SE3070 – Case Studies in Software Engineering

Ticketing System for a Public Transport Network

In major urban centres around the world public transport systems are critical to allowing people to move around. A major source of delay and operating costs (in terms of staff salaries) is collecting fares from passengers. Currently in Sri Lanka unfortunately we follow the same protocol especially in the buses, which is the most used transportation mode in Sri Lanka. That being said there s increasing interest in systems that allow passengers to pay in advance and access public transport using digital technologies (eg: smartcard). The concept was introduced to Sri Lanka recently but it's not that popular or succefully run up to now. But London's Oyster card system is a succefully adopted familiar example for this case study.

In this case study, your teams are bidding to SLIIT Software Development unit, for the contract to develop software to provide ticketing system for the main public transport mode in Sri Lanka.

- The first stage of bidding is to develop a design for your software that offers both functionality to address the complexity of public transport, as well as high levels of usability for passengers and public transport managers.
- In the second round of the contract competition a team of software developers will use your designs to develop, test and evaluate a simulator for your software platform that demonstrates both the usability features and the flexibility of the system to be configured for the needs of different cities around the world.

In the first phase, you are required to demonstrate your understanding of the domain by creating a software functional design (using UML) and user interaction designs for the software.

About the Case Study

In this system individual passengers will be given a digital token, that they will present to a digital reader when they are getting into a bus as well as when they get out of the bus when it arrives the destination. The token might be a smartcard (as in London's Oyster card system), but might also be a physical ticket with a bar code or could be held on a mobile device that can be read using a QR code or handled by some new innovative interaction.

The digital reader in the bus where the passenger presents the token, will give audio or visual feedback that the token has been read successfully. This may be important in situations such as getting on a bus, where the bus driver will be responsible for ensuring that every passenger scans their token and has sufficient credit to permit the journey. Instead of manually checking the validity

of the tickets the Inspectors will use digital readers that enable them to check that passengers have properly used their token for the journey.

When a passenger get a token, they will hold an account with public transport provider. Each account will have an initial credit when they first get the token. There will be pay stations in the major bus stations where they can add credit to the account using cash, debit or credit cards. Also passengers will be able to add credit online by visiting the transport service provider's website. In some situations they should be able to access this service via mobile as well. For some passengers, it may be necessary to be able to look up the journeys they have taken and the fares they have paid so that they can claim expenses back from their employers.

The system needs to be designed so that it can manage different types of fare system. For example, in London's Oyster card system, when a passenger makes a single journey, they pay a fare determined by the length of that one journey. In this situation it would be ideal to calculate the fare based on the starting point and the ending point, where the money will get deducted from the account when the passenger used the token to get out from the bus.

Also when it comes to visitors like foreigners who visit the country temporary might need a different way to travel in buses since they won't have any personal accounts.

Public transport managers also need information from the digital ticketing system. For example, to plan timetables, or to identify potential overcrowding on parts of the network, they will need to know information about how many passengers use different parts of the network at different times of day and on different days of the week. To plan the finances they will need to know information about the fares collected from passengers and how these relate to journeys that have been taken. They may also require information about how often the ticket inspectors discover people travelling without a valid ticket, as this information may affect whether additional inspectors should be employed. The system should be able to provide statistical reports to the public transport managers to analyse different situations.

Existing Systems

Different countries has different needs when it comes to handle the transport systems. It could depend on the types of transport systems they have, government regulations need to be followed and other historical factors. For example, in some cities passengers pay a single fare that allows the passenger to travel for a set period of time, changing buses and trams as necessary until they reach their destination (no matter how far away that is). Some cities have a history of offering a 'day pass' that allows travel throughout a given area for 1 day. Some cities have different fares for peak & off-

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peak times. Some cities operate a flat charge per kilometre or per mile. Below given are some existing systems that might help you to get a better insight about such systems.

- http://www.gettingaroundgermany.info/stadt.shtml
- http://france.angloinfo.com/transport/public-transport/trains-trams-metro/
- http://www.tripadvisor.com/Travel-g187147-s303/Paris:France:Public.Transportation.html
- http://www.expatica.com/nl/leisure/travel_tourism/guide-to-public-transport-in-the-netherlands-17782.html
- http://www.tripadvisor.com/Travel-g188634-c51078/Belgium:Local.Public.Transport.html
- http://www.tripadvisor.co.uk/Travel-g188644-s303/Brussels:Belgium:Public.Transportation.html

For you information

The information in this document is typical of what you might expect to get from a client in industry when developing software systems, i.e. incomplete, possibly ambiguous, and certainly vague.

You are also encouraged to talk to the module delivery team during tutorials to clarify any queries you might have as you design (and then implement) a working system.

Remember, your clients will rarely be computer savvy and it is your job as practicing software engineers/computer scientists, to interpret the English language musings into formal designs and ultimately a software package. If the client could do this, they wouldn't need us.