Assignment 2—Solution

Handout: **Friday, October 7th, 2022**
Due: **23:59, Monday, October 17th, 2022**

1. Requirements Specification (10 marks)

Suppose that you and your friends plan to implement an open-source communication software system like WhatsApp/WeChat, and you are responsible for developing the requirements document for the new system. Based on your experience with WhatsApp/WeChat, please

1. define one functional system requirement for the new system's chat window. (<50 words)

2. define one non-functional system requirement for the new system's chat window, regarding its ease of use or reliability. (<50 words)

Note: 1) Use “shall” for compulsory requirements and “should” for desirable requirements; 2) Be careful with the differences between functional and non-functional requirements; 3) Make sure requirements are verifiable; 4) Provide an explanation in parentheses if necessary.

Functional system requirement: A user shall be able to send at most 100 characters in each text message. (The new platform’s focus is on sending and receiving short messages.)

Non-functional system requirement: A user manual of at least 10 pages shall be provided to explain the steps in all the operations supported by the platform.

2. Requirements Management (10 marks)

Keeping track of the relationships between functional and non-functional requirements is difficult because non-functional requirements are sometimes system-level requirements rather than requirements that are specific to a single function or group of functions.

Please suggest a way in which an engineer responsible for drawing up a system requirements specification might keep track of the relationships between functional and non-functional requirements. (<100 words)

One approach that can be used is to explicitly identify system-level non-functional requirements that are associated with a functional requirement and list them separately. All system requirements that are relevant to each functional requirement should be listed.

Obviously, any sensible answer that provides a way of linking functional and non-functional requirements is acceptable here.

3. System Modeling (10 marks)

Give one reason why it is not always necessary for the model of a system that already exists to be complete and correct. Name one situation where the model of a new system should be complete and correct. (<100 words)

Two reasons:

1. If the aim of the model is to help you work on parts of the system, you only need to model those relevant parts of the system.

2. If the model is used as a discussion focus, you are unlikely to be interested in details and so can ignore parts of the system in the model.

Two situations:

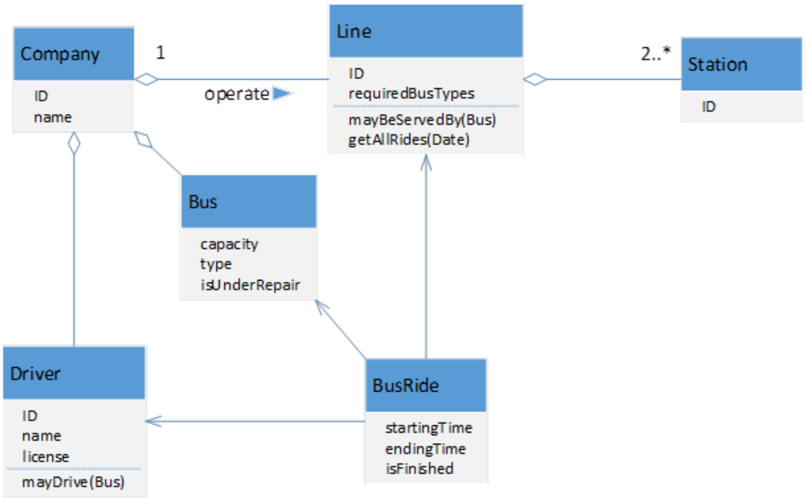
1. The model of a new system should be complete and correct if a model-based approach to development is taking place in which case a complete model is required.

2. You may need a complete and correct model if there is a contractual requirement for such a model to be produced as part of the system documentation.

4. Class Diagram (20 Marks)

The Hong Kong Transport Department wants to build a software system for the management of bus lines and bus drivers. Please design the classes and their relations for the system and draw the corresponding UML class diagram in the white space below. A basic introduction to the system is given below, your design should support all the operations as mentioned in the introduction. Annotate the associations between classes appropriately.

Bus lines are directly operated by bus companies, and they are never shared among companies. Each bus company has a name and an ID. Each bus line has an ID and covers a sequence of two or more bus stations. Each bus station has an ID. While a bus company may own different types of buses, only specific types of buses are allowed to serve each bus line. Each bus has a type and a capacity, i.e., the maximum number of passengers allowed, and it may be in state “working” or “under repair”. Bus drivers must be employees of bus companies. Each driver has a name, an ID, and a driving license, which states the types of buses the driver is allowed to drive. Given a bus type, users of the system can find out whether the type of bus is allowed to serve on a particular bus line and whether a particular bus driver is allowed to drive that bus. A bus ride is a trip of a bus, driven by a driver, along a bus line. Each bus ride has a starting time and an ending time: the ending time should be ignored if the ride is not finished yet. Given a bus line, users of the system can find out all the bus rides on a particular date.



Note that the model above is just one possible solution out of many. Particularly,

- *Some of the attributes can be modeled as get-methods. E.g., ID → getID()*
- *Name and multiplicity of associations are optional.*
- *If the multiplicity of the association between classes Line and Station is given, it must be the same as shown in the diagram.*

How to hand in:

Submit your typed, instead of handwritten, answers in a single PDF file on Blackboard.