

COMP1216. Software Modelling and Design (2018-19)

Coursework: An Online Auction Service

Issue date: 4 March 2019
Submission deadline: 4pm, 29th March 2019

This coursework, to be undertaken in groups of *four**, will contribute 30% towards the total for the unit. The assignment concerns aspects of the requirements analysis, specification, and design of an online auction service. It is intended to develop your skills analysing requirements and designing a software solution using UML tools, to develop your ability to write Event-B models, to gain experience of using the Rodin tool, and also to re-enforce group working.

Please bear in mind the University Academic Integrity regulations: <http://www.calendar.soton.ac.uk/sectionIV/academic-integrity-regs.html>

1 System Requirements

The set of requirements for an online auction service are as follows.

- The online auction service allows users to submit items for auction and to bid for items that are being auctioned.
- Users must be registered with the system in order to be able to submit items for auction and in order to place bids. Thus, a user can take both seller and bidder roles. User name, status, login id and password are recorded. A user status records feedback given to the user by other users, and any penalty points the system has added.
- The system should be able to manage multiple auctions.
- A user (seller) with no more than two penalty points may submit an item for auction. The system creates a new auction and opens the auction to bids from other users (bidders). The system makes available with the auction information the seller's feedback and penalties. An auction has only one seller. No user may be a bidder for an auction for which she is the seller.

- When a seller submits an item for auction, she must provide a name for the item, start and end times for the auction and a reserve price for the item.
- The seller may cancel her auction without penalty at any time until a bid no less than the reserve price is accepted. She may cancel after such a point and before auction closure but will then receive a penalty point. When an auction is cancelled all bidders are informed.
- When a bidder makes a bid on an auction, the bid must be higher than the current highest bid for that auction.
- When an auction duration has passed, that auction is closed.
- For a defined period after auction cancellation or closure, bidders may provide feedback on the seller.
- A closed auction succeeds if the highest bid is at least as high as the reserve price, otherwise it fails. When a closed auction succeeds, the winning (highest) bidder is informed.
- A seller should be able to see the status of their auction at any stage after their auction has started.

2 Part A. Modelling in UML (50 marks)

Your report for part A should contain the following elements (take into account the *page limit*)

1. *Brief title/introduction/comments.* These should include a brief description of each member's contribution (*max 1 page*).
2. (*estimated 4 marks*) *Scope of the system.* Define the scope of the system, including *Need, Goals, Business Case, Stakeholders, High-level operational concepts*, etc. (*max 1 page*)
3. (*estimated 6 marks*) Three full scenarios covering each of a successful, failed, and cancelled auction (max 0.5 pp each)
4. (*estimated 8 marks*) Two full use cases in the Bruegge & duToit format (*max 1 page each*)
5. (*estimated 8 marks*) A use case diagram (*max 1 page*)
6. (*estimated 8 marks*) A class diagram including attributes, operations, associations, multiplicities, inheritance (*max 1 page*)
7. (*estimated 10 marks*) Two sequence diagrams corresponding to two out of three scenarios above (*max 1 page each*).
8. (*estimated 6 marks*) An activity diagram for an auction (*max 1 page*)

Total: *max 11 pages*

Marking and advice: Credit will be given for

- covering all specified functionality in use case analysis, all required structure in class analysis, all required behavior in dynamic analysis
- correct and appropriate use of style and notation; simple and maintainable models
- neat and readable presentation; diagrams preferably drawn with a suitable tool

3 Part B. Modelling in Event-B (50 marks)

1. Use the system requirements and the class diagram to create an Event-B model of the online auction system. Make sure to
 - Identify appropriate Event-B sets and constants.
 - Identify appropriate Event-B variables and invariants. The invariants should clearly specify any constraints between state variables. You may lose marks by not having invariants to represent constraints on auctions.
 - Identify appropriate Event-B events. You should expect to have at least one event for each of the following use cases:
 - create an auction,
 - bid on an auction,
 - cancel an auction,
 - view the status of an auction,
 - close an auction,
 - view the history of all bids on an auction.
 - Where a use case has more than one outcome, you could have an event for each outcome. *It is not necessary to have an event for each step of a use case.*
2. Analyse your Event-B models using the Rodin tool including ProB animation.

Hints

You should consider using extension refinement to structure your Event-B model. The current time may be represented by including a clock variable and an event that increases the clock.

4 Submission Instructions

Each group should submit the following documents

- a written report (PDF format, *one report per group*) clearly indicate your group number, member names and email IDs on the front page. The report must include your answer to each of the tasks in Part A. For Part B, make sure your Event-B models are appropriately commented and are included in the report.
- An archive of your project from the Rodin tool containing your models in Part B.

Your diagrams should be produced with a drawing tool; *Visual Paradigm* is recommended. Your report and Rodin archive should be submitted **electronically** using the automated hand-in facilities found on the ECS webpage at: <https://handin.ecs.soton.ac.uk/>.

The group allocations are on the course Noteswiki page.

If you feel there are any ambiguities in the requirements feel free to make your own interpretation, but make sure any interpretations you make are *clearly indicated in the report*. You should work *together as a group* to accomplish these tasks. It is the responsibility of each group to make initial contact and arrange their own group meetings. Please inform me of any problems contacting your group members. You should avoid discussing your solutions with other groups.

NB: Group size is *four*. It may be necessary to run one or two groups of three depending on the size of the class, or any students dropping out. In these cases the workload will be reduced accordingly.

- Group of 3:
 - Part A: 2 scenarios, 1 sequence diagram only, other components as specified in Section 2 above.
 - Part B: You are *not required* to model the events corresponding to
 - * cancel an auction,
- Group of 2:
 - Part A: 1 scenario, 1 use case, 1 sequence diagram only, other components as specified in Section 2
 - Part B: You are *not required* to model the events corresponding to
 - * cancel an auction,
 - * view the status of an auction,