CSCI910 – Software Requirements, Specifications and Formal Methods

Tutorial 2

Objectives

- Get familiar with the fundamental concepts of software development
- Get familiar with the fundamental concepts of software requirement

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Exercise 1:

Discover ambiguities or omissions in the following statement of requirements for part of a ticket-issuing system:

An automated ticket machine sells rail tickets. Users select their destination and input a credit card and a personal identification number. The rail ticket is issued and their credit card account charged. When the user presses the start button, a menu display of potential destinations is activated, along with a message to the user to select a destination and the type of ticket required. Once a destination has been selected, the ticket price is displayed and customers are asked to input their credit card. Its validity is checked and the user is then asked to input their personal identifier (PIN). When the credit transaction has been validated, the ticket is issued.

Answer 1:
Ambiguities and omissions include:

1. Can a customer buy several tickets for the same destination together or must they be bought one at a time?

2. Can customers cancel a request if a mistake has been made?

3. How should the system respond if an invalid card is input?

4. What happens if customers try to put their card in before selecting a destination (as they would in ATM machines)?

5. Must the user press the start button again if they wish to buy another ticket to a different destination?

6. Should the system only sell tickets between the station where the machine is

Exercise 2:

Suggest how an engineer responsible for drawing up a system requirements specification might keep track of the relationships between functional and non-functional requirements.

Answer 2:

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 which are specific to a single function or group of functions.

One approach that can be used is to explicitly identify system-level nonfunctional requirements that are associated with a functional requirement and list them separately. All system requirements that are relevant for each functional requirement should be listed. They can be related by including them in a table as shown below.

Functional requirement	Related non-functional system requirements	Non-functional requirements
The system shall provide an operation which allows operators to open the release valve to vent steam into the atmosphere.	Safety requirement: No release of steam shall be permitted if maintenance work is being carried out on any steam generation plant.	Timing requirement: The valve must open completely within 2 seconds of the operator initiating the action.

Notice that in this example, the system non-functional requirement would normally take precedence over the timing requirement, which applied to the specific operation.

Exercise 3:

Write a set of non-functional requirements for the ticket-issuing system, setting out its expected reliability and response time.

Answer 3:

Possible non-functional requirements for the ticket issuing system include:

1. Between 0600 and 2300 in any one day, the total system down time should not exceed 5 minutes.
2. Between 0600 and 2300 in any one day, the recovery time after a system failure should not exceed 2 minutes.

3. Between 2300 and 0600 in any one day, the total system down time should not exceed 20 minutes.

All these are availability requirements – note that these vary according to the time of day. Failures when most people are traveling are less acceptable than failures when there are few customers.

4. After the customer presses a button on the machine, the display should be updated within 0.5 seconds.

5. The ticket issuing time after credit card validation has been received should not exceed 10 seconds.

6. When validating credit cards, the display should provide a status message for customers indicating that activity is taking place. This tells the customer that the potentially time consuming activity of validation is still in progress and that the system has not simply failed.

7. The maximum acceptable failure rate for ticket issue requests is 1: 10000.