CS-665: Software Designs and Patterns

Assignment 4

This document should not be disseminated outside the purview of its intended purpose.

Utilizing Legacy Systems (20 points)

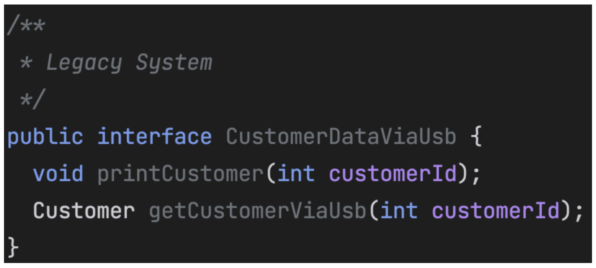
GitHub Project Template Link
https://github.com/edorsini/cs-665-project-template

Application Description

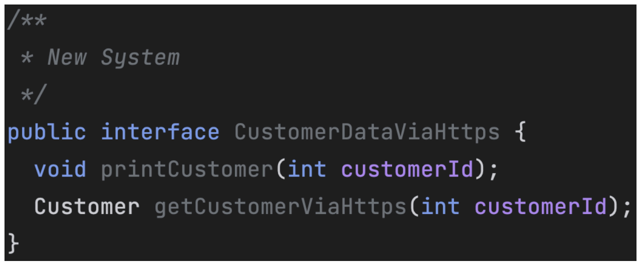
A company has two systems for accessing customer data. One is a newly developed system, while the other is an outdated legacy system. The legacy system retrieves customer data by connecting to external disks through a USB connection and accessing binary files. In contrast, the new system accesses customer data through a secure HTTPS connection and a REST API, connecting to an external server. Both systems have associated APIs that can be taken into consideration.

Boston University Metropolitan College

Ed Orsini | edorsini@bu.edu



```
/**
 * Legacy System
 */
public interface CustomerDataViaUsb {
  void printCustomer(int customerId);
  Customer getCustomerViaUsb(int customerId);
}
```



```
/**
 * New System
 */
public interface CustomerDataViaHttps {
  void printCustomer(int customerId);
  Customer getCustomerViaHttps(int customerId);
}
```

Your task is to develop a software system that facilitates the integration of the old system's interface with the new system's interface. In other words, you'll need to be able to use the new system's interface with the old system's API.

Please note that the implementation of a graphical user interface is not necessary. To demonstrate the functionality of your implementation, you should implement unit tests.

Implementation Details

Your implementation should encompass the following functionality:

- Develop specific implementations for the specified interfaces. (You can create mock objects for customer data as needed.)
- Create concrete implementations and perform tests to demonstrate the effectiveness of your implementation.

Please note:

This assignment requires the application of at least one design pattern from the class. It is your responsibility as a software developer to determine the most suitable pattern for the given scenario.

There are various ways to implement this scenario with different implementation details. There is no single correct design and implementation, as each software developer may make different assumptions and design the software accordingly. Feel free to make your own assumptions and implement the details in a manner that aligns with your ideas, but be sure to thoroughly document them in the README.md file of your project and reflect them in your UML diagrams.

It is important to note that the implementation of a user interface or command line interactions is not necessary (it is optional). Instead, you should implement sequences of user interactions in

JUnit tests to illustrate and test user interactions with the system. You can find an example of JUnit tests in the project template via the Github link at the top of this document.

Tasks

Implementation Description (2 points)

In your implementation of this application, it is important to consider software design principles. This section outlines the main software design concepts and their goals.

For example:

- Explain the level of flexibility in your implementation, including how new object types can be easily added or removed in the future.
- Discuss the simplicity and understandability of your implementation, ensuring that it is easy for others to read and maintain.
- Describe how you have avoided duplicated code and why it is important.
- If applicable, mention any design patterns you have used and explain why they were chosen.

I recommend that you write this description in a `README.md` file using MarkDown format (https://spec.commonmark.org/current/) and add the file to the root folder of your project. This should be done after completing the other tasks in this assignment.

UML Class Diagram (5 points)

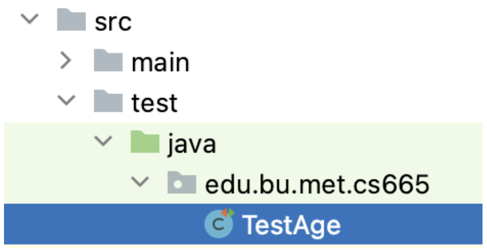
Develop a class model for your application, consisting of 5 to 8 of the most crucial classes, that encompasses the features of the described use case scenario. Only include essential and non-trivial methods.

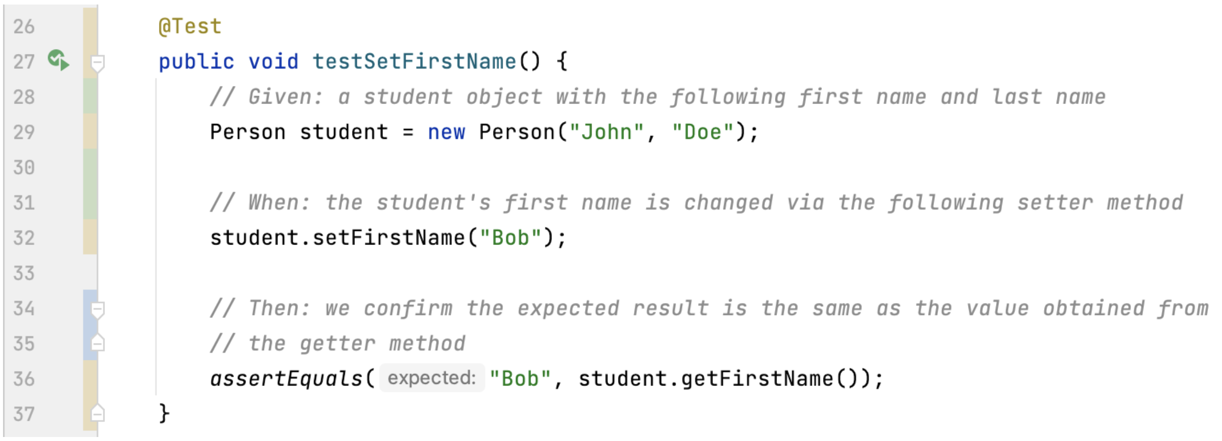
Java Solution (13 points)

- Follow the project template given to implement your project.
- Submit a zip file that includes the implementation package, with a `README.md` file explaining how to compile and run the implementation. Ensure that the zip file includes all subdirectories of the project, excluding any binary files. The zip file should not exceed 10MB in size and should only contain source files, not generated binaries.
- Provide clear and thorough documentation within the code. It is best to write the documentation as the code is being implemented, rather than postponing it for later.

- Adhere to the Google Java Style Guide (https://google.github.io/styleguide/javaguide.html).
- Ensure that the solution can be compiled using the **`mvn compile`** command.
- Implement JUnit tests to verify the functionality of the implementation. **A minimum of 3-5 JUnit tests required.**

The example below is found in the project template as an example in the following file:





```
    @Test
    public void testSetFirstName() {
        // Given: a student object with the following first name and last name
        Person student = new Person("John", "Doe");

        // When: the student's first name is changed via the following setter method
        student.setFirstName("Bob");

        // Then: we confirm the expected result is the same as the value obtained from
        // the getter method
        assertEquals( expected: "Bob", student.getFirstName());
    }
```

Submission

When you have completed your assignment:

1. Ensure that you have the latest version of your code saved on your computer.
2. Compile all results from the three tasks into a single document, such as a PDF file for the UML diagrams.
3. Zip all of your code and the document together into one .zip file. Remember to remove any binary files, which are usually found in the bin/ or target/ folders, as they can significantly increase the size of your zip file.
4. Verify that you have correctly uploaded the zip file. To do this, download the file, unzip it, and confirm that the contents are correct and that the file is not damaged. Please note

that we will only be able to evaluate the zip file uploaded to the blackboard, and any incorrect or damaged files cannot be evaluated.

Grading

Your solution should be a standalone program that can be compiled and executed following the instructions provided in the `README.md` file. It's recommended to utilize the provided project template and utilize build tools like Maven to integrate your implementation. If your program satisfies all the required functionality, compiles, and runs successfully, you will receive full points. Grading will be based on the following evaluation criteria, and points will be deducted for each task accordingly.

- Your UML diagram will be missing important components such as Interfaces/Classes, which will result in a 5% reduction for each missing component.
- To compile your solution, we will use the "**`mvn clean compile`**" command after downloading, unzipping, and running the command on your project. Your code must compile using Java JDK 1.8 or else it will result in a 10% grade deduction for the implementation task.
- If your code includes functionality bugs, a 10% deduction will be applied for each bug found.
- Your submission should include a README.md file that clearly explains your conceptual solution, the steps to compile and execute the code. Failure to include such a file or not providing all requested information will result in a 10% reduction of points.
- Your program must implement the requested functionalities, and if it does not, a 10% deduction will be applied for each missing functionality.
- We will use jplag (https://github.com/jplag/jplag) to programmatically check for plagiarism. Any solutions that are found to be an exact duplicate of someone else's will not be accepted, and we will contact you regarding the issue.

Late Work

Late work will not be accepted. We understand that exceptions can be made in extreme circumstances with proper documentation. For instance, if you provide a doctor/dentist note that verifies you were unable to meet the deadline due to illness, an extension may be granted.

Academic Misconduct in Programming

In a programming course like ours, it's crucial to understand the line between acceptable collaboration and academic misconduct. Our policy on collaboration and communication with classmates is straightforward: you may not share or receive code through any means, including visually, electronically, verbally, or otherwise. Any other forms of collaboration are permitted.

When it comes to communication with individuals who are not classmates, TAs, or the instructor, it is strictly prohibited. This includes posting questions or seeking assistance on programming forums such as StackOverflow.

When using external resources such as the web or Google, a "two-line rule" applies. You may search for information and access any web pages you need, but you may not incorporate more than two lines of code from an external source into your assignment in any form. Even if you alter the code, such as by changing variable names, it remains a violation to use more than two lines of code obtained from an external source.

It is important to properly cite your sources by adding a comment to your code that includes the URL(s) consulted during the construction of your solution. This not only helps to ensure academic integrity but also aids in later recollection of your thought process.