```
foo.fred.bob.sammy=123
```

i. the `sammy` property of the `bob` property of the `fred` property of the `foo` bean is set to the scalar value `123`.

> **Note**
>
> Specified override values are always *literal* values; they are not translated into bean references. This convention also applies when the original value in the XML bean definition specifies a bean reference.

With the `context` namespace introduced in Spring 2.5, it is possible to configure property overriding with a dedicated configuration element:

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

Customizing instantiation logic with a FactoryBean

Implement the `org.springframework.beans.factory.FactoryBean` interface for objects that *are themselves factories*.

The `FactoryBean` interface is a point of pluggability into the Spring IoC container's instantiation logic. If you have complex initialization code that is better expressed in Java as opposed to a (potentially) verbose amount of XML, you can create your own `FactoryBean`, write the complex initialization inside that class, and then plug your custom `FactoryBean` into the container.

The `FactoryBean` interface provides three methods:

- `Object getObject()`: returns an instance of the object this factory creates. The instance can possibly be shared, depending on whether this factory returns singletons or prototypes.
- `boolean isSingleton()`: returns `true` if this `FactoryBean` returns singletons, `false` otherwise.
- `Class getObjectType()`: returns the object type returned by the `getObject()` method or `null` if the type is not known in advance.

The `FactoryBean` concept and interface is used in a number of places within the Spring Framework; more than 50 implementations of the `FactoryBean` interface ship with Spring itself.

When you need to ask a container for an actual `FactoryBean` instance itself instead of the bean it produces, preface the bean's id with the ampersand symbol (`&`) when calling the `getBean()` method of the `ApplicationContext`. So for a given `FactoryBean` with an id of `myBean`, invoking `getBean("myBean")` on the container returns the product of the `FactoryBean`; whereas, invoking `getBean("&myBean")` returns the `FactoryBean` instance itself.

7.9 Annotation-based container configuration

> **Are annotations better than XML for configuring Spring?**
>
> The introduction of annotation-based configurations raised the question of whether this approach is 'better' than XML. The short answer is *it depends*. The long answer is that each approach has its pros and cons, and usually it is up to the developer to decide which strategy suits them better. Due to the way they are defined, annotations provide a lot of context in their declaration, leading to shorter and more concise configuration. However, XML excels at wiring up components without

touching their source code or recompiling them. Some developers prefer having the wiring close to the source while others argue that annotated classes are no longer POJOs and, furthermore, that the configuration becomes decentralized and harder to control.

No matter the choice, Spring can accommodate both styles and even mix them together. It's worth pointing out that through its JavaConfig option, Spring allows annotations to be used in a non-invasive way, without touching the target components source code and that in terms of tooling, all configuration styles are supported by the Spring Tool Suite.

An alternative to XML setups is provided by annotation-based configuration which rely on the bytecode metadata for wiring up components instead of angle-bracket declarations. Instead of using XML to describe a bean wiring, the developer moves the configuration into the component class itself by using annotations on the relevant class, method, or field declaration. As mentioned in the section called "Example: The RequiredAnnotationBeanPostProcessor", using a `BeanPostProcessor` in conjunction with annotations is a common means of extending the Spring IoC container. For example, Spring 2.0 introduced the possibility of enforcing required properties with the @Required annotation. Spring 2.5 made it possible to follow that same general approach to drive Spring's dependency injection. Essentially, the `@Autowired` annotation provides the same capabilities as described in the section called "Autowiring collaborators" but with more fine-grained control and wider applicability. Spring 2.5 also added support for JSR-250 annotations such as `@PostConstruct`, and `@PreDestroy`. Spring 3.0 added support for JSR-330 (Dependency Injection for Java) annotations contained in the javax.inject package such as `@Inject` and `@Named`. Details about those annotations can be found in the relevant section.

> **Note**
>
> Annotation injection is performed *before* XML injection, thus the latter configuration will override the former for properties wired through both approaches.

As always, you can register them as individual bean definitions, but they can also be implicitly registered by including the following tag in an XML-based Spring configuration (notice the inclusion of the `context` namespace):

```
<?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:context="http://www.springframework.org/schema/context"
    xsi:schemaLocation="http://www.springframework.org/schema/beans
        http://www.springframework.org/schema/beans/spring-beans.xsd
        http://www.springframework.org/schema/context
        http://www.springframework.org/schema/context/spring-context.xsd">

    <context:annotation-config/>

</beans>
```

(The implicitly registered post-processors include `AutowiredAnnotationBeanPostProcessor`, `CommonAnnotationBeanPostProcessor`, `PersistenceAnnotationBeanPostProcessor`, as well as the aforementioned `RequiredAnnotationBeanPostProcessor`.)

> **Note**
>
> `<context:annotation-config/>` only looks for annotations on beans in the same application context in which it is defined. This means that, if you put `<context:annotation-config/>`

> in a `WebApplicationContext` for a `DispatcherServlet`, it only checks for `@Autowired` beans in your controllers, and not your services. See Section 22.2, “The DispatcherServlet” for more information.

@Required

The `@Required` annotation applies to bean property setter methods, as in the following example:

```
public class SimpleMovieLister {

    private MovieFinder movieFinder;

    @Required
    public void setMovieFinder(MovieFinder movieFinder) {
        this.movieFinder = movieFinder;
    }

    // ...

}
```

This annotation simply indicates that the affected bean property must be populated at configuration time, through an explicit property value in a bean definition or through autowiring. The container throws an exception if the affected bean property has not been populated; this allows for eager and explicit failure, avoiding NullPointerExceptions or the like later on. It is still recommended that you put assertions into the bean class itself, for example, into an init method. Doing so enforces those required references and values even when you use the class outside of a container.

@Autowired

> **Note**
>
> JSR 330’s `@Inject` annotation can be used in place of Spring’s `@Autowired` annotation in the examples below. See here for more details.

You can apply the `@Autowired` annotation to constructors:

```
public class MovieRecommender {

    private final CustomerPreferenceDao customerPreferenceDao;

    @Autowired
    public MovieRecommender(CustomerPreferenceDao customerPreferenceDao) {
        this.customerPreferenceDao = customerPreferenceDao;
    }

    // ...

}
```

> **Note**
>
> As of Spring Framework 4.3, the `@Autowired` constructor is no longer necessary if the target bean only defines one constructor. If several constructors are available, at least one must be annotated to teach the container which one it has to use.

As expected, you can also apply the `@Autowired` annotation to "traditional" setter methods:

```
public class SimpleMovieLister {

    private MovieFinder movieFinder;

    @Autowired
    public void setMovieFinder(MovieFinder movieFinder) {
        this.movieFinder = movieFinder;
    }

    // ...

}
```

You can also apply the annotation to methods with arbitrary names and/or multiple arguments:

```
public class MovieRecommender {

    private MovieCatalog movieCatalog;

    private CustomerPreferenceDao customerPreferenceDao;

    @Autowired
    public void prepare(MovieCatalog movieCatalog,
            CustomerPreferenceDao customerPreferenceDao) {
        this.movieCatalog = movieCatalog;
        this.customerPreferenceDao = customerPreferenceDao;
    }

    // ...

}
```

You can apply `@Autowired` to fields as well and even mix it with constructors:

```
public class MovieRecommender {

    private final CustomerPreferenceDao customerPreferenceDao;

    @Autowired
    private MovieCatalog movieCatalog;

    @Autowired
    public MovieRecommender(CustomerPreferenceDao customerPreferenceDao) {
        this.customerPreferenceDao = customerPreferenceDao;
    }

    // ...

}
```

It is also possible to provide *all* beans of a particular type from the `ApplicationContext` by adding the annotation to a field or method that expects an array of that type:

```
public class MovieRecommender {

    @Autowired
    private MovieCatalog[] movieCatalogs;

    // ...

}
```

The same applies for typed collections:

```
public class MovieRecommender {

    private Set<MovieCatalog> movieCatalogs;

    @Autowired
    public void setMovieCatalogs(Set<MovieCatalog> movieCatalogs) {
        this.movieCatalogs = movieCatalogs;
    }

    // ...

}
```

> **Tip**
>
> Your beans can implement the `org.springframework.core.Ordered` interface or either use the `@Order` or standard `@Priority` annotation if you want items in the array or list to be sorted into a specific order.

Even typed Maps can be autowired as long as the expected key type is `String`. The Map values will contain all beans of the expected type, and the keys will contain the corresponding bean names:

```
public class MovieRecommender {

    private Map<String, MovieCatalog> movieCatalogs;

    @Autowired
    public void setMovieCatalogs(Map<String, MovieCatalog> movieCatalogs) {
        this.movieCatalogs = movieCatalogs;
    }

    // ...

}
```

By default, the autowiring fails whenever *zero* candidate beans are available; the default behavior is to treat annotated methods, constructors, and fields as indicating *required* dependencies. This behavior can be changed as demonstrated below.

```
public class SimpleMovieLister {

    private MovieFinder movieFinder;

    @Autowired(required=false)
    public void setMovieFinder(MovieFinder movieFinder) {
        this.movieFinder = movieFinder;
    }

    // ...

}
```

> **Note**
>
> Only *one annotated constructor per-class* can be marked as *required*, but multiple non-required constructors can be annotated. In that case, each is considered among the candidates and Spring uses the *greediest* constructor whose dependencies can be satisfied, that is the constructor that has the largest number of arguments.
>
> `@Autowired's` *`required`* `attribute is recommended over the` `@Required` annotation. The *required* attribute indicates that the property is not required for autowiring

> purposes, the property is ignored if it cannot be autowired. `@Required`, on the other hand, is stronger in that it enforces the property that was set by any means supported by the container. If no value is injected, a corresponding exception is raised.

You can also use `@Autowired` for interfaces that are well-known resolvable dependencies: `BeanFactory`, `ApplicationContext`, `Environment`, `ResourceLoader`, `ApplicationEventPublisher`, and `MessageSource`. These interfaces and their extended interfaces, such as `ConfigurableApplicationContext` or `ResourcePatternResolver`, are automatically resolved, with no special setup necessary.

```
public class MovieRecommender {

    @Autowired
    private ApplicationContext context;

    public MovieRecommender() {
    }

    // ...

}
```

> **Note**
>
> `@Autowired`, `@Inject`, `@Resource`, and `@Value` annotations are handled by a Spring `BeanPostProcessor` implementations which in turn means that you *cannot* apply these annotations within your own `BeanPostProcessor` or `BeanFactoryPostProcessor` types (if any). These types must be 'wired up' explicitly via XML or using a Spring `@Bean` method.

Fine-tuning annotation-based autowiring with @Primary

Because autowiring by type may lead to multiple candidates, it is often necessary to have more control over the selection process. One way to accomplish this is with Spring's `@Primary` annotation. `@Primary` indicates that a particular bean should be given preference when multiple beans are candidates to be autowired to a single-valued dependency. If exactly one 'primary' bean exists among the candidates, it will be the autowired value.

Let's assume we have the following configuration that defines `firstMovieCatalog` as the *primary* `MovieCatalog`.

```
@Configuration
public class MovieConfiguration {

    @Bean
    @Primary
    public MovieCatalog firstMovieCatalog() { ... }

    @Bean
    public MovieCatalog secondMovieCatalog() { ... }

    // ...

}
```

With such configuration, the following `MovieRecommender` will be autowired with the `firstMovieCatalog`.

```
public class MovieRecommender {

    @Autowired
    private MovieCatalog movieCatalog;

    // ...

}
```

The corresponding bean definitions appear as follows.

```
<?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:context="http://www.springframework.org/schema/context"
    xsi:schemaLocation="http://www.springframework.org/schema/beans
        http://www.springframework.org/schema/beans/spring-beans.xsd
        http://www.springframework.org/schema/context
        http://www.springframework.org/schema/context/spring-context.xsd">

    <context:annotation-config/>

    <bean class="example.SimpleMovieCatalog" primary="true">
        <!-- inject any dependencies required by this bean -->
    </bean>

    <bean class="example.SimpleMovieCatalog">
        <!-- inject any dependencies required by this bean -->
    </bean>

    <bean id="movieRecommender" class="example.MovieRecommender"/>

</beans>
```

Fine-tuning annotation-based autowiring with qualifiers

`@Primary` is an effective way to use autowiring by type with several instances when one primary candidate can be determined. When more control over the selection process is required, Spring's `@Qualifier` annotation can be used. You can associate qualifier values with specific arguments, narrowing the set of type matches so that a specific bean is chosen for each argument. In the simplest case, this can be a plain descriptive value:

```
public class MovieRecommender {

    @Autowired
    @Qualifier("main")
    private MovieCatalog movieCatalog;

    // ...

}
```

The `@Qualifier` annotation can also be specified on individual constructor arguments or method parameters:

```
public class MovieRecommender {

    private MovieCatalog movieCatalog;

    private CustomerPreferenceDao customerPreferenceDao;

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

    // ...

}
```

The corresponding bean definitions appear as follows. The bean with qualifier value "main" is wired with the constructor argument that is qualified with the same value.

```
<?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:context="http://www.springframework.org/schema/context"
    xsi:schemaLocation="http://www.springframework.org/schema/beans
        http://www.springframework.org/schema/beans/spring-beans.xsd
        http://www.springframework.org/schema/context
        http://www.springframework.org/schema/context/spring-context.xsd">

    <context:annotation-config/>

    <bean class="example.SimpleMovieCatalog">
        <qualifier value="main"/>

        <!-- inject any dependencies required by this bean -->
    </bean>

    <bean class="example.SimpleMovieCatalog">
        <qualifier value="action"/>

        <!-- inject any dependencies required by this bean -->
    </bean>

    <bean id="movieRecommender" class="example.MovieRecommender"/>

</beans>
```

For a fallback match, the bean name is considered a default qualifier value. Thus you can define the bean with an id "main" instead of the nested qualifier element, leading to the same matching result. However, although you can use this convention to refer to specific beans by name, `@Autowired` is fundamentally about type-driven injection with optional semantic qualifiers. This means that qualifier values, even with the bean name fallback, always have narrowing semantics within the set of type matches; they do not semantically express a reference to a unique bean id. Good qualifier values are "main" or "EMEA" or "persistent", expressing characteristics of a specific component that are independent from the bean `id`, which may be auto-generated in case of an anonymous bean definition like the one in the preceding example.

Qualifiers also apply to typed collections, as discussed above, for example, to `Set<MovieCatalog>`. In this case, all matching beans according to the declared qualifiers are injected as a collection. This implies that qualifiers do not have to be unique; they rather simply constitute filtering criteria. For example, you can define multiple `MovieCatalog` beans with the same qualifier value "action", all of which would be injected into a `Set<MovieCatalog>` annotated with `@Qualifier("action")`.

Tip

If you intend to express annotation-driven injection by name, do not primarily use `@Autowired`, even if is technically capable of referring to a bean name through `@Qualifier` values. Instead, use the JSR-250 `@Resource` annotation, which is semantically defined to identify a specific target component by its unique name, with the declared type being irrelevant for the matching process.

For beans that are themselves defined as a collection/map or array type, `@Resource` is a fine solution, referring to the specific collection or array bean by unique name. That said, as of 4.3, collection/map and array types can be matched through Spring's `@Autowired` type matching algorithm as well, as long as the element type information is preserved in `@Bean` return type signatures or collection inheritance hierarchies.

`@Autowired` applies to fields, constructors, and multi-argument methods, allowing for narrowing through qualifier annotations at the parameter level. By contrast, `@Resource` is supported only for fields and bean property setter methods with a single argument. As a consequence, stick with qualifiers if your injection target is a constructor or a multi-argument method.

You can create your own custom qualifier annotations. Simply define an annotation and provide the `@Qualifier` annotation within your definition:

```
@Target({ElementType.FIELD, ElementType.PARAMETER})
@Retention(RetentionPolicy.RUNTIME)
@Qualifier
public @interface Genre {

    String value();
}
```

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

```
public class MovieRecommender {

    @Autowired
    @Genre("Action")
    private MovieCatalog actionCatalog;
    private MovieCatalog comedyCatalog;

    @Autowired
    public void setComedyCatalog(@Genre("Comedy") MovieCatalog comedyCatalog) {
        this.comedyCatalog = comedyCatalog;
    }

    // ...

}
```

Next, provide the information for the candidate bean definitions. You can add `<qualifier/>` tags as sub-elements of the `<bean/>` tag and then specify the `type` and `value` to match your custom qualifier annotations. The type is matched against the fully-qualified class name of the annotation. Or, as a convenience if no risk of conflicting names exists, you can use the short class name. Both approaches are demonstrated in the following example.

```
<?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:context="http://www.springframework.org/schema/context"
    xsi:schemaLocation="http://www.springframework.org/schema/beans
        http://www.springframework.org/schema/beans/spring-beans.xsd
        http://www.springframework.org/schema/context
        http://www.springframework.org/schema/context/spring-context.xsd">

    <context:annotation-config/>

    <bean class="example.SimpleMovieCatalog">
        <qualifier type="Genre" value="Action"/>
        <!-- inject any dependencies required by this bean -->
    </bean>

    <bean class="example.SimpleMovieCatalog">
        <qualifier type="example.Genre" value="Comedy"/>
        <!-- inject any dependencies required by this bean -->
    </bean>

    <bean id="movieRecommender" class="example.MovieRecommender"/>

</beans>
```

In Section 7.10, “Classpath scanning and managed components”, you will see an annotation-based alternative to providing the qualifier metadata in XML. Specifically, see the section called “Providing qualifier metadata with annotations”.

In some cases, it may be sufficient to use an annotation without a value. This may be useful when the annotation serves a more generic purpose and can be applied across several different types of dependencies. For example, you may provide an *offline* catalog that would be searched when no Internet connection is available. First define the simple annotation:

```
@Target({ElementType.FIELD, ElementType.PARAMETER})
@Retention(RetentionPolicy.RUNTIME)
@Qualifier
public @interface Offline {

}
```

Then add the annotation to the field or property to be autowired:

```
public class MovieRecommender {

    @Autowired
    @Offline
    private MovieCatalog offlineCatalog;

    // ...

}
```

Now the bean definition only needs a qualifier `type`:

```
<bean class="example.SimpleMovieCatalog">
    <qualifier type="Offline"/>
    <!-- inject any dependencies required by this bean -->
</bean>
```

You can also define custom qualifier annotations that accept named attributes in addition to or instead of the simple `value` attribute. If multiple attribute values are then specified on a field or parameter to be autowired, a bean definition must match *all* such attribute values to be considered an autowire candidate. As an example, consider the following annotation definition:

```
@Target({ElementType.FIELD, ElementType.PARAMETER})
@Retention(RetentionPolicy.RUNTIME)
@Qualifier
public @interface MovieQualifier {

    String genre();

    Format format();

}
```

In this case `Format` is an enum:

```
public enum Format {
    VHS, DVD, BLURAY
}
```

The fields to be autowired are annotated with the custom qualifier and include values for both attributes: `genre` and `format`.

```
public class MovieRecommender {

    @Autowired
    @MovieQualifier(format=Format.VHS, genre="Action")
    private MovieCatalog actionVhsCatalog;

    @Autowired
    @MovieQualifier(format=Format.VHS, genre="Comedy")
    private MovieCatalog comedyVhsCatalog;

    @Autowired
    @MovieQualifier(format=Format.DVD, genre="Action")
    private MovieCatalog actionDvdCatalog;

    @Autowired
    @MovieQualifier(format=Format.BLURAY, genre="Comedy")
    private MovieCatalog comedyBluRayCatalog;

    // ...

}
```

Finally, the bean definitions should contain matching qualifier values. This example also demonstrates that bean *meta* attributes may be used instead of the `<qualifier/>` sub-elements. If available, the `<qualifier/>` and its attributes take precedence, but the autowiring mechanism falls back on the values provided within the `<meta/>` tags if no such qualifier is present, as in the last two bean definitions in the following example.

```
<?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:context="http://www.springframework.org/schema/context"
    xsi:schemaLocation="http://www.springframework.org/schema/beans
        http://www.springframework.org/schema/beans/spring-beans.xsd
        http://www.springframework.org/schema/context
        http://www.springframework.org/schema/context/spring-context.xsd">

    <context:annotation-config/>

    <bean class="example.SimpleMovieCatalog">
        <qualifier type="MovieQualifier">
            <attribute key="format" value="VHS"/>
            <attribute key="genre" value="Action"/>
        </qualifier>
        <!-- inject any dependencies required by this bean -->
    </bean>

    <bean class="example.SimpleMovieCatalog">
        <qualifier type="MovieQualifier">
            <attribute key="format" value="VHS"/>
            <attribute key="genre" value="Comedy"/>
        </qualifier>
        <!-- inject any dependencies required by this bean -->
    </bean>

    <bean class="example.SimpleMovieCatalog">
        <meta key="format" value="DVD"/>
        <meta key="genre" value="Action"/>
        <!-- inject any dependencies required by this bean -->
    </bean>

    <bean class="example.SimpleMovieCatalog">
        <meta key="format" value="BLURAY"/>
        <meta key="genre" value="Comedy"/>
        <!-- inject any dependencies required by this bean -->
    </bean>

</beans>
```

Using generics as autowiring qualifiers

In addition to the `@Qualifier` annotation, it is also possible to use Java generic types as an implicit form of qualification. For example, suppose you have the following configuration:

```
@Configuration
public class MyConfiguration {

    @Bean
    public StringStore stringStore() {
        return new StringStore();
    }

    @Bean
    public IntegerStore integerStore() {
        return new IntegerStore();
    }

}
```

Assuming that beans above implement a generic interface, i.e. `Store<String>` and `Store<Integer>`, you can `@Autowire` the `Store` interface and the *generic* will be used as a qualifier:

```
@Autowired
private Store<String> s1; // <String> qualifier, injects the stringStore bean

@Autowired
private Store<Integer> s2; // <Integer> qualifier, injects the integerStore bean
```

Generic qualifiers also apply when autowiring Lists, Maps and Arrays:

```
// Inject all Store beans as long as they have an <Integer> generic
// Store<String> beans will not appear in this list
@Autowired
private List<Store<Integer>> s;
```

CustomAutowireConfigurer

The `CustomAutowireConfigurer` is a `BeanFactoryPostProcessor` that enables you to register your own custom qualifier annotation types even if they are not annotated with Spring's `@Qualifier` annotation.

```
<bean id="customAutowireConfigurer"
        class="org.springframework.beans.factory.annotation.CustomAutowireConfigurer">
    <property name="customQualifierTypes">
        <set>
            <value>example.CustomQualifier</value>
        </set>
    </property>
</bean>
```

The `AutowireCandidateResolver` determines autowire candidates by:

- the `autowire-candidate` value of each bean definition
- any `default-autowire-candidates` pattern(s) available on the `<beans/>` element
- the presence of `@Qualifier` annotations and any custom annotations registered with the `CustomAutowireConfigurer`

When multiple beans qualify as autowire candidates, the determination of a "primary" is the following: if exactly one bean definition among the candidates has a `primary` attribute set to `true`, it will be selected.

@Resource

Spring also supports injection using the JSR-250 `@Resource` annotation on fields or bean property setter methods. This is a common pattern in Java EE 5 and 6, for example in JSF 1.2 managed beans or JAX-WS 2.0 endpoints. Spring supports this pattern for Spring-managed objects as well.

`@Resource` takes a name attribute, and by default Spring interprets that value as the bean name to be injected. In other words, it follows *by-name* semantics, as demonstrated in this example:

```
public class SimpleMovieLister {

    private MovieFinder movieFinder;

    @Resource(name="myMovieFinder")
    public void setMovieFinder(MovieFinder movieFinder) {
        this.movieFinder = movieFinder;
    }

}
```

If no name is specified explicitly, the default name is derived from the field name or setter method. In case of a field, it takes the field name; in case of a setter method, it takes the bean property name. So the following example is going to have the bean with name "movieFinder" injected into its setter method:

```
public class SimpleMovieLister {

    private MovieFinder movieFinder;

    @Resource
    public void setMovieFinder(MovieFinder movieFinder) {
        this.movieFinder = movieFinder;
    }

}
```

> **Note**
>
> The name provided with the annotation is resolved as a bean name by the `ApplicationContext` of which the `CommonAnnotationBeanPostProcessor` is aware. The names can be resolved through JNDI if you configure Spring's `SimpleJndiBeanFactory` explicitly. However, it is recommended that you rely on the default behavior and simply use Spring's JNDI lookup capabilities to preserve the level of indirection.

In the exclusive case of `@Resource` usage with no explicit name specified, and similar to `@Autowired`, `@Resource` finds a primary type match instead of a specific named bean and resolves well-known resolvable dependencies: the `BeanFactory`, `ApplicationContext`, `ResourceLoader`, `ApplicationEventPublisher`, and `MessageSource` interfaces.

Thus in the following example, the `customerPreferenceDao` field first looks for a bean named customerPreferenceDao, then falls back to a primary type match for the type `CustomerPreferenceDao`. The "context" field is injected based on the known resolvable dependency type `ApplicationContext`.

```
public class MovieRecommender {

    @Resource
    private CustomerPreferenceDao customerPreferenceDao;

    @Resource
    private ApplicationContext context;

    public MovieRecommender() {
    }

    // ...

}
```

@PostConstruct and @PreDestroy

The `CommonAnnotationBeanPostProcessor` not only recognizes the `@Resource` annotation but also the JSR-250 *lifecycle* annotations. Introduced in Spring 2.5, the support for these annotations offers yet another alternative to those described in initialization callbacks and destruction callbacks. Provided that the `CommonAnnotationBeanPostProcessor` is registered within the Spring `ApplicationContext`, a method carrying one of these annotations is invoked at the same point in the lifecycle as the corresponding Spring lifecycle interface method or explicitly declared callback method. In the example below, the cache will be pre-populated upon initialization and cleared upon destruction.

```
public class CachingMovieLister {

    @PostConstruct
    public void populateMovieCache() {
        // populates the movie cache upon initialization...
    }

    @PreDestroy
    public void clearMovieCache() {
        // clears the movie cache upon destruction...
    }

}
```

Note

For details about the effects of combining various lifecycle mechanisms, see the section called “Combining lifecycle mechanisms”.

7.10 Classpath scanning and managed components

Most examples in this chapter use XML to specify the configuration metadata that produces each `BeanDefinition` within the Spring container. The previous section (Section 7.9, “Annotation-based container configuration”) demonstrates how to provide a lot of the configuration metadata through source-level annotations. Even in those examples, however, the "base" bean definitions are explicitly defined in the XML file, while the annotations only drive the dependency injection. This section describes an option for implicitly detecting the *candidate components* by scanning the classpath. Candidate components are classes that match against a filter criteria and have a corresponding bean definition registered with the container. This removes the need to use XML to perform bean registration; instead you can use annotations (for example `@Component`), AspectJ type expressions, or your own custom filter criteria to select which classes will have bean definitions registered with the container.

Note

Starting with Spring 3.0, many features provided by the Spring JavaConfig project are part of the core Spring Framework. This allows you to define beans using Java rather than using the traditional XML files. Take a look at the `@Configuration`, `@Bean`, `@Import`, and `@DependsOn` annotations for examples of how to use these new features.

@Component and further stereotype annotations

The `@Repository` annotation is a marker for any class that fulfills the role or *stereotype* of a repository (also known as Data Access Object or DAO). Among the uses of this marker is the automatic translation of exceptions as described in the section called “Exception translation”.

Spring provides further stereotype annotations: `@Component`, `@Service`, and `@Controller`. `@Component` is a generic stereotype for any Spring-managed component. `@Repository`, `@Service`, and `@Controller` are specializations of `@Component` for more specific use cases, for example, in the persistence, service, and presentation layers, respectively. Therefore, you can annotate your component classes with `@Component`, but by annotating them with `@Repository`, `@Service`, or `@Controller` instead, your classes are more properly suited for processing by tools or associating with aspects. For example, these stereotype annotations make ideal targets for pointcuts. It is also possible that `@Repository`, `@Service`, and `@Controller` may carry additional semantics in future releases of the Spring Framework. Thus, if you are choosing between using `@Component` or `@Service`