

Spring Framework Dependency Injection (DI) Basics

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“Code with Passion!”



Topics

- What is and Why Dependency Injection (DI)?
- Two DI variants
- Reading configuration
- Bean configuration
- Bean parameter types
- Auto-wiring of beans
- Auto-scanning of beans
- Bean naming



What is and Why Dependency Injection (DI)?

What is Dependency Injection (DI)?

- Also known as Inversion of Control (IoC)
- “Hollywood Principle”
 - Don't call me, I'll call you (“DI Container” is the agent)
- “DI Container” resolves dependencies of components by wiring/injecting dependency objects (push)
 - As opposed to a component looks for and instantiates dependency objects (pull)
- Termed by Martin Fowler

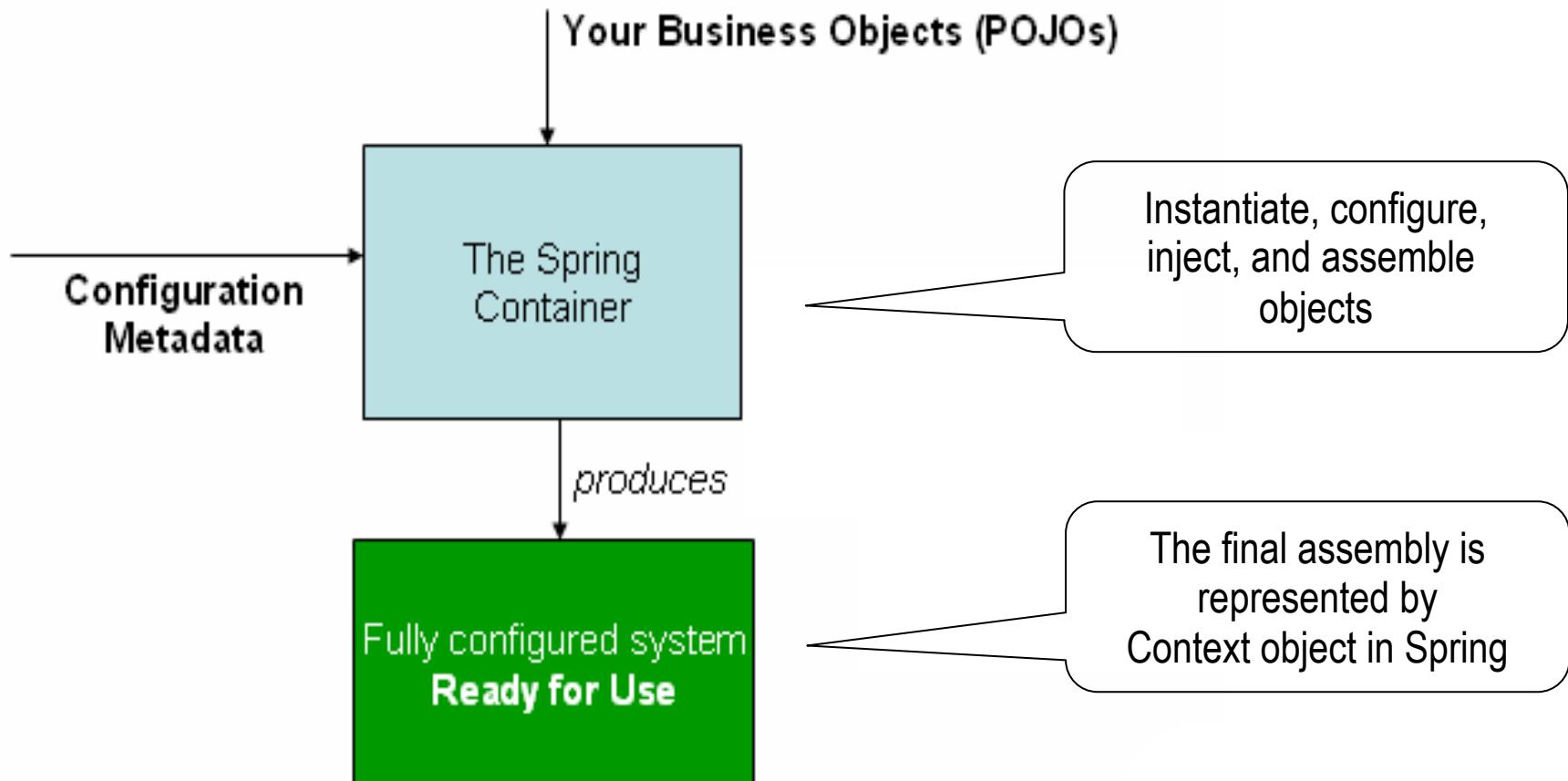
Why Dependency Injection?

- Target components are testable as POJO's
 - During testing, mock dependency objects can be injected by testing framework
 - During production environment, real dependency objects are injected by container
- Target components are more reusable and maintainable
 - No need to have a lookup code in the target component
 - Bean wiring is possible and bean wiring requirement can be specified in the configuration

DI Configuration

- DI container gets its instructions on what objects to instantiate, configure, inject, and assemble by reading configuration metadata
- The configuration metadata is represented in XML and/or Java configuration
 - XML is no longer supported from Spring 5

Spring DI Container





Two Dependency Injection Variants

Two Dependency Injection Variants

- Constructor dependency injection
 - Dependencies are injected through constructors of a component
- Setter dependency injection
 - Dependencies are injected through setter methods of a component

Constructor Dependency Injection

```
public class ConstructorInjection {  
  
    private Dependency dep;  
  
    public ConstructorInjection(Dependency dep) {  
        this.dep = dep;  
    }  
}
```

Setter Dependency Injection

```
public class SetterInjection {  
  
    private Dependency dependency;  
  
    public void setDependency(Dependency dependency) {  
        this.dependency = dependency;  
    }  
}
```



Reading Configuration

DI Container Java Interfaces in Spring

- *org.springframework.beans.factory.BeanFactory*
 - Root interface for accessing a Spring bean container
- *org.springframework.context.ApplicationContext*
 - Sub-interface of BeanFactory
 - Adds easier integration with Spring's AOP features; message resource handling (for use in internationalization), event publication; and application-layer specific contexts such as the WebApplicationContext for use in web applications

Reading Configuration

- #1: Reading Java configuration file
- #2: Reading Java configuration file with Spring Boot class

#1: Reading Java Configuration via AnnotationConfigApplicationContext class

```
@Configuration  
@Import(BeanConfiguration.class)  
public class MainApplication {  
  
    public static void main(String[] args) {  
  
        // AnnotationConfigApplicationContext accepts annotated classes  
        // as input - in particular @Configuration-annotated classes  
        ApplicationContext context  
            = new AnnotationConfigApplicationContext(MainApplication.class);  
  
        Person person = context.getBean(Person.class);  
        System.out.println(person.getName());  
    }  
}
```

#2: Reading Java Configuration via SpringApplication class

```
import org.springframework.boot.SpringApplication;  
  
{@Configuration  
@Import(BeanConfiguration.class)  
public class MainApplication {  
  
    public static void main(String[] args) {  
  
        // SpringApplication bootstraps and launches a Spring application  
        // from a Java main method  
        ApplicationContext context  
            = SpringApplication.run(MainApplication.class, args);  
  
        Person person = context.getBean(Person.class);  
        System.out.println(person.getName());  
    }  
}
```



Bean Configuration

Beans

- The term “bean” is used to refer any component managed by Spring
- Properties of beans may be simple values or more likely references to other beans
- Beans can have multiple names



DI Parameter Types

Injection Parameter Types

- Spring supports various kinds of injection parameters
 1. Simple values
 2. Beans
 3. Collections
- You can use these types for both setter or constructor injections

1.b Injecting Simple Values (Java)

```
@Configuration  
public class BeanConfiguration {  
  
    @Bean  
    public Person getPerson() {  
        Person person = new Person();  
        person.setName("John Smith");  
        person.setAge(85);  
        person.setHeight(1.99F);  
        person.setIsProgrammer(true);  
        return person;  
    }  
  
}
```

(We are going to learn @Configuration and @Bean annotations in detail in next presentation: Spring DI annotation)

Lab:

Exercise 1 & 2: Bean Creation 1 & 2
4935_spring4_di_basics.zip



Injecting Dependency Beans

- Used when you need to inject a dependency bean into another (target bean)

2.b Injecting Beans: Example (Java)

```
@Configuration
public class BeanConfiguration {

    @Bean
    public Address getAddress() {
        Address address = new Address();
        return address;
    }

    @Bean
    public Person getPerson() {
        Person person = new Person();
        person.setAddress(getAddress());
        return person;
    }

}
```

Lab:

Exercise 3: Bean Injection examples
4935_spring4_di_basics.zip





Autowiring of Beans

@Autowired

- Can be used in the target bean's Java source code for specifying DI requirement
 - In Java configuration, **there is no need** to call in Person class
`person.setAddress(getAddress())`
- (We will cover @Autorwired a bit more detail in next presentation – Spring DI annotation)

Lab:

Exercise 4: Autowiring
4935_spring4_di_basics.zip





Autoscanning of Beans

Autoscanning configuration in (Java)

- Any bean annotated with `@Component` under the "com.jpassion.di" package will be auto-detected and their instances will be created by the Spring framework
- No need to have `@Bean` configuration for beans
- We will cover autoscanning in more detail in next presentation (Spring DI annotation)

```
@Configuration  
@ComponentScan(basePackages = {"com.jpassion.di"})  
public class MainApplication {  
  
    public static void main(String[] args) {  
  
        ApplicationContext context = SpringApplication.run(MainApplication.class,  
            args);  
  
        Person person = context.getBean(Person.class);  
        System.out.println(getPersonInfo(person));  
    }  
}
```

Lab:

Exercise 5: Autoscanning
4935_spring4_di_basics.zip





Bean Naming

Bean Naming

- Each bean must have at least one name that is unique within the containing BeanFactory
- Name resolution procedure
 - If a *bean* has an *id* attribute, the value of the *id* attribute is used as the name
 - If there is no *id* attribute, Spring looks for *name* attribute
 - If neither *id* nor *name* attribute are defined, Spring use the *class* name as the name
- A bean can have multiple names
 - Specify comma or semicolon-separated list of names in the name attribute

Bean Naming Example (Java)

```
@Configuration  
public class BeanConfiguration {  
  
    @Bean(name={"name1", "name2", "name3", "name4"})  
    public Person getPerson() {  
        Person person = new Person();  
        return person;  
    }  
  
}
```

Lab:

Exercise 6: Bean naming
4935_spring4_di_basics.zip



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