Spring® Framework

Notes for Professionals

50+ pages

of professional hints and tricks

Contents

About

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Chapter 1: Getting started with Spring Framework

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Section 1.1: Setup (XML Configuration)

Steps to create Hello Spring:

1. Investigate Spring Boot to see if that would better suit your needs.
2. Have a project set up with the correct dependencies. It is recommended that you are using Maven or Gradle.
3. create a POJO class, e.g. `Employee.java`
4. create a XML file where you can define your class and variables. e.g `beans.xml`
5. create your main class e.g. `Customer.java`
6. Include spring-beans (and its transitive dependencies!) as a dependency.

`Employee.java`:

```
package com.test;

public class Employee {

    private String name;

    public String getName() {
        return name;
    }

    public void setName(String name) {
        this.name = name;
    }

    public void displayName() {
        System.out.println(name);
    }
}
```

`beans.xml`:

```
<?xml version="1.0" encoding="UTF-8"?>
<beans xmlns="http://www.springframework.org/schema/beans"
   xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
   xsi:schemaLocation="http://www.springframework.org/schema/beans
   http://www.springframework.org/schema/beans/spring-beans-4.3.xsd">

    <bean id="employee" class="com.test.Employee">
        <property name="name" value="test spring"></property>
    </bean>

</beans>
```

`Customer.java`:

```
package com.test;

import org.springframework.context.ApplicationContext;
import org.springframework.context.support.ClassPathXmlApplicationContext;

public class Customer {
   public static void main(String[] args) {
      ApplicationContext context = new ClassPathXmlApplicationContext("beans.xml");

      Employee obj = (Employee) context.getBean("employee");
      obj.displayName();
   }
}
```

Section 1.2: Showcasing Core Spring Features by example

Description

This is a self-contained running example including/showcasing: minimum *dependencies* needed, Java *Configuration*, *Bean declaration* by annotation and Java Configuration, *Dependency Injection* by Constructor and by Property, and *Pre/Post* hooks.

Dependencies

These dependencies are needed in the classpath:

1. spring-core
2. spring-context
3. spring-beans
4. spring-aop
5. spring-expression
6. commons-logging

Main Class

Starting from the end, this is our Main class that serves as a placeholder for the `main()` method which initialises the Application Context by pointing to the Configuration class and loads all the various beans needed to showcase particular functionality.

```
package com.stackoverflow.documentation;

import org.springframework.context.ApplicationContext;
```

```
import org.springframework.context.annotation.AnnotationConfigApplicationContext;



public class Main {

    public static void main(String[] args) {

        //initializing the Application Context once per application.
        ApplicationContext applicationContext =
                new AnnotationConfigApplicationContext(AppConfig.class);

        //bean registered by annotation
        BeanDeclaredByAnnotation beanDeclaredByAnnotation =
                applicationContext.getBean(BeanDeclaredByAnnotation.class);
        beanDeclaredByAnnotation.sayHello();

        //bean registered by Java configuration file
        BeanDeclaredInAppConfig beanDeclaredInAppConfig =
                applicationContext.getBean(BeanDeclaredInAppConfig.class);
        beanDeclaredInAppConfig.sayHello();

        //showcasing constructor injection
        BeanConstructorInjection beanConstructorInjection =
                applicationContext.getBean(BeanConstructorInjection.class);
        beanConstructorInjection.sayHello();

        //showcasing property injection
        BeanPropertyInjection beanPropertyInjection =
                applicationContext.getBean(BeanPropertyInjection.class);
        beanPropertyInjection.sayHello();

        //showcasing PreConstruct / PostDestroy hooks
        BeanPostConstructPreDestroy beanPostConstructPreDestroy =
                applicationContext.getBean(BeanPostConstructPreDestroy.class);
        beanPostConstructPreDestroy.sayHello();
    }
}
```

Application Configuration file

The configuration class is annotated by `@Configuration` and is used as a parameter in the initialised Application Context. The `@ComponentScan` annotation at the class level of the configuration class points to a package to be scanned for Beans and dependencies registered using annotations. Finally the `@Bean` annotation serves as a bean definition in the configuration class.

```
package com.stackoverflow.documentation;

import org.springframework.context.annotation.Bean;
import org.springframework.context.annotation.ComponentScan;
import org.springframework.context.annotation.Configuration;

@Configuration
@ComponentScan("com.stackoverflow.documentation")
public class AppConfig {

    @Bean
    public BeanDeclaredInAppConfig beanDeclaredInAppConfig() {
        return new BeanDeclaredInAppConfig();
    }
```

```
}
```

Bean Declaration by Annotation

The `@Component` annotation serves to demarcate the POJO as a Spring bean available for registration during component scanning.

```
@Component
public class BeanDeclaredByAnnotation {

    public void sayHello() {
        System.out.println("Hello, World from BeanDeclaredByAnnotation !");
    }
}
```

Bean Declaration by Application Configuration

Notice that we don't need to annotate or otherwise mark our POJO since the bean declaration/definition is happening in the Application Configuration class file.

```
public class BeanDeclaredInAppConfig {

    public void sayHello() {
        System.out.println("Hello, World from BeanDeclaredInAppConfig !");
    }
}
```

Constructor Injection

Notice that the `@Autowired` annotation is set at the constructor level. Also notice that unless explicitely defined by name the default autowiring is happening *based on the type* of the bean (in this instance `BeanToBeInjected`).

```
package com.stackoverflow.documentation;

import org.springframework.beans.factory.annotation.Autowired;
import org.springframework.stereotype.Component;

@Component
public class BeanConstructorInjection {

    private BeanToBeInjected dependency;

    @Autowired
    public BeanConstructorInjection(BeanToBeInjected dependency) {
        this.dependency = dependency;
    }

    public void sayHello() {
        System.out.print("Hello, World from BeanConstructorInjection with dependency: ");
        dependency.sayHello();
    }
}
```

Property Injection

Notice that the `@Autowired` annotation demarcates the setter method whose name follows the JavaBeans standard.

```java
package com.stackoverflow.documentation;


import org.springframework.beans.factory.annotation.Autowired;
import org.springframework.stereotype.Component;

@Component
public class BeanPropertyInjection {

    private BeanToBeInjected dependency;

    @Autowired
    public void setBeanToBeInjected(BeanToBeInjected beanToBeInjected) {
        this.dependency = beanToBeInjected;
    }

    public void sayHello() {
        System.out.println("Hello, World from BeanPropertyInjection !");
    }
}
```

PostConstruct / PreDestroy hooks

We can intercept initialisation and destruction of a Bean by the `@PostConstruct` and `@PreDestroy` hooks.

```java
package com.stackoverflow.documentation;

import org.springframework.stereotype.Component;

import javax.annotation.PostConstruct;
import javax.annotation.PreDestroy;

@Component
public class BeanPostConstructPreDestroy {

    @PostConstruct
    public void pre() {
        System.out.println("BeanPostConstructPreDestroy - PostConstruct");
    }

    public void sayHello() {
        System.out.println(" Hello World, BeanPostConstructPreDestroy !");
    }

    @PreDestroy
    public void post() {
        System.out.println("BeanPostConstructPreDestroy - PreDestroy");
    }
}
```

Section 1.3: What is Spring Framework, why should we go for it?

Spring is a framework, which provides bunch of classes, by using this we don't need to write boiler plate logic in our code, so Spring provides an abstract layer on J2ee.

For Example in Simple JDBC Application programmer is responsible for

1. Loading the driver class

2. Creating the connection
3. Creating statement object
4. Handling the exceptions
5. Creating query
6. Executing query
7. Closing the connection

Which is treated as boilerplate code as every programmer write the same code. So for simplicity the framework takes care of boilerplate logic and the programmer has to write only business logic. So by using Spring framework we can develop projects rapidly with minimum lines of code, without any bug, the development cost and time also reduced.

So Why to choose Spring as struts is there

Strut is a framework which provide solution to web aspects only and struts is invasive in nature. Spring has many features over struts so we have to choose Spring.

1. Spring is ***Noninvasive*** in nature: That means you don't need to extend any classes or implement any interfaces to your class.
2. Spring is ***versatile***: That means it can integrated with any existing technology in your project.
3. Spring provides ***end to end*** project development: That means we can develop all the modules like business layer, persistence layer.
4. Spring is ***light weight***: That means if you want to work on particular module then , you don't need to learn complete spring, only learn that particular module(eg. Spring Jdbc, Spring DAO)
5. Spring supports ***dependency injection***.
6. Spring supports ***multiple project development*** eg: Core java Application, Web Application, Distributed Application, Enterprise Application.
7. Spring supports Aspect oriented Programming for cross cutting concerns.

So finally we can say Spring is an alternative to Struts. But Spring is not a replacement of J2EE API, As Spring supplied classes internally uses J2EE API classes. Spring is a vast framework so it has divided into several modules. No module is dependent to another except Spring Core. Some Important modules are

1. Spring Core
2. Spring JDBC
3. Spring AOP
4. Spring Transaction
5. Spring ORM
6. Spring MVC

Chapter 2: Spring Core

Section 2.1: Introduction to Spring Core

Spring is a vast framework, so the Spring framework has been divided in several modules which makes spring lightweight. Some important modules are:

1. Spring Core
2. Spring AOP
3. Spring JDBC
4. Spring Transaction
5. Spring ORM
6. Spring MVC

All the modules of Spring are independent of each other except Spring Core. As Spring core is the base module, so in all module we have to use Spring Core

Spring Core

Spring Core talking all about dependency management.That means if any arbitrary classes provided to spring then Spring can manage dependency.

What is a dependency:
From project point of view, in a project or application multiple classes are there with different functionality. and each classes required some functionality of other classes.

Example:

```
class Engine {

  public void start() {
    System.out.println("Engine started");
  }
}

class Car {

  public void move() {
    // For moving start() method of engine class is required
  }
}
```

Here class Engine is required by class car so we can say class engine is dependent to class Car, So instead of we managing those dependency by Inheritance or creating object as fallows.

By Inheritance:

```
class Engine {

  public void start() {
    System.out.println("Engine started");
  }
}

class Car extends Engine {
```

```
  public void move() {
    start(); //Calling super class start method,
  }
}
```

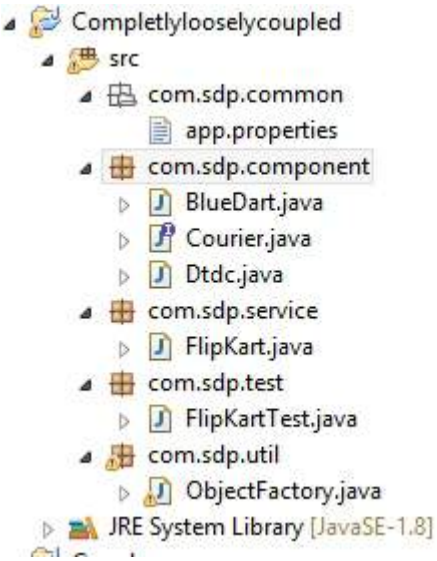
By creating object of dependent class:

```
class Engine {

  public void start() {
    System.out.println("Engine started");
  }
}

class Car {

  Engine eng = new Engine();

  public void move() {
   eng.start();
  }
}
```

So instead of we managing dependency between classes spring core takes the responsibility dependency management. But Some rule are there, The classes must be designed with some design technique that is Strategy design pattern.

Section 2.2: Understanding How Spring Manage Dependency?

Let me write a piece of code which shows completely loosely coupled, Then you can easily understand how Spring core manage the dependency internally. Consider an scenario, Online business Flipkart is there, it uses some times DTDC or Blue Dart courier service , So let me design a application which shows complete loosely coupled. The Eclipse Directory as fallows:




```
//Interface
package com.sdp.component;

public interface Courier {
    public String deliver(String iteams,String address);

}
```

//implementation classes

```
  package com.sdp.component;

public class BlueDart implements Courier {


    public String deliver(String iteams, String address) {

        return iteams+ "Shiped to Address "+address +"Through BlueDart";
    }

}

package com.sdp.component;

public class Dtdc implements Courier {


    public String deliver(String iteams, String address) {
        return iteams+ "Shiped to Address "+address +"Through Dtdc";    }

}
```

//Component classe

```
package com.sdp.service;

import com.sdp.component.Courier;

public class FlipKart {
    private Courier courier;

    public void setCourier(Courier courier) {
        this.courier = courier;
    }
    public void shopping(String iteams,String address)
    {
        String status=courier.deliver(iteams, address);
        System.out.println(status);
    }

}
```

//Factory classes to create and return Object

```
package com.sdp.util;

import java.io.IOException;
import java.util.Properties;

import com.sdp.component.Courier;

public class ObjectFactory {
private static Properties props;
static{

    props=new Properties();
    try {
```

```
props.load(ObjectFactory.class.getClassLoader().getResourceAsStream("com//sdp//common//app.properti
es"));
    } catch (IOException e) {
        // TODO Auto-generated catch block
        e.printStackTrace();
    }

}
public static Object getInstance(String logicalclassName)
{
    Object obj = null;
    String originalclassName=props.getProperty(logicalclassName);
    try {
         obj=Class.forName(originalclassName).newInstance();
    } catch (InstantiationException e) {
        // TODO Auto-generated catch block
        e.printStackTrace();
    } catch (IllegalAccessException e) {
        // TODO Auto-generated catch block
        e.printStackTrace();
    } catch (ClassNotFoundException e) {
        // TODO Auto-generated catch block
        e.printStackTrace();
    }
    return obj;
}

    }
```

//properties file

```
BlueDart.class=com.sdp.component.BlueDart
Dtdc.class=com.sdp.component.Dtdc
FlipKart.class=com.sdp.service.FlipKart
```

//Test class

```
package com.sdp.test;

import com.sdp.component.Courier;
import com.sdp.service.FlipKart;
import com.sdp.util.ObjectFactory;

public class FlipKartTest {
    public static void main(String[] args) {
        Courier courier=(Courier)ObjectFactory.getInstance("Dtdc.class");
        FlipKart flipkart=(FlipKart)ObjectFactory.getInstance("FlipKart.class");
        flipkart.setCourier(courier);
        flipkart.shopping("Hp Laptop", "SR Nagar,Hyderabad");

    }

}
```

If we write this code then we can manually achieve loose coupling,this is applicable if all the classes want either BlueDart or Dtdc , But if some class want BlueDart and some other class want Dtdc then again it will be tightly coupled, So instead of we creating and managing the dependency injection Spring core takes the responsibility of creating and managing the beans, Hope This will helpful, in next example we wil see the !st application on Spring core with deitals

Chapter 3: Spring Expression Language (SpEL)

Section 3.1: Syntax Reference

You can use `@Value("#{expression}")` to inject value at runtime, in which the `expression` is a SpEL expression.

Literal expressions

Supported types include strings, dates, numeric values (int, real, and hex), boolean and null.

```
"#{'Hello World'}"  //strings
"#{3.1415926}"      //numeric values (double)
"#{true}"           //boolean
"#{null}"           //null
```

Inline list

```
"#{1,2,3,4}"               //list of number
"#{{'a','b'},{'x','y'}}"  //list of list
```

Inline Maps

```
"#{name:'Nikola',dob:'10-July-1856'}"
"#{name:{first:'Nikola',last:'Tesla'},dob:{day:10,month:'July',year:1856}}" //map of maps
```

Invoking Methods

```
"#{'abc'.length()}"      //evaluates to 3
"#{f('hello')}"   //f is a method in the class to which this expression belongs, it has a string
parameter
```

Chapter 4: Obtaining a SqlRowSet from SimpleJdbcCall

This describes how to directly obtain a **SqlRowSet** using **SimpleJdbcCall** with a stored procedure in your database that has a **cursor output parameter**,

I am working with an Oracle database, I've attempted to create an example that should work for other databases, my Oracle example details issues with Oracle.

Section 4.1: SimpleJdbcCall creation

Typically, you will want to create your SimpleJdbcCalls in a Service.

This example assumes your procedure has a single output parameter that is a cursor; you will need to adjust your declareParameters to match your procedure.

```
@Service
public class MyService() {

@Autowired
    private DataSource dataSource;

    // Autowire your configuration, for example
    @Value("${db.procedure.schema}")
    String schema;

    private SimpleJdbcCall myProcCall;

    // create SimpleJdbcCall after properties are configured
    @PostConstruct
    void initialize() {
        this.myProcCall = new SimpleJdbcCall(dataSource)
                        .withProcedureName("my_procedure_name")
                        .withCatalogName("my_package")
                        .withSchemaName(schema)
                        .declareParameters(new SqlOutParameter(
                            "out_param_name",
                            Types.REF_CURSOR,
                            new SqlRowSetResultSetExtractor()));
    }

    public SqlRowSet myProc() {
        Map<String, Object> out = this.myProcCall.execute();
        return (SqlRowSet) out.get("out_param_name");
    }

}
```

There are many options you can use here:

- **withoutProcedureColumnMetaDataAccess()** needed if you have overloaded procedure names or just don't want SimpleJdbcCall to validate against the database.
- **withReturnValue()** if procedure has a return value. First value given to declareParameters defines the return value. Also, if your procedure is a function, use **withFunctionName** and **executeFunction** when executing.
- **withNamedBinding()** if you want to give arguments using names instead of position.

- **useInParameterNames()** defines the argument order. I think this may be required if you pass in your arguments as a list instead of a map of argument name to value. Though it may only be required if you use withoutProcedureColumnMetaDataAccess()

Section 4.2: Oracle Databases

Here's how to resolve issues with Oracle.

Assuming your procedure output parameter is `ref cursor`, you will get this exception.

> java.sql.SQLException: Invalid column type: 2012

So change `Types.REF_CURSOR` to `OracleTypes.CURSOR` in **simpleJdbcCall.declareParameters()**

Supporting OracleTypes

You may only need to do this if you have certain column types in your data.

The next issue I encountered was that proprietary Types such as `oracle.sql.TIMESTAMPTZ` caused this error in SqlRowSetResultSetExtractor:

> Invalid SQL type for column; nested exception is java.sql.SQLException: Invalid SQL type for column

So we need to create a **ResultSetExtractor** that supports Oracle types.
I will explain the reason for password after this code.

```
package com.boost.oracle;

import oracle.jdbc.rowset.OracleCachedRowSet;
import org.springframework.dao.DataAccessException;
import org.springframework.jdbc.core.ResultSetExtractor;
import org.springframework.jdbc.support.rowset.ResultSetWrappingSqlRowSet;
import org.springframework.jdbc.support.rowset.SqlRowSet;

import java.sql.ResultSet;
import java.sql.SQLException;

/**
 * OracleTypes can cause {@link org.springframework.jdbc.core.SqlRowSetResultSetExtractor}
 * to fail due to a Oracle SQL type that is not in the standard {@link java.sql.Types}.
 *
 * Also, types such as {@link oracle.sql.TIMESTAMPTZ} require a Connection when processing
 * the ResultSet; {@link OracleCachedRowSet#getConnectionInternal()} requires a JNDI
 * DataSource name or the username and password to be set.
 *
 * For now I decided to just set the password since changing SpringBoot to a JNDI DataSource
 * configuration is a bit complicated.
 *
 * Created by Arlo White on 2/23/17.
 */
public class OracleSqlRowSetResultSetExtractor implements ResultSetExtractor<SqlRowSet> {

    private String oraclePassword;

    public OracleSqlRowSetResultSetExtractor(String oraclePassword) {
```

```
        this.oraclePassword = oraclePassword;
    }

    @Override
    public SqlRowSet extractData(ResultSet rs) throws SQLException, DataAccessException {
        OracleCachedRowSet cachedRowSet = new OracleCachedRowSet();
        // allows getConnectionInternal to get a Connection for TIMESTAMPTZ
        cachedRowSet.setPassword(oraclePassword);
        cachedRowSet.populate(rs);
        return new ResultSetWrappingSqlRowSet(cachedRowSet);
    }

}
```

Certain Oracle types require a Connection to obtain the column value from a ResultSet. TIMESTAMPTZ is one of these types. So when `rowSet.getTimestamp(colIndex)` is called, you will get this exception:

> Caused by: java.sql.SQLException: One or more of the authenticating RowSet properties not set at oracle.jdbc.rowset.OracleCachedRowSet.getConnectionInternal(OracleCachedRowSet.java:560) at oracle.jdbc.rowset.OracleCachedRowSet.getTimestamp(OracleCachedRowSet.java:3717) at org.springframework.jdbc.support.rowset.ResultSetWrappingSqlRowSet.getTimestamp

If you dig into this code, you will see that the OracleCachedRowSet needs the password or a JNDI DataSource name to get a Connection. If you prefer the JNDI lookup, just verify that OracleCachedRowSet has DataSourceName set.

So in my Service, I Autowire in the password and declare the output parameter like this:

```
new SqlOutParameter("cursor_param_name", OracleTypes.CURSOR, new
OracleSqlRowSetResultSetExtractor(oraclePassword))
```

Chapter 5: Creating and using beans

Section 5.1: Autowiring all beans of a specific type

If you've got multiple implementations of the same interface, Spring can autowire them all into a collection object. I'm going to use an example using a Validator pattern1

Foo Class:

```
public class Foo {
     private String name;
     private String emailAddress;
     private String errorMessage;
     /** Getters & Setters omitted **/
}
```

Interface:

```
public interface FooValidator {
    public Foo validate(Foo foo);
}
```

Name Validator Class:

```
@Component(value="FooNameValidator")
public class FooNameValidator implements FooValidator {
    @Override
    public Foo validate(Foo foo) {
        //Validation logic goes here.
    }
}
```

Email Validator Class:

```
@Component(value="FooEmailValidator")
public class FooEmailValidator implements FooValidator {
    @Override
    public Foo validate(Foo foo) {
        //Different validation logic goes here.
    }
}
```

You can now autowire these validators individually or together into a class.

Interface:

```
public interface FooService {
    public void handleFoo(Foo foo);
}
```

Class:

```
@Service
public class FooServiceImpl implements FooService {
    /** Autowire all classes implementing FooValidator interface**/
    @Autowired
```

```
    private List<FooValidator> allValidators;

    @Override
    public void handleFoo(Foo foo) {
       /**You can use all instances from the list**/
       for(FooValidator validator : allValidators) {
           foo = validator.validate(foo);
       }
    }
}
```

It's worth noting that if you have more than one implementation of an interface in the Spring IoC container and don't specify which one you want to use with the `@Qualifier` annotation, Spring will throw an exception when trying to start, because it won't know which instance to use.

1: This is not the right way to do such simple validations. This is a simple example about autowiring. If you want an idea of a much easier validation method look up how Spring does validation with annotations.

Section 5.2: Basic annotation autowiring

Interface:

```
public interface FooService {
    public int doSomething();
}
```

Class:

```
@Service
public class FooServiceImpl implements FooService {
    @Override
    public int doSomething() {
        //Do some stuff here
        return 0;
    }
}
```

It should be noted that a class must implement an interface for Spring to be able to autowire this class. There is a method to allow Spring to autowire stand-alone classes using load time weaving, but that is out of scope for this example.

You can gain access to this bean in any class that instantiated by the Spring IoC container using the `@Autowired` annotation.

Usage:

```
@Autowired([required=true])
```

The `@Autowired` annotation will first attempt to autowire by type, and then fall back on bean name in the event of ambiguity.

This annotation can be applied in several different ways.

Constructor injection:

```
public class BarClass() {
    private FooService fooService
```

```
    @Autowired
    public BarClass(FooService fooService) {
        this.fooService = fooService;
    }
}
```

Field injection:

```
public class BarClass() {
    @Autowired
    private FooService fooService;
}
```

Setter injection:

```
public class BarClass() {
    private FooService fooService;

    @Autowired
    public void setFooService(FooService fooService) {
        this.fooService = fooService;
    }
}
```

Section 5.3: Using FactoryBean for dynamic bean instantiation

In order to dynamically decide what beans to inject, we can use `FactoryBeans`. These are classes which implement the factory method pattern, providing instances of beans for the container. They are recognized by Spring and can be used transparently, without need to know that the bean comes from a factory. For example:

```
public class ExampleFactoryBean extends AbstractFactoryBean<String> {
    // This method determines the type of the bean for autowiring purposes
    @Override
    public Class<?> getObjectType() {
        return String.class;
    }

    // this factory method produces the actual bean
    @Override
    protected String createInstance() throws Exception {
        // The thing you return can be defined dynamically,
        // that is read from a file, database, network or just
        // simply randomly generated if you wish.
        return "Something from factory";
    }
}
```

Configuration:

```
@Configuration
public class ExampleConfig {
    @Bean
    public FactoryBean<String> fromFactory() {
        return new ExampleFactoryBean();
    }
}
```

Getting the bean:

```
AbstractApplicationContext context = new AnnotationConfigApplicationContext(ExampleConfig.class);
String exampleString = (String) context.getBean("fromFactory");
```

To get the actual FactoryBean, use the ampersand prefix before the bean's name:

```
FactoryBean<String> bean = (FactoryBean<String>) context.getBean("&fromFactory");
```

Please note that you can only use `prototype` or `singleton` scopes - to change the scope to `prototype` override `isSingleton` method:

```
public class ExampleFactoryBean extends AbstractFactoryBean<String> {
    @Override
    public boolean isSingleton() {
        return false;
    }

    // other methods omitted for readability reasons
}
```

Note that scoping refers to the actual instances being created, not the factory bean itself.

Section 5.4: Declaring Bean

To declare a bean, simply annotate a method with the `@Bean` annotation or annotate a class with the `@Component` annotation (annotations `@Service`, `@Repository`, `@Controller` could be used as well).

When JavaConfig encounters such a method, it will execute that method and register the return value as a bean within a BeanFactory. By default, the bean name will be that of the method name.

We can create bean using one of three ways:

1. **Using Java based Configuration**: In Configuration file we need to declare bean using @bean annotation

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

2. **Using XML based configuration**: For XML based configuration we need to create declare bean in application configuration XML i.e.

   ```
   <beans>
       <bean name="transferService" class="com.acme.TransferServiceImpl"/>
   </beans>
   ```

3. **Annotation-Driven Component**: For annotation-driven components, we need to add the @Component annotation to the class we want to declare as bean.

   ```
   @Component("transferService")
   public class TransferServiceImpl implements TransferService {
   ```

```
    ...
}
```

Now all three beans with name `transferService` are available in `BeanFactory` or `ApplicationContext`.

Section 5.5: Autowiring specific bean instances with @Qualifier

If you've got multiple implementations of the same interface, Spring needs to know which one it should autowire into a class. I'm going to use a Validator pattern in this example.1

Foo Class:

```
public class Foo {
     private String name;
     private String emailAddress;
     private String errorMessage;
     /** Getters & Setters omitted **/
}
```

Interface:

```
public interface FooValidator {
    public Foo validate(Foo foo);
}
```

Name Validator Class:

```
@Component(value="FooNameValidator")
public class FooNameValidator implements FooValidator {
    @Override
    public Foo validate(Foo foo) {
        //Validation logic goes here.
    }
}
```

Email Validator Class:

```
@Component(value="FooEmailValidator")
public class FooEmailValidator implements FooValidator {
    @Override
    public Foo validate(Foo foo) {
        //Different validation logic goes here.
    }
}
```

You can now autowire these validators individually into a class.

Interface:

```
public interface FooService {
    public void handleFoo(Foo foo);
}
```

Class:

```
@Service
public class FooServiceImpl implements FooService {
    /** Autowire validators individually **/
    @Autowired
    /*
     * Notice how the String value here matches the value
     * on the @Component annotation? That's how Spring knows which
     * instance to autowire.
     */
    @Qualifier("FooNameValidator")
    private FooValidator nameValidator;

    @Autowired
    @Qualifier("FooEmailValidator")
    private FooValidator emailValidator;

    @Override
    public void handleFoo(Foo foo) {
        /**You can use just one instance if you need**/
        foo = nameValidator.validate(foo);
    }
}
```

It's worth noting that if you have more than one implementation of an interface in the Spring IoC container and don't specify which one you want to use with the `@Qualifier` annotation, Spring will throw an exception when trying to start, because it won't know which instance to use.

1: This is not the right way to do such simple validations. This is a simple example about autowiring. If you want an idea of a much easier validation method look up how Spring does validation with annotations.

Section 5.6: Autowiring specific instances of classes using generic type parameters

If you've got an interface with a generic type parameter, Spring can use that to only autowire implementations that implement a type parameter you specify.

Interface:

```
public interface GenericValidator<T> {
    public T validate(T object);
}
```

Foo Validator Class:

```
@Component
public class FooValidator implements GenericValidator<Foo> {
    @Override
    public Foo validate(Foo foo) {
        //Logic here to validate foo objects.
    }
}
```

Bar Validator Class:

```
@Component
public class BarValidator implements GenericValidator<Bar> {
    @Override
    public Bar validate(Bar bar) {
```

```
        //Bar validation logic here
    }
}
```

You can now autowire these validators using type parameters to decide which instance to autowire.

Interface:

```
public interface FooService {
    public void handleFoo(Foo foo);
}
```

Class:

```
@Service
public class FooServiceImpl implements FooService {
    /** Autowire Foo Validator **/
    @Autowired
    private GenericValidator<Foo> fooValidator;

    @Override
    public void handleFoo(Foo foo) {
        foo = fooValidator.validate(foo);
    }
}
```

Section 5.7: Inject prototype-scoped beans into singletons

The container creates a singleton bean and injects collaborators into it only once. This is not the desired behavior when a singleton bean has a prototype-scoped collaborator, since the prototype-scoped bean should be injected every time it is being accessed via accessor.

There are several solutions to this problem:

1. Use lookup method injection
2. Retrieve a prototype-scoped bean via `javax.inject.Provider`
3. Retrieve a prototype-scoped bean via `org.springframework.beans.factory.ObjectFactory` (an equivalent of #2, but with the class that is specific to Spring)
4. Make a singleton bean container aware via implementing `ApplicationContextAware` interface

Approaches #3 and #4 are generally discouraged, since they strongly tie an app to Spring framework. Thus, they are not covered in this example.

Lookup method injection via XML configuration and an abstract method

Java Classes

```
public class Window {
}

public abstract class WindowGenerator {

    public Window generateWindow() {
        Window window = createNewWindow(); // new instance for each call
        ...
    }
```

```
    protected abstract Window createNewWindow(); // lookup method
}
```

XML

```
<bean id="window" class="somepackage.Window" scope="prototype" lazy-init="true"/>

<bean id="windowGenerator" class="somepackage.WindowGenerator">
    <lookup-method name="createNewWindow" bean="window"/>
</bean>
```

Lookup method injection via Java configuration and @Component

Java Classes

```
public class Window {
}

@Component
public class WindowGenerator {

    public Window generateWindow() {
        Window window = createNewWindow(); // new instance for each call
        ...
    }

    @Lookup
    protected Window createNewWindow() {
        throw new UnsupportedOperationException();
    }
}
```

Java configuration

```
@Configuration
@ComponentScan("somepackage") // package where WindowGenerator is located
public class MyConfiguration {

    @Bean
    @Lazy
    @Scope(scopeName = ConfigurableBeanFactory.SCOPE_PROTOTYPE)
    public Window window() {
        return new Window();
    }
}
```

Manual lookup method injection via Java configuration

Java Classes

```
public class Window {
}

public abstract class WindowGenerator {

    public Window generateWindow() {
        Window window = createNewWindow(); // new instance for each call
        ...
    }
```

```
    protected abstract Window createNewWindow(); // lookup method
}
```

Java configuration

```
@Configuration
public class MyConfiguration {

    @Bean
    @Lazy
    @Scope(scopeName = ConfigurableBeanFactory.SCOPE_PROTOTYPE)
    public Window window() {
        return new Window();
    }

    @Bean
    public WindowGenerator windowGenerator(){
        return new WindowGenerator() {
            @Override
            protected Window createNewWindow(){
                return window();
            }
        };
    }
}
```

Injection of a protoype-scoped bean into singleton via `javax.inject.Provider`

Java classes

```
public class Window {
}

public class WindowGenerator {

    private final Provider<Window> windowProvider;

    public WindowGenerator(final Provider<Window> windowProvider) {
        this.windowProvider = windowProvider;
    }

    public Window generateWindow() {
        Window window = windowProvider.get(); // new instance for each call
        ...
    }
}
```

XML

```
<bean id="window" class="somepackage.Window" scope="prototype" lazy-init="true"/>

<bean id="windowGenerator" class="somepackage.WindowGenerator">
    <constructor-arg>
        <bean class="org.springframework.beans.factory.config.ProviderCreatingFactoryBean">
            <property name="targetBeanName" value="window"/>
        </bean>
    </constructor-arg>
</bean>
```

The same approaches can be used for other scopes as well (e.g. for injection a request-scoped bean into singleton).

Chapter 6: Bean scopes

Section 6.1: Additional scopes in web-aware contexts

There are several scopes that are available only in a web-aware application context:

- **request** - new bean instance is created per HTTP request
- **session** - new bean instance is created per HTTP session
- **application** - new bean instance is created per `ServletContext`
- **globalSession** - new bean instance is created per global session in Portlet environment (in Servlet environment global session scope is equal to session scope)
- **websocket** - new bean instance is created per WebSocket session

No additional setup is required to declare and access web-scoped beans in Spring Web MVC environment.

XML Configuration

```
<bean id="myRequestBean" class="OneClass" scope="request"/>
<bean id="mySessionBean" class="AnotherClass" scope="session"/>
<bean id="myApplicationBean" class="YetAnotherClass" scope="application"/>
<bean id="myGlobalSessionBean" class="OneMoreClass" scope="globalSession"/>
```

Java Configuration (prior to Spring 4.3)

```
@Configuration
public class MyConfiguration {

    @Bean
    @Scope(value = WebApplicationContext.SCOPE_REQUEST, proxyMode = ScopedProxyMode.TARGET_CLASS)
    public OneClass myRequestBean() {
        return new OneClass();
    }

    @Bean
    @Scope(value = WebApplicationContext.SCOPE_SESSION, proxyMode = ScopedProxyMode.TARGET_CLASS)
    public AnotherClass mySessionBean() {
        return new AnotherClass();
    }

    @Bean
    @Scope(value = WebApplicationContext.SCOPE_APPLICATION, proxyMode =
ScopedProxyMode.TARGET_CLASS)
    public YetAnotherClass myApplicationBean() {
        return new YetAnotherClass();
    }

    @Bean
    @Scope(value = WebApplicationContext.SCOPE_GLOBAL_SESSION, proxyMode =
ScopedProxyMode.TARGET_CLASS)
    public OneMoreClass myGlobalSessionBean() {
        return new OneMoreClass();
    }
}
```

Java Configuration (after Spring 4.3)

```
@Configuration
public class MyConfiguration {
```

```
    @Bean
    @RequestScope
    public OneClass myRequestBean() {
        return new OneClass();
    }

    @Bean
    @SessionScope
    public AnotherClass mySessionBean() {
        return new AnotherClass();
    }

    @Bean
    @ApplicationScope
    public YetAnotherClass myApplicationBean() {
        return new YetAnotherClass();
    }
}
```

Annotation-Driven Components

```
@Component
@RequestScope
public class OneClass {
    ...
}

@Component
@SessionScope
public class AnotherClass {
    ...
}

@Component
@ApplicationScope
public class YetAnotherClass {
    ...
}

@Component
@Scope(scopeName = WebApplicationContext.SCOPE_GLOBAL_SESSION, proxyMode =
ScopedProxyMode.TARGET_CLASS)
public class OneMoreClass {
    ...
}

@Component
@Scope(scopeName = "websocket", proxyMode = ScopedProxyMode.TARGET_CLASS)
public class AndOneMoreClass {
    ...
}
```

Section 6.2: Prototype scope

A prototype-scoped bean is not pre-created on Spring container startup. Instead, a new fresh instance will be created every time a request to retrieve this bean is sent to the container. This scope is recommended for stateful objects, since its state won't be shared by other components.

In order to define a prototype-scoped bean, we need to add the @Scope annotation, specifying the type of scope we want.

Given the following MyBean class:

```
public class MyBean {
    private static final Logger LOGGER = LoggerFactory.getLogger(MyBean.class);
    private String property;

    public MyBean(String property) {
        this.property = property;
        LOGGER.info("Initializing {} bean...", property);
    }

    public String getProperty() {
        return this.property;
    }

    public void setProperty(String property) {
        this.property = property;
    }
}
```

We define a bean definition, stating its scope as prototype:

```
@Configuration
public class PrototypeConfiguration {

    @Bean
    @Scope("prototype")
    public MyBean prototypeBean() {
        return new MyBean("prototype");
    }
}
```

In order to see how it works, we retrieve the bean from the Spring container and set a different value for its property field. Next, we will again retrieve the bean from the container and look up its value:

```
MyBean prototypeBean1 = context.getBean("prototypeBean", MyBean.class);
prototypeBean1.setProperty("changed property");

MyBean prototypeBean2 = context.getBean("prototypeBean", MyBean.class);

logger.info("Prototype bean 1 property: " + prototypeBean1.getProperty());
logger.info("Prototype bean 2 property: " + prototypeBean2.getProperty());
```

Looking at the following result, we can see how a new instance has been created on each bean request:

```
Initializing prototype bean...
Initializing prototype bean...
Prototype bean 1 property: changed property
Prototype bean 2 property: prototype
```

A common mistake is to assume that the bean is recreated per invocation or per thread, this is **NOT** the case. Instead an instance is created PER INJECTION (or retrieval from the context). If a Prototype scoped bean is only ever injected into a single singleton bean, there will only ever be one instance of that Prototype scoped bean.

Spring does not manage the complete lifecycle of a prototype bean: the container instantiates, configures, decorates and otherwise assembles a prototype object, hands it to the client and then has no further knowledge of that prototype instance.

Section 6.3: Singleton scope

If a bean is defined with singleton scope, there will only be one single object instance initialized in the Spring container. All requests to this bean will return the same shared instance. This is the default scope when defining a bean.

Given the following MyBean class:

```
public class MyBean {
    private static final Logger LOGGER = LoggerFactory.getLogger(MyBean.class);
    private String property;

    public MyBean(String property) {
        this.property = property;
        LOGGER.info("Initializing {} bean...", property);
    }

    public String getProperty() {
        return this.property;
    }

    public void setProperty(String property) {
        this.property = property;
    }
}
```

We can define a singleton bean with the @Bean annotation:

```
@Configuration
public class SingletonConfiguration {

    @Bean
    public MyBean singletonBean() {
        return new MyBean("singleton");
    }
}
```

The following example retrieves the same bean twice from the Spring context:

```
MyBean singletonBean1 = context.getBean("singletonBean", MyBean.class);
singletonBean1.setProperty("changed property");

MyBean singletonBean2 = context.getBean("singletonBean", MyBean.class);
```

When logging the singletonBean2 property, the message *"changed property"* will be shown, since we just retrieved the same shared instance.

Since the instance is shared among different components, it is recommended to define singleton scope for stateless objects.

Lazy singleton beans

By default, singleton beans are pre-instantiated. Hence, the shared object instance will be created when the Spring container is created. If we start the application, the *"Initializing singleton bean..."* message will be shown.

If we don't want the bean to be pre-instantiated, we can add the @Lazy annotation to the bean definition. This will prevent the bean from being created until it is first requested.

```
@Bean
@Lazy
public MyBean lazySingletonBean() {
    return new MyBean("lazy singleton");
}
```

Now, if we start the Spring container, no *"Initializing lazy singleton bean..."* message will appear. The bean won't be created until it is requested for the first time:

```
logger.info("Retrieving lazy singleton bean...");
context.getBean("lazySingletonBean");
```

If we run the application with both singleton and lazy singleton beans defined, It will produce the following messages:

```
Initializing singleton bean...
Retrieving lazy singleton bean...
Initializing lazy singleton bean...
```

Chapter 7: Conditional bean registration in Spring

Section 7.1: Register beans only when a property or value is specified

A spring bean can be configured such that it will register *only* if it has a particular value *or* a specified property is met. To do so, implement `Condition.matches` to check the property/value:

```
public class PropertyCondition implements Condition {
    @Override
    public boolean matches(ConditionContext context, AnnotatedTypeMetadata metadata) {
        return context.getEnvironment().getProperty("propertyName") != null;
        // optionally check the property value
    }
}
```

In Java config, use the above implementation as a condition to register the bean. Note the use of @Conditional annotation.

```
@Configuration
public class MyAppConfig {

    @Bean
    @Conditional(PropertyCondition.class)
    public MyBean myBean() {
      return new MyBean();
    }
}
```

In `PropertyCondition`, any number of conditions can be evaluated. However it is advised to separate the implementation for each condition to keep them loosely coupled. For example:

```
@Configuration
public class MyAppConfig {

    @Bean
    @Conditional({PropertyCondition.class, SomeOtherCondition.class})
    public MyBean myBean() {
      return new MyBean();
    }
}
```

Section 7.2: Condition annotations

Except main `@conditional` annotation there are set of similar annotation to be used for different cases.

Class conditions

The `@ConditionalOnClass` and `@ConditionalOnMissingClass` annotations allows configuration to be included based on the presence or absence of specific classes.

E.g. when `OObjectDatabaseTx.class` is added to dependencies and there is no `OrientWebConfigurer` bean we create the configurer.

```
@Bean
@ConditionalOnWebApplication
@ConditionalOnClass(OObjectDatabaseTx.class)
@ConditionalOnMissingBean(OrientWebConfigurer.class)
public OrientWebConfigurer orientWebConfigurer() {
    return new OrientWebConfigurer();
}
```

Bean conditions

The `@ConditionalOnBean` and `@ConditionalOnMissingBean` annotations allow a bean to be included based on the presence or absence of specific beans. You can use the value attribute to specify beans by type, or name to specify beans by name. The search attribute allows you to limit the `ApplicationContext` hierarchy that should be considered when searching for beans.

See the example above when we check whether there is no defined bean.

Property conditions

The `@ConditionalOnProperty` annotation allows configuration to be included based on a Spring Environment property. Use the prefix and name attributes to specify the property that should be checked. By default any property that exists and is not equal to `false` will be matched. You can also create more advanced checks using the `havingValue` and `matchIfMissing` attributes.

```
@ConditionalOnProperty(value='somebean.enabled', matchIfMissing = true, havingValue="yes")
@Bean
public SomeBean someBean(){
}
```

Resource conditions

The `@ConditionalOnResource` annotation allows configuration to be included only when a specific resource is present.

```
@ConditionalOnResource(resources = "classpath:init-db.sql")
```

Web application conditions

The `@ConditionalOnWebApplication` and `@ConditionalOnNotWebApplication` annotations allow configuration to be included depending on whether the application is a 'web application'.

```
@Configuration
@ConditionalOnWebApplication
public class MyWebMvcAutoConfiguration {...}
```

SpEL expression conditions

The `@ConditionalOnExpression` annotation allows configuration to be included based on the result of a SpEL expression.

```
@ConditionalOnExpression("${rest.security.enabled}==false")
```

Chapter 8: Spring JSR 303 Bean Validation

Spring has JSR303 bean validation support. We can use this to do input bean validation. Separate validation logic from business logic using JSR303.

Section 8.1: @Valid usage to validate nested POJOs

Suppose we have a POJO class User we need to validate.

```
public class User {

    @NotEmpty
    @Size(min=5)
    @Email
    private String email;
}
```

and a controller method to validate the user instance

```
public String registerUser(@Valid User user, BindingResult result);
```

Let's extend the User with a nested POJO Address we also need to validate.

```
public class Address {

    @NotEmpty
    @Size(min=2, max=3)
    private String countryCode;
}
```

Just add `@Valid` annotation on address field to run validation of nested POJOs.

```
public class User {

    @NotEmpty
    @Size(min=5)
    @Email
    private String email;

    @Valid
    private Address address;
}
```

Section 8.2: Spring JSR 303 Validation - Customize error messages

Suppose we have a simple class with validation annotations

```
public class UserDTO {
    @NotEmpty
    private String name;

    @Min(18)
    private int age;

//getters/setters
```

```
}
```

A controller to check the UserDTO validity.

```
@RestController
public class ValidationController {

    @RequestMapping(value = "/validate", method = RequestMethod.POST)
    public ResponseEntity<String> check(@Valid @RequestBody UserDTO userDTO,
           BindingResult bindingResult) {
        return new ResponseEntity<>("ok" , HttpStatus.OK);
    }
}
```

And a test.

```
@Test
public void testValid() throws Exception {
    TestRestTemplate template = new TestRestTemplate();
    String url = base + contextPath + "/validate";
    Map<String, Object> params = new HashMap<>();
    params.put("name", "");
    params.put("age", "10");

    MultiValueMap<String, String> headers = new LinkedMultiValueMap<>();
    headers.add("Content-Type", "application/json");

    HttpEntity<Map<String, Object>> request = new HttpEntity<>(params, headers);
    String res = template.postForObject(url, request, String.class);

    assertThat(res, equalTo("ok"));
}
```

Both name and age are invalid so in the BindingResult we have two validation errors. Each has array of codes.

Codes for Min check

```
0 = "Min.userDTO.age"
1 = "Min.age"
2 = "Min.int"
3 = "Min"
```

And for NotEmpty check

```
0 = "NotEmpty.userDTO.name"
1 = "NotEmpty.name"
2 = "NotEmpty.java.lang.String"
3 = "NotEmpty"
```

Let's add a custom.properties file to substitute default messages.

```
@SpringBootApplication
@Configuration
public class DemoApplication {

    @Bean(name = "messageSource")
    public MessageSource messageSource() {
        ReloadableResourceBundleMessageSource bean = new ReloadableResourceBundleMessageSource();
        bean.setBasename("classpath:custom");
```

```
        bean.setDefaultEncoding("UTF-8");
        return bean;
    }

    @Bean(name = "validator")
    public LocalValidatorFactoryBean validator() {
        LocalValidatorFactoryBean bean = new LocalValidatorFactoryBean();
        bean.setValidationMessageSource(messageSource());
        return bean;
    }

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

If we add to the custom.properties file the line

```
NotEmpty=The field must not be empty!
```

The new value is shown for the error. To resolve message validator looks through the codes starting from the beginning to find proper messages.

Thus when we define `NotEmpty` key in the .properties file for all cases where the `@NotEmpty` annotation is used our message is applied.

If we define a message

```
Min.int=Some custom message here.
```

All annotations where we app min check to integer values use the newly defined message.

The same logic could be applied if we need to localize the validation error messages.

Section 8.3: JSR303 Annotation based validations in Springs examples

Add any JSR 303 implementation to your classpath. Popular one used is Hibernate validator from Hibernate.

```
<dependency>
    <groupId>org.hibernate</groupId>
    <artifactId>hibernate-validator</artifactId>
    <version>4.2.0.Final</version>
</dependency>
```

Lets say the there is a rest api to create user in the system

```
@RequestMapping(value="/registeruser", method=RequestMethod.POST)
public String registerUser(User user);
```

The input json sample would look like as below

```
{"username" : "abc@abc.com", "password" : "password1", "password2":"password1"}
```

User.java

```
public class User {

    private String username;
    private String password;
    private String password2;

    getXXX and setXXX

}
```

We can define JSR 303 validations on User Class as below.

```
public class User {

    @NotEmpty
    @Size(min=5)
    @Email
    private String username;

    @NotEmpty
    private String password;

    @NotEmpty
    private String password2;

}
```

We may also need to have a business validator like password and password2(confirm password) are same, for this we can add a custom validator as below. Write a custom annotation for annotating the data field.

```
@Target({ ElementType.FIELD })
@Retention(RetentionPolicy.RUNTIME)
@Constraint(validatedBy = PasswordValidator.class)
public @interface GoodPassword {
    String message() default "Passwords won't match.";
    Class<?>[] groups() default {};
    Class<? extends Payload>[] payload() default {};
}
```

Write a Validator class for applying Validation logic.

```
public class PastValidator implements ConstraintValidator<GoodPassword, User> {
    @Override
    public void initialize(GoodPassword annotation) {}

    @Override
    public boolean isValid(User user, ConstraintValidatorContext context) {
        return user.getPassword().equals(user.getPassword2());
    }
}
```

Adding this validation to User Class

```
@GoodPassword
public class User {

    @NotEmpty
    @Size(min=5)
    @Email
```

```
    private String username;

    @NotEmpty
    private String password;

    @NotEmpty
    private String password2;
}
```

@Valid triggers validation in Spring. BindingResult is an object injected by spring which has list of errors after validation.

```
public String registerUser(@Valid User user, BindingResult result);
```

JSR 303 annotation has message attributes on them which can be used for providing custom messages.

```
@GoodPassword
public class User {

    @NotEmpty(message="Username Cant be empty")
    @Size(min=5, message="Username cant be les than 5 chars")
    @Email(message="Should be in email format")
    private String username;

    @NotEmpty(message="Password cant be empty")
    private String password;

    @NotEmpty(message="Password2 cant be empty")
    private String password2;

}
```

Chapter 9: ApplicationContext Configuration

Section 9.1: Autowiring

Autowiring is done using a *sterotype* annotation to specify what classes are going to be beans in the `ApplicationContext`, and using the `Autowired` and `Value` annotations to specify bean dependencies. The unique part of autowiring is that there is no external `ApplicationContext` definition, as it is all done within the classes that are the beans themselves.

```
@Component // The annotation that specifies to include this as a bean
           // in the ApplicationContext
class Book {

    @Autowired // The annotation that wires the below defined Author
               // instance into this bean
    Author author;

    String title = "It";

    Author getAuthor() { return author; }
    String getTitle() { return title; }
}

@Component // The annotation that specifies to include
           // this as a bean in the ApplicationContext
class Author {
    String firstName = "Steven";
    String lastName = "King";

    String getFirstName() { return firstName; }
    String getLastName() { return lastName; }
}
```

Section 9.2: Bootstrapping the ApplicationContext

Java Config

The configuration class needs only to be a class that is on the classpath of your application and visible to your applications main class.

```
class MyApp {
    public static void main(String[] args) throws Exception {
        AnnotationConfigApplicationContext appContext =
            new AnnotationConfigApplicationContext(MyConfig.class);

        // ready to retrieve beans from appContext, such as myObject.
    }
}

@Configuration
class MyConfig {
    @Bean
    MyObject myObject() {
        // ...configure myObject...
    }
```

```
    // ...define more beans...
}
```

Xml Config

The configuration xml file needs only be on the classpath of your application.

```
class MyApp {
    public static void main(String[] args) throws Exception {
        ClassPathXmlApplicationContext appContext =
            new ClassPathXmlApplicationContext("applicationContext.xml");

        // ready to retrieve beans from appContext, such as myObject.
    }
}

<?xml version="1.0" encoding="UTF-8"?>
<!-- applicationContext.xml -->
<beans xmlns="http://www.springframework.org/schema/beans"
    xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
    xsi:schemaLocation="http://www.springframework.org/schema/beans
                        http://www.springframework.org/schema/beans/spring-beans.xsd">
    <bean id="myObject" class="com.example.MyObject">
        <!-- ...configure myObject... -->
    </bean>

    <!-- ...define more beans... -->
</beans>
```

Autowiring

Autowiring needs to know which base packages to scan for annotated beans (`@Component`). This is specified via the `#scan(String...)` method.

```
class MyApp {
    public static void main(String[] args) throws Exception {
        AnnotationConfigApplicationContext appContext =
            new AnnotationConfigApplicationContext();
        appContext.scan("com.example");
        appContext.refresh();

        // ready to retrieve beans from appContext, such as myObject.
    }
}

// assume this class is in the com.example package.
@Component
class MyObject {
    // ...myObject definition...
}
```

Section 9.3: Java Configuration

Java configuration is typically done by applying the `@Configuration` annotation to a class to suggest that a class contains bean definitions. The bean definitions are specified by applying the `@Bean` annotation to a method that returns an object.

```
@Configuration // This annotation tells the ApplicationContext that this class
```

```
                // contains bean definitions.
class AppConfig {
    /**
     * An Author created with the default constructor
     * setting no properties
     */
    @Bean // This annotation marks a method that defines a bean
    Author author1() {
        return new Author();
    }

    /**
     * An Author created with the constructor that initializes the
     * name fields
     */
    @Bean
    Author author2() {
        return new Author("Steven", "King");
    }

    /**
     * An Author created with the default constructor, but
     * then uses the property setters to specify name fields
     */
    @Bean
    Author author3() {
        Author author = new Author();
        author.setFirstName("George");
        author.setLastName("Martin");
        return author;
    }

    /**
     * A Book created referring to author2 (created above) via
     * a constructor argument.  The dependency is fulfilled by
     * invoking the method as plain Java.
     */
    @Bean
    Book book1() {
        return new Book(author2(), "It");
    }

    /**
     * A Book created referring to author3 (created above) via
     * a property setter.  The dependency is fulfilled by
     * invoking the method as plain Java.
     */
    @Bean
    Book book2() {
        Book book = new Book();
        book.setAuthor(author3());
        book.setTitle("A Game of Thrones");
        return book;
    }
}
```

```
// The classes that are being initialized and wired above...
class Book { // assume package org.springframework.example
    Author author;
    String title;
```

```
    Book() {} // default constructor
    Book(Author author, String title) {
        this.author = author;
        this.title= title;
    }

    Author getAuthor() { return author; }
    String getTitle() { return title; }

    void setAuthor(Author author) {
        this.author = author;
    }

    void setTitle(String title) {
        this.title= title;
    }
}

class Author { // assume package org.springframework.example
    String firstName;
    String lastName;

    Author() {} // default constructor
    Author(String firstName, String lastName) {
        this.firstName = firstName;
        this.lastName = lastName;
    }

    String getFirstName() { return firstName; }
    String getLastName() { return lastName; }

    void setFirstName(String firstName) {
        this.firstName = firstName;
    }

    void setLastName(String lastName) {
        this.lastName = lastName;
    }
}
```

Section 9.4: Xml Configuration

Xml configuration is typically done by defining beans within an xml file, using Spring's specific `beans` schema. Under the root `beans` element, typical bean definition would be done using the `bean` subelement.

```
<?xml version="1.0" encoding="UTF-8"?>
<beans xmlns="http://www.springframework.org/schema/beans"
   xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
   xsi:schemaLocation="http://www.springframework.org/schema/beans
                       http://www.springframework.org/schema/beans/spring-beans.xsd">
    <!-- An Author created with the default constructor
        setting no properties -->
    <bean id="author1" class="org.springframework.example.Author" />

    <!-- An Author created with the constructor that initializes the
        name fields -->
    <bean id="author2" class="org.springframework.example.Author">
        <constructor-arg index="0" value="Steven" />
        <constructor-arg index="1" value="King" />
    </bean>
```

```
    <!-- An Author created with the default constructor, but
        then uses the property setters to specify name fields -->
    <bean id="author3" class="org.springframework.example.Author">
        <property name="firstName" value="George" />
        <property name="lastName" value="Martin" />
    </bean>

    <!-- A Book created referring to author2 (created above) via
        a constructor argument -->
    <bean id="book1" class="org.springframework.example.Book">
        <constructor-arg index="0" ref="author2" />
        <constructor-arg index="1" value="It" />
    </bean>

    <!-- A Book created referring to author3 (created above) via
        a property setter -->
    <bean id="book1" class="org.springframework.example.Book">
        <property name="author" ref="author3" />
        <property name="title" value="A Game of Thrones" />
    </bean>
</beans>
```

```
// The classes that are being initialized and wired above...
class Book { // assume package org.springframework.example
    Author author;
    String title;

    Book() {} // default constructor
    Book(Author author, String title) {
        this.author = author;
        this.title= title;
    }

    Author getAuthor() { return author; }
    String getTitle() { return title; }

    void setAuthor(Author author) {
        this.author = author;
    }

    void setTitle(String title) {
        this.title= title;
    }
}

class Author { // assume package org.springframework.example
    String firstName;
    String lastName;

    Author() {} // default constructor
    Author(String firstName, String lastName) {
        this.firstName = firstName;
        this.lastName = lastName;
    }

    String getFirstName() { return firstName; }
    String getLastName() { return lastName; }

    void setFirstName(String firstName) {
        this.firstName = firstName;
    }
```

```
    void setLastName(String lastName) {
        this.lastName = lastName;
    }
}
```

Chapter 10: RestTemplate

Section 10.1: Downloading a Large File

The `getForObject` and `getForEntity` methods of `RestTemplate` load the entire response in memory. This is not suitable for downloading large files since it can cause out of memory exceptions. This example shows how to stream the response of a GET request.

```
RestTemplate restTemplate // = ...;

// Optional Accept header
RequestCallback requestCallback = request -> request.getHeaders()
        .setAccept(Arrays.asList(MediaType.APPLICATION_OCTET_STREAM, MediaType.ALL));

// Streams the response instead of loading it all in memory
ResponseExtractor<Void> responseExtractor = response -> {
    // Here I write the response to a file but do what you like
    Path path = Paths.get("some/path");
    Files.copy(response.getBody(), path);
    return null;
};
restTemplate.execute(URI.create("www.something.com"), HttpMethod.GET, requestCallback,
responseExtractor);
```

Note that you cannot simply return the `InputStream` from the extractor, because by the time the execute method returns, the underlying connection and stream are already closed.

Section 10.2: Setting headers on Spring RestTemplate request

The `exchange` methods of `RestTemplate` allows you specify a `HttpEntity` that will be written to the request when execute the method. You can add headers (such user agent, referrer...) to this entity:

```
public void testHeader(final RestTemplate restTemplate){
        //Set the headers you need send
        final HttpHeaders headers = new HttpHeaders();
        headers.set("User-Agent", "eltabo");

        //Create a new HttpEntity
        final HttpEntity<String> entity = new HttpEntity<String>(headers);

        //Execute the method writing your HttpEntity to the request
        ResponseEntity<Map> response = restTemplate.exchange("https://httpbin.org/user-agent",
HttpMethod.GET, entity, Map.class);
        System.out.println(response.getBody());
    }
```

Also you can add an interceptor to your `RestTemplate` if you need to add the same headers to multiple requests:

```
public void testHeader2(final RestTemplate restTemplate){
    //Add a ClientHttpRequestInterceptor to the RestTemplate
    restTemplate.getInterceptors().add(new ClientHttpRequestInterceptor(){
        @Override
        public ClientHttpResponse intercept(HttpRequest request, byte[] body,
ClientHttpRequestExecution execution) throws IOException {
            request.getHeaders().set("User-Agent", "eltabo");//Set the header for each request
            return execution.execute(request, body);
        }
```

```
    });

    ResponseEntity<Map> response = restTemplate.getForEntity("https://httpbin.org/user-agent",
Map.class);
    System.out.println(response.getBody());

    ResponseEntity<Map> response2 = restTemplate.getForEntity("https://httpbin.org/headers",
Map.class);
    System.out.println(response2.getBody());
}
```

Section 10.3: Generics results from Spring RestTemplate

To let `RestTemplate` understand generic of returned content we need to define result type reference.

`org.springframework.core.ParameterizedTypeReference` has been introduced since 3.2

```
Wrapper<Model> response = restClient.exchange(url,
                          HttpMethod.GET,
                          null,
                          new ParameterizedTypeReference<Wrapper<Model>>() {}).getBody();
```

Could be useful to get e.g. `List<User>` from a controller.

Section 10.4: Using Preemptive Basic Authentication with RestTemplate and HttpClient

Preemptive basic authentication is the practice of sending http basic authentication credentials (username and password) *before* a server replies with a `401` response asking for them. This can save a request round trip when consuming REST apis which are known to require basic authentication.

As described in the Spring documentation, Apache HttpClient may be used as the underlying implementation to create HTTP requests by using the `HttpComponentsClientHttpRequestFactory`. HttpClient can be configured to do preemptive basic authentication.

The following class extends `HttpComponentsClientHttpRequestFactory` to provide preemptive basic authentication.

```
/**
 * {@link HttpComponentsClientHttpRequestFactory} with preemptive basic
 * authentication to avoid the unnecessary first 401 response asking for
 * credentials.
 * <p>
 * Only preemptively sends the given credentials to the given host and
 * optionally to its subdomains. Matching subdomains can be useful for APIs
 * using multiple subdomains which are not always known in advance.
 * <p>
 * Other configurations of the {@link HttpClient} are not modified (e.g. the
 * default credentials provider).
 */
public class PreAuthHttpComponentsClientHttpRequestFactory extends
HttpComponentsClientHttpRequestFactory {

    private String hostName;
    private boolean matchSubDomains;
    private Credentials credentials;

    /**
```

```
     * @param httpClient
     *            client
     * @param hostName
     *            host name
     * @param matchSubDomains
     *            whether to match the host's subdomains
     * @param userName
     *            basic authentication user name
     * @param password
     *            basic authentication password
     */
    public PreAuthHttpComponentsClientHttpRequestFactory(HttpClient httpClient, String hostName,
            boolean matchSubDomains, String userName, String password) {
        super(httpClient);
        this.hostName = hostName;
        this.matchSubDomains = matchSubDomains;
        credentials = new UsernamePasswordCredentials(userName, password);
    }

    @Override
    protected HttpContext createHttpContext(HttpMethod httpMethod, URI uri) {
        // Add AuthCache to the execution context
        HttpClientContext context = HttpClientContext.create();
        context.setCredentialsProvider(new PreAuthCredentialsProvider());
        context.setAuthCache(new PreAuthAuthCache());
        return context;
    }

    /**
     * @param host
     *            host name
     * @return whether the configured credentials should be used for the given
     *         host
     */
    protected boolean hostNameMatches(String host) {
        return host.equals(hostName) || (matchSubDomains && host.endsWith("." + hostName));
    }

    private class PreAuthCredentialsProvider extends BasicCredentialsProvider {
        @Override
        public Credentials getCredentials(AuthScope authscope) {
            if (hostNameMatches(authscope.getHost())) {
                // Simulate a basic authenticationcredentials entry in the
                // credentials provider.
                return credentials;
            }
            return super.getCredentials(authscope);
        }
    }

    private class PreAuthAuthCache extends BasicAuthCache {
        @Override
        public AuthScheme get(HttpHost host) {
            if (hostNameMatches(host.getHostName())) {
                // Simulate a cache entry for this host. This instructs
                // HttpClient to use basic authentication for this host.
                return new BasicScheme();
            }
            return super.get(host);
        }
    }
}
```

This can be used as follows:

```
HttpClientBuilder builder = HttpClientBuilder.create();
ClientHttpRequestFactory requestFactory =
    new PreAuthHttpComponentsClientHttpRequestFactory(builder.build(),
        "api.some-host.com", true, "api", "my-key");
RestTemplate restTemplate = new RestTemplate(requestFactory);
```

Section 10.5: Using Basic Authentication with HttpComponent's HttpClient

Using `HttpClient` as `RestTemplate`'s underlying implementation to create HTTP requests allows for automatic handling of basic authentication requests (an http 401 response) when interacting with APIs. This example shows how to configure a `RestTemplate` to achieve this.

```
// The credentials are stored here
CredentialsProvider credsProvider = new BasicCredentialsProvider();
credsProvider.setCredentials(
        // AuthScope can be configured more extensively to restrict
        // for which host/port/scheme/etc the credentials will be used.
        new AuthScope("somehost", AuthScope.ANY_PORT),
        new UsernamePasswordCredentials("username", "password"));

// Use the credentials provider
HttpClientBuilder builder = HttpClientBuilder.create();
builder.setDefaultCredentialsProvider(credsProvider);

// Configure the RestTemplate to use HttpComponent's HttpClient
ClientHttpRequestFactory requestFactory =
        new HttpComponentsClientHttpRequestFactory(builder.build());
RestTemplate restTemplate = new RestTemplate(requestFactory);
```

Chapter 11: Task Execution and Scheduling

Section 11.1: Enable Scheduling

Spring provides a useful task scheduling support. To enable it, just annotate any of your `@Configuration` classes with `@EnableScheduling`:

```
@Configuration
@EnableScheduling
public class MyConfig {

    // Here it goes your configuration
}
```

Section 11.2: Cron expression

A Cron expression consists of six sequential fields -

```
second, minute, hour, day of month, month, day(s) of week
```

and is declared as follows

```
@Scheduled(cron = "* * * * * *")
```

We can also set the timezone as -

```
@Scheduled(cron="* * * * * *", zone="Europe/Istanbul")
```

Notes: -

```
syntax            means                example                explanation
-------------------------------------------------------------------------------
*                 match any            "* * * * * *"          do always
*/x               every x              "*/5 * * * * *"        do every five seconds
?                 no specification     "0 0 0 25 12 ?"        do every Christmas Day
```

Example: -

```
syntax                        means
-------------------------------------------------------------------------------
"0 0 * * * *"                 the top of every hour of every day.
"*/10 * * * * *"              every ten seconds.
"0 0 8-10 * * *"              8, 9 and 10 o'clock of every day.
"0 0/30 8-10 * * *"           8:00, 8:30, 9:00, 9:30 and 10 o'clock every day.
"0 0 9-17 * * MON-FRI"        on the hour nine-to-five weekdays
"0 0 0 25 12 ?"               every Christmas Day at midnight
```

A method declared with `@Scheduled()` is called explicitly for every matching case.

If we want some code to be executed when a cron expression is met, then we have to specify it in the annotation:

```
@Component
public class MyScheduler{
```

```
    @Scheduled(cron="*/5 * * * * MON-FRI")
    public void doSomething() {
        // this will execute on weekdays
    }
}
```

If we want to print current time in our console for every after 5 seconds -

```
import org.slf4j.Logger;
import org.slf4j.LoggerFactory;
import org.springframework.scheduling.annotation.Scheduled;
import org.springframework.stereotype.Component;

import java.text.SimpleDateFormat;
import java.util.Date;


@Component
public class Scheduler {

    private static final Logger log = LoggerFactory.getLogger(Scheduler.class);
    private static final SimpleDateFormat dateFormat = new SimpleDateFormat("HH:mm:ss");

    @Scheduled(cron = "*/5 * * * * *")
    public void currentTime() {
        log.info("Current Time      = {}", dateFormat.format(new Date()));
    }

}
```

Example using XML configuration:

Example class:

```
import org.slf4j.Logger;
import org.slf4j.LoggerFactory;
import org.springframework.stereotype.Component;

import java.text.SimpleDateFormat;
import java.util.Date;


@Component("schedulerBean")
public class Scheduler {

    private static final Logger log = LoggerFactory.getLogger(Scheduler.class);
    private static final SimpleDateFormat dateFormat = new SimpleDateFormat("HH:mm:ss");

    public void currentTime() {
        log.info("Current Time      = {}", dateFormat.format(new Date()));
    }

}
```

Example XML(task-context.xml):

```
  <?xml version="1.0" encoding="UTF-8"?>
<beans xmlns="http://www.springframework.org/schema/beans"
   xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
```

```
    xmlns:task="http://www.springframework.org/schema/task"
    xsi:schemaLocation="http://www.springframework.org/schema/beans
        http://www.springframework.org/schema/beans/spring-beans-4.1.xsd
        http://www.springframework.org/schema/task
        http://www.springframework.org/schema/task/spring-task-4.1.xsd">


     <task:scheduled-tasks scheduler="scheduledTasks">
         <task:scheduled ref="schedulerBean" method="currentTime" cron="*/5 * * * * MON-FRI" />
     </task:scheduled-tasks>

     <task:scheduler id="scheduledTasks" />

</beans>
```

Section 11.3: Fixed delay

If we want some code to be executed periodically after the execution which was before is finished, we should use fixed delay (measured in milliseconds):

```
@Component
public class MyScheduler{

    @Scheduled(fixedDelay=5000)
    public void doSomething() {
        // this will execute periodically, after the one before finishes
    }
}
```

Section 11.4: Fixed Rate

If we want something to be executed periodically, this code will be triggered once per the value in milliseconds we specify:

```
@Component
public class MyScheduler{

    @Scheduled(fixedRate=5000)
    public void doSomething() {
        // this will execute periodically
    }
}
```

Chapter 12: Spring Lazy Initialization

Section 12.1: Example of Lazy Init in Spring

The `@Lazy` allow us to instruct the IOC container to delay the initialization of a bean. By default, beans are instantiated as soon as the IOC container is created, The `@Lazy` allow us to change this instantiation process.

lazy-init in spring is the attribute of bean tag. The values of lazy-init are true and false. If lazy-init is true, then that bean will be initialized when a request is made to bean. This bean will not be initialized when the spring container is initialized. If lazy-init is false then the bean will be initialized with the spring container initialization and this is the default behavior.

app-conf.xml

```
<beans xmlns="http://www.springframework.org/schema/beans"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xmlns:util="http://www.springframework.org/schema/util"
xsi:schemaLocation="http://www.springframework.org/schema/beans
http://www.springframework.org/schema/beans/spring-beans-3.0.xsd
http://www.springframework.org/schema/util
http://www.springframework.org/schema/util/spring-util-3.0.xsd">

<bean id="testA" class="com.concretepage.A"/>
<bean id="testB" class="com.concretepage.B" lazy-init="true"/>
```

A.java

```
package com.concretepage;
public class A {
public A(){
    System.out.println("Bean A is initialized");
   }
}
```

B.java

```
package com.concretepage;
public class B {
public B(){
    System.out.println("Bean B is initialized");
   }
}
```

SpringTest.java

```
package com.concretepage;
import org.springframework.context.ApplicationContext;
import org.springframework.context.support.ClassPathXmlApplicationContext;
public class SpringTest {
public static void main(String[] args) {
     ApplicationContext context = new ClassPathXmlApplicationContext("app-conf.xml");
     System.out.println("Feth bean B.");
     context.getBean("testB");
   }
}
```

Output

```
Bean A is initialized
Feth bean B.
Bean B is initialized
```

Section 12.2: For component scanning and auto-wiring

```
@Component
@Lazy
public class Demo {
    ....
    ....
}

@Component
public class B {

    @Autowired
    @Lazy // If this is not here, Demo will still get eagerly instantiated to satisfy this request.
    private Demo demo;

    .......
 }
```

Section 12.3: Lazy initialization in the configuration class

```
@Configuration
// @Lazy - For all Beans to load lazily
public class AppConf {

    @Bean
    @Lazy
    public Demo demo() {
        return new Demo();
    }
}
```

Chapter 13: Property Source

Section 13.1: Sample xml configuration using PropertyPlaceholderConfigurer

```
<bean class="org.springframework.beans.factory.config.PropertyPlaceholderConfigurer">
    <property name="locations">
     <list>
           <value>classpath:ReleaseBundle.properties</value>
     </list>
</bean>
```

Section 13.2: Annotation

Sample property file : nexus.properties

Sample property file content:

```
nexus.user=admin
nexus.pass=admin
nexus.rest.uri=http://xxx.xxx.xxx.xxx:xxxx/nexus/service/local/artifact/maven/content
```

Sample Context File xml configuration

```
<context:property-placeholder location="classpath:ReleaseBundle.properties" />
```

Sample Property Bean using annotations

```
@Component
@PropertySource(value = { "classpath:nexus.properties" })
public class NexusBean {

    @Value("${" + NexusConstants.NEXUS_USER + "}")
    private String user;

    @Value("${" + NexusConstants.NEXUS_PASS + "}")
    private String pass;

    @Value("${" + NexusConstants.NEXUS_REST_URI + "}")
    private String restUri;
}
```

Sample Constant class

```
public class NexusConstants {
    public static final String NexusConstants.NEXUS_USER="";
    public static final String NexusConstants.NEXUS_PASS="";
    public static final String NexusConstants.NEXUS_REST_URI="";
}
```

Chapter 14: Dependency Injection (DI) and Inversion of Control (IoC)

Section 14.1: Autowiring a dependency through Java configuration

Constructor injection through Java configuration can also utilize autowiring, such as:

```
@Configuration
class AppConfig {
  @Bean
  public Bar bar() { return new Bar(); }

  @Bean
  public Foo foo(Bar bar) { return new Foo(bar); }
}
```

Section 14.2: Autowiring a dependency through XML configuration

Dependencies can be autowired when using the component scan feature of the Spring framework. For autowiring to work, the following XML configuration must be made:

```
<context:annotation-config/>
<context:component-scan base-package="[base package]"/>
```

where, `base-package` is the fully-qualified Java package within which Spring should perform component scan.

> Constructor injection

Dependencies can be injected through the class constructor as follows:

```
@Component
class Bar { ... }

@Component
class Foo {
  private Bar bar;

  @Autowired
  public Foo(Bar bar) { this.bar = bar; }
}
```

Here, `@Autowired` is a Spring-specific annotation. Spring also supports JSR-299 to enable application portability to other Java-based dependency injection frameworks. This allows `@Autowired` to be replaced with `@Inject` as:

```
@Component
class Foo {
  private Bar bar;

  @Inject
  public Foo(Bar bar) { this.bar = bar; }
}
```

> Property injection

Dependencies can also be injected using setter methods as follows:

```
@Component
class Foo {
  private Bar bar;

  @Autowired
  public void setBar(Bar bar) { this.bar = bar; }
}
```

> Field injection

Autowiring also allows initializing fields within class instances directly, as follows:

```
@Component
class Foo {
  @Autowired
  private Bar bar;
}
```

For Spring versions 4.1+ you can use Optional for optional dependencies.

```
@Component
class Foo {

    @Autowired
    private Optional<Bar> bar;
}
```

The same approach can be used for constructor DI.

```
@Component
class Foo {
    private Optional<Bar> bar;

    @Autowired
    Foo(Optional<Bar> bar) {
        this.bar = bar;
    }
}
```

Section 14.3: Injecting a dependency manually through XML configuration

Consider the following Java classes:

```
class Foo {
  private Bar bar;

  public void foo() {
    bar.baz();
  }
}
```

As can be seen, the class `Foo` needs to call the method `baz` on an instance of another class `Bar` for its method `foo` to work successfully. `Bar` is said to be a dependency for `Foo` since `Foo` cannot work correctly without a `Bar` instance.

> Constructor injection

When using XML configuration for Spring framework to define Spring-managed beans, a bean of type `Foo` can be configured as follows:

```
<bean class="Foo">
  <constructor-arg>
    <bean class="Bar" />
  </constructor-arg>
</bean>
```

or, alternatively (more verbose):

```
<bean id="bar" class="bar" />

<bean class="Foo">
  <constructor-arg ref="bar" />
</bean>
```

In both cases, Spring framework first creates an instance of `Bar` and `injects` it into an instance of `Foo`. This example assumes that the class `Foo` has a constructor that can take a `Bar` instance as a parameter, that is:

```
class Foo {
  private Bar bar;

  public Foo(Bar bar) { this.bar = bar; }
}
```

This style is known as **constructor injection** because the dependency (`Bar` instance) is being injected into through the class constructor.

> Property injection

Another option to inject the `Bar` dependency into `Foo` is:

```
<bean class="Foo">
  <property name="bar">
    <bean class="Bar" />
  </property>
</bean>
```

or, alternatively (more verbose):

```
<bean id="bar" class="bar" />

<bean class="Foo">
  <property name="bar" ref="bar" />
</bean>
```

This requires the `Foo` class to have a setter method that accepts a `Bar` instance, such as:

```
class Foo {
  private Bar bar;

  public void setBar(Bar bar) { this.bar = bar; }
}
```

Section 14.4: Injecting a dependency manually through Java configuration

The same examples as shown above with XML configuration can be re-written with Java configuration as follows.

> Constructor injection

```
@Configuration
class AppConfig {
  @Bean
  public Bar bar() { return new Bar(); }

  @Bean
  public Foo foo() { return new Foo(bar()); }
}
```

> Property injection

```
@Configuration
class AppConfig {
  @Bean
  public Bar bar() { return new Bar(); }

  @Bean
  public Foo foo() {
    Foo foo = new Foo();
    foo.setBar(bar());

    return foo;
  }
}
```

Chapter 15: JdbcTemplate

The JdbcTemplate class executes SQL queries, update statements and stored procedure calls, performs iteration over ResultSets and extraction of returned parameter values. It also catches JDBC exceptions and translates them to the generic, more informative, exception hierarchy defined in the org.springframework.dao package.

Instances of the JdbcTemplate class are threadsafe once configured so it can be safely inject this shared reference into multiple DAOs.

Section 15.1: Basic Query methods

Some of the queryFor* methods available in JdbcTemplate are useful for simple sql statements that perform CRUD operations.

Querying for Date

```
String sql = "SELECT create_date FROM customer WHERE customer_id = ?";
int storeId = jdbcTemplate.queryForObject(sql, java.util.Date.class, customerId);
```

Querying for Integer

```
String sql = "SELECT store_id FROM customer WHERE customer_id = ?";
int storeId = jdbcTemplate.queryForObject(sql, Integer.class, customerId);
```

OR

```
String sql = "SELECT store_id FROM customer WHERE customer_id = ?";
int storeId = jdbcTemplate.queryForInt(sql, customerId);                //Deprecated in spring-
jdbc 4
```

Querying for String

```
String sql = "SELECT first_Name FROM customer WHERE customer_id = ?";
String firstName = jdbcTemplate.queryForObject(sql, String.class, customerId);
```

Querying for List

```
String sql = "SELECT first_Name FROM customer WHERE store_id =  ?";
List<String> firstNameList = jdbcTemplate.queryForList(sql, String.class, storeId);
```

Section 15.2: Query for List of Maps

```
int storeId = 1;
DataSource dataSource = ... //
JdbcTemplate jdbcTemplate = new JdbcTemplate(dataSource);
String sql = "SELECT * FROM customer WHERE store_id = ?";
List<Map<String, Object>> mapList = jdbcTemplate.queryForList(sql, storeId);

for(Map<String, Object> entryMap : mapList)
{
  for(Entry<String, Object> entry : entryMap.entrySet())
  {
       System.out.println(entry.getKey() + " / " + entry.getValue());
  }
  System.out.println("---");
```

```
}
```

Section 15.3: SQLRowSet

```
DataSource dataSource = ... //
JdbcTemplate jdbcTemplate = new JdbcTemplate(dataSource);
String sql = "SELECT * FROM customer";
SqlRowSet rowSet = jdbcTemplate.queryForRowSet(sql);

while(rowSet.next())
{
  String firstName = rowSet.getString("first_name");
  String lastName = rowSet.getString("last_name");
  System.out.println("Vorname: " + firstName);
  System.out.println("Nachname: " + lastName);
  System.out.println("---");
}
```

OR

```
String sql = "SELECT * FROM customer";
List<Customer> customerList = jdbcTemplate.query(sql, new RowMapper<Customer>()    {

  @Override
  public Customer mapRow(ResultSet rs, int rowNum) throws SQLException
  {
    Customer customer = new Customer();
    customer.setFirstName(rs.getString("first_Name"));
    customer.setLastName(rs.getString("first_Name"));
    customer.setEmail(rs.getString("email"));

    return customer;
  }

});
```

Section 15.4: Batch operations

JdbcTemplate also provides convenient methods to execute batch operations.

Batch Insert

```
final ArrayList<Student> list = // Get list of students to insert..
String sql = "insert into student (id, f_name, l_name, age, address) VALUES (?, ?, ?, ?, ?)"
jdbcTemplate.batchUpdate(sql, new BatchPreparedStatementSetter(){
    @Override
    public void setValues(PreparedStatement ps, int i) throws SQLException {
        Student s = l.get(i);
        ps.setString(1, s.getId());
        ps.setString(2, s.getF_name());
        ps.setString(3, s.getL_name());
        ps.setInt(4, s.getAge());
        ps.setString(5, s.getAddress());
    }

    @Override
    public int getBatchSize() {
        return l.size();
    }
```

```
});
```

Batch Update

```
final ArrayList<Student> list = // Get list of students to update..
String sql = "update student set f_name = ?, l_name = ?, age = ?, address = ? where id = ?"
jdbcTemplate.batchUpdate(sql, new BatchPreparedStatementSetter(){
    @Override
    public void setValues(PreparedStatement ps, int i) throws SQLException {
        Student s = l.get(i);
        ps.setString(1, s.getF_name());
        ps.setString(2, s.getL_name());
        ps.setInt(3, s.getAge());
        ps.setString(4, s.getAddress());
        ps.setString(5, s.getId());
    }

    @Override
    public int getBatchSize() {
        return l.size();
    }
});
```

There are further batchUpdate methods which accept List of object array as input parameters. These methods internally use BatchPreparedStatementSetter to set the values from the list of arrays into sql statement.

Section 15.5: NamedParameterJdbcTemplate extension of JdbcTemplate

> The `NamedParameterJdbcTemplate` class adds support for programming JDBC statements using named parameters, as opposed to programming JDBC statements using only classic placeholder ('?') arguments. The `NamedParameterJdbcTemplate` class wraps a `JdbcTemplate`, and delegates to the wrapped `JdbcTemplate` to do much of its work.

```
DataSource dataSource = ... //
NamedParameterJdbcTemplate jdbcTemplate = new NamedParameterJdbcTemplate(dataSource);

String sql = "SELECT count(*) FROM customer WHERE city_name=:cityName";
Map<String, String> params = Collections.singletonMap("cityName", cityName);
int count = jdbcTemplate.queryForObject(sql, params, Integer.class);
```

Chapter 16: SOAP WS Consumption

Section 16.1: Consuming a SOAP WS with Basic auth

Create your own WSMessageSender:

```
import java.io.IOException;
import java.net.HttpURLConnection;

import org.springframework.ws.transport.http.HttpUrlConnectionMessageSender;

import sun.misc.BASE64Encoder;

public class CustomWSMessageSender extends HttpUrlConnectionMessageSender{

    @Override
    protected void prepareConnection(HttpURLConnection connection)
            throws IOException {

        BASE64Encoder enc = new sun.misc.BASE64Encoder();
        String userpassword = "yourUser:yourPassword";
        String encodedAuthorization = enc.encode( userpassword.getBytes() );
        connection.setRequestProperty("Authorization", "Basic " + encodedAuthorization);

        super.prepareConnection(connection);
    }
}
```

In your WS configuration class set the MessageSender you just created:

```
myWSClient.setMessageSender(new CustomWSMessageSender());
```

Chapter 17: Spring profile

Section 17.1: Spring Profiles allows to configure parts available for certain environment

Any `@Component` or `@Configuration` could be marked with `@Profile` annotation

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

    // ...
}
```

The same in XML config

```
<beans profile="dev">
    <bean id="dataSource" class="<some data source class>" />
</beans>
```

Active profiles could be configured in the `application.properties` file

```
spring.profiles.active=dev,production
```

or specified from command line

```
--spring.profiles.active=dev,hsqldb
```

or in SpringBoot

```
SpringApplication.setAdditionalProfiles("dev");
```

It is possible to enable profiles in Tests using the annotation `@ActiveProfiles("dev")`

Chapter 18: Understanding the dispatcher-servlet.xml

In Spring Web MVC, DispatcherServlet class works as the front controller. It is responsible for managing the flow of the spring MVC application.

DispatcherServlet is also like normal servlet need to be configured in web.xml

Section 18.1: dispatcher-servlet.xml

This is the important configuration file where we need to specify the ViewResolver and View components.

The context:component-scan element defines the base-package where DispatcherServlet will search the controller class.

Here, the InternalResourceViewResolver class is used for the ViewResolver.

The prefix+string returned by controller+suffix page will be invoked for the view component.

This xml file should be located inside the WEB-INF directory.

```
<beans xmlns="http://www.springframework.org/schema/beans"
   xmlns:context="http://www.springframework.org/schema/context"
   xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
   xsi:schemaLocation="
http://www.springframework.org/schema/beans
http://www.springframework.org/schema/beans/spring-beans-3.0.xsd
http://www.springframework.org/schema/context
http://www.springframework.org/schema/context/spring-context-3.0.xsd">

    <context:component-scan base-package="com.srinu.controller.Employee" />

    <bean
       class="org.springframework.web.servlet.view.InternalResourceViewResolver">
        <property name="prefix">
            <value>/WEB-INF/views/</value>
        </property>
        <property name="suffix">
            <value>.jsp</value>
        </property>
    </bean>
</beans>
```

Section 18.2: dispatcher servlet configuration in web.xml

In this XML file, we are specifying the servlet class DispatcherServlet that acts as the front controller in Spring Web MVC. All the incoming request for the HTML file will be forwarded to the DispatcherServlet.

```
<?xml version="1.0" encoding="UTF-8"?>
<web-app version="2.5"
    xmlns="http://java.sun.com/xml/ns/javaee"
    xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
    xsi:schemaLocation="http://java.sun.com/xml/ns/javaee
    http://java.sun.com/xml/ns/javaee/web-app_2_5.xsd">
 <servlet>
    <servlet-name>spring</servlet-name>
```

```
    <servlet-class>org.springframework.web.servlet.DispatcherServlet</servlet-class>
    <load-on-startup>1</load-on-startup>
</servlet>
<servlet-mapping>
    <servlet-name>spring</servlet-name>
    <url-pattern>*.html</url-pattern>
</servlet-mapping>
</web-app>
```

Credits

Thank you greatly to all the people from Stack Overflow Documentation who helped provide this content, more changes can be sent to web@petercv.com for new content to be published or updated

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