Spring AOP Example – Advice

Written on March 25, 2010 at 9:13 am by mkyong

The Spring AOP (Aspect-oriented programming) framework is used to modularize cross-cutting concerns in aspects. Put it simple, it's just an interceptor to intercept some processes, for example, when a method is executed, Spring AOP can hijack the executing method, and add extra functionality before or after the method execution.

Spring AOP supports four types of advices

- Before advice – Run before the method execution
- After returning advice – Run after the method returns a result
- After throwing advice – Run after the method throws an exception
- Around advice – Run around the method execution, combine all three advices above.

Here's a simple example to show how Spring AOP advice work. Create a simple customer service class with few print method for the demonstration later.

```
package com.mkyong.customer.services;

public class CustomerService
{
        private String name;
        private String url;

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

        public void printName(){
                System.out.println("Customer name : " + this.name);
        }

        public void printURL(){
                System.out.println("Customer website : " + this.url);
        }

        public void printThrowException(){
                throw new IllegalArgumentException();
        }

}
```

Bean configuration file (Spring-Customer.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-2.5.xsd">

   <bean id="customerService" class="com.mkyong.customer.services.CustomerService" >
        <property name="name" value="Yong Mook Kim" />
        <property name="url" value="http://www.mkyong.com" />
   </bean>

</beans>
```

Run it

```
package com.mkyong.common;

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

import com.mkyong.customer.services.CustomerService;
public class App
{
    public static void main( String[] args )
    {
        ApplicationContext appContext =
          new ClassPathXmlApplicationContext(new String[] {"Spring-Customer.xml"});

        CustomerService cust =
          (CustomerService)appContext.getBean("customerService");

        System.out.println("*************************");
        cust.printName();
        System.out.println("*************************");
        cust.printURL();
        System.out.println("*************************");
        try{
                cust.printThrowException();
        }catch(Exception e){

        }

    }
}
```

output

```
*************************
Customer name : Yong Mook Kim
*************************
Customer website : http://www.mkyong.com
*************************
```

A simple Spring project to DI a bean and output some Strings.

1. Before advice

It will execute before the method execution. Create a class which implements **MethodBeforeAdvice** interface.

```
package com.mkyong.aop;

import java.lang.reflect.Method;
import org.springframework.aop.MethodBeforeAdvice;

public class HijackBeforeMethod implements MethodBeforeAdvice
{
        @Override
        public void before(Method method, Object[] args, Object target)
                throws Throwable {
           System.out.println("HijackBeforeMethod : Before method hijacked!");
        }
}
```

In Bean configuration file (Spring-Customer.xml), create a bean for **HijackBeforeMethod** class , and a new proxy object named '**customerServiceProxy**'.

- 'target' poperty define which bean you want to hijack.
- 'interceptorNames' property define which class (advice) you want apply to this proxy object.

```
<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-2.5.xsd">

   <bean id="customerService" class="com.mkyong.customer.services.CustomerService" >
        <property name="name" value="Yong Mook Kim" />
        <property name="url" value="http://www.mkyong.com" />
   </bean>

   <bean id="hijackBeforeMethodBean" class="com.mkyong.aop.HijackBeforeMethod" />

   <bean id="customerServiceProxy"
        class="org.springframework.aop.framework.ProxyFactoryBean">

        <property name="target" ref="customerService" />

        <property name="interceptorNames">
                <list>
                        <value>hijackBeforeMethodBean</value>
                </list>
        </property>
    </bean>
</beans>
```

Run it again, now you retrieve the **customerServiceProxy**bean instead of **customerService**bean.

```
package com.mkyong.common;

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

import com.mkyong.customer.services.CustomerService;
public class App
{
    public static void main( String[] args )
    {
        ApplicationContext appContext =
          new ClassPathXmlApplicationContext(new String[] {"Spring-Customer.xml"});
        CustomerService cust =
          (CustomerService)appContext.getBean("customerServiceProxy");

        System.out.println("*************************");
        cust.printName();
        System.out.println("*************************");
        cust.printURL();
        System.out.println("*************************");
        try{
                cust.printThrowException();
        }catch(Exception e){

        }
    }
}
```

output

```
*************************
HijackBeforeMethod : Before method hijacked!
Customer name : Yong Mook Kim
*************************
HijackBeforeMethod : Before method hijacked!
Customer website : http://www.mkyong.com
*************************
HijackBeforeMethod : Before method hijacked!
```

It will run the **HijackBeforeMethod's before()** method, before every customerService's methods are execute.

2. After returning advice

It will execute after the method is return a result. Create a class which implements **AfterReturningAdvice** interface.

```
package com.mkyong.aop;

import java.lang.reflect.Method;
import org.springframework.aop.AfterReturningAdvice;

public class HijackAfterMethod implements AfterReturningAdvice
{
        @Override
        public void afterReturning(Object returnValue, Method method,
                Object[] args, Object target) throws Throwable {
         System.out.println("HijackAfterMethod : After method   hijacked!");
        }
}
```

Bean configuration file

```
<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-2.5.xsd">

   <bean id="customerService" class="com.mkyong.customer.services.CustomerService" >
        <property name="name" value="Yong Mook Kim" />
        <property name="url" value="http://www.mkyong.com" />
   </bean>

   <bean id="hijackAfterMethodBean" class="com.mkyong.aop.HijackAfterMethod" />

   <bean id="customerServiceProxy"
        class="org.springframework.aop.framework.ProxyFactoryBean">

        <property name="target" ref="customerService" />

        <property name="interceptorNames">
                <list>
                        <value>hijackAfterMethodBean</value>
                </list>
        </property>
   </bean>
</beans>
```

Run it again, output

```
*************************
Customer name : Yong Mook Kim
HijackAfterMethod : After method hijacked!
*************************
Customer website : http://www.mkyong.com
HijackAfterMethod : After method hijacked!
*************************
```

It will run the **HijackAfterMethod's afterReturning()** method, after every customerService's methods are return the result.

3. After throwing advice

This is execute after the method throws an exception. Create a class which implements ThrowsAdvice interface, and create a **afterThrowing** method to hijack the **IllegalArgumentException** exception.

```
package com.mkyong.aop;

import org.springframework.aop.ThrowsAdvice;

public class HijackThrowException implements ThrowsAdvice
{
   public void afterThrowing(IllegalArgumentException e) throws Throwable {
        System.out.println("HijackThrowException : Throw exception hijacked!");
   }
}
```

Bean configuration file

```
<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-2.5.xsd">

   <bean id="customerService" class="com.mkyong.customer.services.CustomerService" >
        <property name="name" value="Yong Mook Kim" />
        <property name="url" value="http://www.mkyong.com" />
   </bean>

   <bean id="hijackThrowExceptionBean" class="com.mkyong.aop.HijackThrowException"/>

   <bean id="customerServiceProxy"
        class="org.springframework.aop.framework.ProxyFactoryBean">

        <property name="target" ref="customerService" />

        <property name="interceptorNames">
                <list>
                        <value>hijackThrowExceptionBean</value>
                </list>
        </property>
   </bean>
</beans>
```

Run it again, output

```
*************************
Customer name : Yong Mook Kim
*************************
Customer website : http://www.mkyong.com
*************************
HijackThrowException : Throw exception hijacked!
```

It will run the **HijackThrowException's afterThrowing()** method, after customerService's methods throw an exception.

4. Around advice

It combine all three advices above, and execute during method execution. Create a class which implements **MethodInterceptor** interface. You have to call the **“methodInvocation.proceed();”** to proceed with the original method execution, else the original method will not execute.

```
package com.mkyong.aop;

import java.util.Arrays;

import org.aopalliance.intercept.MethodInterceptor;
import org.aopalliance.intercept.MethodInvocation;

public class HijackAroundMethod implements MethodInterceptor
{
   @Override
   public Object invoke(MethodInvocation methodInvocation) throws Throwable {

   System.out.println("Method name : "
             + methodInvocation.getMethod().getName());
   System.out.println("Method arguments : "
             + Arrays.toString(methodInvocation.getArguments()));

   //same with MethodBeforeAdvice
   System.out.println("HijackAroundMethod : Before method hijacked!");

   try{
        //proceed to original method call
        Object result = methodInvocation.proceed();

        //same with AfterReturningAdvice
        System.out.println("HijackAroundMethod : Before after hijacked!");

        return result;

     }catch(IllegalArgumentException e){
        //same with ThrowsAdvice
        System.out.println("HijackAroundMethod : Throw exception hijacked!");
        throw e;
     }
  }
}
```

Bean configuration file

```
<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-2.5.xsd">

   <bean id="customerService" class="com.mkyong.customer.services.CustomerService" >
        <property name="name" value="Yong Mook Kim" />
        <property name="url" value="http://www.mkyong.com" />
   </bean>

   <bean id="hijackAroundMethodBean" class="com.mkyong.aop.HijackAroundMethod" />

   <bean id="customerServiceProxy"
        class="org.springframework.aop.framework.ProxyFactoryBean">

        <property name="target" ref="customerService" />

        <property name="interceptorNames">
                <list>
                        <value>hijackAroundMethodBean</value>
                </list>
        </property>
   </bean>
</beans>
```

Run it again, output

```
*************************
Method name : printName
Method arguments : []
HijackAroundMethod : Before method hijacked!
Customer name : Yong Mook Kim
HijackAroundMethod : Before after hijacked!
*************************
Method name : printURL
Method arguments : []
HijackAroundMethod : Before method hijacked!
Customer website : http://www.mkyong.com
HijackAroundMethod : Before after hijacked!
*************************
Method name : printThrowException
Method arguments : []
HijackAroundMethod : Before method hijacked!
HijackAroundMethod : Throw exception hijacked!
```

It will run the **HijackAroundMethod's invoke()** method, after every customerService's method execution.

Conclusion

Most of the Spring developers are just implement the 'Around advice ', since it can apply all the advice type, but a better practice should choose an most suitable advice type to satisfy the requirements.

Pointcut

In this example, all the methods in a customer service class are intercepted (advice) automatically. But for most cases, you may need to use Pointcut and Advisor to intercept a method via it's method name.

You can download this Spring AOP advice example here – Spring-AOP-advice-Example.zip

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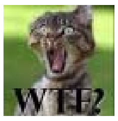
-  evilripper : lol fu***ng msn plus!!! :-D ctrl+space == hide! [More]

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