DISTRIBUTED PROCESSING TASK

Version 2.0
BSc Computing for Games
COMP260

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"...a folk definition of insanity is to do the same thing over and over again and to expect the results to be different. By this definition, we in fact require that programmers of multithreaded systems be insane. Were they sane, they could not understand their programs."

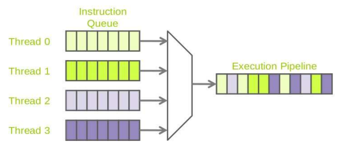
— Edward A. Lee

"No one can write correct programs in a language where a=a+1 is not deterministic."

— Luiz Henrique de Figueiredo

"Frameworks don't solve scalability problems, design solves scalability problems."

— Ryan Tomayko



Multi-threading is commonly used to improve performance in games.

Introduction

In this assignment, you are required to design and implement algorithms that process data in a *distributed* manner by developing a prototype multiplayer dungeon, implemented as client and server applications in Python.

Games are resource intensive. Compounding this issue, players are sensitive to performance issues. It is critical, then, to leverage available resources to ensure adequate performance. Distributed processing is one solution. Apply the principles of coordination and agreement, and you will be successful.

This assignment is formed of several parts:

(A) **Design** a distributed processing architecture in UML for a MUD that will:

- i. **Support** multiple client instances on a single computer
- ii. **Enable** players to navigate multiple locations in a virtual dungeon
- iii. **Allow** players to be aware of other players in the same location
- iv. **Permit** players in the same room to communicate.
- v. **Robustness** that allows the server to continue operation when a client is lost
- vi. **Robustness** that allows a client to continue (limited) operation when server is lost
- vii. **Create** a suitable wireframe mock-up of the client UI.
- viii. **Use** appropriate UML techniques to capture:
  - (a) The architectural form of the client and server applications
  - (b) The function of the client and server applications
  - (c) The data transmitted between client and server applications

(B) **Implement** a MUD prototype as client and server applications in Python that will:

- i. **Support** multiple clients using socket-based networking
- ii. **Incorporate** distributed processing using threads for both client and server applications
- iii. Be **realised** as fault-tolerant client-server architecture.

(C) **Implement** a more refined design and MUD prototype that will:

- i. Revise any issues raised by your tutor and/or your peers.

(D) **Present** a practical demonstration of the MUD prototype that will:

- i. Show academic integrity and technical communication skills.

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Assignment Setup

This assignment is a **programming task**. Fork the GitHub repository at:

```
https://github.com/Falmouth-Games-Academy/comp260-server
```

Use the existing directory structure and, as required, extend this structure with sub-directories. Ensure that you maintain the readme.mdfile.

Modify the .gitignore to the defaults for **Python**. Please, also ensure that you add editor-specific files and folders to .gitignore.

Part A

Part A consists of a **single formative submission**. This work is **individual** and will be assessed on a **threshold** basis. This deliverable is not assessed and is intended to be advisory at this stage.

To complete Part A, incorporate the design, using UML, into the readme.md document. Show this to your tutor in-class. If acceptable, it will be signed-off. You will receive immediate **informal feedback** from your **tutor**.

Part B

Part B is a **single formative submission**. This work is **individual** and will be assessed on a **threshold** basis. The following criteria are used to determine a pass or fail:

(a) Submission is timely;
(b) Enough work is available to conduct a meaningful review;
(c) A broadly appropriate review of a peer's work is submitted.

To complete Part B, prepare a draft version of the MUD. Please ensure that the source code and related assets are pushed to GitHub and are made available prior to the scheduled peer-review workshop. Then, attend the scheduled session.

You will receive immediate **informal feedback** from your **peers**.

Part C

Part C is a **single summative submission**. This work is **individual** and will be assessed on a **criterion-referenced** basis. Please refer to the marking rubric at the end of this document for further detail.

To complete Part C, revise the MUD based on the feedback you have received. Then, upload it to the LearningSpace. Ensure that you include the readme.md document containing the design that you developed in Part A. Please note, the LearningSpace will only accept a single .zipfile.
You will receive **formal feedback** from your **tutor** three weeks after the final submission deadline.

Part D

Part D is a single **summative submission**. This work is **individual** and will be assessed on a **threshold** basis. The following criteria are used to determine a pass or fail:

(a) Enough work is available to hold a meaningful discussion;
(b) Clear evidence of programming knowledge **and** communication skills;
(c) No breaches of academic integrity.

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To complete Part D, prepare a practical demonstration of the computer programs. Ensure that the source code and related assets are pushed to GitHub and a pull request is made prior to the scheduled viva session. Then, attend the scheduled viva session.

You will receive immediate **informal feedback** from your **tutor**.

Additional Guidance

A common pitfall is poor planning or time management. Many underestimate the work involved in designing and implementing multiplayer games. It simply cannot be crammed into a last minute deluge just before a deadline. There is a critical and time-consuming phase of testing! It is, therefore, very important that you begin work early and sustain a consistent pace: little and often.

The first deadline is close to the start of the module and not much material will have been covered by this point. Please rest assured, this first formative submission is supposed to be a simple analysis of design. It is advisory to kick start the project such that you receive early feedback to give you some direction and to encourage you to practice your programming skills.

FAQ

- **What is the deadline for this assignment?**
  Falmouth University policy states that deadlines must only be specified on the MyFalmouthsystem.

- **WhatshouldIdotoseekhelp?**
  You can email your tutor for informal clarifications. For informal feedback, make a pull request on GitHub.

- **Is this a mistake?**
  If you have discovered an issue with the brief itself, the source files are available at:

  https://github.com/Falmouth-Games-Academy/bsc-assignment-briefs.

  Please raise an issue and comment accordingly.

Additional Resources

- **Additional resources have been migrated to the Talis Aspire system, which is available at:**

  https://resourcelists.falmouth.ac.uk/

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Marking Rubric

Criterion	Weight	Refer for Resubmission	Basic Proficiency	Novice Competency	Novice Proficiency	Professional Competency	Professional Proficiency
Threshold	40%	At least one part is missing or is unsatisfactory.	Parts A—D are complete and timely. Enough work is available to hold a meaningful discussion. Provided a meaningful review of a peer's work. Submission of client and server applications written in Python. Clear evidence of programming knowledge and communication skills. Appropriate use of GitHub for version control. No breaches of academic integrity.				
MUD Design	20%	Little to no design work. Design does not incorporate concurrency in either client or server Little to no UML. No client wireframes	Design has some merit. Design sufficiently incorporates concurrency in client and server applications. Some use of UML, but incomplete modelling or components. Some considerations given to client or server robustness Client wire framing / mock-up given some consideration	Design has modest merit. Design sufficiently incorporates concurrency in client and server applications UML is leveraged adequately and covers most of the required components. Some considerations given to client are server robustness	Design has much merit. Design sufficiently incorporates concurrency in client and server applications UML is leveraged adequately and covers all the required components Robustness issues of client or server are considered Evidence of client wire framing / mock-up	Design has considerable merit. Design, with high appropriateness, concurrency in client and server applications. UML is leveraged adequately and covers all the required components Robustness issues of client and server are considered	Design has significant merit. Design, with high appropriateness, concurrency in client and server applications. UML is leveraged adequately and covers all the required components Robustness issues of client and server are adequately considered High quality of client wire framing / mock-up
MUD Implementation	20%	Little to no evidence of distributed processes.	Server can support at least one client Client will fail when server is lost / not present Server will fail when client is lost / not present UI is challenging to use Overall service suffers from threading / performance issues	Server can support several clients but has issues when clients connect or disconnect Client or Server will handle loss without failure UI is stable Occasional threading issues	Server can support multiple clients with barely noticeable issues Client or Server will generally handle loss without failure UI is stable Very occasional threading issues	Server can support multiple clients with no noticeable issues Client will generally handle loss of server without failure Server will generally handle loss of client without failure UI is stable & functional No noticeable threading issues	Server can support multiple clients with no noticeable issues Client will handle loss of server without failure Server will handle loss of client without failure UI provides good UX No noticeable threading issues
Demo	20%	No demo. Little to no ability to articulate either networking or concurrency concepts.	Demo somewhat sufficient to illustrate key distributed processing concepts. Some ability to articulate either networking or concurrency concepts.	Demo sufficient to illustrate key distributed processing concepts. Modest ability to articulate either networking or concurrency concepts. Some ability to articulate design decisions.	Demo adequate to illustrate key distributed processing concepts. Much ability to articulate either networking or concurrency concepts. Modest ability to articulate design decisions.	Demo appropriate to illustrate key distributed processing concepts. Considerable ability to articulate either networking or concurrency concepts. Much ability to articulate design decisions.	Demo highly appropriate to illustrate key distributed processing concepts. Significant ability to articulate either networking or concurrency concepts. Considerable ability to articulate design decisions.