

Annotation-based Configuration

“Code with Passion!”



Topics

- Spring Annotations (related to Spring Beans)
- Two different ways of defining Spring Beans
 - *Through configuration*
 - *Through component-scanning*
- `@Component`, `@Controller`, `@Repository`, `@Service`
- `@SpringBootConfiguration`, `@EnableAutoConfiguration`
- `@Qualifier`
- *Custom qualifier*

Two ways of Defining Spring Beans

Two ways of Defining Spring Beans

- Through Java configuration class
- Through component-scanning

Defining Spring Beans through Configuration

@Configuration and @Bean

- Annotating a class with the `@Configuration` indicates that the class can be used by the Spring DI container as a source of bean definitions

```
@Configuration  
public class AppConfig {  
  
    // MyService is typically an interface type  
    @Bean  
    public MyService myService() {  
        return new MyServiceImpl();  
    }  
  
    @Bean  
    public YourService yourService() {  
        return new YourServiceImpl();  
    }  
}
```

AnnotationConfigApplicationContext

- *@Configuration* class is used as input when instantiating an *AnnotationConfigApplicationContext*

```
public static void main(String[] args) {  
  
    // Read bean configuration defined in the AppConfig.class  
    // and perform bean instantiation, configuration, wiring, and assembly  
    ApplicationContext ctx =  
        new AnnotationConfigApplicationContext(AppConfig.class);  
  
    // Retrieve MyClass object  
    MyService myService = ctx.getBean(MyService.class);  
    myService.doStuff();  
}
```

Two Options of Specifying Dependencies in Configuration Class

- Option #1: Specify dependency as argument
- Option #2: Call a method that returns dependency

Option #1: How to specify dependency

- Specify dependency as an argument

```
@Configuration  
public class AppConfig {  
  
    @Bean  
    public TransferService transferService(AccountRepository accountRepository) {  
        return new TransferServiceImpl(accountRepository);  
    }  
  
    @Bean  
    public AccountRepository accountRepository() {  
        return new InMemoryAccountRepository();  
    }  
}
```



TransferService has a dependency of AccountRepository

Option #2: How to specify dependency

- Call a method that returns a dependency

```
@Configuration  
public class AppConfig {  
  
    @Bean  
    public TransferService transferService() {  
        return new TransferServiceImpl(accountRepository());  
    }  
  
    @Bean  
    public AccountRepository accountRepository() {  
        return new InMemoryAccountRepository();  
    }  
}
```

TransferService
has a dependency of
AccountRepository

Lab:

Exercise 5: Java based configuration
4939_spring4_di_annotation.zip



Defining Spring Beans through Component Scanning (@ComponentScan)

@ComponentScan

- No need to declare beans with `@Bean` annotations in the configuration
 - > The beans needs to be annotated with `@Component` (or specialized annotations from `@Component`)
- Use *basePackages attribute* to define specific packages to scan
 - > If specific packages are not defined, the scanning will occur from the package of the class with this annotation

Component Scan

- The specified package via base-package attribute – `com.jpassion.examples` package in the example below - will be scanned, looking for any `@Component`-annotated (and its stereo-typed annotations - `@Service`, `@Repository`, `@Controller`) classes, and those classes will be registered

```
@Configuration  
{@ComponentScan("com.jpassion.examples")  
public class BeanConfiguration {  
  
    // @Bean  
    // public CustomerService getCustomerService() {  
    //     CustomerService customerService = new CustomerServiceImpl();  
    //     return customerService;  
    // }  
    //  
    // @Bean  
    // public CustomerDao getCustomerDao() {  
    //     CustomerDao customerDao = new CustomerDaoImpl();  
    //     return customerDao;  
    // }  
    //  
}}}
```

No need to manually
configure beans

Lab:

Exercise 6: `@Service` and `@Repository`
Annotations

`4939_spring4_di_annotation.zip`



@Component & Further Stereotype Annotations (@Repository, @Service, @Controller)

@Component, @Repository, @Service, @Controller

- *@Component* is a generic stereotype for any Spring-managed component
- *@Repository, @Service, and @Controller* are specializations of *@Component* for more specific use cases (We are going to cover these in detail in Spring MVC topics)
 - > *@Repository* – for persistence
 - > *@Service* – for service
 - > *@Controller* – for controller

@Repository, @Service, @Controller

- **@Repository**
 - > A class that is annotated with "@Repository" is eligible for Spring org.springframework.dao.DataAccessException translation.
- **@Service**
 - > A class that is annotated with "@Service" plays a role of business service
- **@Controller**
 - > A class that is annotated with "@Controller" plays a role of controller in the Spring MVC application

@Profile

@Profile

- Spring Profiles provide a way to segregate parts of your application configuration and make it only available in certain environments
- Any @Component or @Configuration can be marked with @Profile to limit when it is loaded

```
@Configuration  
{@Profile("production")  
public class ProductionConfiguration {  
  
    // ...  
  
}}
```

- You can then set a `spring.profiles.active` Environment property to specify which profiles are active
- You can also specify the property in `application.properties` file
`spring.profiles.active=production,mysql`

Lab:

Exercise 7: @Profile
[4939_spring4_di_annotation.zip](#)



`@SpringBootApplication`
`@EnableAutoConfiguration`

@SpringBootApplication

- Composite annotation (Stereo annotation)
- Introduced as part of Spring Boot

```
@Target(ElementType.TYPE)
@Retention(RetentionPolicy.RUNTIME)
@Documented
@Inherited
@Configuration
@EnableAutoConfiguration
@ComponentScan
public @interface SpringBootApplication {

    /**
     * Exclude specific auto-configuration classes such that they will never be applied.
     * @return the classes to exclude
     */
    Class<?>[] exclude() default {};
}
```

@EnableAutoConfiguration

- Enable auto-configuration of the Spring Application Context, attempting to guess and configure beans that you are likely to need
- Introduced as part of Spring Boot
- Auto-configuration classes are usually applied based on your classpath and what beans you have defined
 - > If you have tomcat-embedded.jar on your classpath, you are likely to want a TomcatEmbeddedServletContainerFactory (unless you have defined your own EmbeddedServletContainerFactory bean)
- Auto-configuration tries to be as intelligent as possible and will back-away as you define more of your own configuration
 - > You can always manually exclude() any configuration that you never want to apply
 - > Auto-configuration is always applied after user-defined beans have been registered.

@Autowired

@Autowired

- Can be used in the Java source code for specifying DI requirement
- Places where *@Autowired* can be used
 - > Constructor methods (constructor injection)
 - > Setter methods (setter injection)
 - > Fields (field injection)

@Autowired at Constructor method

```
public class MovieRecommender {  
    private CustomerPreferenceDao customerPreferenceDao;  
  
    @Autowired // used at the constructor – optional from Spring 4.3 if this is only constructor  
    public MovieRecommender(  
        CustomerPreferenceDao customerPreferenceDao) {  
        this.customerPreferenceDao = customerPreferenceDao;  
    }  
  
    // ...  
}
```

@Autowired at Setter method

```
public class SimpleMovieLister {  
    private MovieFinder movieFinder;  
  
    // MovieFinder object gets created and injected by Spring DI container  
    @Autowired  
    public void setMovieFinder(MovieFinder movieFinder) {  
        this.movieFinder = movieFinder;  
    }  
    // ...  
}
```

@Autowired at Field

```
public class MovieRecommender {  
    @Autowired // used at the field  
    private MovieCatalog movieCatalog;  
  
    // ...  
}
```

Lab:

Exercise 1: Autowiring with
"@Autowired" annotation
[4939_spring4_di_annotation.zip](#)



**@Qualifier,
@Primary**

Fine-tuning @Autowired with Qualifiers

- Because autowiring by type may lead to multiple candidates, it is often necessary to have more control over the selection process
- One way to accomplish this is with Spring's `@Qualifier` annotation

```
public class MovieRecommender {  
  
    // Among the multiple candidates of MovieCatalog type, select  
    // the one that has the bean name "main".  
    @Autowired  
    @Qualifier("main")  
    private MovieCatalog movieCatalog;  
  
    // ...  
}
```

Fine-tuning @Autowired with @Qualifier

- The @Qualifier annotation can also be specified on individual constructor arguments or method arguments

```
public class MovieRecommender {  
  
    private MovieCatalog movieCatalog;  
    private CustomerPreferenceDao customerPreferenceDao;  
  
    @Autowired  
    public void prepare(  
        @Qualifier("main") MovieCatalog movieCatalog,  
        CustomerPreferenceDao customerPreferenceDao) {  
        this.movieCatalog = movieCatalog;  
        this.customerPreferenceDao = customerPreferenceDao;  
    }  
  
    // ...  
}
```

Qualifier name is usually bean name

```
@Configuration  
public class BeanConfiguration {  
  
    @Bean(name = "myaddress")  
    public AddressInterface getMyAddress() {  
        AddressInterface address = new MyAddress();  
        return address;  
    }  
  
    @Bean(name = "youraddress")  
    public AddressInterface getYourAddress() {  
        AddressInterface address = new YourAddress();  
        return address;  
    }  
  
    @Bean  
    public Person getPerson() {  
        Person person = new Person();  
        return person;  
    }  
}
```

There are two candidates to AddressInterface type: MyAddress and YourAddress.

Give name to these candidates so that they can be specified in the selection process

Custom Qualifier

Creating Custom Qualifier Annotation

- You can create your own custom qualifier annotations.

```
// Create custom qualifier annotation called "Genre"
@Target({ElementType.FIELD, ElementType.PARAMETER})
@Retention(RetentionPolicy.RUNTIME)
@Qualifier
public @interface Genre {
    String value();
}
```

@Autowired with Custom Qualifier

- Then you can provide the custom qualifier annotation on autowired fields and parameters:

```
public class MovieRecommender {  
  
    @Autowired  
    @Genre("Action")  
    private MovieCatalog actionCatalog;  
  
    private MovieCatalog comedyCatalog;  
  
    @Autowired  
    public void setComedyCatalog(  
        @Genre("Comedy") MovieCatalog comedyCatalog) {  
        this.comedyCatalog = comedyCatalog;  
    }  
  
    // ...  
}
```

Lab:

Exercise 2: Fine-tuning with @Qualifier
annotation and custom annotation
[4939_spring4_di_annotation.zip](#)



Code with Passion!

