UTM
UNIVERSITI TEKNOLOGI MALAYSIA
Department of Computer Science
Faculty of Computing

Project

(Linked-List Implementation)

[13] Courier Service System

Programme	:	Bachelor of Computer Science (*Data Engineering*)
Subject Code	:	SECJ2013
Subject Name	:	Data Structure & Algorithms
Session-Sem	:	2023/2024-1

Prepared by :
1) MUHAMMAD DANIEL HAKIM BIN SYAHRULNIZAM (A22EC0207)
2) MUHAMMAD NUR AZHAR BIN MOHD YAZID (A22EC0220)
3) MUHAMMAD SAFWAN BIN MOHD AZMI (A22EC0221)

Section : 02

Group : TechTurtles

Lecturer : Dr. Lizawati Md Yusuf

1. Objective

In this project, Courier Service System aims to:

- To utilize a stack and queue operations to manage packages, the administrator can add new packages with information like the tracking number, address, sender, recipient, category, and delivery status, among other tasks, using the system. The system also uses stack and queue operations to delete a package.

2. Overview

- When we made the code, we had a problem in implementing tree data structure. But, we use stack and queue operations in our project. Our project is mainly about managing parcels in courier service.
- To implement this data structure, we use templates for stack and queue respectively. We divided the operations into 2 cases, each for stack and queue operations.
- For retrieving a list of parcels, we use file operations by importing a txt file named “ ParcelDataProject.txt ".
- For stack operations, we simply use the push function to add a new parcel into the system. For deleting an unnecessary parcel, we apply the pop function.
- For queue operations, we simply use the enqueue function to add a new parcel into the system. For deleting an unnecessary parcel, we apply the dequeue function.

3. Synopsis

First and foremost, the system allows the administrator to add a new parcel using two methods; using stack or queue operations. When the user is using stack operations to add a new parcel, the new parcel will be “pushed” at the top of the list. Then, when the user is using queue operations, the new parcel will be added at the back of the list.

Secondly, administrators can delete existing parcels using either stack or queue operations. When the user is using stack operations to delete an existing parcel, the parcel will be “popped” from the top of the list. Then, when the user is using queue operations, the parcel will be removed from the front of the list.

4. Design

Pseudocode

1. Start
2. The system reads the file data from ParcelDataProject.txt.
    2.1. If there is an error in the opening file, the system will terminate.
3. The system will prompt the user to input a choice number between 1 to 3.
    3.1. Case 1: If user selects case 1, the user will be implementing stack operations to enter a new parcel using push function, or remove an item using pop function.
        3.1.1. If case 1, the parcel will be added at the top of the stack.
        3.1.2. Else if case 2, the parcel will be removed from the top of the stack.
        3.1.3. Else if case 3, the user will be returned to the main menu.
        3.1.4. Else the system will display “Invalid choice. Please enter a number between 1 and 3”.
    3.2. Case 2 : If user enters case 2, the user will be implementing queue operations to enter a new parcel using enQueue function, or remove an item using deQueue function.
        3.2.1. If case 1, the parcel will be added at the back of the queue.
        3.2.2. Else if case 2, the parcel will be removed from the front of the queue.
        3.2.3. Else if case 3, the user will be returned to the main menu.
        3.2.4. Else the system will display “Invalid choice. Please enter a number between 1 and 3”.
    3.3. Case 3 : If the user enters choice 3, the system will be terminated.
    3.4. Else the system will display “Invalid choice. Please enter a number between 1 and 3”.
4. End

5. Description of how to implement data structure operations: stack and queue.

In this program, we apply stack and queue operations and utilize a class named ParcelList. Then, the ParcelList class uses stack and queue templates in its class. The implementation of stack and queue operations here are used for adding a parcel at the top of the stack or at the back of the queue, or deleting a parcel from the list, either by deleting a parcel from the top of the stack or the front of the queue.

The two main classes Parcel and ParcelList are used in the provided C++ code to construct a courier service system. The technology makes it possible to handle packages using a queue or a stack. The ParcelList class has functions for adding parcels to the stack (addNode), showing all parcels in the stack (displayAllNodes), and removing the most recent parcel added (deleteNode) among other stack operations. The std::stack data structure is used by the stack implementation. The ParcelList class, on the other hand, has functions for handling queue activities, such as enqueueing a parcel, dequeuing the first parcel added, and displayAllNodesQueue, which shows every parcel in the queue.

The queue data structure is used by the queue implementation. Using a stack or a queue, these operations let users add, remove, and inspect parcel details in order to interact with the system. The primary menu of the programme allows you to choose between stack and queue operations, giving you freedom in how you manage the Courier Service System.

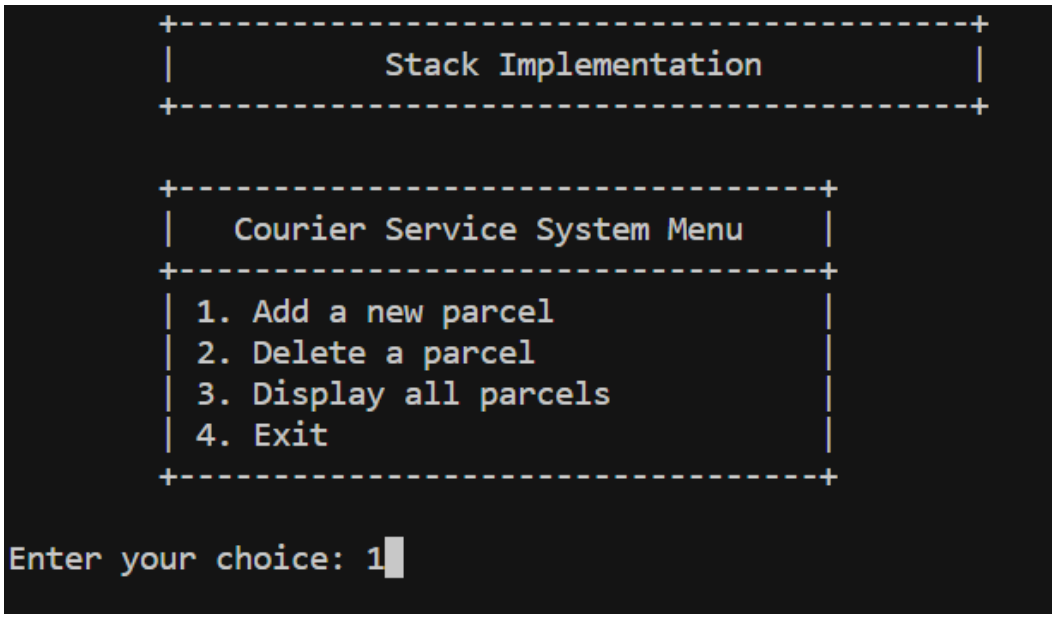
For OOP principles used in our code, we applied encapsulation, in which the tracking number, address, sender/receiver names, category, status, and remark, along with any associated methods, are all encapsulated within the Parcel class. Public getter functions (getTrackingNumber(), getAddress(), etc.) regulate access to the data members, while member functions (addNoteToParcel(), displayDetails(), etc.) make it easier to modify the data.

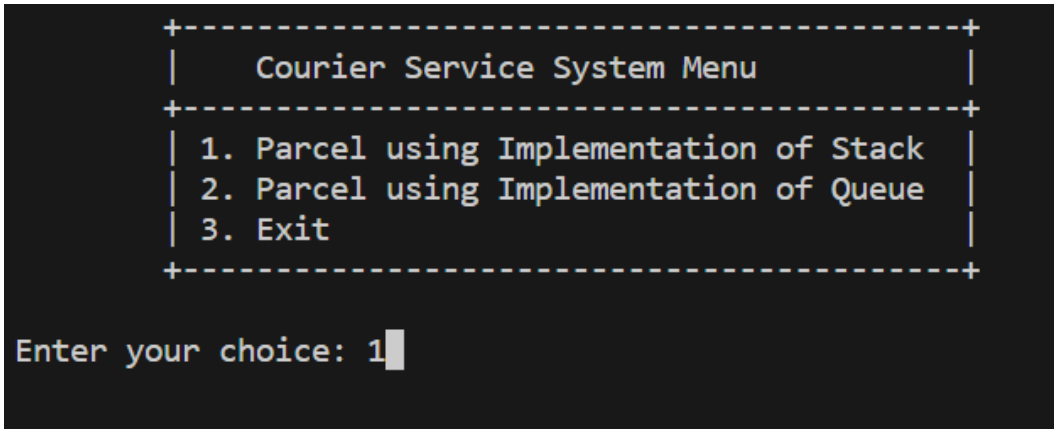
Next, we used abstraction by shielding the user from the implementation specifics, the Parcel and ParcelList classes offer a high-level abstraction. Through well specified interfaces (member functions), users can interact with parcels and parcel lists without having to comprehend the underlying technology. Then, inheritance is an essential OOP concept, even though it isn't shown clearly in the code that is provided. Inheritance could be used to build derived classes that inherit the characteristics and actions of the base classes in the event that the system evolved to include additional kinds of parcels or specialized lists. Function overloading is the means by which polymorphism is accomplished. For instance, the Parcel class's displayShippingCategory() and displayStatusDelivery() methods are overloaded to offer various behaviors depending on the category and status of the parcel, respectively.

When instances of the Parcel class are included as members of the ParcelList class, it illustrates composition. The ParcelList class uses the features offered by the Parcel class to manage parcels. It is made up of a stack (parcelStack) and a queue (parcelQueue).

6. User manual/guide

6.1 Stack Implementation to add new parcel:





```
+----------------------------------+
|   Courier Service System Menu    |
+----------------------------------+
| 1. Add a new parcel              |
| 2. Delete a parcel               |
| 3. Display all parcels           |
| 4. Exit                          |
+----------------------------------+

Enter your choice: 1

Enter parcel details:
Tracking Number: JK1024
Address: Taman Megah Ria
Sender's Name: Zareq
Receiver's Name: Haniff

A: Bulky & Heavy Delivery  B: Standard Delivery
Shipping Option (A/B): A
Status Delivery (0 for Complete, 1 for Incomplete): 0
```

```
1   JK1024      Taman Megah Ria          Zareq       Haniff       Bulky & Heavy Delivery    COMPLETE
-------------------------------------------------------------------------------------------------------
2   Y15ZR       Bukit Bintang            Marhumi     Rom          Standard Delivery         INCOMPLETE
-------------------------------------------------------------------------------------------------------
3   UN456       Taman Universiti         Azman       Hashim       Bulky & Heavy Delivery    COMPLETE
-------------------------------------------------------------------------------------------------------
4   A9834       Taman Bukit Dahlia       Hakim       Syahrulnizam Standard Delivery         INCOMPLETE
-------------------------------------------------------------------------------------------------------
5   A5500       Taman Bahagia            Safwan      Azmi         Standard Delivery         COMPLETE
-------------------------------------------------------------------------------------------------------
6   A8600       Taman Harmoni            Azhar       Yazid        Bulky & Heavy Delivery    COMPLETE
-------------------------------------------------------------------------------------------------------
+--------------------------------+
```

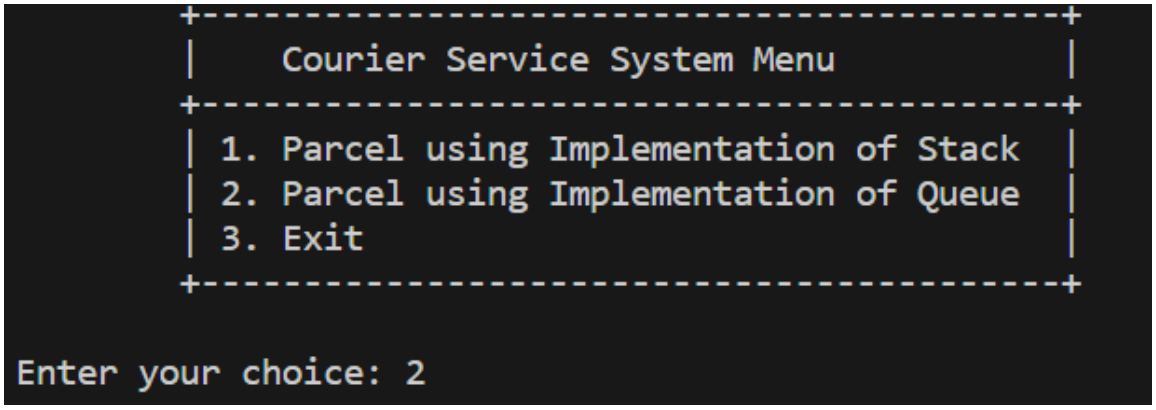
6.2 Stack Implementation to delete parcel from stack:

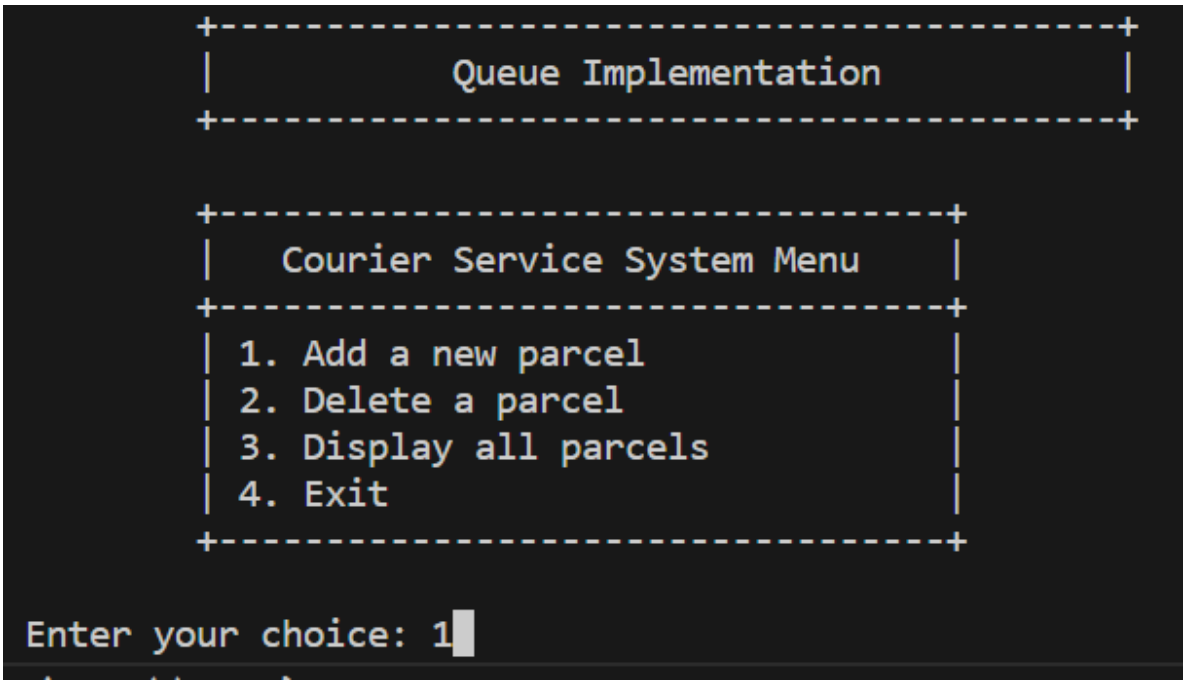
```
Enter your choice: 2
       1    Y15ZR         Bukit Bintang              Marhumi       Rom          Standard Delivery           INCOMPLETE

       ------------------------------------------------------------------------------------------------------------------
       2    UN456         Taman Universiti           Azman         Hashim       Bulky & Heavy Delivery      COMPLETE

       ------------------------------------------------------------------------------------------------------------------
       3    A9834         Taman Bukit Dahlia         Hakim         Syahrulnizam Standard Delivery           INCOMPLETE

       ------------------------------------------------------------------------------------------------------------------
       4    A5500         Taman Bahagia              Safwan        Azmi         Standard Delivery           COMPLETE

       ------------------------------------------------------------------------------------------------------------------
       5    A8600         Taman Harmoni              Azhar         Yazid        Bulky & Heavy Delivery      COMPLETE

       ------------------------------------------------------------------------------------------------------------------
```

6.3 Stack Implementation to display all parcel:

```
Enter your choice: 3
       1    Y15ZR         Bukit Bintang              Marhumi       Rom          Standard Delivery           INCOMPLETE

       ------------------------------------------------------------------------------------------------------------------
       2    UN456         Taman Universiti           Azman         Hashim       Bulky & Heavy Delivery      COMPLETE

       ------------------------------------------------------------------------------------------------------------------
       3    A9834         Taman Bukit Dahlia         Hakim         Syahrulnizam Standard Delivery           INCOMPLETE

       ------------------------------------------------------------------------------------------------------------------
       4    A5500         Taman Bahagia              Safwan        Azmi         Standard Delivery           COMPLETE

       ------------------------------------------------------------------------------------------------------------------
       5    A8600         Taman Harmoni              Azhar         Yazid        Bulky & Heavy Delivery      COMPLETE

       ------------------------------------------------------------------------------------------------------------------
```

6.4 Queue Implementation to add new parcel:





```
Enter parcel details:
Tracking Number: HL1029
Address: Taman Yu
Sender's Name: Jhi Yang
Receiver's Name: Zhu Lim

A: Bulky & Heavy Delivery  B: Standard Delivery
Shipping Option (A/B): B
Status Delivery (0 for Complete, 1 for Incomplete): 1
```

1	A8600	Taman Harmoni	Azhar	Yazid	Bulky & Heavy Delivery	COMPLETE
2	A5500	Taman Bahagia	Safwan	Azmi	Standard Delivery	COMPLETE
3	A9834	Taman Bukit Dahlia	Hakim	Syahrulnizam	Standard Delivery	INCOMPLETE
4	UN456	Taman Universiti	Azman	Hashim	Bulky & Heavy Delivery	COMPLETE
5	Y15ZR	Bukit Bintang	Marhumi	Rom	Standard Delivery	INCOMPLETE
6	HL1029	Taman Yu	Jhi Yang	Zhu Lim	Standard Delivery	INCOMPLETE

6.5 Queue Implementation to delete parcel:

```
Enter your choice: 2
       1    A5500          Taman Bahagia               Safwan        Azmi          Standard Delivery           COMPLETE

       ------------------------------------------------------------------------------------------------------------------------
       2    A9834          Taman Bukit Dahlia          Hakim         Syahrulnizam  Standard Delivery           INCOMPLETE

       ------------------------------------------------------------------------------------------------------------------------
       3    UN456          Taman Universiti            Azman         Hashim        Bulky & Heavy Delivery      COMPLETE

       ------------------------------------------------------------------------------------------------------------------------
       4    Y15ZR          Bukit Bintang               Marhumi       Rom           Standard Delivery           INCOMPLETE

       ------------------------------------------------------------------------------------------------------------------------
       5    HL1029         Taman Yu                    Jhi Yang      Zhu Lim       Standard Delivery           INCOMPLETE

       ------------------------------------------------------------------------------------------------------------------------
```

6.6 Queue Implementation to display all parcel:

```
Enter your choice: 3
       1    A5500          Taman Bahagia               Safwan        Azmi          Standard Delivery           COMPLETE

       ------------------------------------------------------------------------------------------------------------------------
       2    A9834          Taman Bukit Dahlia          Hakim         Syahrulnizam  Standard Delivery           INCOMPLETE

       ------------------------------------------------------------------------------------------------------------------------
       3    UN456          Taman Universiti            Azman         Hashim        Bulky & Heavy Delivery      COMPLETE

       ------------------------------------------------------------------------------------------------------------------------
       4    Y15ZR          Bukit Bintang               Marhumi       Rom           Standard Delivery           INCOMPLETE

       ------------------------------------------------------------------------------------------------------------------------
       5    HL1029         Taman Yu                    Jhi Yang      Zhu Lim       Standard Delivery           INCOMPLETE

       ------------------------------------------------------------------------------------------------------------------------
```