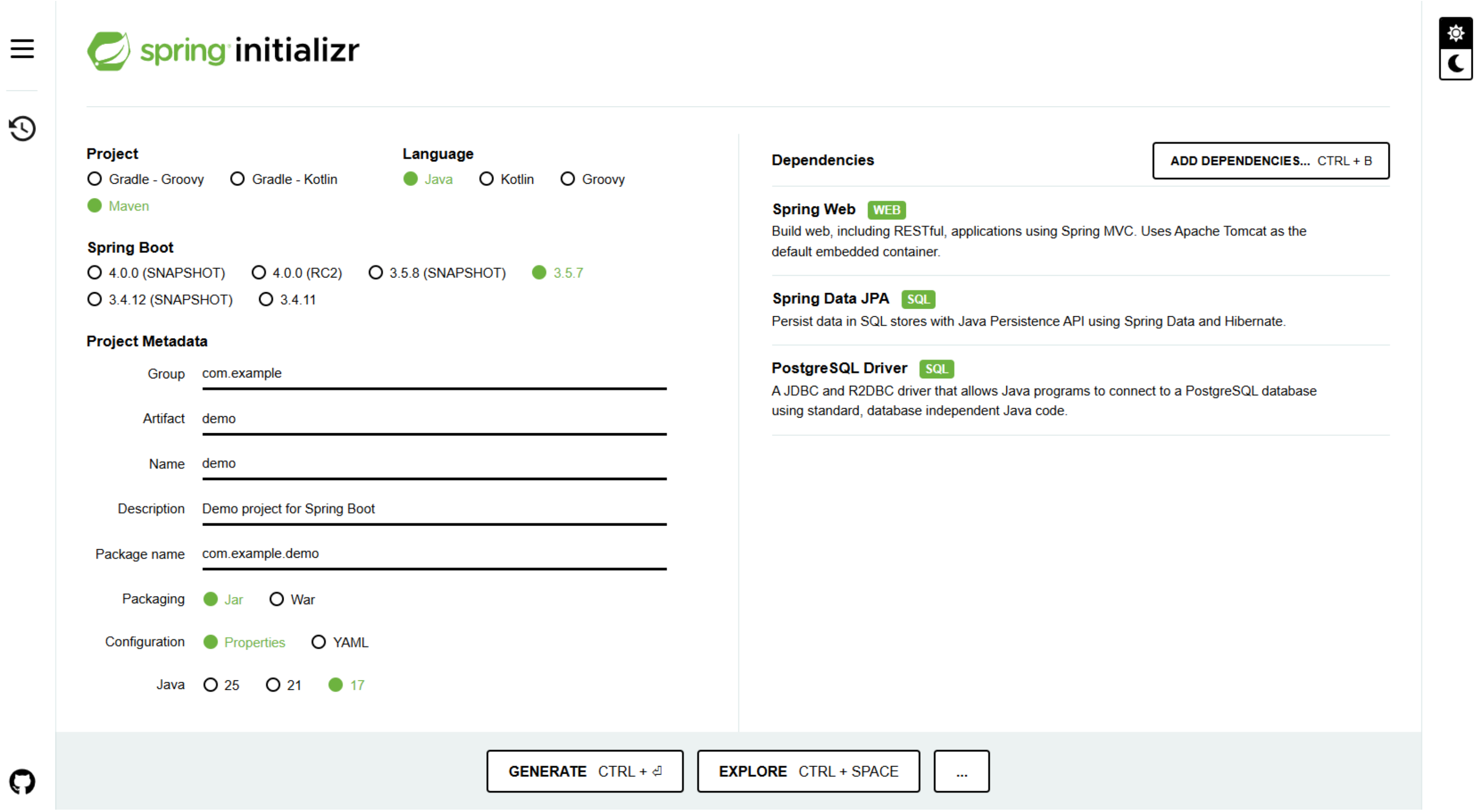
Java ○ 25 ○ 21 ● 17

Dependencies

No dependency selected

start.spring.io

Spring – Initializr



Project

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● Maven

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● Java ○ Kotlin ○ Groovy

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○ 3.4.12 (SNAPSHOT) ○ 3.4.11

Project Metadata

Group: com.example

Artifact: demo

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Description: Demo project for Spring Boot

Package name: com.example.demo

Packaging: ● Jar ○ War

Configuration: ● Properties ○ YAML

Java: ○ 25 ○ 21 ● 17

Dependencies

Spring Web WEB

Build web, including RESTful, applications using Spring MVC. Uses Apache Tomcat as the default embedded container.

Spring Data JPA SQL

Persist data in SQL stores with Java Persistence API using Spring Data and Hibernate.

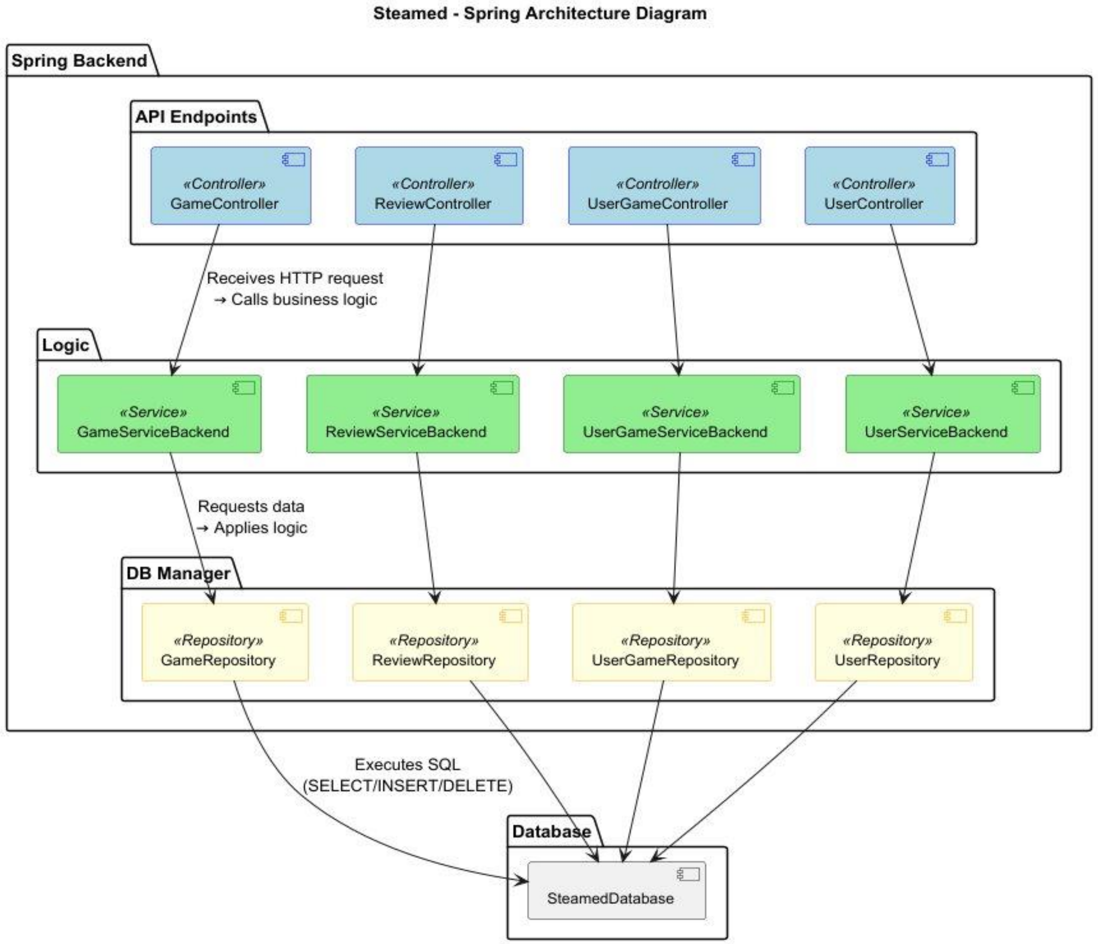
PostgreSQL Driver SQL

A JDBC and R2DBC driver that allows Java programs to connect to a PostgreSQL database using standard, database independent Java code.

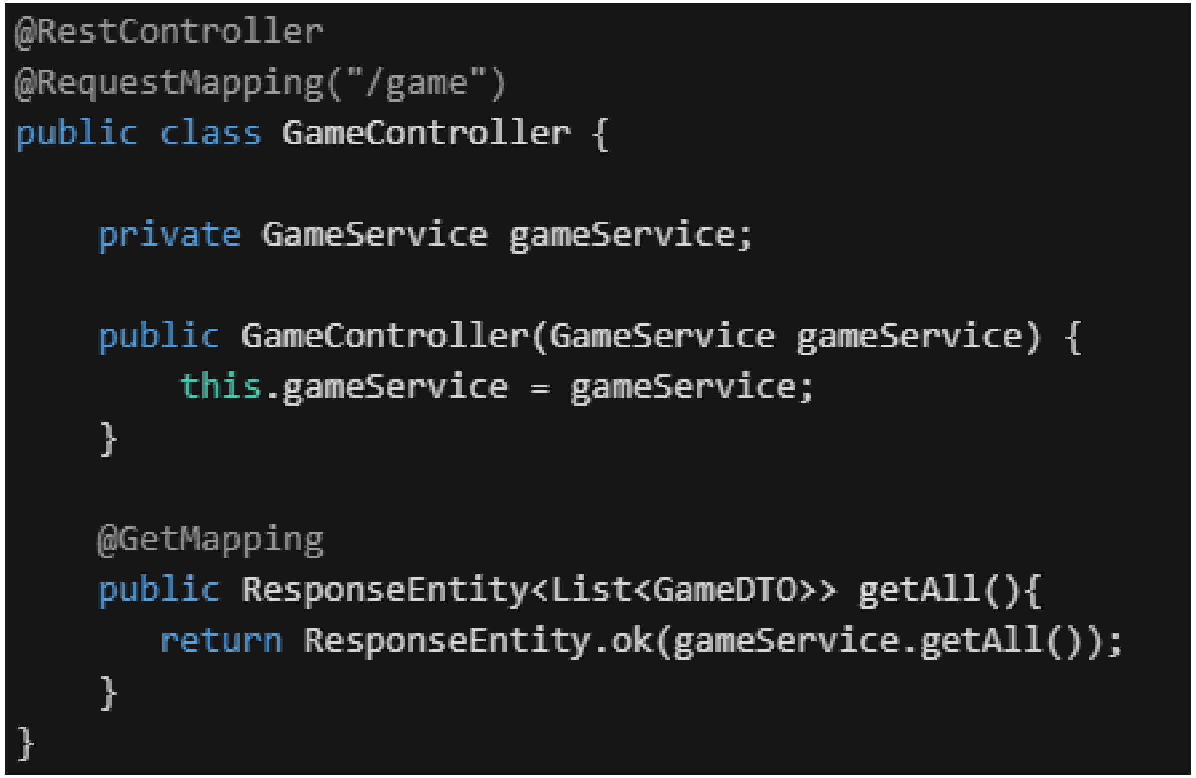
start.spring.io

Spring – How to Use

- Controller
- Service
- Repository


Steamed - Spring Architecture Diagram
Spring Backend
API Endpoints
«Controller» GameController
«Controller» ReviewController
«Controller» UserGameController
«Controller» UserController
Receives HTTP request
→ Calls business logic
Logic
«Service» GameServiceBackend
«Service» ReviewServiceBackend
«Service» UserGameServiceBackend
«Service» UserServiceBackend
Requests data
→ Applies logic
DB Manager
«Repository» GameRepository
«Repository» ReviewRepository
«Repository» UserGameRepository
«Repository» UserRepository
Executes SQL
(SELECT/INSERT/DELETE)
Database
SteamedDatabase

Spring (Web) – Controller



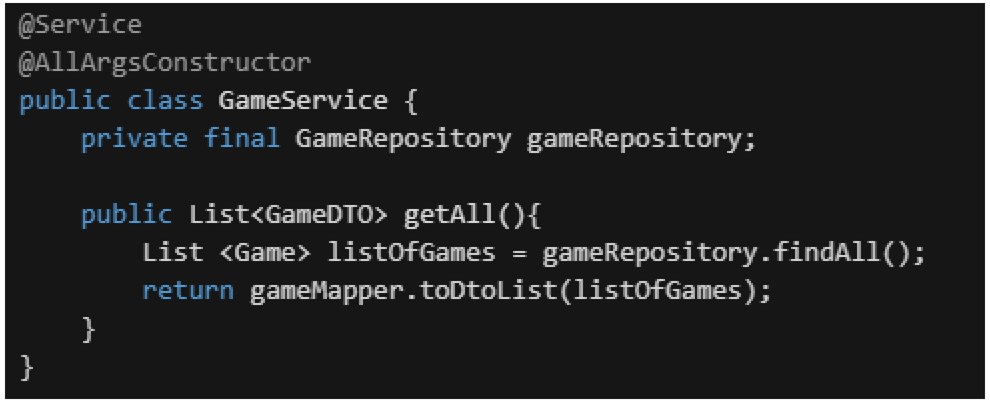
```java
@RestController
@RequestMapping("/game")
public class GameController {

    private GameService gameService;

    public GameController(GameService gameService) {
        this.gameService = gameService;
    }

    @GetMapping
    public ResponseEntity<List<GameDTO>> getAll(){
       return ResponseEntity.ok(gameService.getAll());
    }
}
```

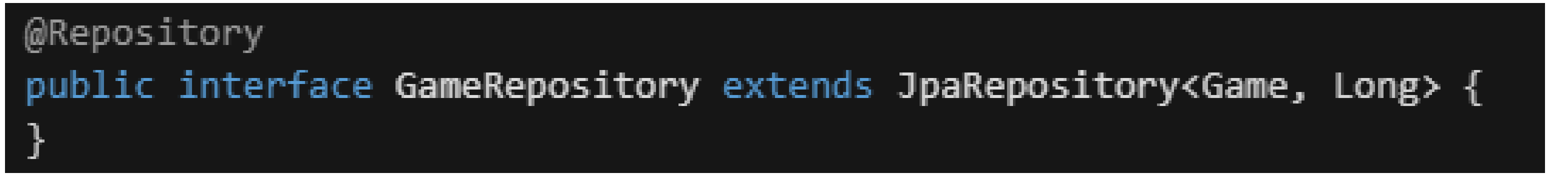
Spring (Web) – Service



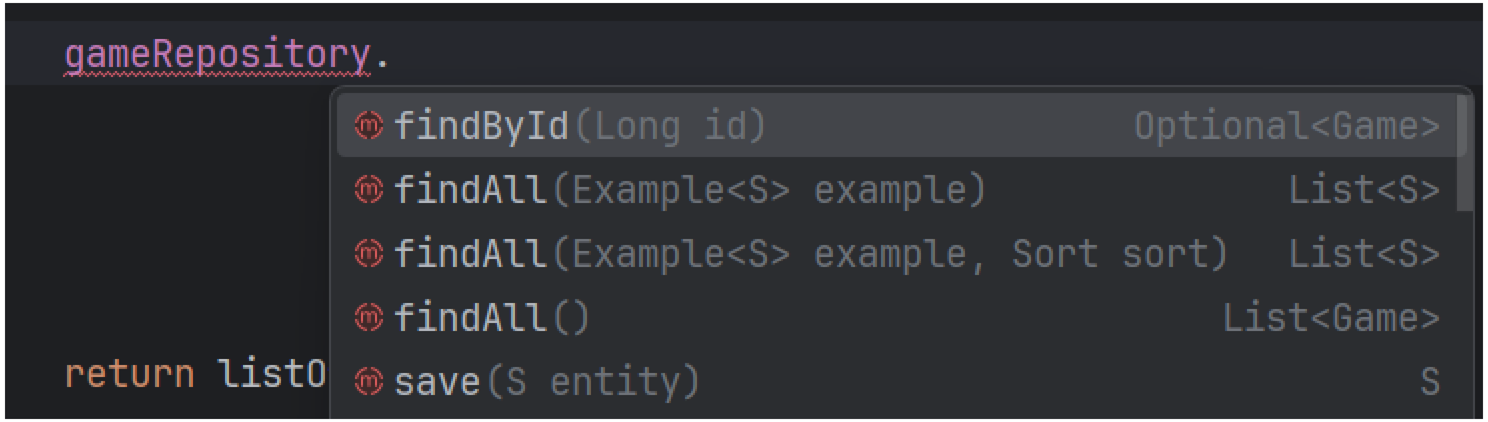
```
@Service
@AllArgsConstructor
public class GameService {
    private final GameRepository gameRepository;

    public List<GameDTO> getAll(){
        List <Game> listOfGames = gameRepository.findAll();
        return gameMapper.toDtoList(listOfGames);
    }
}
```

Spring (Data JPA) – Repository



```java
@Repository
public interface GameRepository extends JpaRepository<Game, Long> {
}
```



```
gameRepository.
          findById(Long id)                          Optional<Game>
          findAll(Example<S> example)                       List<S>
          findAll(Example<S> example, Sort sort)            List<S>
          findAll()                                      List<Game>
return listO save(S entity)                                       S
```

Workshop

Image sources:

- devmercy (12 January 2025) Spring Data JPA: Speed Up Development & Business Focus. Available at: https://dev.to/devmercy/spring-data-jpa-speed-up-development-business-focus-1ob9 (Accessed: 16 November 2025).

- TMS Outsource (August 13, 2025) Java Statistics: Usage and Market Share. Available at: https://tms-outsource.com/blog/posts/java-statistics/ (Accessed: 13 November 2025).