

## COMP6226 Software Modelling and Design Coursework 2

<b>Assignment:</b>	Software Modelling and Design with Event-B	<b>Lecturer:</b>	ra3@ecs	<b>Weighting:</b>	25%
<b>Deadline:</b>	11/01/2022, <b>16:01</b>	<b>Feedback:</b>	28/01/2022	<b>Effort:</b>	37.5 hours per person

### Instructions

This is group coursework. You should work in the pairs that you have formed for CW1. If you have any issues, please contact me as soon as possible.

Your team is responsible for creating Event-B models for the following parts of the **Construction Packages Delivery system** that you analysed in your first coursework.

Tasks:

- Identify necessary **sets**, **constants**, **axioms** and construct appropriate Contexts.
- Identify all necessary Event-B **variables** and **invariants** for each Machine.
- Write Event-B specification for the following events:
  1. An admin adds a new **driver** to the system
  2. An admin adds a new **vendor** to the system
  3. An admin adds a new **delivery job** by choosing a **vendor** and assign the **package** to a **driver**.
  4. An Admin viewing a list of **pending**, **allocated**, and **in-progress** delivery jobs
  5. An admin viewing a list of **delivery jobs** completed by a **driver**
  6. An admin sending a message to a **driver while attending a delivery job**
  7. An admin cancelling a delivery job that is **pending**
  8. A driver viewing the list of their allocated jobs
  9. A driver marks a job allocated to them with **pending** state as **in-progress** or an **in-progress** job as **delivered**
  10. Refine your abstract model by adding a **new property**, named **package size** into your system. In the next step, you are required to refine your abstract specification by amending/adding necessary sets/variables/events that represent the cases that each delivery package should have a size. Each driver can only handle a subset of packages (based on their vehicle size) and an admin should allocate each package to a driver based on the package size.
- 11. In the next stage, you have to write a report based on the Event-B models you produced. For each of the requirements above, you should copy and paste relevant parts including events, variables, and definitions from your Rodin model into your report and then provide a few sentences explaining how that requirement is fulfilled by your models. Providing comments in your Event-B models that link Event-B artefacts to the requirements is also highly recommended (as I will be looking at your models separately).

As the evidence of your model verification, you can include screenshots from the Rodin provers and/or ProB animator of your model.

The main body of the report **should not** exceed 20 pages in total, excluding the title page, contents pages, appendices and references. Reports that exceed this limit may be subject to penalty.

Students' attention is drawn to the [University regulations regarding academic integrity](#) that discusses the originality of work.

## Documentation - A suggested structure for your report:

Title page (includes module information, group information, project name ...)

Abstract

Contents

Acknowledgement (if required)

1. High level specification of requested context/variables/invariants/events
2. Specification verification using Rodin provers and/or ProB animator
3. Your refinement policy and an explanation of your refined contexts and machines
4. Refinement verification using Rodin provers and/or ProB animator
5. Conclusion
6. References

Completed mark distribution form

If you have any questions regarding this assignment, please ask your questions in the lectures.

## Submission

There should be **one electronic submission** of your work **per group** (via Hand-in system). Each group should select one individual who should hand in the work on behalf of the group. Ensure your **group No** and **the names of the group members** are clearly stated on the front page of your reports.

Submit your **written report** as a Word or PDF document (not both!) plus the **Rodin Archive of your project** to the Hand-in system.

You must also hand in a completed mark distribution form, which is available on the module website, in which you propose a distribution of marks amongst the members of your group. Each group member should sign the form, indicating agreement with the proposed distribution. The form should be submitted with your report. In the absence of exceptional circumstances, group members should contribute equally to the coursework. Significant deviations from the equal distribution of marks may be investigated and we reserve the right to impose a distribution of marks. If you have difficulty completing the form, contact me.

## Relevant Learning Outcomes (LOs)

1. Acquire experience of developing formal specifications for a given problem in a small team.
2. Use formal techniques such as abstraction and refinement in the context of Event-B formalism to develop your formal models in a stepwise manner.
3. Demonstrate your ability in using the Rodin toolset to produce and verify your models using proofs and animation plug-ins such as ProB.
4. Preparation of formal documentation to a high standard. Evaluate and justify the outcome of implementing a solution to a problem.

## Marking Scheme

<i>Criterion</i>	<i>Description</i>	<i>LOs</i>	<i>Total</i>
High level specification	A clear statement of purpose, sets and constants definition, necessary variables, invariants and complete set of guards and events.	1,2,4	40
Specification verification	Precision, clarity and accuracy of modelling requirements. Producing models with no outstanding proofs and demonstration of the correct behaviour of the system, using ProB.	2,3	20
Model refinement	Effective and efficient use of a refinement mechanism, clear demonstration of how different necessary elements such as sets, constants, variables, invariants and events are refined.	2,4	10
Refinement verification	Precision, clarity and accuracy of refinement strategy. Producing models with no outstanding proofs and demonstration of the correct behaviour of the system, using ProB.	3,4	10
Justification	Reasons as to why particular choices were made. Is this a sensible approach and does it follow good practices?	1,2,3	10
Presentation	Quality of English, layout, clarity of purpose, linking between models and the text of the report; readability and clarity of all parts of the report.	4	10

*Late submissions will be penalised at 10% per working day. No work can be accepted after feedback has been given. Please note the University regulations regarding academic integrity. The marking scheme is indicative, and all marks returned to students are for feedback purposes. These marks will be prior to moderation and before late penalties are applied.*