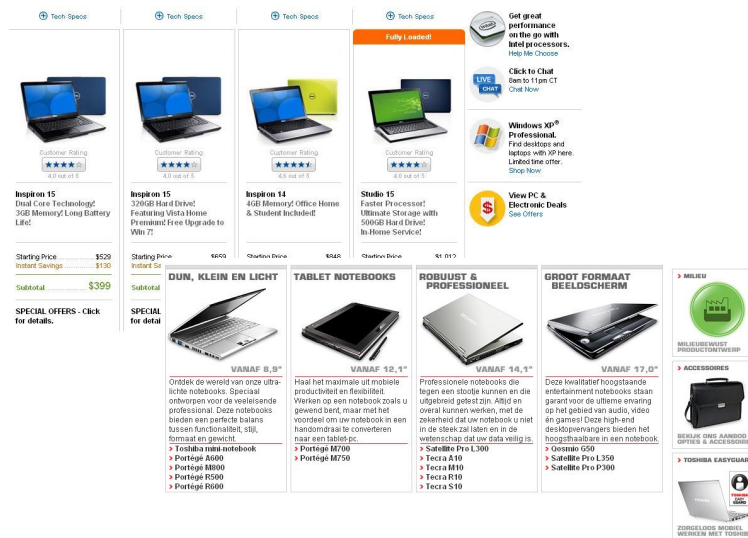


# Practical assignment for Software Specification (2IW05)

## Laptop WebStore

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## Assignment: Informal Description

This assignment concerns the specification of a typical Business Information System, namely, a system for configuring and ordering laptops as well as managing the orders.

The system is meant to sell laptops by using a web-based interface. It allows the clients to customize different models of laptops. In particular, the user can modify the following parts for each model and choose the desired configuration among the available parts:

- CPU type,
- amount of memory,
- hard disk capacity, and
- graphics card type.

For example, for a particular model, called UX1045, the following parts and part models are available:

- CPU type:
  - Intel Core 2 Duo Processor T7400
  - Intel Core 2 Quad Core Processor Q9400
  - Intel Core 2 Quad Core Processor Q8300
- amount of memory:
  - 2 GB
  - 6 GB
  - 8 GB
- hard disk capacity
  - 500 GB
  - 640 GB
  - 750 GB
- graphics card type
  - 512MB ATI Radeon HD 4350
  - 1 GB DDR3 nVidia GeForce GTX285

Each model has its own parts and may differ from above. Each model has a fixed basic price and the total price of a configured computer comprises the fixed basic price plus the price of the chosen part models (each of which has a fixed price). The available parts of a model may be more than the above-mentioned four items (e.g., for some models, the included software packages can be customized, as well).

There are two types of shipment for each configured system: fast and normal. The shipment cost (depending on the type of shipment) is added to the total price. The total delivery time depends on shipment type as well as two other parameters: the first is the assembly time, which is fixed for each model, and the second is the availability of optional parts. The system keeps track of available parts and if a part is not available in stock, it should be ordered from the provider. Then, a customized system requiring such a part takes slightly longer before delivery. The amount of time for the delivery of each part is fixed beforehand by the provider. It is essential to provide the client with a delivery time (taking all of these into account), when a purchase is being made. This is assuming that the part providers stand by their promised delivery time.

To buy a system, the user should first obtain a username. This can be achieved by filling a web form in which username, password, name and address of the client are requested. Such information should remain confidential in the system. The payment procedure is performed via a third-party web-site (such as the IDEAL web-banking system). For security reasons, no payment information (e.g., credit card or account number) may be stored by the system. After completing the financial transaction with the third-party web-site, the user should receive the final confirmation of the order and a bill via the system.

Another functionality of the system concerns managing current orders. A user can login and view her/his current orders and will be informed about the remaining time to delivery as well as the

status of the order (waiting for parts / in assembly line / in shipment). If an order has not reached the assembly line, it can be cancelled by the client and the parts will return to stock.

When the availability of a part model reaches a certain threshold, the system orders new parts from the provider (both the threshold and the number to be ordered is fixed per part model). A provider has a specified delivery time for each part. Before the new parts are delivered, new orders (requiring the same component) may be placed and thus, the availability may reach zero (as mentioned in the paragraph about the delivery time) and thus, the clients should wait before the arrival of new parts before their order is sent to the assembly line. If in the meanwhile some orders are cancelled and the parts in stock again reach the threshold, the order to the provider is *not* cancelled. The orders to the providers are processed via an external system.

When an order is placed, available parts are reserved for that order and unavailable parts are ordered. This strategy may change and be optimized in the future in order to shorten the delivery time (in case the reserved parts can be used for another order).

The sales manager can define new laptop and part models for, or remove existing models from the system. The required parts and part models of a laptop model (and their corresponding information, such as price, provider, delivery time) are also defined by the sales manager. The sales manager can get reports about the availability of parts and their ongoing orders as well as the latest status clients with laptop orders.

The above description leaves plenty of room for design decisions; these design decision can be made by each group as long as they are documented, well-motivated, reasonable and consistent (both with the other decisions you make and with the above-given description). You do not need to contact your instructor for each design decision that you make.

## Deliverables

The table below indicates the deadlines concerning the deliverables and feedbacks. The deliverable have to be handed in to the instructors (both electronically *in a single pdf file* and on paper, unless indicated otherwise by the instructor), and the instructor will make an appointment with each group to discuss the deliverables and give feedback on them. The received feedback has to be incorporated in the final report. All deliverables and the final reports are mandatory for the practical project, i.e., one does not get any points, if only the final report is delivered. The contents of each deliverable are described next.

<b>Deliverable</b>	<b>Date</b>
Use-Case, Analysis and Design Models	December 12, 2011
Feedback on Use-Case, Analysis and Design Models	December 19, 2011
Elaborated Design Models	January 13, 2011
Feedback Elaborated Design Models	January 17, 2011
Final Report	January 22, 2011

### Use-Case, Analysis and Design Models

This deliverable comprises the following components:

- Use cases: Give the use cases for the system and provide their textual description (pre- and post-conditions, main and exceptional scenarios).

- Analysis model: Identify the high-level classes (entities) of the system and their attributes, draw system-level sequence diagrams.
- Design model: Partition the functionality among classes and detail the class diagram. Use this partitioning and instances of classes to realize basic functionalities in the use-cases. Make sure that you identify and cover the state information and the state transformations involved in the operations described in the use cases. Describe the use cases in more detail using sequence diagrams. Explain how these sequence diagrams relate to the use cases.

## Elaborated Design Models

This deliverable comprises the following components:

- Formal specification of functionality: Give formal descriptions of the functionality involved in the case study. This includes specifying the class structure, and the functionality of the methods in Alloy. Identify 5-10 properties of the class operations (or their composition) and its operations and check them in Alloy. Specify one system (use-case-level) operation and show that it has the same effect as the composition of its constituent operations. Include a number of animations of system behavior in your report.
- StateChart: Give StateCharts that describes the behavior of each class and the whole system.

Do include the first deliverable in your second report. Specify all changes that you have made to your first deliverable as the result of feedbacks / revised design decisions.

## Final Report

Combine all previous deliverables and the comments provided by the instructor into a final report.

## Judgement Criteria

### Syntax and Integrity

Half of the total mark is dedicated to the syntax and integrity of the components of the final report. The final report should contain a syntactically correct and sufficiently comprehensive account of the following components:

1. Use case diagram and the description of use-cases,
2. Class diagram (both at the analysis and the design level) and its formalization,
3. Sequence diagrams (both at system level and design level),
4. State diagrams.

One of the most important criteria in judging items 1 to 4 is the extent to which the given feedback for each item is applied in the final version.

## Consistency

The remaining 50% of the mark is divided equally between the following aspects of consistency:

1. Uses cases should be consistent with the informal requirements and all informal requirements should be captured by the use case descriptions.
2. Each use-case should be captured by a system-level and a design-level sequence diagram (SD).
3. Each non-trivial method in the class diagram should have an Alloy specification.
4. Each use case description should be modeled by one or more SDs. Each entity in the design-level SD should be an object of a class given in the class diagram. Each message received by an object in the design-level SD should be a method of the target class in the class diagram.
5. Each class (or each combination of classes) should have a state diagram. Each scenario specified by an SD should be a trace of the system-level composition of state diagrams.

The report should clearly indicate that the above items are taken into account.