

Exam: Software Engineering

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1. Requirements elicitation

Assume that, during the `ReportEmergency` use case (described below), the `FieldOfficer` can invoke a `Help` feature when filling an emergency report. This feature provides a detailed description for each field and specifies which fields are required. Write the `HelpReportEmergency` use case describing this `Help` feature and modify the `ReportEmergency` use case to take into account this help functionality. Which relationship should you use to relate the `ReportEmergency` and `HelpReportEmergency`?

Location	Use case description
Field Officer station	<ol style="list-style-type: none">1. The <code>FieldOfficer</code> activates the “Report Emergency” function of her terminal.2. <code>FRIEND</code> responds by presenting a form to the officer. The form includes an emergency type menu (general emergency, fire, transportation), a location, incident description, resource request, and hazardous material fields.3. The <code>FieldOfficer</code> fills the form by specifying minimally the emergency type and description fields. The <code>FieldOfficer</code> may also describe possible responses to the emergency situation and request specific resources. Once the form is completed, the <code>FieldOfficer</code> submits the form by pressing the “Send Report” button, at which point the <code>Dispatcher</code> is notified.
Dispatcher station	<ol style="list-style-type: none">4. The <code>Dispatcher</code> is notified of a new incident report by a popup dialog. The <code>Dispatcher</code> reviews the submitted information and creates an <code>Incident</code> in the database by invoking the <code>OpenIncident</code> use case. All the information contained in the <code>FieldOfficer</code>’s form is automatically included in the <code>Incident</code>. The <code>Dispatcher</code> selects a response by allocating resources to the <code>Incident</code> (with the <code>AllocateResources</code> use case) and acknowledges the emergency report by sending a short message to the <code>FieldOfficer</code>.
Field Officer station	<ol style="list-style-type: none">5. The <code>FieldOfficer</code> receives the acknowledgment and the selected response.

Figure 1 `ReportEmergency` use case.

2. Analysis

Identify the participating objects in the `ReportEmergency` use case (described in the previous question) using, for example, Abbott's heuristics. Draw a UML sequence diagram depicting the interactions between these objects during the use case. Then identify the static relationships between these objects and any attributes that you can infer from the use case description. Draw the resulting object model as a UML class diagram. Include a brief natural language description for each object that you identified.

3. System design

You are developing a system that stores its data on a Unix file system. You anticipate that you will port future versions of the system to other operating systems that provide different file systems. Which design pattern do you use to guard against this change? Draw an object model representing the storage subsystem, including the design pattern and its relationship to other objects.

4. Object design

Consider a tool for representing a simplified requirements specification document, as represented by the object model in (Figure 2). Using the transformations rules for associations described in the Object Design lecture (also described in Section 7.4.8. in the book), reformulate the associations in Figure 2 as attributes and operations. Specify the visibility of the attributes and operations you create. Assume all associations are bidirectional.

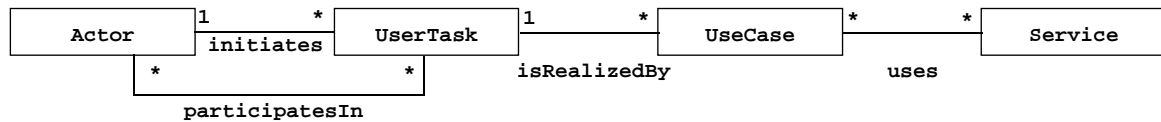


Figure 2 UML Class diagram of simplified requirements specification document.

5. Rationale management

Below is an excerpt from a system design document. It is a natural language description of the rationale for selecting a processor. Model this rationale with issues, proposals, arguments, criteria, and resolutions, as defined in the rationale lecture (and in Chapter 8 of the book). Once you draw the issue model for the text below, assume that the designers found that the cheap processor did not meet performance constraint and they had to select X91. Draw a second issue model representing the revised design decision.

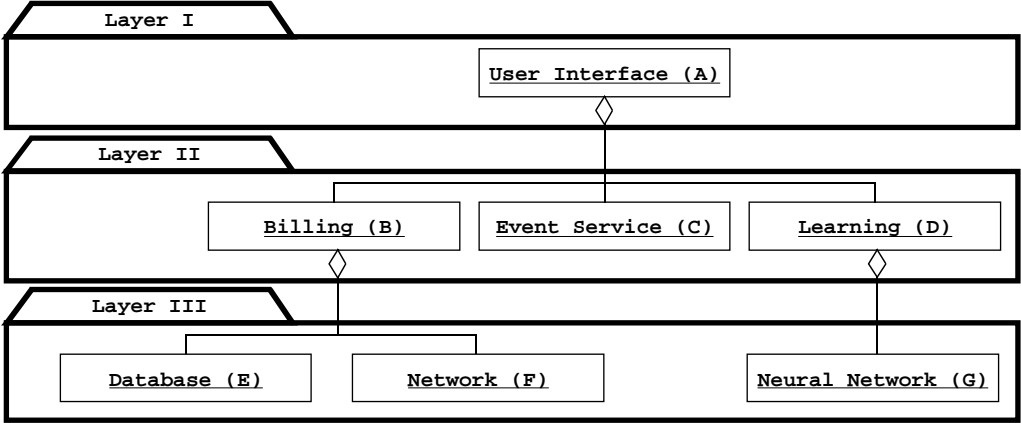
We considered three different processors for our system: X91, Y01, and Z2000. X91 is a high performance processor that has been widely available in the industry. Y01 is a clone that yield lower performance but is much cheaper than X91. Z2000 is a next generation processor that will be both cheap and offer better performance than X91 and Y01, however, it is announced only for next year. Given the cost constraints we are required to meet for the per unit price of each manufactured system, we selected Y01.

Use indented text for describing issue models, for example:

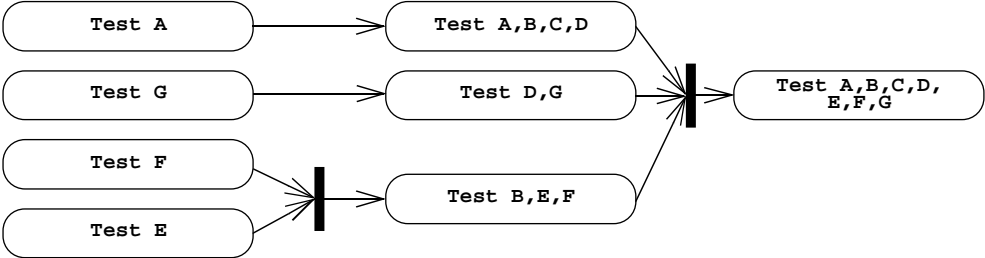
```
I: issue 1
  P[1]: proposal
    A+: good idea
  P[2]: another proposal
    A-: bad idea
R: P[1], because it's a good idea.
```

6. Testing

Given the following subsystem decomposition:



comment on the testing plan used by the project manager:



What decisions were made? Why? What are the advantages and disadvantages of this particular test plan?