**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.
2. **Create an Aspect for Logging:**
   * Create a package **com.library.aspect** and add a class **LoggingAspect** with a method to log execution times.
3. **Enable AspectJ Support:**
   * Update **applicationContext.xml** to enable **AspectJ** support and register the aspect.
4. **Test the Aspect:**
   * Run the **LibraryManagementApplication** main class and observe the console for log messages indicating method execution times.

**Solutions:**

 **Add Spring AOP Dependency**:

* Update pom.xml to include Spring AOP dependency:

<dependencies>

<dependency>

<groupId>org.springframework</groupId>

<artifactId>spring-aop</artifactId>

<version>5.3.20</version>

</dependency>

<!-- Example: Log4j dependency for more advanced logging -->

<dependency>

<groupId>org.apache.logging.log4j</groupId>

<artifactId>log4j-api</artifactId>

<version>2.20.0</version>

</dependency>

</dependencies>

**Create an Aspect for Logging**:

* Create a package com.library.aspect and add a class LoggingAspect:

package com.library.aspect;

import org.aspectj.lang.annotation.Aspect;

import org.aspectj.lang.annotation.Around;

import org.aspectj.lang.ProceedingJoinPoint;

import org.slf4j.Logger;

import org.slf4j.LoggerFactory;

import org.springframework.stereotype.Component;

@Aspect

@Component

public class LoggingAspect {

private static final Logger logger = LoggerFactory.getLogger(LoggingAspect.class);

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

public Object logExecutionTime(ProceedingJoinPoint joinPoint) throws Throwable {

long start = System.currentTimeMillis();

try {

return joinPoint.proceed();

} finally {

long executionTime = System.currentTimeMillis() - start;

logger.info(joinPoint.getSignature() + " executed in " + executionTime + "ms");

}

}

}

**Enable AspectJ Support**:

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

<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">

<!-- Define beans -->

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

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

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

</bean>

<!-- Define aspect bean -->

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

<!-- Enable AspectJ auto-proxying -->

<aop:aspectj-autoproxy proxy-target-class="true"/>

</beans>