



Department of Computing

Module Name: **Clean Coding and Concurrent Programming**

Module Code: **COMP63038**

Title of Assignment: **Assignment 2**

Module Learning Outcomes for This Assignment

3. Apply concurrency in the design and implementation of a multiuser, multi-tier, client-server application.	Application Problem solving
4. Critically discuss the concurrency mechanisms available for a given problem and justify the selection made for a solution.	Analysis Communication

Submission deadline

Submit by 5th October 2025 no later than 17:00 (via LMs)

Demonstration dates

Week after submission

Demonstrations will be held by appointment with your CC&CP tutor

Feedback deadlines

You will be given oral verbal feedback during the demonstration.

Further written feedback will be made available via Blackboard within 20 working days after your demonstration

Introduction

This assignment, which contributes 50% to the module's marks, consists of

1. Refactoring an application so that it becomes a multi-user, multi-tier, client-server application.
2. Writing a report that critically discusses the concurrency mechanisms available for your application, justifying the selections made.

The assignment will be assessed by demonstration and report.

To prepare for this assignment you should complete the tutorial exercises.

You should read the mark scheme carefully to understand how the grades will be allocated to each element of the assignment.

Fundamental requirements

In this assignment, you must satisfy **all** the following fundamental requirements, otherwise you could be awarded zero marks for the assignment

1. You must be the only author of the work you submit for assessment. You must not have help with this assignment from any person except for members of the regular teaching team. You are reminded of the university's policy about academic misconduct, as described at:
http://www.staffs.ac.uk/support_depts/info_centre/handbook/academiclife.jsp
2. During the demonstration, if asked, you must be able to explain in detail the software you present for assessment.
3. You must submit your assignment via this module's Blackboard presence using the link provided in the Assessment section. Follow the instructions given with the link.

Assignment details

1. Preparation

Do the following as the starting point for this assignment:

- a) Make a copy of your solution to Assignment 1

2. Write a GUI interface for your chosen application

Replace the command-line interface of your chosen application with a Graphical User Interface (GUI). Maintain the Clean

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Architecture features of the application. Ensure that all use cases remain and work correctly.

Review your interface with your tutor before continuing with the next steps.

3. Refactor the application to use concurrency

Refactor your application from step 2 to make it a multi-user, multi-tier, client-server application.

Make sure you satisfy the criteria in the mark scheme (See Appendix A: Rubric)

4. Write automatic test clients

Write two or more test clients that will simultaneously send asynchronous requests in rapid succession to the server. If the server cannot handle the requests immediately, it should put them in a queue for processing as soon as possible.

5. Write a report

Write a report in which you provide evidence for the various criteria in the marking rubric (see Appendix A). As a minimum, you should:

- a) Discuss the allocation of Clean Architecture components to the various parts of the multi-tier client-server application.
 - b) Critically analyse the concurrency mechanisms appropriately available to you when refactoring the application and justify your choice of concurrency in your application.
- Make sure you satisfy the criteria in the mark scheme (See Appendix A: Rubric)

6. Submit your work

Clean your Visual Studio solution before submission to reduce the size of the zip file. On or before the submission deadline, upload to Blackboard a zip file containing:

- Your final application after completing step 3, including the clean tests.
- Your report

Mark Scheme

You should refer frequently to the marking scheme during your work on this assignment.

How your work will be assessed

Your submission will be assessed using the rubric shown in Appendix A, which will give you quantitative and qualitative feedback on your work. You should ensure that your report presents evidence to support the awarding of marks in each criterion of the rubric.

After submitting your work, you will be required to demonstrate your software to a member of the teaching team for this module. You will run your software to prove that it works, and you will be asked questions about your code. You are expected to answer these questions correctly and confidently. Incorrect or unconfident answers might result in your marks being reduced. You are reminded of the university's policy about academic misconduct, as described at: http://www.staffs.ac.uk/support_depts/info_centre/handbook/academic-life.jsp If you do not demonstrate your software, you will score zero marks for the assignment.

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If you wish, you can use your own laptop for the demonstration.

Instructions for the demonstration

You can find your demonstration appointment time on Blackboard using the link provided in the Assessment section.

To prevent delays in the demonstration, it is essential that you arrive **at least** ten minutes early for your appointment and do the following before your demonstration start-time:

1. Log on to a PC (or your own laptop) in the demonstration room at a location indicated by your assessor;
2. Open Visual Studio, and prepare your application, which includes running the SQL commands to create and populate your database;
3. Be ready to show the tutor that the dates on your files are the same as those submitted via Blackboard;
4. Make sure that your database is in its initial state (i.e. ready to run without delay);
5. Await instructions from the tutor who will assess your demonstration.

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Appendix A: Rubric

Assignment 2 (2 pages)

Criterion (weighting)	Mark (%)				
	0-39	40-49	50-59	60-69	70-100
Quality of the GUI (10%)	No GUI or GUI with significant problems	The GUI has working functionality for all use cases	The GUI uses features described in Week 1 of Semester 2	In addition, the GUI uses a few features not described in Week 1 of Semester 2	In addition, the GUI uses many features not described in Week 1 of Semester 2
Server-side concurrency (25%)	No concurrency used or The application has significant problems	The server will correctly handle requests from a single client if they come one at a time and send correct responses	In addition, the server will handle requests from multiple clients if they come one at a time	In addition, the server will handle requests from multiple clients, even if they come simultaneously	In addition, the server will handle multiple requests from multiple clients, when they are sent simultaneously by fast, automatic clients, by putting them in a queue for processing as soon as possible

Client-side concurrency (25%)	No concurrency used or The application has significant problems	The client will correctly send requests to the server and process responses from the server	In addition, two clients on two different computers can interact with the server	In addition, when one client changes data that is displayed on another client, the other client will immediately show the change	In addition, two test clients simultaneously send asynchronous requests in rapid succession
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Architecture (20%)	No concurrency used or The application has significant problems	The Clean Architecture model has been preserved in the refactoring	Architectural components have been correctly allocated to the various parts of the multi-tier clientserver application	In addition, the client tier successfully runs as a different application from the other tiers	In addition, client, server and database tiers run as three different applications
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Criterion (weighting)	Mark (%)				
	0-39	40-49	50-59	60-69	70-100

Critical discussion (20%)	No critical discussion or Very limited analysis Or Rewriting of lecture notes	One or two appropriate concurrency mechanisms discussed OR Discussion of the allocation of Clean Architecture components to the various parts of the multi-tier clientserver application	One or two appropriate concurrency mechanisms discussed AND Discussion of the allocation of Clean Architecture components to the various parts of the multi-tier clientserver application	In addition, several more appropriate concurrency mechanisms discussed with suitable justification	In addition, all appropriate concurrency mechanisms discussed with insightful justification
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