Software Engineering

LESSON 05

Spring Framework (Core)

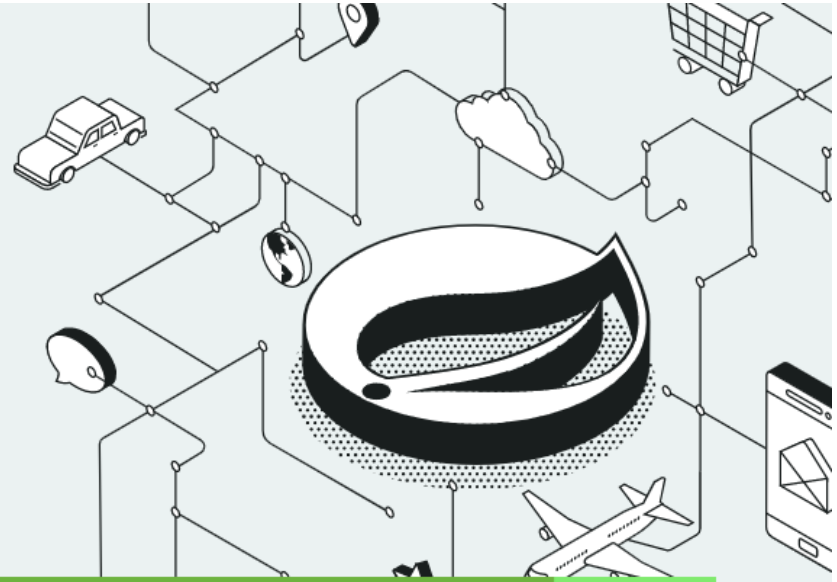
Outline

- Introduction
- Spring projects
- Spring Framework Architecture
- Web Project Example
- Web Project Example (VS Code)

Introduction

Why Spring?

Spring makes programming Java quicker, easier, and safer for everybody. Spring's focus on speed, simplicity, and productivity has made it the world's most popular Java framework.



"We use a lot of the tools that come with the Spring framework and reap the benefits of having a lot of the out of the box solutions, and not having to worry about writing a ton of additional code—so that really saves us some time and energy."

Introduction

Spring is everywhere

Spring's flexible libraries are trusted by developers all over the world. Spring delivers delightful experiences to millions of end-users every day—whether that's streaming TV, connected cars, online shopping, or countless other innovative solutions. Spring also has contributions from all the big names in tech, including Alibaba, Amazon, Google, Microsoft, and more.

Spring is flexible

Spring's flexible and comprehensive set of extensions and third-party libraries let developers build almost any application imaginable. At its core, Spring Framework's Inversion of Control (IoC) and Dependency Injection (DI) features provide the foundation for a wide-ranging set of features and functionality. Whether you're building secure, reactive, cloud-based microservices for the web, or complex streaming data flows for the enterprise, Spring has the tools to help.

Spring is productive

Spring Boot transforms how you approach Java programming tasks, radically streamlining your experience. Spring Boot combines necessities such as an application context and an auto-configured, embedded web server to make microservice development a cinch. To go even faster, you can combine Spring Boot with Spring Cloud's rich set of supporting libraries, servers, patterns, and templates, to safely deploy entire microservices-based architectures into the cloud, in record time.

Spring is fast

Our engineers care deeply about performance. With Spring, you'll notice fast startup, fast shutdown, and optimized execution, by default. Increasingly, Spring projects also support the reactive (nonblocking) programming model for even greater efficiency. Developer productivity is Spring's superpower. Spring Boot helps developers build applications with ease and with far less toil than other competing paradigms. Embedded web servers, auto-configuration, and "fat jars" help you get started quickly, and innovations like LiveReload in Spring DevTools mean developers can iterate faster than ever before. You can even start a new Spring project in seconds, with the Spring

What Spring can do

Microservices

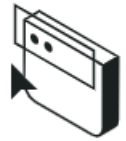
Quickly deliver production-grade features with independently evolvable microservices.

Reactive

Spring's asynchronous, nonblocking architecture means you can get more from your computing resources.

Cloud

Your code, any cloud—we've got you covered. Connect and scale your services, whatever your platform.



Web apps

Frameworks for fast, secure, and responsive web applications connected to any data store.

Serverless

The ultimate flexibility. Scale up on demand and scale to zero when there's no demand.

Event Driven

Integrate with your enterprise. React to business events. Act on your streaming data in realtime.

Batch

Automated tasks. Offline processing of data at a time to suit you.

Spring projects

Spring Boot

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

Spring Framework

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

Spring Data

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

Spring Cloud

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

Spring projects

Spring Cloud Data Flow

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

Spring Security

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

Spring Session

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

Spring Integration

Supports the well-known Enterprise Integration Patterns through lightweight messaging and declarative adapters.

Spring projects

Spring for Android

Provides key Spring components for use in developing Android applications.

Spring CredHub

Provides client-side support for storing, retrieving, and deleting credentials from a CredHub server running in a Cloud Foundry platform.

Spring Flo

Provides a JavaScript library that offers a basic embeddable HTML5 visual builder for pipelines and simple graphs.

Spring for Apache Kafka

Provides Familiar Spring Abstractions for Apache Kafka.

Spring projects

Spring LDAP

Simplifies the development of applications that use LDAP by using Spring's familiar template-based approach.

Spring Mobile

Simplifies the development of mobile web apps through device detection and progressive rendering options.

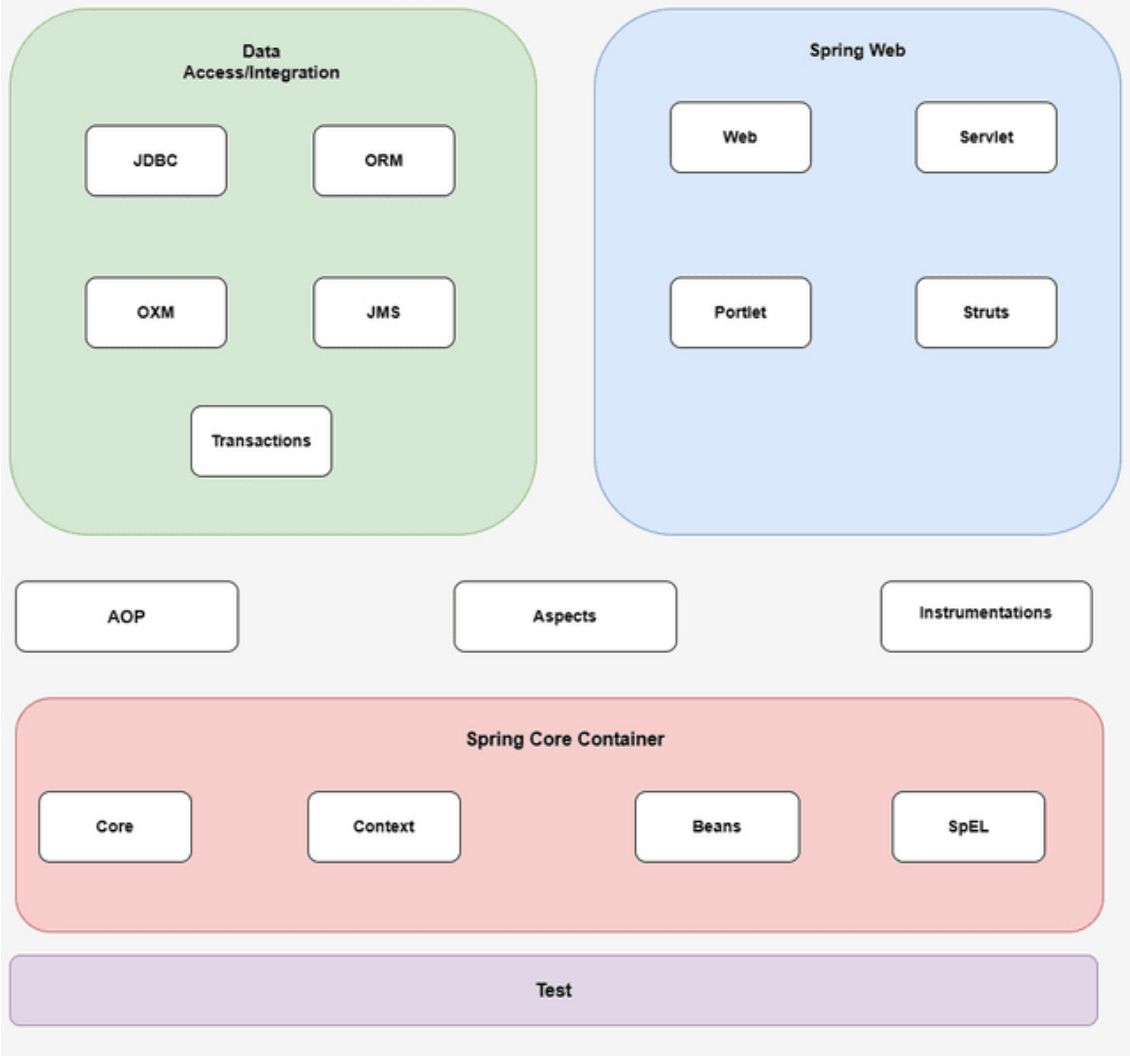
Spring Roo

Makes it fast and easy to build full Java applications in minutes.

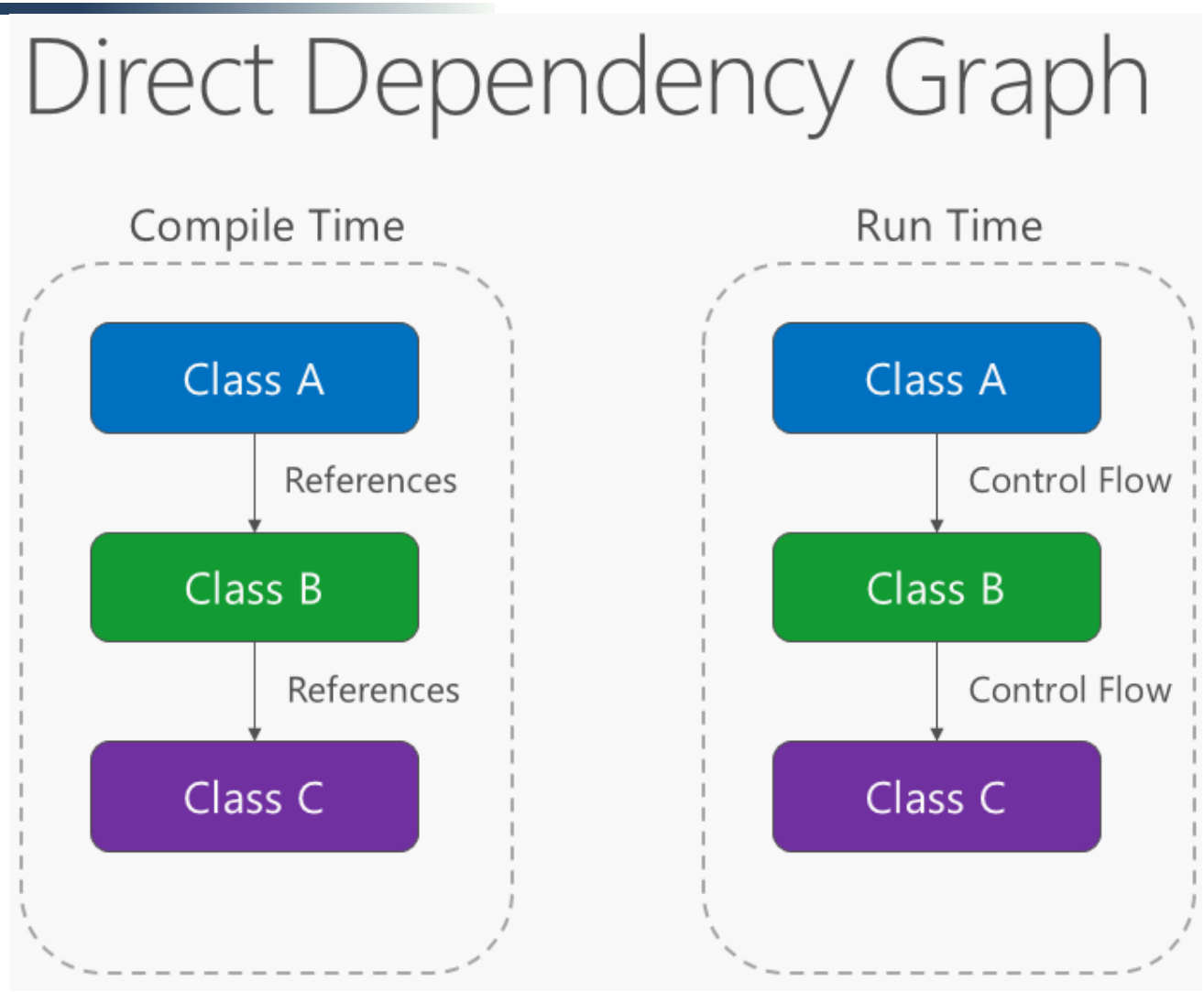
Spring Shell

Makes writing and testing RESTful applications easier with CLI-based resource discovery and interaction.

Spring Framework Architecture

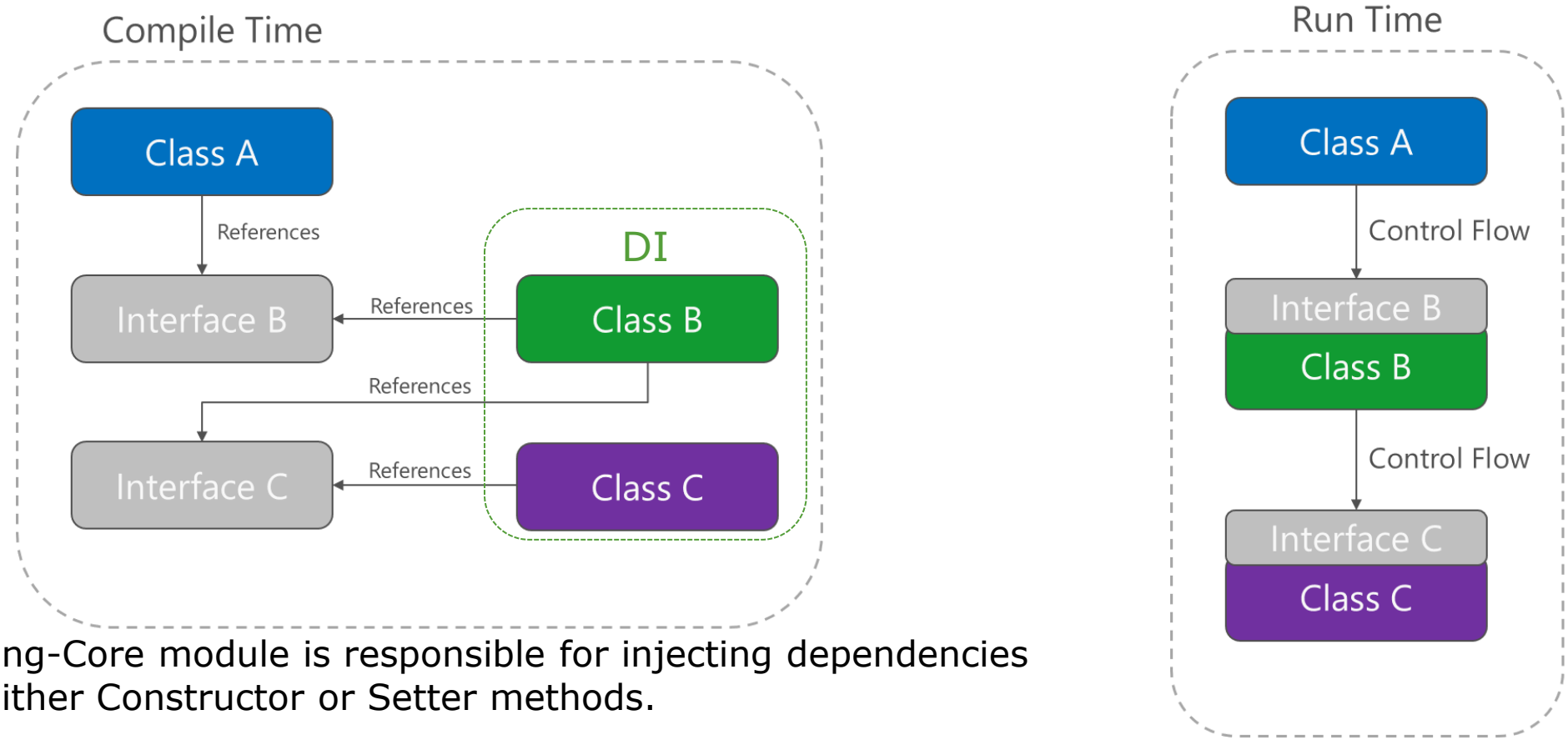


Inversion of Control (IoC)



Inversion of Control (IoC)

Inverted Dependency Graph

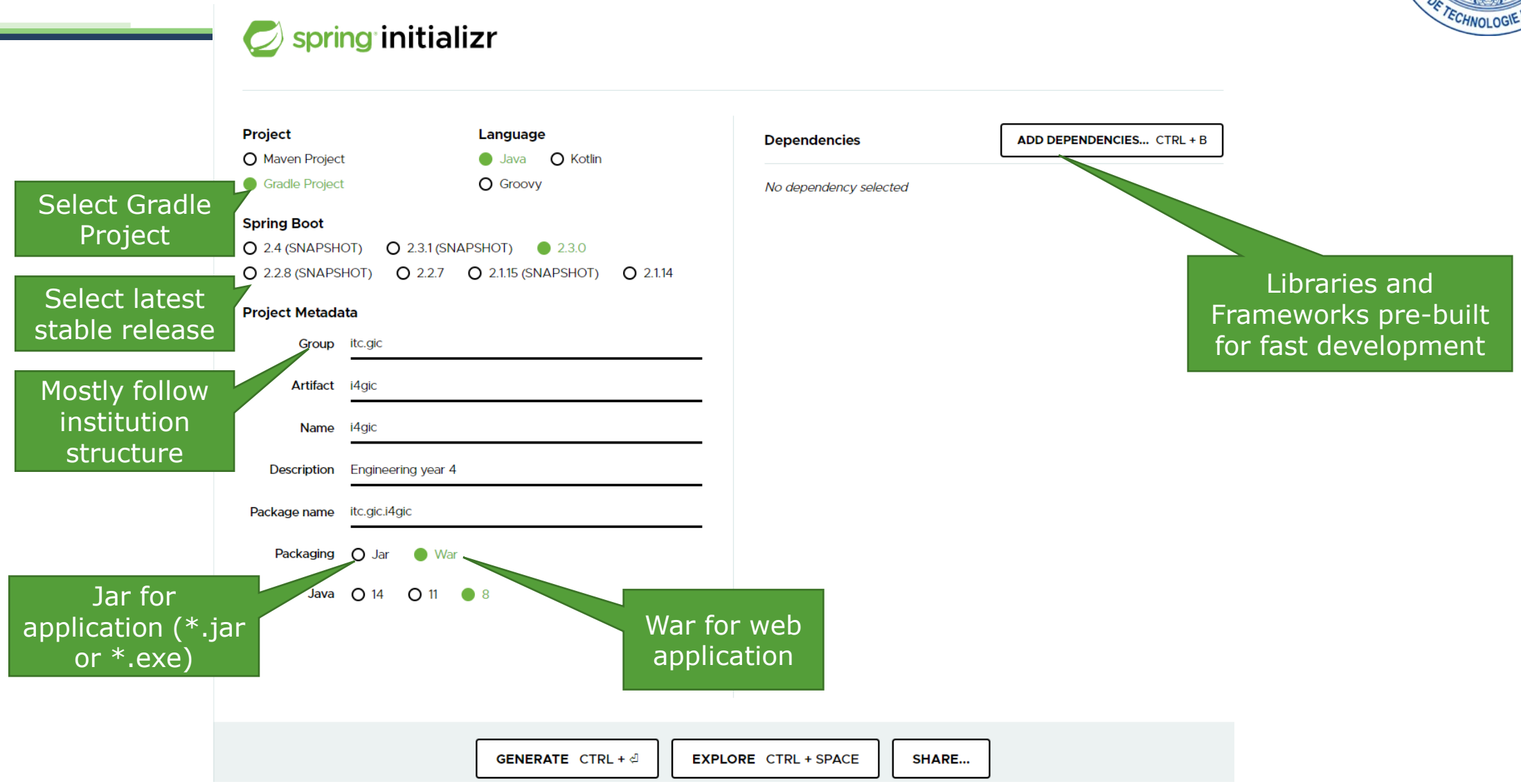


The Spring-Core module is responsible for injecting dependencies through either Constructor or Setter methods.

Web Project Example

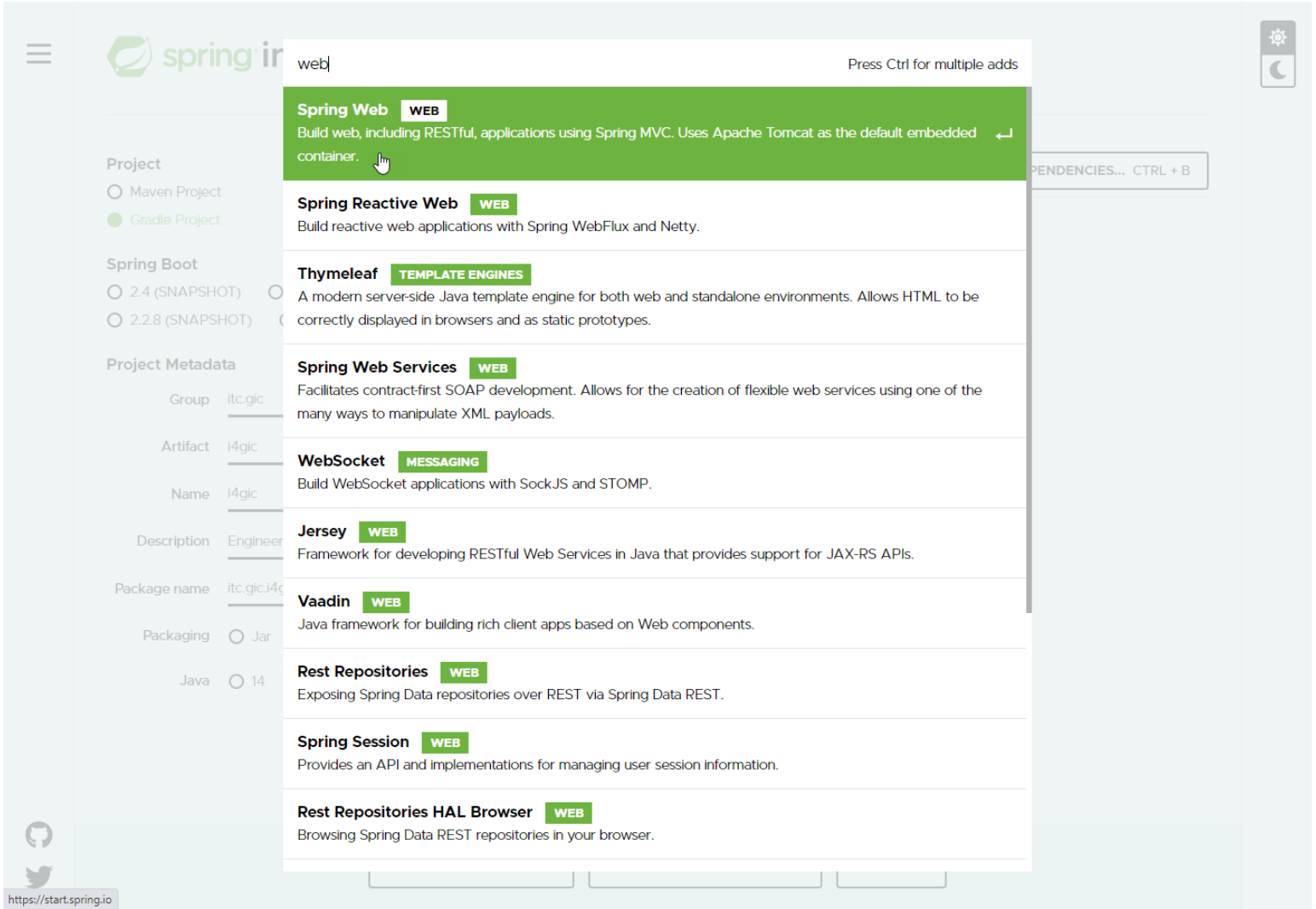
Step 1: Use start.spring.io to create a “web” project. In the “Dependencies” dialog search for and add the “web” dependency as shown in the screenshot. Hit the “Generate” button, download the zip, and unpack it into a folder on your computer.

Web Project Example



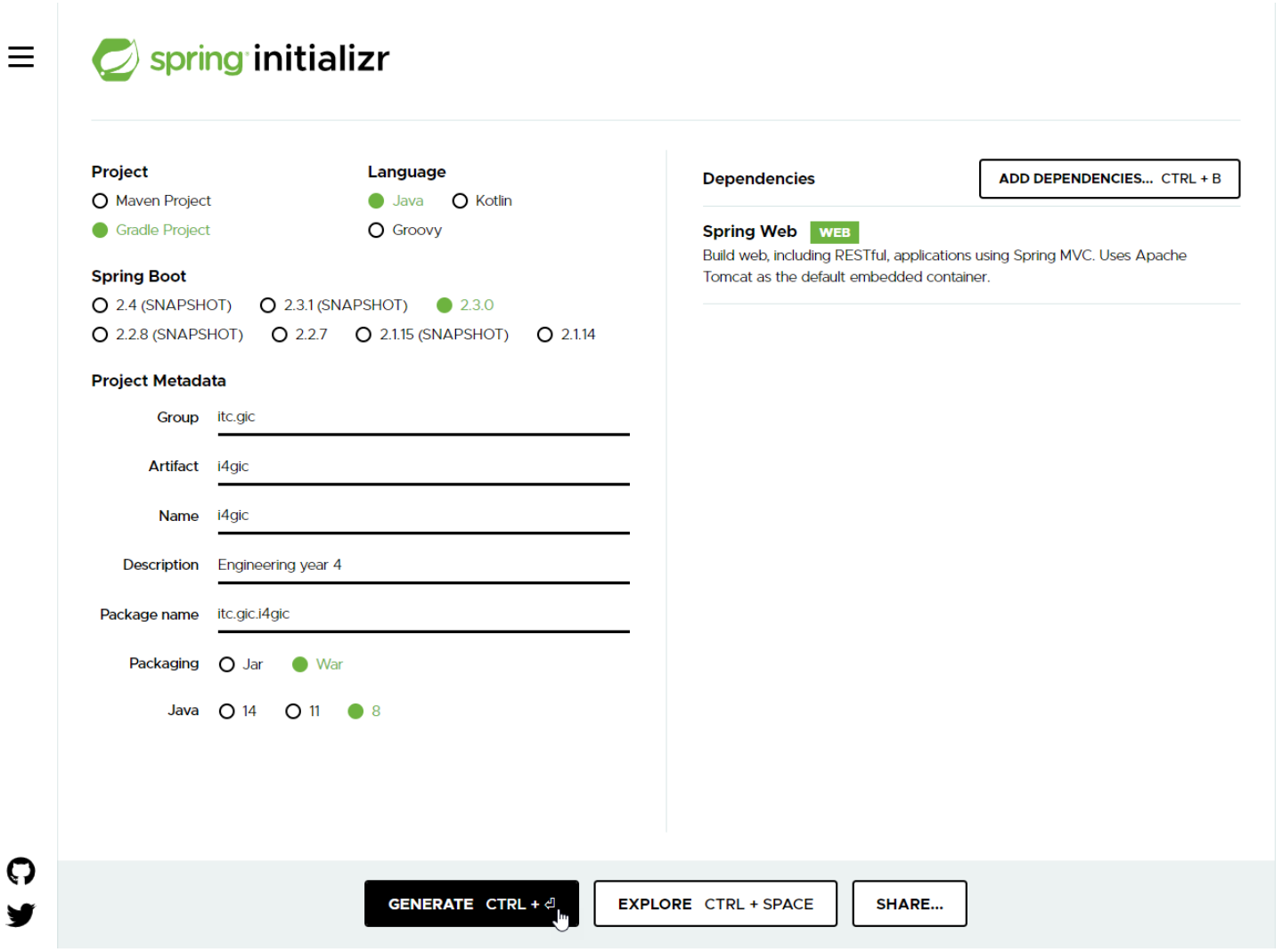
Web Project Example

Add **Spring Web** dependency project.



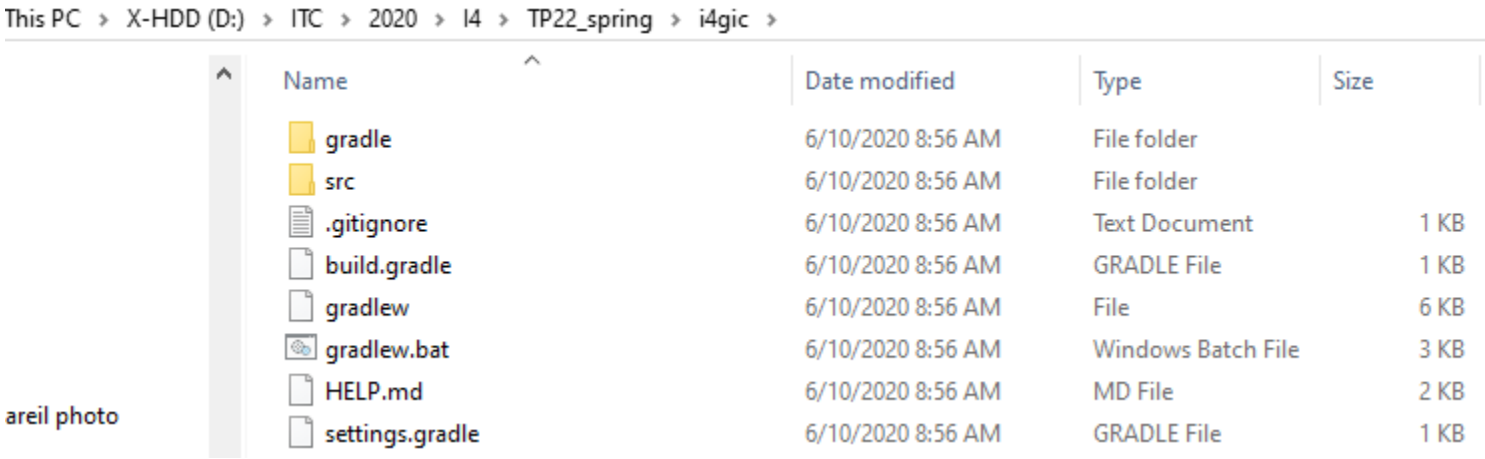
Web Project Example

Click button **GENERATE** to generate and download the project.

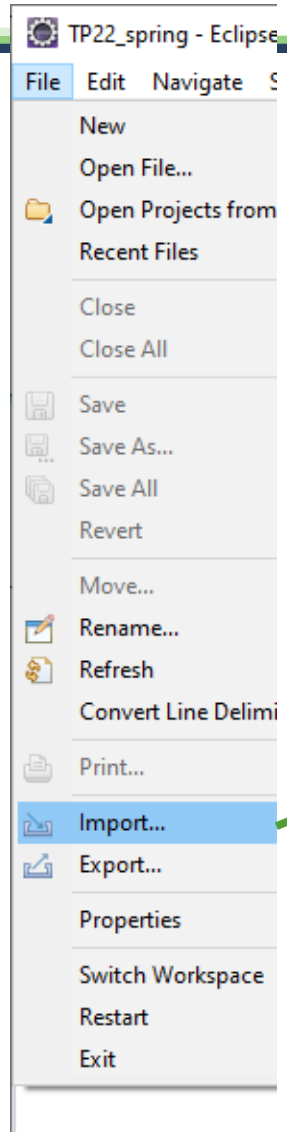


Web Project Example

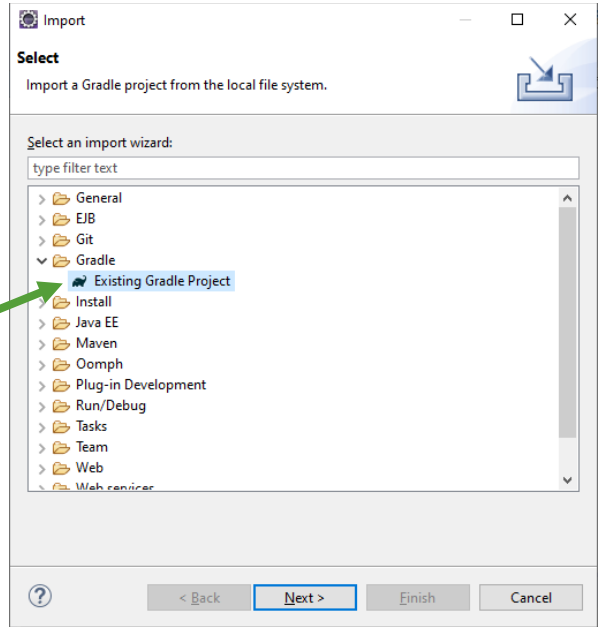
Extract downloaded file.

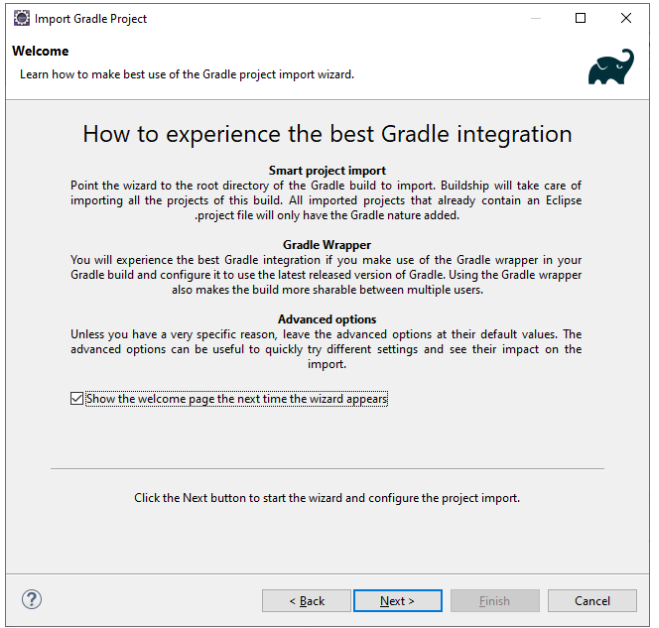


Web Project Example



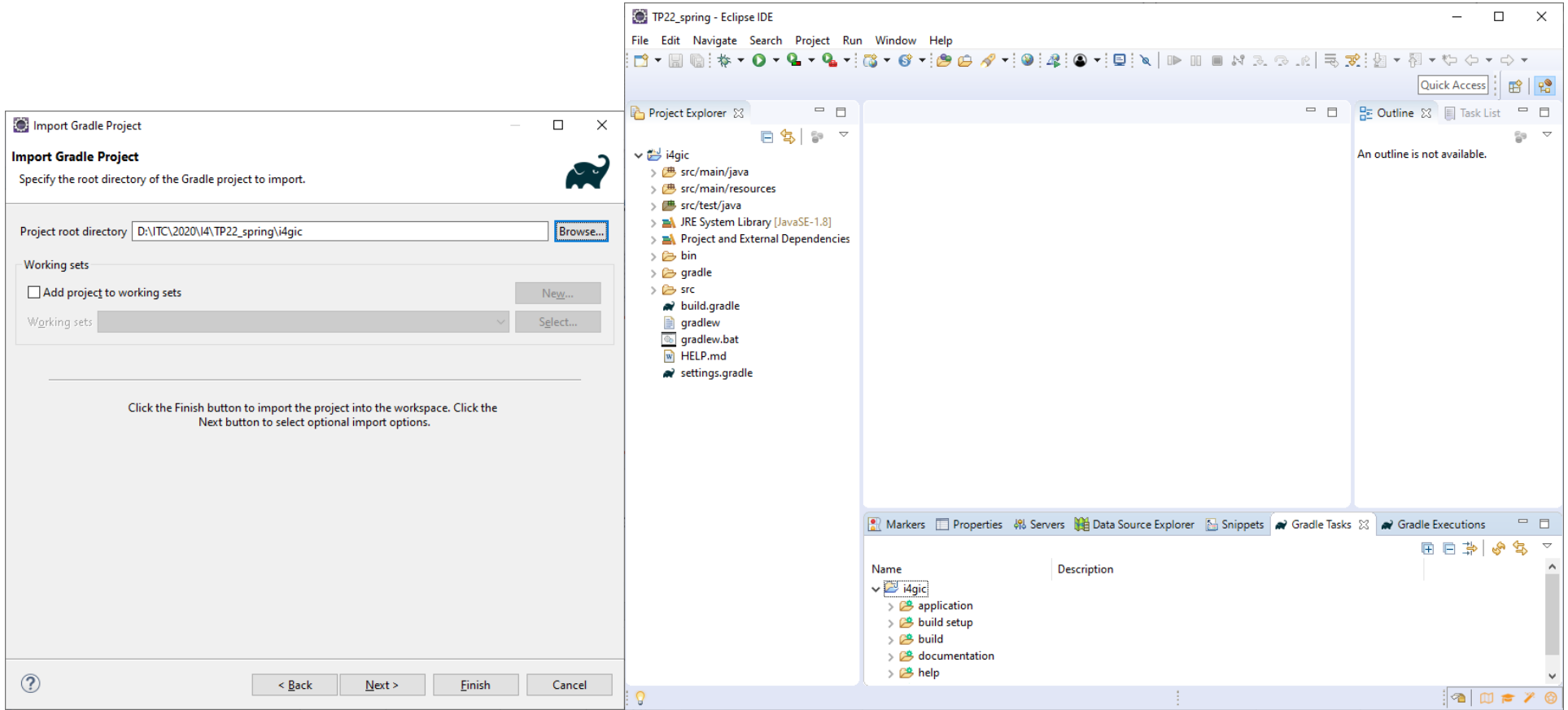
- IDE supports IntelliJ IDEA, Spring Tools, Visual Studio Code, or Eclipse, and many more.
- In this example we use **Eclipse**.
  1. Open Eclipse
  2. File menu ➔ Import…➔Existing Gradle Project ➔Next ➔Next ➔Browse…





Web Project Example

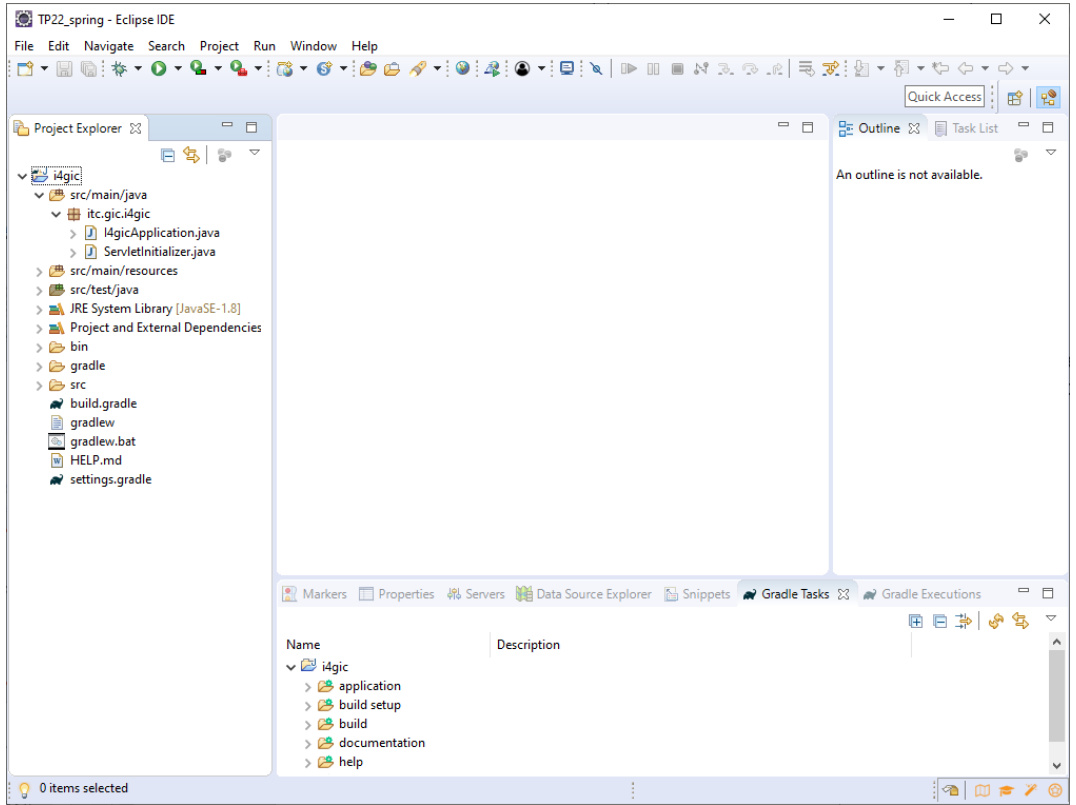
3. Select extracted folder **i4gic**
4. If keep defaults just click **Finish**.



Web Project Example

Step 2: Add your code

Locate the **I4gicApplication.java** file in the **src/main/java/itc/gic/i4gic** folder. Now change the contents of the file by adding the extra method and annotations shown in the code below. You can copy and paste the code or just type it.



Web Project Example

```java
package itc.gic.i4gic;

import org.springframework.boot.SpringApplication;
import org.springframework.boot.autoconfigure.SpringBootApplication;
import org.springframework.web.bind.annotation.GetMapping;
import org.springframework.web.bind.annotation.RequestParam;
import org.springframework.web.bind.annotation.RestController;

@SpringBootApplication
@RestController
public class I4gicApplication {

  public static void main(String[] args) {
    SpringApplication.run(I4gicApplication.class, args);
  }

  @GetMapping("/hello")
  public String hello(@RequestParam(name="name", defaultValue="World")String name) {
    return String.format("Hello %s!", name);
  }
}
```

The hello() method we've added is designed to take a String parameter called name, and then combine this parameter with the word "Hello" in the code. This means that if you set your name to "Sreng" in the request, the response would be "Hello Sreng!".

Web Project Example

```java
package itc.gic.i4gic;

import org.springframework.boot.SpringApplication;
import org.springframework.boot.autoconfigure.SpringBootApplication;
import org.springframework.web.bind.annotation.GetMapping;
import org.springframework.web.bind.annotation.RequestParam;
import org.springframework.web.bind.annotation.RestController;

@SpringBootApplication
@RestController
public class I4gicApplication {

  public static void main(String[] args) {
    SpringApplication.run(I4gicApplication.class, args);
  }

  @GetMapping("/hello")
  public String hello(@RequestParam(name="name", defaultValue="World")String name) {
    return String.format("Hello %s!", name);
  }
}
```

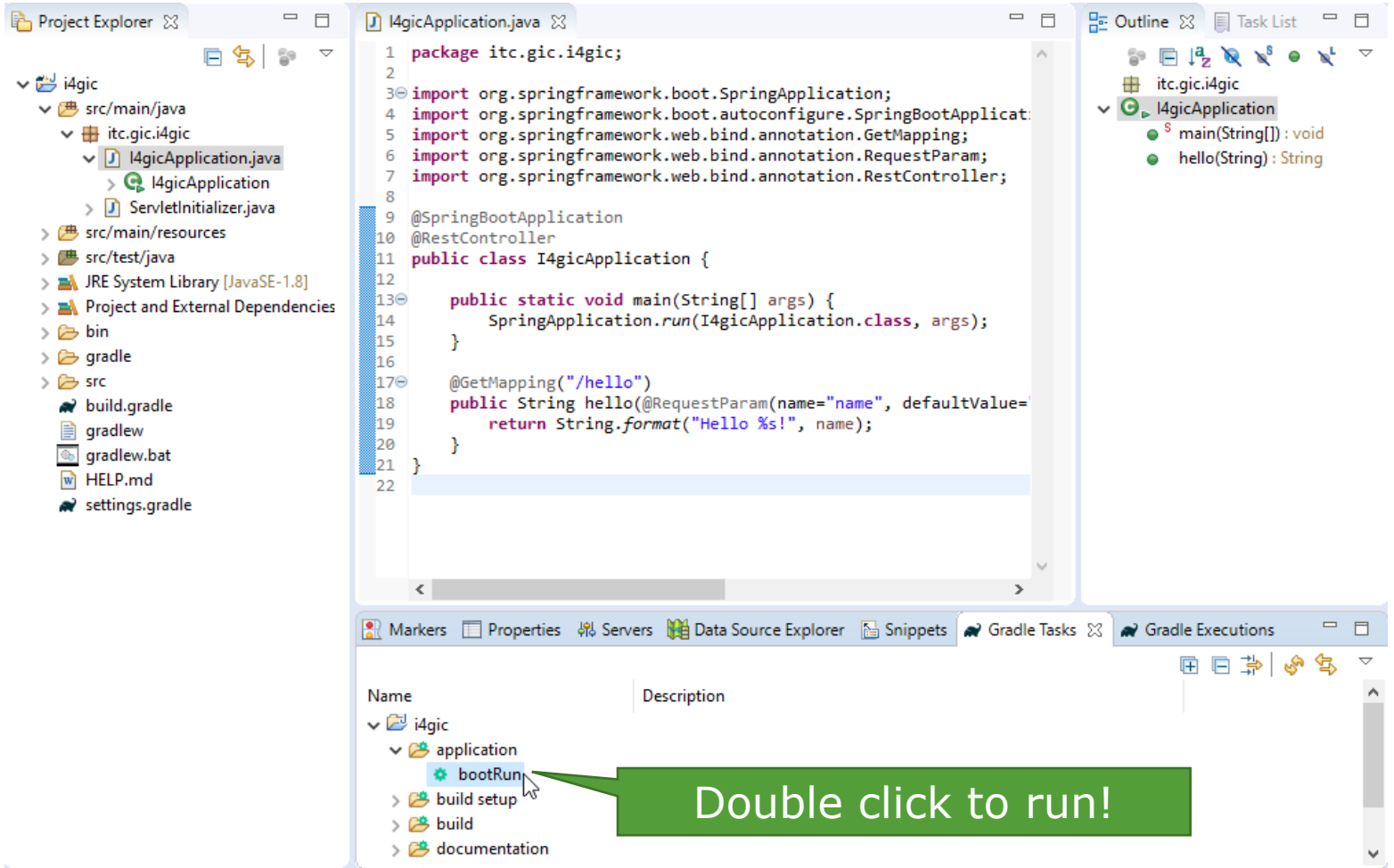
The **@RestController** annotation tells Spring that this code describes an endpoint that should be made available over the web.

The **@GetMapping("/hello")** tells Spring to use our hello() method to answer requests that get sent to the http://localhost:8080/hello address.

the **@RequestParam** is telling Spring to expect a name value in the request, but if it's not there, it will use the word "**World**" by default.

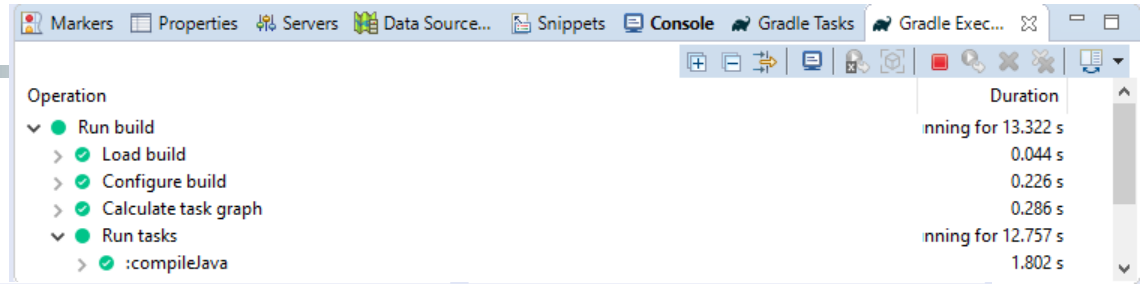
Web Project Example

Step 3: Run web app



Web Project Example

Step 3: Run web app



Markers | Properties | Servers | Data Source Explorer | Snippets | Console | Gradle Tasks | Gradle Executions

i4gic - bootRun [Gradle Project] bootRun in D:\ITC\2020\I4\TP22_spring\i4gic (Jun 10, 2020 4:56:23 PM)

```
Working Directory: D:\ITC\2020\I4\TP22_spring\i4gic
Gradle User Home: C:\Users\DICE\.gradle
Gradle Distribution: Gradle wrapper from target build
Gradle Version: 6.4.1
Java Home: C:\Program Files\Java\jdk1.8.0_181
JVM Arguments: None
Program Arguments: None
Build Scans Enabled: false
Offline Mode Enabled: false
Gradle Tasks: bootRun

> Task :compileJava
> Task :processResources
> Task :classes

> Task :bootRun

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 \\/  ___)| |_)| | | | | || (_| |  ) ) ) )
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 =========|_|==============|___/=/_/_/_/
 :: Spring Boot ::        (v2.3.0.RELEASE)

2020-06-10 16:56:28.080  INFO 7532 --- [           main] itc.gic.i4gic.I4gicApplication           : Starting I4gicApplication on DESKTOP-P9IPQM1 with PID 7532 (D:\ITC
\2020\I4\TP22_spring\i4gic\build\classes\java\main started by DICE in D:\ITC\2020\I4\TP22_spring\i4gic)
2020-06-10 16:56:28.084  INFO 7532 --- [           main] itc.gic.i4gic.I4gicApplication           : No active profile set, falling back to default pro
2020-06-10 16:56:30.069  INFO 7532 --- [           main] o.s.b.w.embedded.tomcat.TomcatWebServer  : Tomcat initialized with port(s): 8080 (http)
2020-06-10 16:56:30.082  INFO 7532 --- [           main] o.apache.catalina.core.StandardService   : Starting service [Tomcat]
2020-06-10 16:56:30.083  INFO 7532 --- [           main] org.apache.catalina.core.StandardEngine  : Starting Servlet engine: [Apache Tomcat/9.0.35]
2020-06-10 16:56:30.177  INFO 7532 --- [           main] o.a.c.c.C.[Tomcat].[localhost].[/]       : Initializing Spring embedded WebApplicationContext
2020-06-10 16:56:30.177  INFO 7532 --- [           main] o.s.web.context.ContextLoader            : Root WebApplicationContext: initialization completed in 2029 ms
2020-06-10 16:56:30.362  INFO 7532 --- [           main] o.s.s.concurrent.ThreadPoolTaskExecutor  : Initializing ExecutorService 'applicationTaskExecutor'
2020-06-10 16:56:30.533  INFO 7532 --- [           main] o.s.b.w.embedded.tomcat.TomcatWebServer  : Tomcat started on port(s): 8080 (http) with context path ''
2020-06-10 16:56:30.545  INFO 7532 --- [           main] itc.gic.i4gic.I4gicApplication           : Started I4gicApplication in 2.954 seconds (JVM running for 3.556)
```
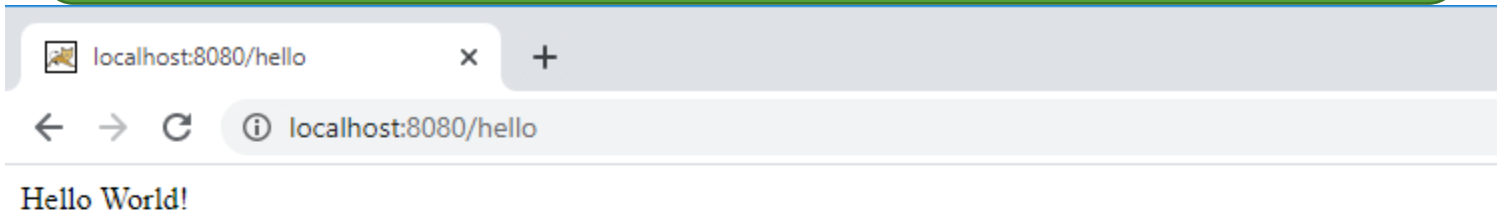

Start Tomcat 9.0.35 at port 8080

Web Project Example

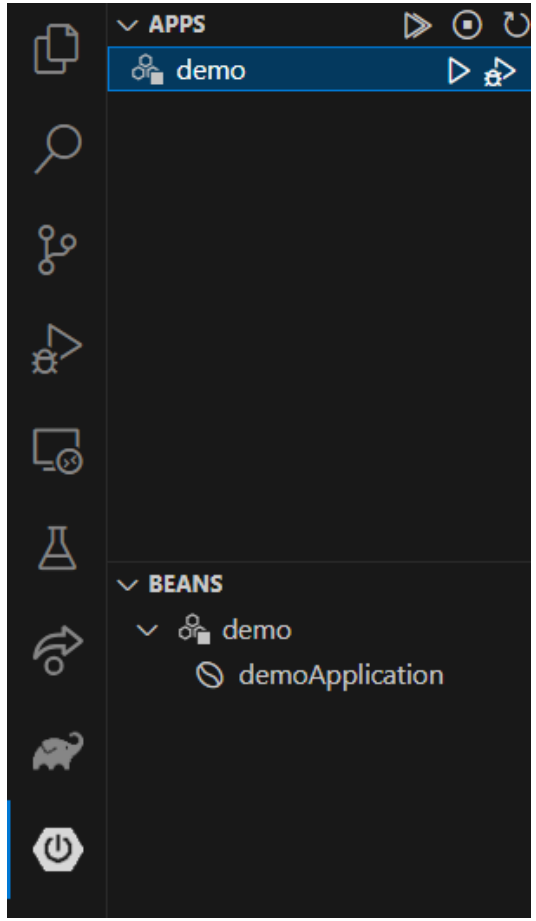
Now open your browser and go to address:
http://localhost:8080/hello



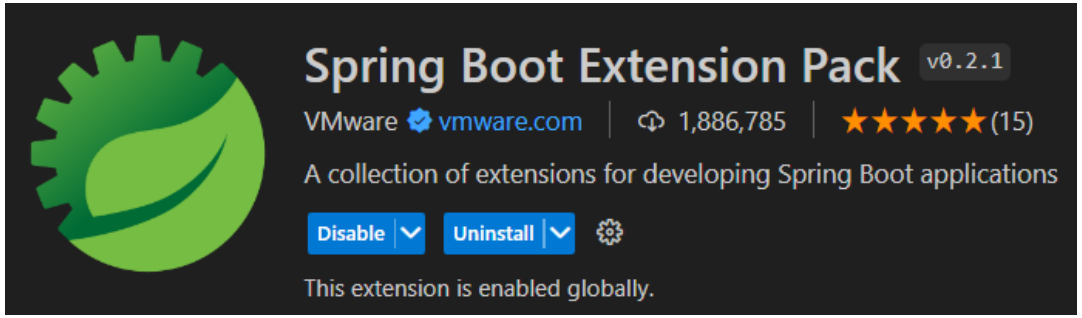
Try add parameter to URL **?name=your_name** what will be displayed?

Web Project Example (VS Code)

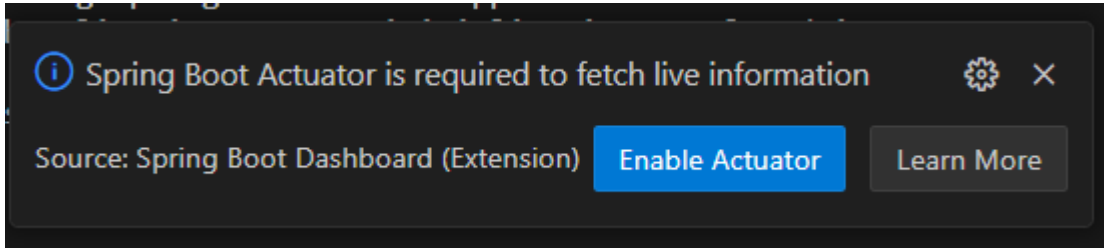
- In case we use **Visual Studio Code**.



1. Open the project folder with Visual Studio Code
2. "**Spring Boot Extension Pack**" is needed



3. After the extension is activated, you run the project by opening Spring Boot Tab on the left.
   If you want to monitor app health, enable Actuator.



References

- https://spring.io/
- https://spring.io/quickstart
- https://start.spring.io/
- https://spring.io/guides
- https://spring.io/guides#getting-started-guides
- https://spring.io/projects
- https://projects.spring.io/spring-roo/#quick-start
- https://www.geeksforgeeks.org/spring-framework-architecture/