**Exercise 3: Implementing Logging with Spring AOP**

**Scenario:**

The library management application requires logging capabilities to track method execution times.

**Steps:**

1. **Add Spring AOP Dependency:**
   * Update **pom.xml** to include Spring AOP dependency.

<project xmlns="http://maven.apache.org/POM/4.0.0" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"

xsi:schemaLocation="http://maven.apache.org/POM/4.0.0 http://maven.apache.org/xsd/maven-4.0.0.xsd">

<modelVersion>4.0.0</modelVersion>

<groupId>com.library</groupId>

<artifactId>LibraryManagement</artifactId>

<version>0.0.1-SNAPSHOT</version>

<packaging>jar</packaging>

<name>LibraryManagement</name>

<url>http://maven.apache.org</url>

<properties>

<project.build.sourceEncoding>UTF-8</project.build.sourceEncoding>

</properties>

<dependencies>

<!-- AOP dependencies -->

<!-- https://mvnrepository.com/artifact/org.springframework.boot/spring-boot-starter-aop -->

<dependency>

<groupId>org.springframework.boot</groupId>

<artifactId>spring-boot-starter-aop</artifactId>

<version>3.3.2</version>

</dependency>

<!-- https://mvnrepository.com/artifact/org.slf4j/slf4j-simple -->

<dependency>

<groupId>org.slf4j</groupId>

<artifactId>slf4j-simple</artifactId>

<version>2.0.14</version>

<scope>test</scope>

</dependency>

<!-- https://mvnrepository.com/artifact/org.springframework/spring-core -->

<dependency>

<groupId>org.springframework</groupId>

<artifactId>spring-core</artifactId>

<version>6.1.11</version>

</dependency>

<!-- https://mvnrepository.com/artifact/org.springframework/spring-context -->

<dependency>

<groupId>org.springframework</groupId>

<artifactId>spring-context</artifactId>

<version>6.1.11</version>

</dependency>

<dependency>

<groupId>junit</groupId>

<artifactId>junit</artifactId>

<version>3.8.1</version>

<scope>test</scope>

</dependency>

<!-- https://mvnrepository.com/artifact/org.springframework/spring-aop -->

<dependency>

<groupId>org.springframework</groupId>

<artifactId>spring-aop</artifactId>

<version>6.1.11</version>

</dependency>

<!-- https://mvnrepository.com/artifact/org.springframework/spring-aspects -->

<dependency>

<groupId>org.springframework</groupId>

<artifactId>spring-aspects</artifactId>

<version>6.1.11</version>

</dependency>

<!-- https://mvnrepository.com/artifact/org.aspectj/aspectjrt -->

<dependency>

<groupId>org.aspectj</groupId>

<artifactId>aspectjrt</artifactId>

<version>1.9.22.1</version>

<scope>runtime</scope>

</dependency>

<!-- https://mvnrepository.com/artifact/org.aspectj/aspectjweaver -->

<dependency>

<groupId>org.aspectj</groupId>

<artifactId>aspectjweaver</artifactId>

<version>1.9.22.1</version>

</dependency>

</dependencies>

</project>

1. **Create an Aspect for Logging:**
   * Create a package **com.library.aspect** and add a class **LoggingAspect** with a method to log execution times.

**LoggingAspect.java 🡪**

package com.library.aspect;

import org.aspectj.lang.ProceedingJoinPoint;

import org.aspectj.lang.annotation.Around;

import org.aspectj.lang.annotation.Aspect;

import org.springframework.stereotype.Component;

@Aspect

@Component

public class LoggingAspect {

@Around("execution(\* com.library.service.\*.\*(..))")

public Object logExecutionTime(ProceedingJoinPoint joinPoint) throws Throwable {

long start = System.currentTimeMillis();

Object proceed = joinPoint.proceed();

long executionTime = System.currentTimeMillis() - start;

System.out.println(joinPoint.getSignature() + " executed in " + executionTime + "ms");

return proceed;

}

}

1. **Enable AspectJ Support:**
   * Update **applicationContext.xml** to enable **AspectJ** support and register the aspect.

**applicationContext.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:aop="http://www.springframework.org/schema/aop"

       xsi:schemaLocation="http://www.springframework.org/schema/beans

                           http://www.springframework.org/schema/beans/spring-beans.xsd

                            http://www.springframework.org/schema/aop

                             http://www.springframework.org/schema/aop/spring-aop.xsd">

    <!-- Enable AspectJ support -->

    <aop:aspectj-autoproxy/>

    <!-- Bean definition for BookRepository -->

    <bean id="bookRepository" class="com.library.repository.BookRepository"/>

    <!-- Bean definition for BookService -->

    <bean id="bookService" class="com.library.service.BookService">

        <property name="bookRepository" ref="bookRepository"/>

    </bean>

    <!-- Bean definition for LoggingAspect -->

   <bean id="loggingAspect" class="com.library.aspect.LoggingAspect"/>

</beans>

1. **Test the Aspect:**
   * Run the **LibraryManagementApplication** main class and observe the console for log messages indicating method execution times.

**LibraryManagementApplication.java 🡪**

package com.library;

import com.library.service.BookService;

import org.springframework.context.ApplicationContext;

import org.springframework.context.support.ClassPathXmlApplicationContext;

public class LibraryManagementApplication {

    public static void main(String[] args) {

        ApplicationContext context = new ClassPathXmlApplicationContext("applicationContext.xml");

        BookService bookService = (BookService) context.getBean("bookService");

        bookService.testMessage();

    }

}