Assignment

ITS1033 – Object Oriented Programming

BSc (Hons.) in Computer Science via GDSE

Take Home Assignment
Total Marks: 100

Objectives

Test the student's knowledge of the fundamentals of Object-Oriented Programming using Java.

- Object-oriented concepts
- Java Swing/JavaFX application development
- In-memory application development

Student's ability to find and learn how to display time on the system real-time

Coursework Requirements and Instructions

- You have to focus on how to implement this system using your knowledge from the module Object-Oriented Programming.
- You are required to create the application in this assignment as a Java Swing/FX application.
- This assignment consists of 2 parts, Part A and Part B. Both parts carry marks and you are required to successfully attempt both parts to be able to face the viva-voce at the end of this assignment.
- Refer to the assignment Guidelines at the end of each part to understand the specific guidelines to be followed when developing the project required

Submission

- You should submit the deliverables of the coursework on or before the due date specified.
- Your work is to be made into a .zip file with the file name format "[GDSE*BatchNo*_ITS1114_*YourName*]" and should be submitted to the google class room.

- EXAMPLE: If your GDSE batch is 58 and your name is Nimal Perera,
    - The .zip file name: GDSE58_ITS1114_NimalPerera.zip

Vehicle Parking System

Introduction

"Saman Rice" is a company that distributes rice all around Sri Lanka. For distribution, they use a range of vehicles from vans to lorries with 10 feet long trailers. These vehicles are usually parked in the basement of the company. There is only one entrance to the basement, where vehicles and the parking space inside the basement are quite limited.

The security guard in the basement usually manages the vehicle flow and arranges vehicle parking spaces with great effort due to limited space inside the basement. However, with spontaneous and unorganized parking that happens occasionally, sometimes drivers of the transport vehicles find themselves in deadlocks when moving in and out of the basement. In the worst-case scenario, they might not even find a parking slot to park the Transport Vehicles.

To alleviate the situation, the company decided to divide the basement into sections (Parking-slots), assign numbers to them, and implement a system for drivers to park their vehicles orderly.

The basement was dived into parking slots as follows,

(A standard parking slot is 10 feet wide and 20 feet long)

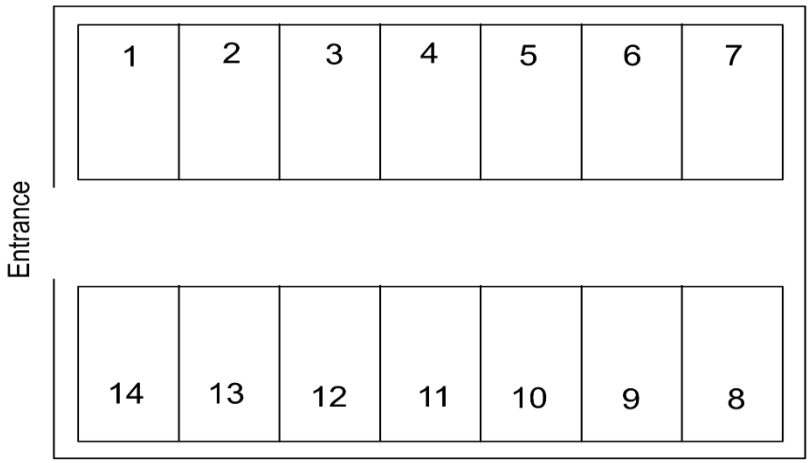


Figure 1: Parking slots available in the basement of the Company

Proposed Parking Process

1. When a driver brings the vehicle to the entrance of the basement, he can choose the vehicle that he is driving from the panel available at the side of the entrance of the basement. Then the system will assign a parking slot that is available matching the vehicle criteria.
2. Then the driver can park the vehicle at the given slot.
3. When a driver leaves with a vehicle, he should enter his name and select the vehicle that he is driving.
4. Parking slots 1,2,3,4,13 and 12 are reserved for vans.
5. Slot number 14 is reserved for the employee transportation bus of the company.
6. The company has 14 vehicles *(You can find the list of vehicles in the appendix*).
7. The company has 16 drivers. *(You can find the list of drivers in the appendix).*

System Requirements

1. The driver should be able to select his name and the vehicle number he is driving when bringing the vehicles in and out of the basement.
2. The 14th slot should only be available for the employee transportation bus.
3. When parking, slots should be assigned to vehicles in the ascending order.
4. Parking time and the leaving time of the vehicles should be automatically saved and the management should be able to view them from the interface at the entrance of the basement.
5. If a slot number in between two vehicles is freed, the vehicle should be assigned to park in the first available slot when the slot numbers are arranged in the ascending order.
6. Management should be able to see the list of vehicles outside the company premises and the drivers who are driving the vehicle.

Use case diagram

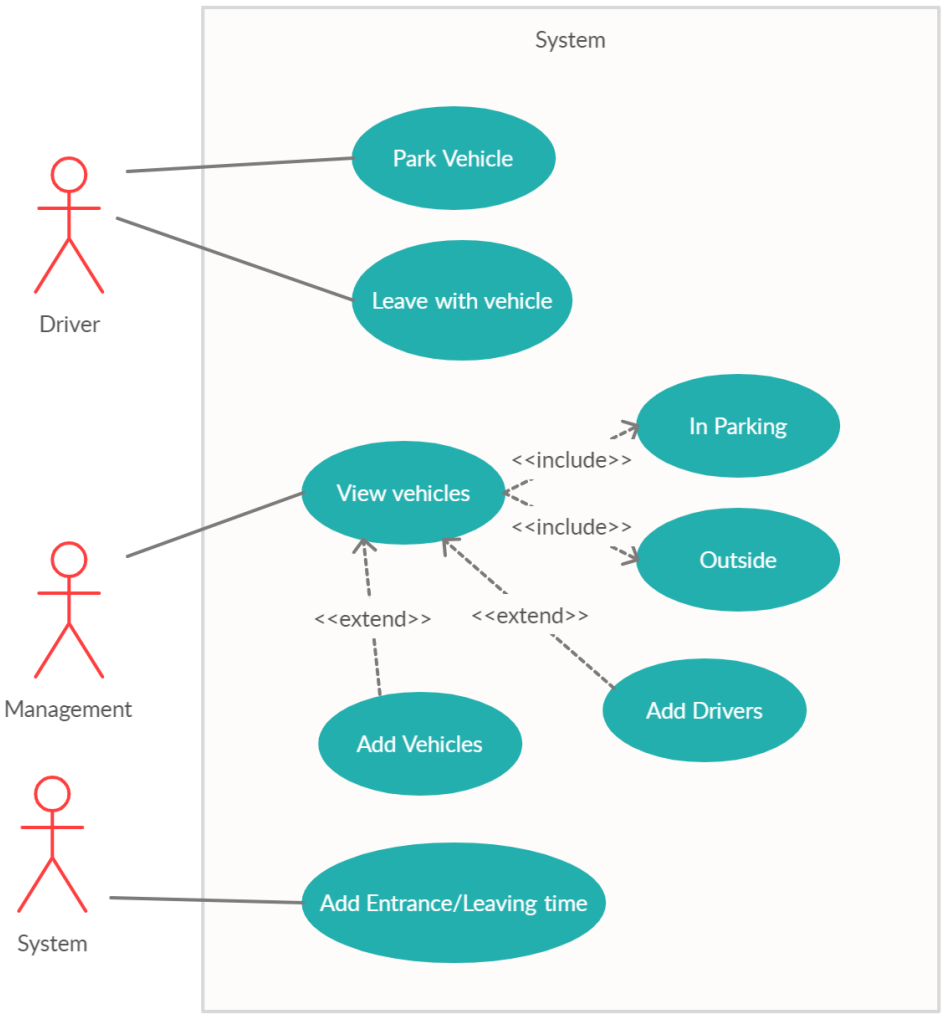


Figure 2: Usecase for the Software system

PART A

You are asked to develop an in-memory software system, to be kept at the entrance of the basement that assigns suitable parking slots for the drivers.

Note: You must utilize the four object-oriented concepts that you have learned in this module for the development of the system. Additionally, please refer to the **class diagram** provided in the **appendix** as assistance for Part A.

Evaluation of the assignment will be held in the form of an individual VIVA.

PART A – Guidelines

1. Use the Java Swing package or JavaFX to implement the User Interfaces for the suggested system.
2. The details of the drivers and the vehicles can be added to the system by the management. However, the maximum number of vehicles that the company has should be 14.
3. You are not allowed to use Java collection classes like “Array List” for this assignment.
4. From the first interface, the driver should be able to get the parking slot from the panel at the front of the basement.

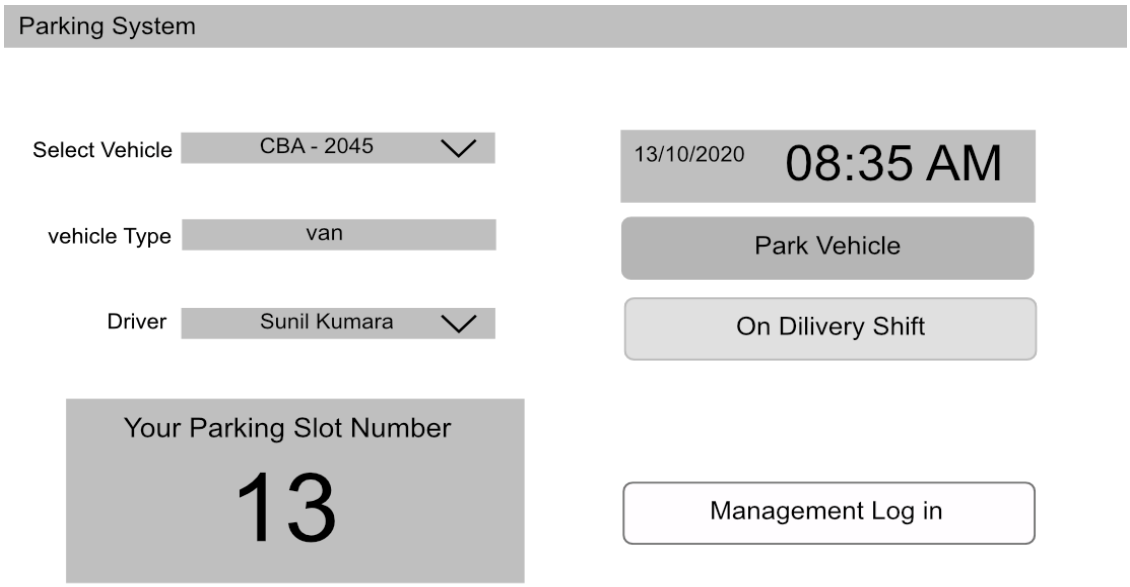


Figure 3: First interface of the system

5. Time on the parking system should update in real-time.
6. When the driver comes to park the vehicle and selects the vehicle number and driver name and the driver who drove the vehicle type should automatically be selected.
7. If a vehicle outside the car park is selected, the “On delivery shift” button should be disabled.
8. If a vehicle is inside the car park is selected, the “Park Vehicle” button should be disabled.
9. Management login should be displayed in an option pane.

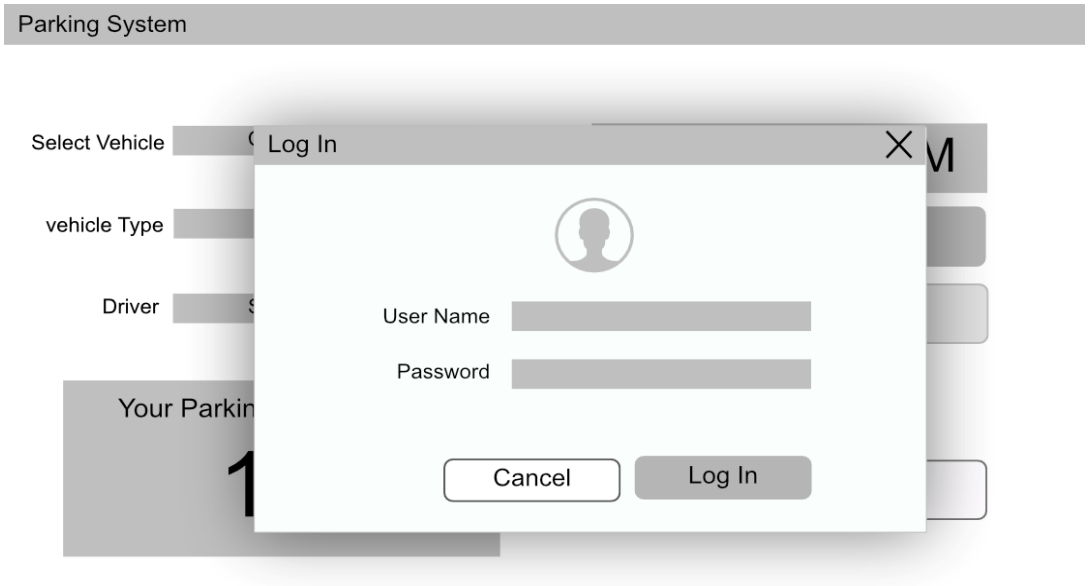
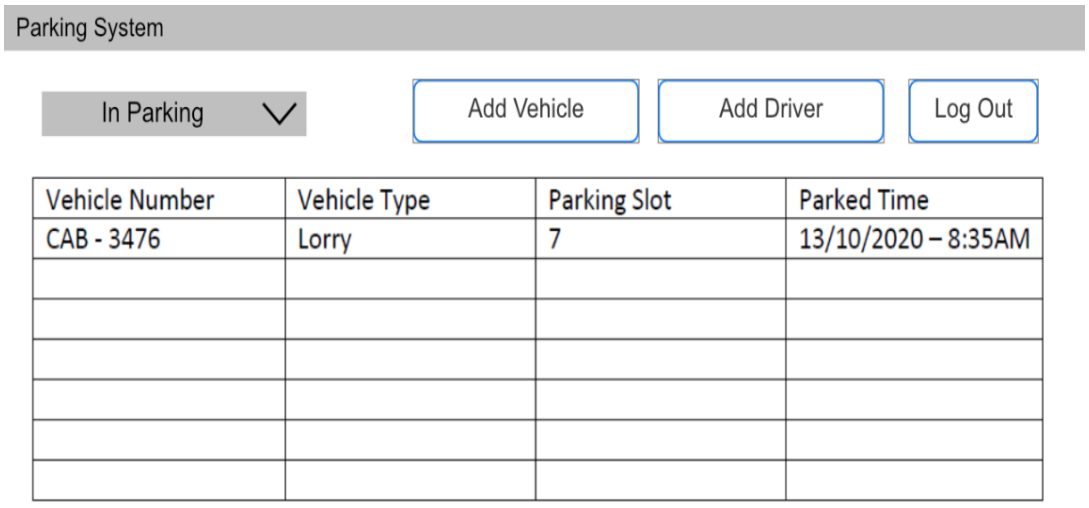


Figure 4: Management Login interface

10. After login in the management should be able to view the vehicles inside and outside the car parking.



Vehicle Number	Vehicle Type	Parking Slot	Parked Time
CAB - 3476	Lorry	7	13/10/2020 – 8:35AM

Figure 5: Vehicle list currently in Parking

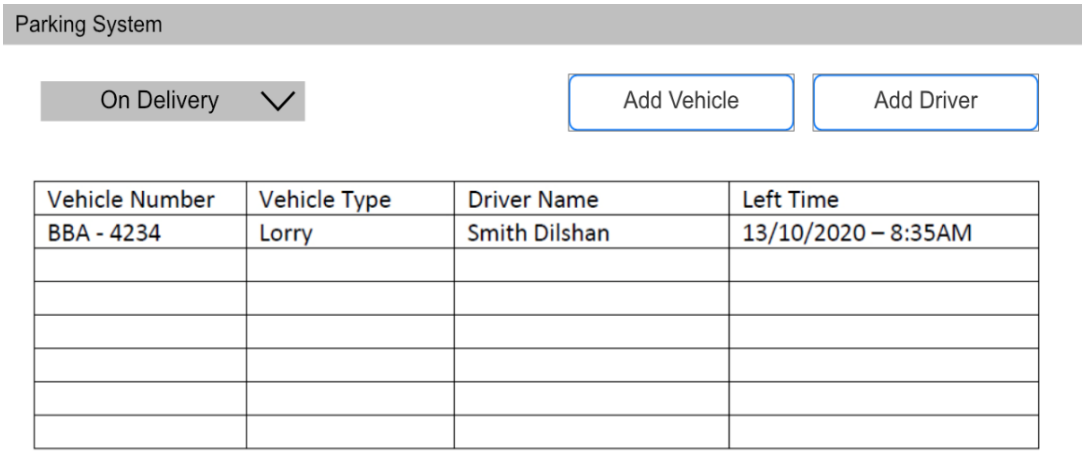


Figure 6: Vehicle List Currently on Delivery

11. Management should be able to add vehicles/drivers to the system. All the input fields must be validated.

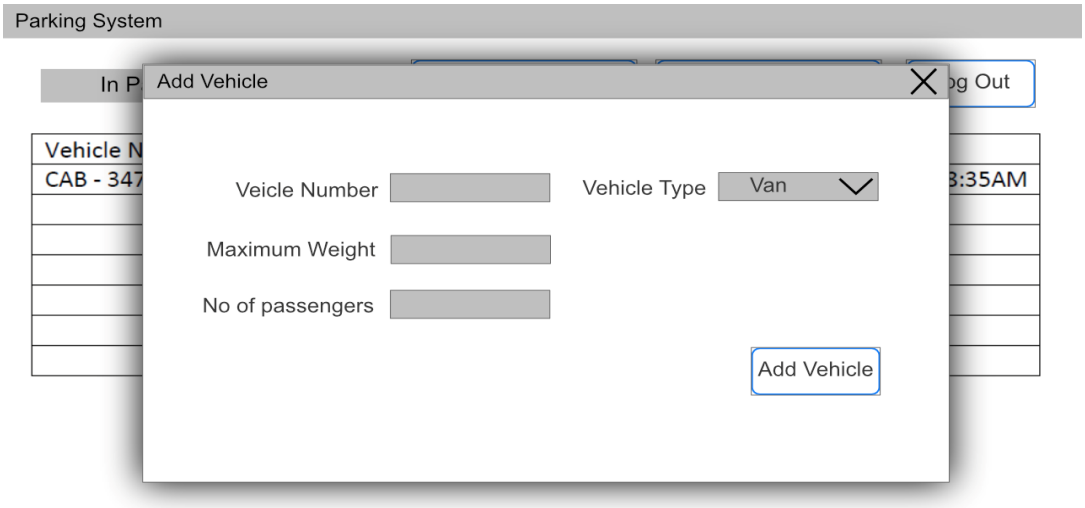


Figure 7: Add Vehicle to the system

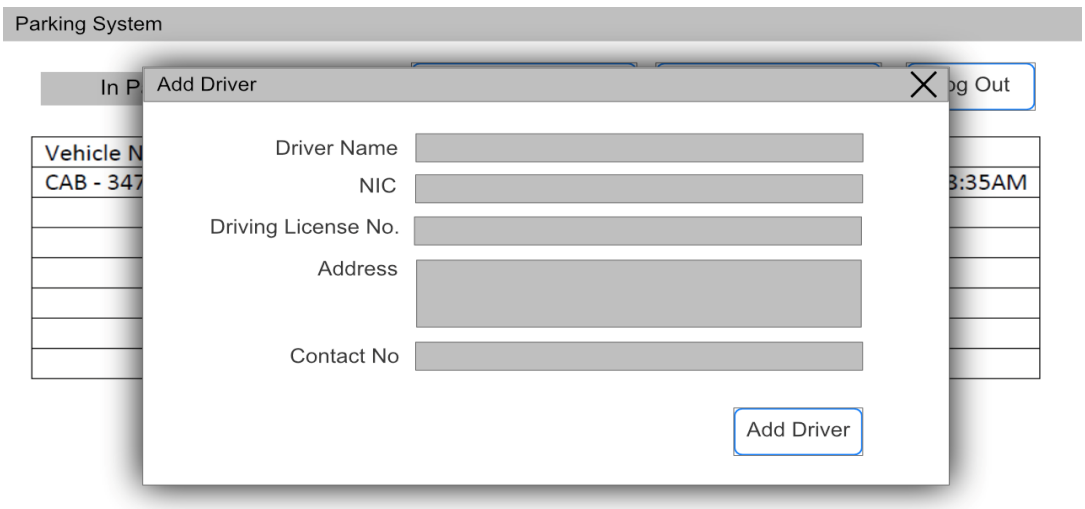


Figure 8: Add Driver to the system

12. Date and time can be obtained through the “Date” class in the “util” package. Please refer to the following code lines.

```
import java.text.SimpleDateFormat;
import java.util.Date;
public class ExampleDate {
  public static void main(String[] args) {
    SimpleDateFormat formatter = new SimpleDateFormat("dd/MM/yyyy HH:mm");
    Date date = new Date();
    System.out.println(formatter.format(date));
  }
}
```

PART B

You should be able to answer the following questions in the VIVA regarding the OOP module.

1. Explain the OOP concepts. Use real-world examples and code snippets from your system.
2. What is a class?
3. What is an Object?
4. Explain what a constructor is.
5. What are the different types of constructors and why do we use them?
6. Explain method overloading.
7. Explain method Overriding.
8. Explain the “super” keyword.
9. What does “this” keyword refer to?
10. What is an interface?
11. What are the access modifiers? Name them and explain.
12. Explain the difference between method overloading and method overriding.
13. Explain Static Variables and Methods.
14. What is runtime or dynamic polymorphism?
15. Explain a subclass and a superclass.
16. Explain the exception hierarchy in java.
17. What is the difference between an error and an exception?

PART B – Guidelines

1. Please make sure that you have completed Part A since, without the system, you will not be allowed to attend the VIVA.
2. Be punctual to the VIVA according to the schedule provided to you by the Academic Division.

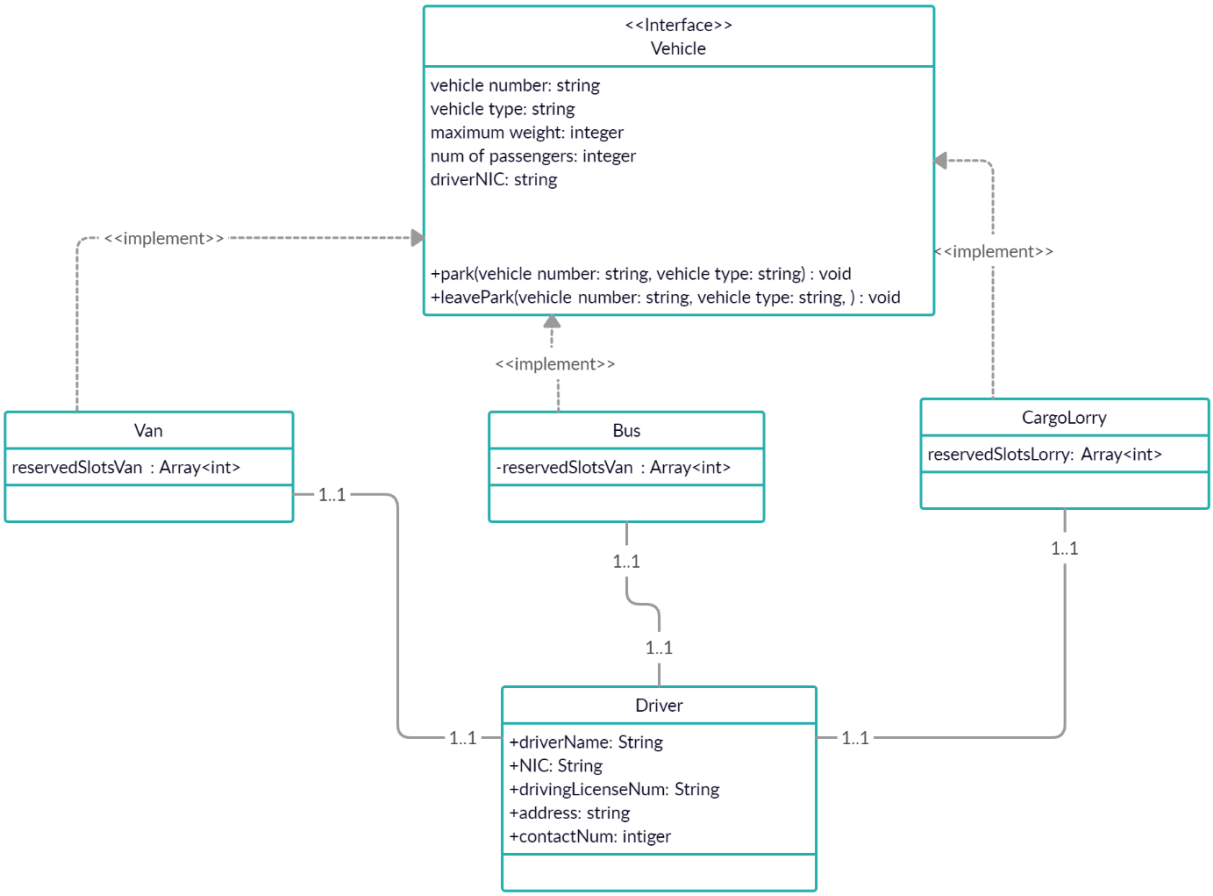
Evaluation Criteria

Method	Marks
Deliverables	10
Application	30
Viva	60

Pass Mark: 50

Appendix

Class Diagram



Vehicle Table

Vehicle Number	Vehicle Type	Maximum Weight (kg)	Number of Passengers
NA-3434	Bus	3500	60
KA-4563	Van	1000	7
58-3567	Van	1500	4
GF-4358	Van	800	4
CCB-3568	Van	1800	8
LM-6679	Van	1500	4
QA-3369	Van	1800	6
KB-3668	Cargo Lorry	2500	2
JJ-9878	Cargo Lorry	3000	2
GH-5772	Cargo Lorry	4000	3
XY-4456	Cargo Lorry	3500	2
YQ-3536	Cargo Lorry	2000	2
CBB-3566	Cargo Lorry	2500	2
QH-3444	Cargo Lorry	5000	4

Driver Table

Name	NIC	Driving License No.	Address	Contact
Sumith Kumara	7835348345V	B6474845	Panadura	0725637456
Amila Pathirana	8826253734V	B3354674	Galle	0717573583
Jithmal Perera	9283289272V	B3674589	Horana	0772452457
Sumith Dissanayaka	9425245373V	B8366399	Kaluthara	0782686390
Sumanasiri Herath	8976544373V	B3537538	Beruwala	0772534436
Awantha Fernando	9173537839V	B3554789	Colombo 5	0714534356
Charith Sudara	9573536833V	B6835836	Baththaramulla	0771536662
Prashan Dineth	9362426738V	B2683536	Wadduwa	0715353434
Chethiya Dilan	9162353436V	B6836836	Panadura	0772436737
Dushantha Perera	9255556343V	B3334435	Matara	0777245343
Sumith Udayanga	8735354355V	B3573783	Galle	0703635442
Dinesh Udara	9026344373V	B5343783	Hettimulla	0713456878
Udana Chathuranga	9692653338V	B7888632	Kottawa	0772442444
Mohommad Riaz	9124537733V	B3638537	Kaluthara	0777544222
Sandun Kumara	9563524267V	B2263333	Panadura	0772325544
Priyanga Perera	9135343537V	B3853753	Matara	0723344562