**Exercise 5: Implementing the Decorator Pattern**

**Scenario:**

You are developing a notification system where notifications can be sent via multiple channels (e.g., Email, SMS). Use the Decorator Pattern to add functionalities dynamically.

**Steps:**

1. **Create a New Java Project:**
   * Create a new Java project named **DecoratorPatternExample**.
2. **Define Component Interface:**
   * Create an interface **Notifier** with a method **send()**.
3. **Implement Concrete Component:**
   * Create a class **EmailNotifier** that implements Notifier.
4. **Implement Decorator Classes:**
   * Create abstract decorator class **NotifierDecorator** that implements **Notifier** and holds a reference to a **Notifier** object.
   * Create concrete decorator classes like **SMSNotifierDecorator**, **SlackNotifierDecorator** that extend **NotifierDecorator**.
5. **Test the Decorator Implementation:**
   * Create a test class to demonstrate sending notifications via multiple channels using decorators.

**Code:**

package DecoratorPatternExample;

public interface Notifier {

void send(String message);

}

public class EmailNotifier implements Notifier {

@Override

public void send(String message) {

System.out.println("Sending Email: " + message);

}

}

// Abstract Decorator Class

public abstract class NotifierDecorator implements Notifier {

protected Notifier wrappedNotifier;

public NotifierDecorator(Notifier notifier) {

this.wrappedNotifier = notifier;

}

@Override

public void send(String message) {

wrappedNotifier.send(message);

}

}

// Concrete Decorator Classes

public class SMSNotifierDecorator extends NotifierDecorator {

public SMSNotifierDecorator(Notifier notifier) {

super(notifier);

}

@Override

public void send(String message) {

super.send(message);

sendSMS(message);

}

private void sendSMS(String message) {

System.out.println("Sending SMS: " + message);

}

}

public class SlackNotifierDecorator extends NotifierDecorator {

public SlackNotifierDecorator(Notifier notifier) {

super(notifier);

}

@Override

public void send(String message) {

super.send(message);

sendSlack(message);

}

private void sendSlack(String message) {

System.out.println("Sending Slack message: " + message);

}

}

public class Main {

public static void main(String[] args) {

Notifier notifier = new EmailNotifier();

// Wrap the base notifier with SMS notifier

notifier = new SMSNotifierDecorator(notifier);

// Wrap the SMS notifier with Slack notifier

notifier = new SlackNotifierDecorator(notifier);

// Send notification using the decorated notifier

notifier.send("Hello! This is a test notification.");

}

}