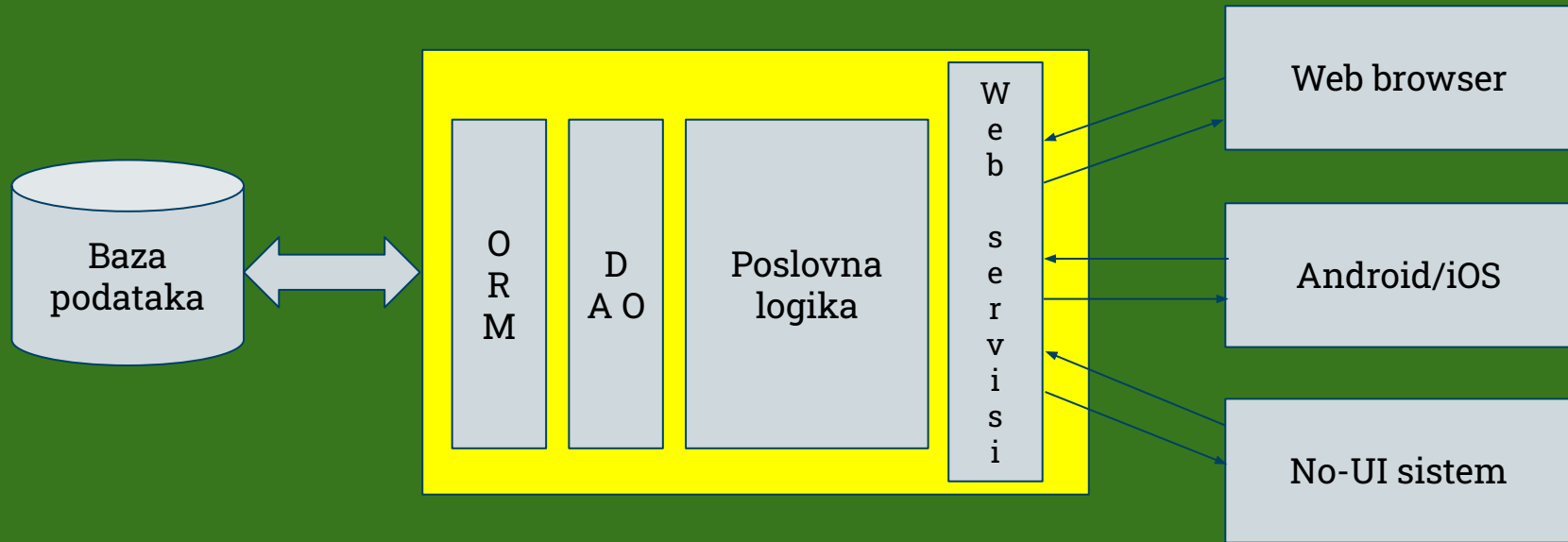


Uvod u Spring radni okvir

Sadržaj

- Namena Spring radnog okvira
- Spring Boot
- Java anotacije
- Maven

Spring u višeslojnoj arhitekturi



Objektno-relaciono mapiranje

- Objektni model domena potrebno je preslikati u relacioni model
- Java Enterprise Edition (JEE) specifikacija za ORM je Java Persistence API (JPA)
- Više postojećih implementacija JPA specifikacije
 - Hibernate
 - EclipseLink
 - Apache OpenJPA
- Spring radni okvir koristi Hibernate

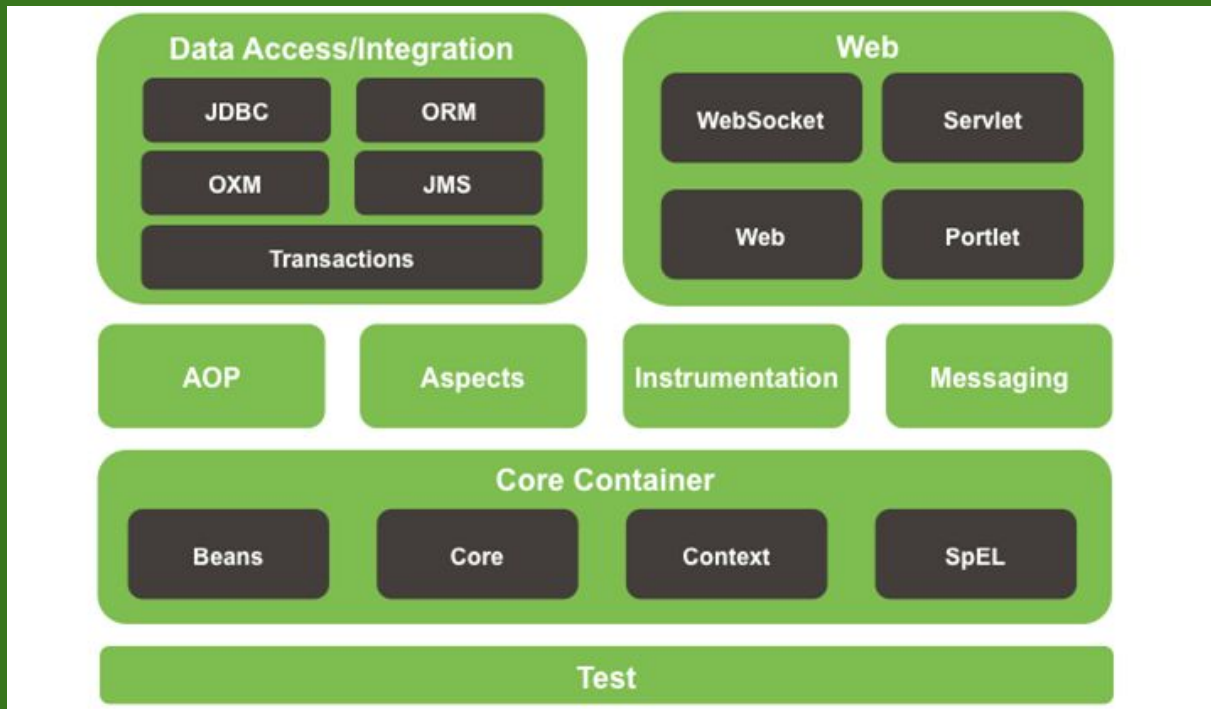
RESTful *web* servisi

- *Representational State Transfer (REST)* je softverski stil arhitekture
- Koristi HTTP metode za izvršavanje operacija
 - GET - čitanje
 - POST - upis
 - PUT - modifikacija
 - DELETE - brisanje
- Uz navođenje URL-a i HTTP metode šalje se poruka *provider*-u servisa
- Kao rezultat servis vraća odgovor u odgovarajućem formatu
- Koristi JSON za format poruka
 - Pogodno za Java Script klijente, nema potrebe za konverzijom sadržaj poruke

O Spring radnom okviru

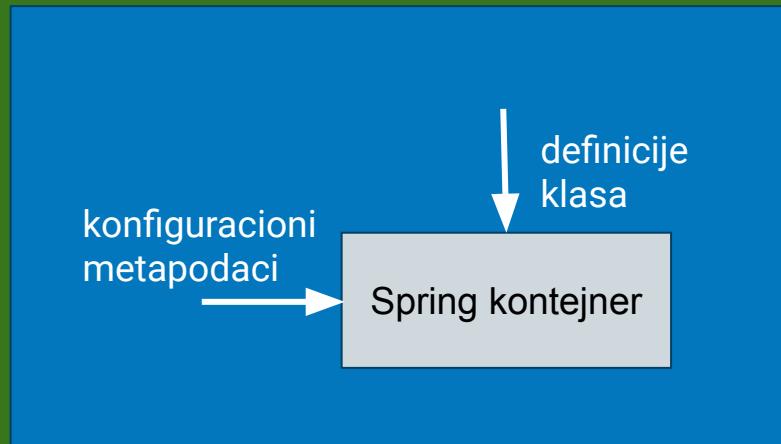
- Radni okvir otvorenog koda (engl. *open source framework*)
- Nastao kao odgovor na komplikovanu JEE specifikaciju za razvoj aplikacija srednjeg sloja (koje se industriji nazivaju *backend* aplikacije)
- Definiše “model programiranja i konfigurisanja” za aplikacije zasnovane na Java programskom jeziku
- Obezbeđuje *Inversion of Control* kontejner
- Čini ga više modula različite namene

Spring moduli



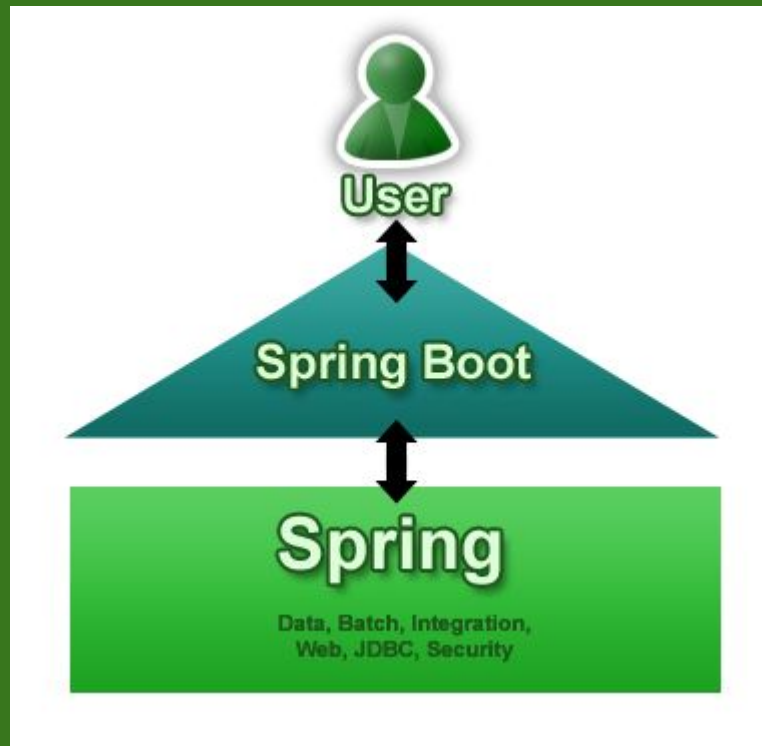
Spring kontejner

- Koristi konfiguracione metapodatke i definicije klasa kako bi instancirao i inicijalizovao komponente aplikacije
- Konfigurisanje
 - XML
 - Java anotacije (Spring 2.5+)
 - Java kod (Spring 3.0+)
- Kontejner upravlja *bean*-ovima unutar konteksta aplikacije



Spring Boot

- Projekat u okviru Spring-a
- Olakšava razvoj Spring aplikacija
- Obezbeđuje
 - znatno brže *getting started* iskustvo
 - nefunkcionalne mogućnosti aplikacije
 - ugrađeni Tomcat
 - *security*
 - metrika
 - ...



Kreiranje Spring Boot aplikacije

- <https://start.spring.io/>

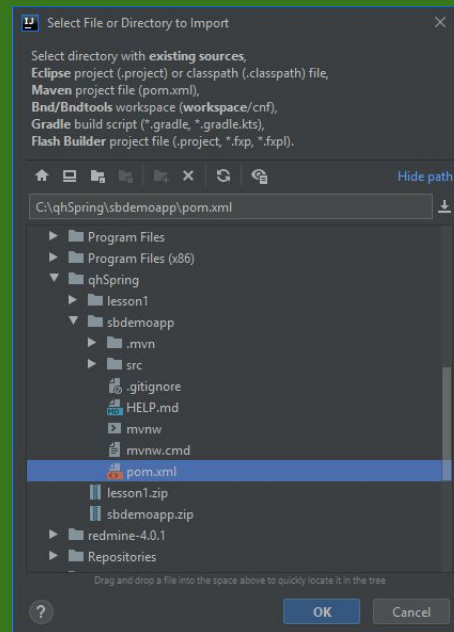
The screenshot shows the Spring Initializr web application interface. The header features the Spring logo and the text "spring initializr". The main content area is divided into several sections:

- Project:** Includes radio buttons for "Maven Project" (selected) and "Gradle Project".
- Language:** Includes radio buttons for "Java" (selected), "Kotlin", and "Groovy".
- Spring Boot:** Includes radio buttons for "2.3.0 RC1", "2.3.0 (SNAPSHOT)", "2.2.7 (SNAPSHOT)", "2.2.6" (selected), "2.1.14 (SNAPSHOT)", and "2.1.13".
- Project Metadata:** Includes input fields for "Group" (com.example), "Artifact" (demo), "Name" (demo), "Description" (Demo project for Spring Boot), and "Package name" (com.example.demo).
- Packaging:** Includes radio buttons for "Jar" (selected) and "War".
- Java:** Includes radio buttons for "14", "11", and "8" (selected).
- Dependencies:** Includes a button "ADD DEPENDENCIES... CTRL + B" and the text "No dependency selected".

At the bottom of the interface, there are three buttons: "GENERATE CTRL + G", "EXPLORE CTRL + SPACE", and "SHARE...".

Kreiranje Spring Boot projekta u IDE

- Spring Tool Suite (STS)
 - generisanje kostura Spring Boot projekta iz IDE
File - New - Spring Starter Project
 - otvaranje projekta generisanog pomoću stranice Sprint Initializr
- IntelliJ IDEA
 - generisanje kostura Spring Boot projekta iz IDE
File - New - Project... - Spring Intializr
 - otvaranje projekta generisanog pomoću Sprint Initializr



Spring Boot Application klasa

- `@SpringBootApplication` predstavlja metapodatke za Spring kontejner

```
package rs.inforce.sbdemoapp;

import org.springframework.boot.SpringApplication;
import org.springframework.boot.autoconfigure.SpringBootApplication;

@SpringBootApplication
public class SbdemoappApplication {

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

}
```

Log pri pokretanju Spring Boot aplikacije

```
Console Endpoints
↑
↓
:: Spring Boot :: (v2.2.5.RELEASE)

2020-03-18 16:43:35.279 INFO 15520 --- [main] r.i.sbdemoapp.SbdemoappApplication : Starting SbdemoappApplication on DESKTOP-P9S026E with PID 15520 (C:\qhSpring\sbdemoapp\target\classes started by djordje in C:\qhSpring\sbdemoapp)
2020-03-18 16:43:35.284 INFO 15520 --- [main] r.i.sbdemoapp.SbdemoappApplication : No active profile set, falling back to default profiles: default
2020-03-18 16:43:36.261 INFO 15520 --- [main] .s.d.r.c.RepositoryConfigurationDelegate : Bootstrapping Spring Data JPA repositories in DEFAULT mode.
2020-03-18 16:43:36.276 INFO 15520 --- [main] .s.d.r.c.RepositoryConfigurationDelegate : Finished Spring Data repository scanning in 11ms. Found 0 JPA repository interfaces.
2020-03-18 16:43:36.745 INFO 15520 --- [main] o.s.b.w.embedded.tomcat.TomcatWebServer : Tomcat initialized with port(s): 8080 (http)
2020-03-18 16:43:36.745 INFO 15520 --- [main] o.apache.catalina.core.StandardService : Starting service [Tomcat]
2020-03-18 16:43:36.745 INFO 15520 --- [main] org.apache.catalina.core.StandardEngine : Starting Servlet engine: [Apache Tomcat/9.0.31]
2020-03-18 16:43:36.870 INFO 15520 --- [main] o.a.c.c.C.[Tomcat].[localhost].[/] : Initializing Spring embedded WebApplicationContext
2020-03-18 16:43:36.870 INFO 15520 --- [main] o.s.web.context.ContextLoader : Root WebApplicationContext: initialization completed in 1541 ms
2020-03-18 16:43:36.995 INFO 15520 --- [main] com.zaxxer.hikari.HikariDataSource : HikariPool-1 - Starting...
2020-03-18 16:43:37.151 INFO 15520 --- [main] com.zaxxer.hikari.HikariDataSource : HikariPool-1 - Start completed.
2020-03-18 16:43:37.198 INFO 15520 --- [main] o.hibernate.jpa.internal.util.LogHelper : HHH000204: Processing PersistenceUnitInfo [name: default]
2020-03-18 16:43:37.292 INFO 15520 --- [main] org.hibernate.Version : HHH000412: Hibernate ORM core version 5.4.12.Final
2020-03-18 16:43:38.061 INFO 15520 --- [main] o.hibernate.annotations.common.Version : HCANN000001: Hibernate Commons Annotations {5.1.0.Final}
2020-03-18 16:43:38.418 INFO 15520 --- [main] org.hibernate.dialect.Dialect : HHH000400: Using dialect: org.hibernate.dialect.H2Dialect
2020-03-18 16:43:39.182 INFO 15520 --- [main] o.h.e.t.j.p.i.JtaPlatformInitiator : HHH000490: Using JtaPlatform implementation: [org.hibernate.engine.transaction.jta.platform.internal.NoJtaPlatform]
2020-03-18 16:43:39.276 INFO 15520 --- [main] j.LocalContainerEntityManagerFactoryBean : Initialized JPA EntityManagerFactory for persistence unit 'default'
2020-03-18 16:43:39.760 WARN 15520 --- [main] JpaBaseConfiguration$JpaWebConfiguration : spring.jpa.open-in-view is enabled by default. Therefore, database queries may be performed during view rendering. Explicitly configure spring.jpa.
2020-03-18 16:43:40.267 INFO 15520 --- [main] o.s.s.concurrent.ThreadPoolTaskExecutor : Initializing ExecutorService 'applicationTaskExecutor'
2020-03-18 16:43:40.641 INFO 15520 --- [main] o.s.b.w.embedded.tomcat.TomcatWebServer : Tomcat started on port(s): 8080 (http) with context path ''
2020-03-18 16:43:40.641 INFO 15520 --- [main] r.i.sbdemoapp.SbdemoappApplication : Started SbdemoappApplication in 5.92 seconds (JVM running for 7.096)
```

Ukratko o Java anotacijama

- Predstavljaju metapodatke o delovima programa
- Dostupne od Java 5 verzije
- Mogu da se odnose na:
 - kompajliranje
 - procesiranje prilikom *deployment*-a
 - procesiranje prilikom izvršavanja aplikacije
- Primeri:
 - `@Override`
`public void paint(Graphics g) {...`
 - `@Author(name="Djordje")`
`public class Order {...`

Anotacija `@SpringBootApplication`

- Prečica za tri anotacije

- `@Configuration`

Ukazuje da klasa sadrži konfigurisanje konteksta Spring aplikacije

- `@EnableAutoConfiguration`

Omogućava automatsko konfigurisanje - važna osobina Spring Boot aplikacija.

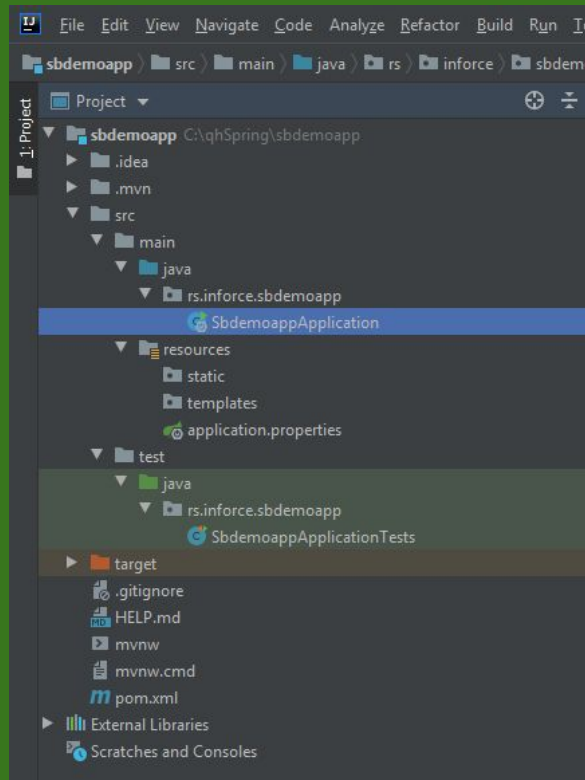
Primer: Ukoliko na *classpath*-u imamo HSQLDB i nismo ručno konfigurisali *bean* za konekciju na bazu podataka, Spring će automatski konfigurisati *in-memory* bazu podataka

- `@ComponentScan`

Omogućava skeinanje Spring *bean*-ova u paketu ove klase i svim podređenim paketima

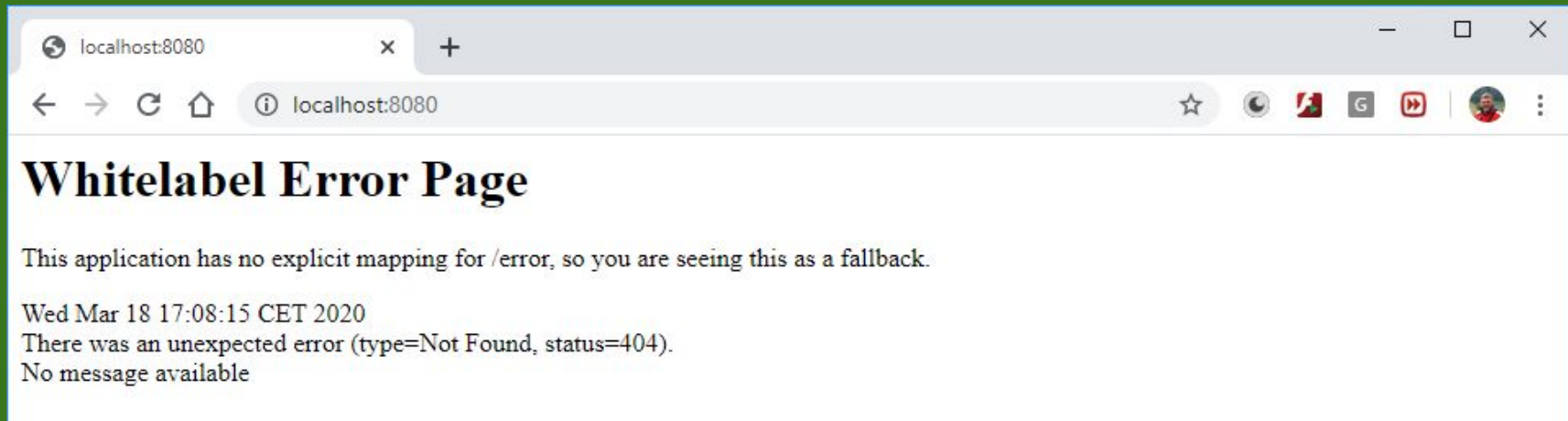
Struktura projekta

- Maven struktura
 - src/main/java
 - src/main/resources
 - src/test/java
- Fajl application.properties
- Fajl pom.xml
 - zavisnosti
 - Java verzija
 - način pakovanja (jar ili war)



Pristup *home* stranici aplikacije (1)

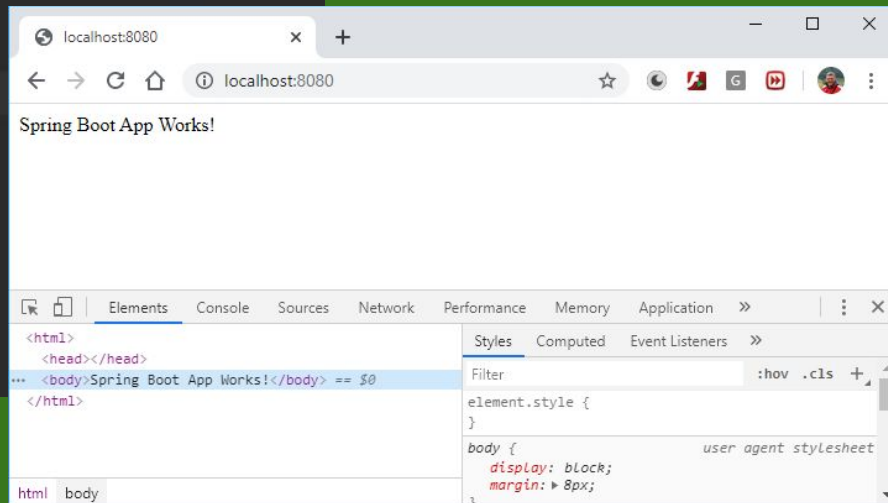
- Stranica koja prikazuje grešku znači da Spring aplikacija radi ali da ne može da odgovori na konkretan HTTP zahtev (<http://localhost:8080>)



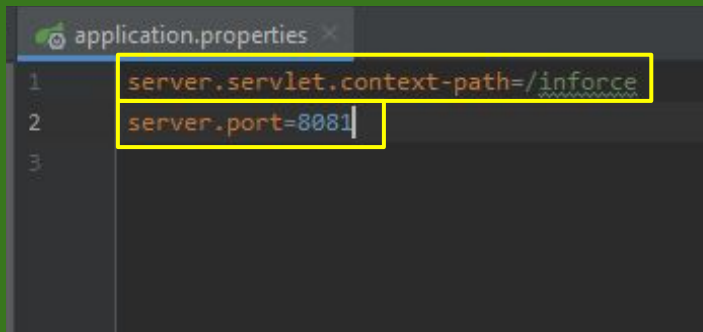
Pristup *home* stranici aplikacije (2)

```
package rs.inforce.sbdemoapp.controllers;  
  
import org.springframework.web.bind.annotation.RequestMapping;  
import org.springframework.web.bind.annotation.RestController;
```

```
@RestController  
public class DemoController {  
  
    @RequestMapping("/")  
    public String greeting() {  
        return "Spring Boot App Works!";  
    }  
}
```

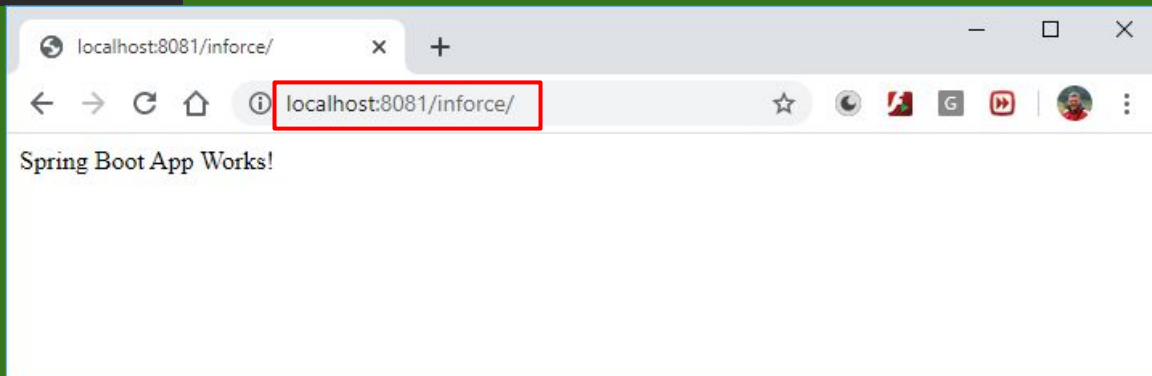


Konfigurisanje u application.properties



A screenshot of an IDE showing the `application.properties` file. The file contains two lines of configuration: `server.servlet.context-path=/inforce` on line 1 and `server.port=8081` on line 2. Both lines are highlighted with yellow boxes. The IDE interface shows line numbers 1, 2, and 3 on the left margin.

```
1 server.servlet.context-path=/inforce
2 server.port=8081
3
```



Sadržaj fajla pom.xml

```
m pom.xml x
1  <?xml version="1.0" encoding="UTF-8"?>
2  <project xmlns="http://maven.apache.org/POM/4.0.0" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
3    xsi:schemaLocation="http://maven.apache.org/POM/4.0.0 https://maven.apache.org/xsd/maven-4.0.0.xsd">
4    <modelVersion>4.0.0</modelVersion>
5    <parent>
6      <groupId>org.springframework.boot</groupId>
7      <artifactId>spring-boot-starter-parent</artifactId>
8      <version>2.2.5.RELEASE</version>
9      <relativePath/> <!-- lookup parent from repository -->
10   </parent>
11   <groupId>rs.inforce</groupId>
12   <artifactId>sbdemoapp</artifactId>
13   <version>0.0.1-SNAPSHOT</version>
14   <name>sbdemoapp</name>
15   <description>Spring Boot Demo App</description>
16
17   <properties>
18     <java.version>1.8</java.version>
19   </properties>
20
21   <dependencies>
22     <dependency>
23       <groupId>org.springframework.boot</groupId>
24       <artifactId>spring-boot-starter-data-jpa</artifactId>
25     </dependency>
26     <dependency>
27       <groupId>org.springframework.boot</groupId>
28       <artifactId>spring-boot-starter-web</artifactId>
```

Rezime

- Opisane osnove Spring radnog okvira
- Kreirana jednostavna Spring Boot aplikacija
- Analizirana struktura aplikacije
- Izvršeno konfigurisanje pomoću application.properties fajla
- Analiziran sadržaj pom.xml fajla