Course: ENSF 614–Fall2021

Lab #: Lab 5

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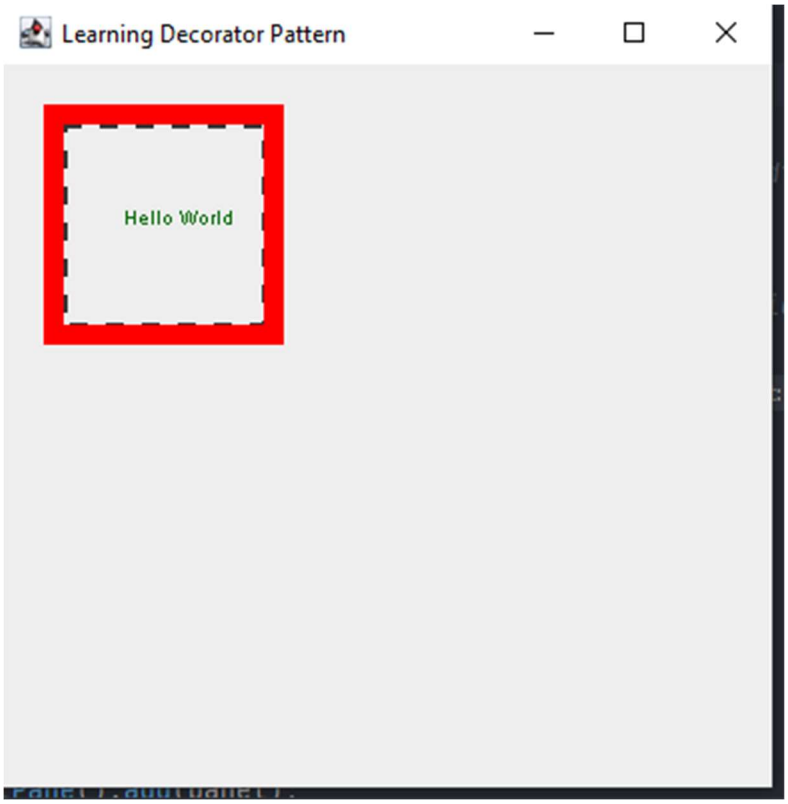
Submission Date: 2021-10-25

Exercise A

Output:



Source Code

```java
/* File Name: Text.java
 * Lab # and Assignment #: Lab #7
 * Lab section: 1
 * Completed by: Graydon Hall and Jared Kraus
 * Submission Date: 2021-11-22s
 */

package ExB;

import java.awt.*;

public class Text implements Component {
    private int x;
    private int y;
    private String text;

    public Text(String text, int x, int y) {
        this.x = x;
        this.y = y;
        this.text = text;
    }

    @Override
    public void draw(Graphics g) {
        var oldColor = g.getColor();
        Color dark_green = new Color(0,102,0);
        g.setColor(dark_green);
        g.drawString(text, x, y);
        g.setColor(oldColor);
    }
}
```

```java
/* File Name: BorderDecorator.java
 * Lab # and Assignment #: Lab #7
 * Lab section: 1
 * Completed by: Graydon Hall and Jared Kraus
 * Submission Date: 2021-11-22
 */

package ExB;

import java.awt.*;

public class BorderDecorator extends Decorator {

    public BorderDecorator(Component component, int x, int y, int width, int height) {
        super(component, x, y, width, height);
    }

    @Override
    public void draw(Graphics g) {
        component.draw(g);
        Graphics2D g2d = (Graphics2D) g;
        Stroke dashed = new BasicStroke(3, BasicStroke.CAP_BUTT,
BasicStroke.JOIN_BEVEL, 0, new float[]{9}, 0);
        g2d.setStroke(dashed);
        g2d.drawRect(x, y, width, height);
    }
}
```

```java
/* File Name: ColouredFrameDecorator.java
 * Lab # and Assignment #: Lab #7
 * Lab section: 1
 * Completed by: Graydon Hall and Jared Kraus
 * Submission Date: 2021-11-22
 */

package ExB;

import java.awt.*;

public class ColouredFrameDecorator extends Decorator {
    private int thickness;

    public ColouredFrameDecorator(Component component, int x, int y, int width, int
height, int t) {
        super(component, x, y, width, height);
        this.thickness = t;
    }

    @Override
    public void draw(Graphics g) {
        component.draw(g);
        Graphics2D g2d = (Graphics2D) g;
        var oldStroke = g2d.getStroke();
        var oldColour = g2d.getColor();
        g2d.setStroke(new BasicStroke(thickness));
        g2d.setColor(Color.RED);
        g2d.drawRect(x, y, width, height);
        g2d.setStroke(oldStroke);
        g2d.setColor(oldColour);
```

```
    }
}
```

```
/* File Name: ColouredGlassDecorator.java
 * Lab # and Assignment #: Lab #7
 * Lab section: 1
 * Completed by: Graydon Hall and Jared Kraus
 * Submission Date: 2021-11-22
 */

package ExB;

import java.awt.*;

public class ColouredGlassDecorator extends Decorator {

    public ColouredGlassDecorator(Component component, int x, int y, int width, int
height) {
        super(component, x, y, width, height);
    }

    @Override
    public void draw(Graphics g) {
        component.draw(g);
        Graphics2D g2d = (Graphics2D) g;
        var oldColour = g2d.getColor();
        var oldComposite = g2d.getComposite();
        g2d.setColor(Color.GREEN);
        g2d.setComposite(AlphaComposite.getInstance(AlphaComposite.SRC_OVER, 1 *
0.1f));
        g2d.fillRect(25, 25, 110, 110);
        g2d.setColor(oldColour);
        g2d.setComposite(oldComposite);
    }
}
```

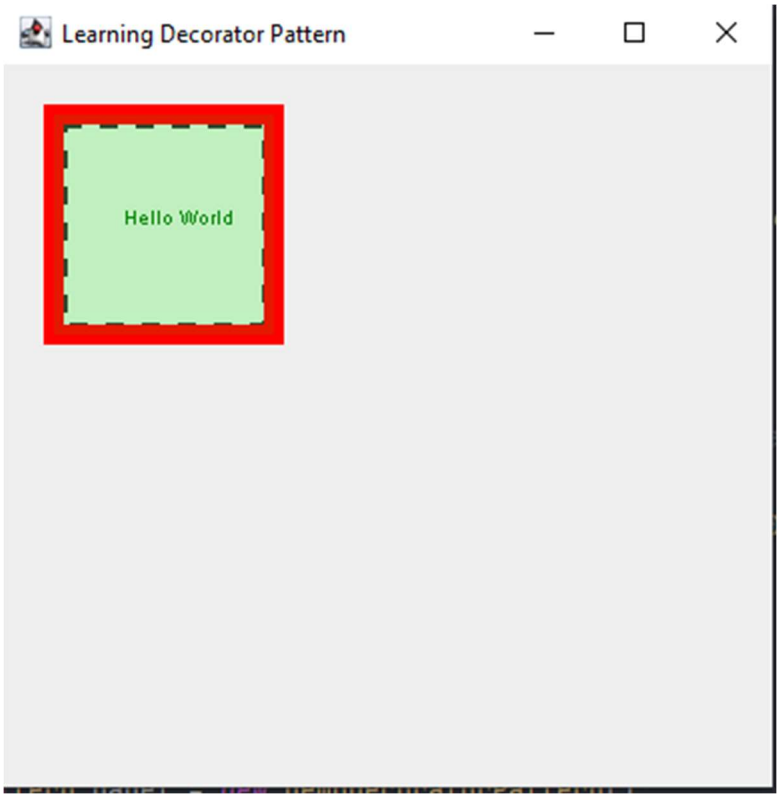
```
/* File Name: Component.java
 * Lab # and Assignment #: Lab #7
 * Lab section: 1
 * Completed by: Graydon Hall and Jared Kraus
 * Submission Date: 2021-11-22
 */

package ExB;

import java.awt.*;

public interface Component {
    public void draw(Graphics g);
}
```

```java
/* File Name: Decorator.java
 * Lab # and Assignment #: Lab #7
 * Lab section: 1
 * Completed by: Graydon Hall and Jared Kraus
 * Submission Date: 2021-11-22
 */

package ExB;

public abstract class Decorator implements Component {

    protected Component component;
    protected int x;
    protected int y;
    protected int width;
    protected int height;


    public Decorator(Component component, int x, int y, int width, int height) {
        this.component = component;
        this.x = x;
        this.y = y;
        this.width = width;
        this.height = height;
    }



}
```

```java
/* File Name: Text.java
 * Lab # and Assignment #: Lab #7
 * Lab section: 1
 * Completed by: Graydon Hall and Jared Kraus
 * Submission Date: 2021-11-22s
 */

package ExB;

import java.awt.*;

public class Text implements Component {
    private int x;
    private int y;
    private String text;

    public Text(String text, int x, int y) {
        this.x = x;
        this.y = y;
        this.text = text;
    }

    @Override
    public void draw(Graphics g) {
        var oldColor = g.getColor();
        Color dark_green = new Color(0,102,0);
        g.setColor(dark_green);
        g.drawString(text, x, y);
        g.setColor(oldColor);
    }
}
```

Exercise B

Output



Source Code

```
/* File Name: DemoDecoratorPattern.java
 * Lab # and Assignment #: Lab #7
 * Lab section: 1
 * Completed by: Graydon Hall and Jared Kraus
 * Submission Date: 2021-11-22
 */

package ExB;

import javax.swing.*;
import java.awt.*;

public class DemoDecoratorPattern extends JPanel {
   Component t;

    public DemoDecoratorPattern(){
        t = new Text("Hello World", 60, 80);
   }

    public void paintComponent(Graphics g){
        int fontSize = 10;
        g.setFont(new Font("TimesRoman", Font.PLAIN, fontSize));
        // GlassFrameDecorator info: x = 25, y = 25, width = 110, and height = 110
        t = new ColouredGlassDecorator(new ColouredFrameDecorator(
                new BorderDecorator(t, 30, 30, 100, 100), 25, 25, 110, 110, 10), 25,
25,
                110, 110);
        t.draw(g);
    }

   public static void main(String[] args) {
```

```
        DemoDecoratorPattern panel = new DemoDecoratorPattern();
        JFrame frame = new JFrame("Learning Decorator Pattern");
        frame.getContentPane().add(panel);
        frame.setSize(400,400);
        frame.setDefaultCloseOperation(JFrame.EXIT_ON_CLOSE);
        frame.setLocationRelativeTo(null);
        frame.setVisible(true);
    }
}
```

```
/* File Name: BorderDecorator.java
 * Lab # and Assignment #: Lab #7
 * Lab section: 1
 * Completed by: Graydon Hall and Jared Kraus
 * Submission Date: 2021-11-22
 */

package ExB;

import java.awt.*;

public class BorderDecorator extends Decorator {

    public BorderDecorator(Component component, int x, int y, int width, int height) {
        super(component, x, y, width, height);
    }

    @Override
    public void draw(Graphics g) {
        component.draw(g);
        Graphics2D g2d = (Graphics2D) g;
        Stroke dashed = new BasicStroke(3, BasicStroke.CAP_BUTT,
BasicStroke.JOIN_BEVEL, 0, new float[]{9}, 0);
        g2d.setStroke(dashed);
        g2d.drawRect(x, y, width, height);
    }
}
```

```
/* File Name: ColouredFrameDecorator.java
 * Lab # and Assignment #: Lab #7
 * Lab section: 1
 * Completed by: Graydon Hall and Jared Kraus
 * Submission Date: 2021-11-22
 */

package ExB;

import java.awt.*;

public class ColouredFrameDecorator extends Decorator {
    private int thickness;

    public ColouredFrameDecorator(Component component, int x, int y, int width, int
height, int t) {
        super(component, x, y, width, height);
        this.thickness = t;
    }

    @Override
    public void draw(Graphics g) {
```

```
        component.draw(g);
        Graphics2D g2d = (Graphics2D) g;
        var oldStroke = g2d.getStroke();
        var oldColour = g2d.getColor();
        g2d.setStroke(new BasicStroke(thickness));
        g2d.setColor(Color.RED);
        g2d.drawRect(x, y, width, height);
        g2d.setStroke(oldStroke);
        g2d.setColor(oldColour);
    }
}
```

```
/* File Name: ColouredGlassDecorator.java
 * Lab # and Assignment #: Lab #7
 * Lab section: 1
 * Completed by: Graydon Hall and Jared Kraus
 * Submission Date: 2021-11-22
 */

package ExB;

import java.awt.*;

public class ColouredGlassDecorator extends Decorator {

    public ColouredGlassDecorator(Component component, int x, int y, int width, int
height) {
        super(component, x, y, width, height);
    }

    @Override
    public void draw(Graphics g) {
        component.draw(g);
        Graphics2D g2d = (Graphics2D) g;
        var oldColour = g2d.getColor();
        var oldComposite = g2d.getComposite();
        g2d.setColor(Color.GREEN);
        g2d.setComposite(AlphaComposite.getInstance(AlphaComposite.SRC_OVER, 1 *
0.1f));
        g2d.fillRect(25, 25, 110, 110);
        g2d.setColor(oldColour);
        g2d.setComposite(oldComposite);
    }
}
```

```
/* File Name: Component.java
 * Lab # and Assignment #: Lab #7
 * Lab section: 1
 * Completed by: Graydon Hall and Jared Kraus
 * Submission Date: 2021-11-22
 */

package ExB;

import java.awt.*;

public interface Component {
    public void draw(Graphics g);
}
```

```java
/* File Name: Decorator.java
 * Lab # and Assignment #: Lab #7
 * Lab section: 1
 * Completed by: Graydon Hall and Jared Kraus
 * Submission Date: 2021-11-22
 */

package ExB;

public abstract class Decorator implements Component {

    protected Component component;
    protected int x;
    protected int y;
    protected int width;
    protected int height;


    public Decorator(Component component, int x, int y, int width, int height) {
        this.component = component;
        this.x = x;
        this.y = y;
        this.width = width;
        this.height = height;
    }
}
```

```java
/* File Name: Text.java
 * Lab # and Assignment #: Lab #7
 * Lab section: 1
 * Completed by: Graydon Hall and Jared Kraus
 * Submission Date: 2021-11-22s
 */

package ExB;

import java.awt.*;

public class Text implements Component {
    private int x;
    private int y;
    private String text;

    public Text(String text, int x, int y) {
        this.x = x;
        this.y = y;
        this.text = text;
    }

    @Override
    public void draw(Graphics g) {
        var oldColor = g.getColor();
        Color dark_green = new Color(0,102,0);
        g.setColor(dark_green);
        g.drawString(text, x, y);
        g.setColor(oldColor);
    }
}
```

Exercise C

Output

```
\MEng\Semester 3\ENSF 614\Labs\Lab 7\GH\Ex_C\" ; if ($?) { g++ -std=c++14 *.cpp  -o main } ; if ($?) { .\main }
Created a new Client_A object called ca ...
adding two usernames, Jack and Judy, by client ca ...
Jack sucessfully added!
Judy sucessfully added!
Created a new Client_B object called cb ...
Adding two usernames called Jim and Josh, by client cb ...
Jim sucessfully added!
Josh sucessfully added!
Now adding another username called Jim by client ca.
It must be avoided because a similar username already exits ...
Error: Unable to add Jim because a user with that name already exists.
Another attempt to add username called Jim, but this time by client cb,
with a different password
It must be avoided again ...
Error: Unable to add Jim because a user with that name already exists.
Now client cb validates existence of username Jack and his password:
Found: username: Jack and the password is: apple5000
Now client ca validates existence of username Jack with a wrong password.
User not found
Username or password NOT found
Trying to make a new Client_A object which is a copy of client ca:
Adding a usernames called Tim by client ca2 ...
Tim sucessfully added!
Make a new Client_A object called ca3:
Make ca3 a copy of ca2:
Now client ca3 validates existence of username Tim and his password:
Found: username: Tim and the password is: blue_sky
PS C:\Users\grayd\OneDrive\Documents\School\MEng\Semester 3\ENSF 614\Labs\Lab 7\GH\Ex_C>
```

Source Code

```cpp
/* File Name: main.cpp
* Lab # and Assignment #: Lab #7
* Lab section: 1
* Completed by: Graydon Hall and Jared Kraus
* Submission Date: 2021-11-22
*/

#include "Client_A.hpp"
#include "Client_B.hpp"
#include "User.hpp"
#include <iostream>
using namespace std;

int main() {

    Client_A ca;
    cout << "Created a new Client_A object called ca ..." << endl;

    cout << "adding two usernames, Jack and Judy, by client ca ..." << endl;
    ca.add("Jack", "apple5000");
    ca.add("Judy", "orange$1234");

    Client_B cb;
    cout << "Created a new Client_B object called cb ... " << endl;
    cout << "Adding two usernames called Jim and Josh, by client cb ..." << endl;
```

```
    cb.add("Jim", "brooks$2017");
    cb.add("Josh", "mypass2000");

    cout << "Now adding another username called Jim by client ca.\n";
    cout << "It must be avoided because a similar username already exits ..." << endl;
    ca.add("Jim", "brooks$2017");
    cout << "Another attempt to add username called Jim, but this time by client cb,\n";
    cout << "with a different password\n";
    cout << "It must be avoided again ..." << endl;
    cb.add("Jim", "br$2017");

    cout << "Now client cb validates existence of username Jack and his password: " << endl;
    if( User *u = cb.validate("Jack", "apple5000"))
        cout << "Found: username: " << u->username << " and the password is: " << u-
>password <<  endl;
    else
        cout << "Username or password NOT found" << endl;


    cout << "Now client ca validates existence of username Jack with a wrong password. " <<
endl;
    if( User *u = ca.validate("Jack", "apple4000"))
        cout << "Found: username is: " << u->username << " and password is: " << u->password
<<  endl;
    else
        cout << "Username or password NOT found" << endl;



    cout << "Trying to make a new Client_A object which is a copy of client ca:" << endl;
    Client_A ca2 = ca;
    cout << "Adding a usernames called Tim by client ca2 ..." << endl;
    cb.add("Tim", "blue_sky");
    cout << "Make a new Client_A object called ca3:" << endl;
    Client_A ca3;
    cout << "Make ca3 a copy of ca2:" << endl;
    ca3 = ca2;
    cout << "Now client ca3 validates existence of username Tim and his password: " << endl;
    if( User *u = ca3.validate("Tim", "blue_sky"))
        cout << "Found: username: " << u->username << " and the password is: " << u-
>password <<  endl;
    else
        cout << " Tim NOT found" << endl;
#if 0
    cout << "Lets now make a couple of objects of LoginServer by main funciton:" << endl;
    LoginServer x;
    LoginServer y = x;
    x = y;
    cout << "Now LoginServer x validates existence of username Tim and his password: " <<
endl;
```

```
    if( User *u = y.validate("Tim", "blue_sky"))
        cout << "Found: username: " << u->username << " and the password is: " << u-
>password <<  endl;
    else
        cout << "Tim NOT found" << endl;
#endif

    return 0;
}
```

```
/* File Name: User.hpp
* Lab # and Assignment #: Lab #7
* Lab section: 1
* Completed by: Graydon Hall and Jared Kraus
* Submission Date: 2021-11-22
*/

#ifndef USER
#define USER
#include <string>
using namespace std;

struct User
{
    string username;
    string password;
};

#endif
```

```
/* File Name: LoginServer.hpp
* Lab # and Assignment #: Lab #7
* Lab section: 1
* Completed by: Graydon Hall and Jared Kraus
* Submission Date: 2021-11-22
*/

#ifndef LOGINSERVER
#define LOGINSERVER
#include <string>
#include <vector>
#include "User.hpp"
using namespace std;

class LoginServer{
protected:
```

```
    static LoginServer* instance;
    vector<User> users;
private:
    LoginServer(){}
    LoginServer(const LoginServer& src);
    LoginServer& operator=(LoginServer&rhs);
public:
    static LoginServer* getInstance();
    void add(string username, string password);
    User* validate(string username, string password);
};

#endif
```

```
/* File Name: LoginServer.cpp
* Lab # and Assignment #: Lab #7
* Lab section: 1
* Completed by: Graydon Hall and Jared Kraus
* Submission Date: 2021-11-22
*/

#include "User.hpp"
#include "LoginServer.hpp"
#include <iostream>
using namespace std;

// define static class variable
LoginServer* LoginServer::instance = nullptr;

LoginServer* LoginServer::getInstance(){

    if(instance==nullptr){
        instance = new LoginServer();
    }
    // note that instance is a pointer to a LoginServer
    return instance;
}

void LoginServer::add(string username, string password){
    // first check user does not already exist
    User u;
    for(int i=0; i < users.size(); i++){
        u = users.at(i);
        if (u.username == username ){
            cout<<"Error: Unable to add " << username << " because a user with that name
already exists.\n";
            return;
        }
    }
```

```
    // if we get here, then means user with same username not found in database
    User user;
    user.password = password;
    user.username=username;
    users.push_back(user);
    cout<< username << " sucessfully added!\n";

}

User* LoginServer::validate(string username, string password){
    // check if a user exists in the database with this username AND password
    User u;
    for(int i=0; i < users.size(); i++){
        u = users.at(i);
        if (u.username == username & u.password == password){
            return &(users.at(i));
        }
    }

    // user was not found
    cout << "User not found\n";
    return NULL;
}

LoginServer::LoginServer(const LoginServer& src){
    if(this !=&src){
        for(int i=0; i < src.users.size(); i++){
            this->users.push_back(src.users.at(i));
            this->instance=src.instance;
        }
    }
}

LoginServer& LoginServer::operator=(LoginServer&rhs){
    if(this !=&rhs){
        for(int i=0; i < rhs.users.size(); i++){
            this->users.push_back(rhs.users.at(i));
            this->instance=rhs.instance;
        }
    }
}
```

```cpp
/* File Name: Client_A.hpp
* Lab # and Assignment #: Lab #7
* Lab section: 1
* Completed by: Graydon Hall and Jared Kraus
* Submission Date: 2021-11-22
*/

#ifndef CLIENTA
#define CLIENTA
#include <string>
#include <vector>
#include "LoginServer.hpp"
using namespace std;

class Client_A{

private:
    LoginServer* instance;
public:
    void add(string username, string password);
    User* validate(string username, string password);
    Client_A();
};

#endif
```

```cpp
/* File Name: Client_A.cpp
* Lab # and Assignment #: Lab #7
* Lab section: 1
* Completed by: Graydon Hall and Jared Kraus
* Submission Date: 2021-11-22
*/

#include <string>
#include <vector>
#include "LoginServer.hpp"
#include "Client_A.hpp"
using namespace std;
Client_A::Client_A(){
    instance = LoginServer::getInstance();
}

void Client_A::add(string username, string password){
    instance->add(username, password);
}

User* Client_A::validate(string username, string password){
    return instance->validate(username, password);
}
```

```cpp
/* File Name: Client_B.hpp
* Lab # and Assignment #: Lab #7
* Lab section: 1
* Completed by: Graydon Hall and Jared Kraus
* Submission Date: 2021-11-22
*/


#ifndef CLIENTB
#define CLIENTB
#include <string>
#include <vector>
#include "LoginServer.hpp"
using namespace std;

class Client_B{

private:
    LoginServer* instance;
public:
    void add(string username, string password);
    User* validate(string username, string password);
    Client_B();
};

#endif
```

```cpp
/* File Name: Client_B.cpp
* Lab # and Assignment #: Lab #7
* Lab section: 1
* Completed by: Graydon Hall and Jared Kraus
* Submission Date: 2021-11-22
*/


#include <string>
#include <vector>
#include "LoginServer.hpp"
#include "Client_B.hpp"
using namespace std;


Client_B::Client_B(){
    instance = LoginServer::getInstance();
}

void Client_B::add(string username, string password){
    instance->add(username, password);
}
```

```
User* Client_B::validate(string username, string password){
    return instance->validate(username, password);
}
```

Exercise C, part II Discussion

1. **Does your program allow creating objects of LoginServer?**
   No it does not

2. **If no, why?**
   The reason we are not allowed to do this is because of the Singleton design pattern we implemented. The singleton principal is a design pattern which ensures we can only have one instance for a class, which in this cas is the LoginServer class. For this design pattern, we make the constructor, copy constructor, and assignment operator for LoginServer private, so that they cannot be publicly accessed. This way, the only way a LoginServer can be created is by using the static getInstance() method, which will only instantiate a new LoginServer object if one does not currently exist.