St Mary's University Twickenham London

CPS4004 – Database Systems – Assessment Brief

Module Code:	CPS4004
Module Title:	Database Systems
Module Convenor:	Elisabetta Canetta
Module Level:	4

Assessment Number:	2
Assessment Title:	St Mary's Logistics
Assessment Weight:	60%
Assessment Individual/Group:	Individual
Assessment Type:	Software Artefact with Report
Assessment Time/Word Count Restrictions:	1 software artefact 1800 words report
Assessment Time/Word Count Limit Consequences:	It is essential that assignments keep within the time/word count limit stated above. Any work beyond the maximum time/word length permitted will be disregarded and not accounted for in the final grade.

Issue Date:	8th April 2024
Hand in Date:	13th May 2024
Planned Feedback Date:	Within 3 working weeks
Mode of Submission:	Online via Moodle
Number of copies to be submitted:	1 copy of each of the following: • a report in pdf format • a zip file containing your software artefact

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Internal Moderator:	Elisabetta Canetta
Moderation Date:	8th April 2024

Table of Contents

Introduction

This assessment aims to evaluate your ability to apply database concepts and technologies in a real-world scenario. You are tasked with designing and implementing a robust database solution for a fictional global logistics and supply chain management company, St Mary's Logistics. This organisation operates in a highly dynamic environment, handling vast amounts of data related to shipments, inventory, and global logistics.

Problem Scenario

St. Mary's Logistics operates multiple warehouses across different locations, manages transportation services, and oversees various aspects of supply chain management for its clients. However, the current system relies heavily on manual processes and disparate data sources, leading to inefficiencies and errors in operations.

One of the major issues faced by St. Mary's Logistics is the lack of a centralised database system to manage inventory across warehouses. Without real-time visibility into inventory levels, the company struggles with inventory management, leading to stock outs, overstocking, and delays in fulfilling client orders. Additionally, manual data entry and reliance on spreadsheets make it challenging to track shipments, manage transportation schedules, and optimise route planning effectively.

Moreover, the company faces data security concerns as sensitive information related to client orders, inventory, and transportation schedules is stored across multiple systems, increasing the risk of data breaches and unauthorised access.

Requirements

You are required to develop a database-driven system for St Mary's Logistics. The requirements for the system are as follows:

a) **Centralised Database System** – Develop a centralised database system using Python and SQLite to manage inventory across St. Mary's Logistics warehouses. The system should provide real-time visibility into inventory levels, track stock movements, and generate alerts for low inventory levels or stock outs.

b) **Inventory Management Features** – Implement features for inventory management, including adding new inventory items, updating stock levels, tracking incoming and outgoing shipments, and generating reports on inventory status.

c) **Transportation Management** - Integrate transportation management functionalities into the database system to track transportation schedules, manage vehicle fleets, assign drivers, and optimise route planning for efficient delivery of goods.

d) **Data Security Measures**: Implement robust data security measures to protect sensitive information stored in the database. This includes role-based access control, encryption of sensitive data, and regular auditing of database activities to detect and prevent unauthorised access.

e) **Scalability and Performance**: Design the database system to be scalable to accommodate the company's growing data needs and ensure optimal performance even during peak operational periods.

f) **User-Friendly Interface**: Develop a user-friendly interface for employees to interact with the database system, allowing them to easily input and retrieve data related to inventory management and transportation logistics.

Environment and Tools

You are required to use any of the following tools:

- **Adobe PDF Reader**: To view your final report which is saved as a PDF file.
- **DBML**: As your mark-up language.
- **Draw.io** (or equivalent tool): To create diagrams.
- **Git Tools** and **GitHub** for version control
- **Microsoft Word** (or equivalent tool): To write your report and export as a PDF.
- **PyCharm** (or equivalent) as your integrated development environment
- **Python 3.11+** as the standard python library
- **SQLite 3** as your database management system
- **SQLite Studio** (or equivalent tool) to browser your database

- Additionally, the following libraries/modules may be imported and utilised:
  - **enum** – to add enumerations
  - **os** – to retrieve or check file paths or file permissions
  - **pytest** – to test your implementation
  - **queue** – to create connection pools
  - **random** – to generate random numbers
  - **sqlite** – to develop your database
  - **thread** – to add multi-threading
  - **tkinter** – to create a graphical interface if desired
  - **math** – for maths functions
  - **unittest** – to construct and run tests

- No other python libraries or modules should be used

Submission

The assessment must be completed individually. You must not share, in part or whole, your assessment with another party other than the module convenor and for the purpose of submission to the university. You must ensure that the University's academic misconduct guidelines are followed in their entirety.

You should use the assessment submission link on the module's Moodle page to submit the following files:

- A **PDF** file for your report. This should not be included in the zip file but instead submitted as a separate file. Failure to do so may result in zero being awarded.

- A **Zip** file of your software artefact. This should contain your solution files, git log, and other files required to view and run your solution.

You should ensure that you make a timely submission by the deadline stated at the start of this assessment brief.

Assessment Criteria

Your assessment will be graded according to the following criteria:

Grading criteria	Functionality	Documentation	Professional Practice
Mark band			
80-100 Pass (1st)	Displays exceptional skills with comprehensive implementation and design considerations including strong considerations and implementation for efficiency, security, and scalability.	Exceptional analysis and evaluation provided, offering deep insights into the software artefact's strengths and weaknesses, supported by evidence and critical reflection. Report is exceptionally well-structured with use of referencing and citations, with thorough and accurate citation of relevant sources to support arguments and analysis.	Demonstrates exceptional adherence to industry and ethical practice with strong usage of version control with a well-structured repository, regular commits, detailed commit messages, and evidence of branching and merging strategies.
70-79 Pass (1st)	Exhibits advanced skills with comprehensive database development, and in-depth design considerations. Implements features for efficiency, security, and scalability.	Advanced communication in explaining complex software development concepts. Well structured report with appropriate citations and captions where relevant.	Advanced adherence to code conventions, ethics, and relevant industry practice with usage of version control with a well-structured repository, regular commits, detailed commit messages, and evidence of branching and merging strategies.
60-69 Pass (2.1)	Good, consistent knowledge and understanding of the material, main concepts, key theories, and practice at this level. Exhibits advanced skills in database application development.	Strong communication in explaining complex programming and problem-solving concepts.	Competent adherence to ethics, code conventions and other relevant industry practice with usage of version control with regular commits and meaningful commit messages that provide clear context for changes.
50-59 Pass (2.2)	Sound, routine knowledge and understanding of the material, main concepts and key theories. Some flaws may be evident. Shows improved skills with refined implementation.	Improved communication skills seen in summarising design and implementation.	Improved adherence to code conventions and other relevant industry practice. Some ethical considerations. Usage of version control with regular commits. Commit messages provide some context but may lack detail or consistency.
40-49 Pass (3rd) (*Threshold*)	Demonstrates basic skills in developing a functional application	Basic communication evident in summary of implemented solution.	Basic adherence to code conventions and other relevant industry practice with evidence of version control usage. Commits are sporadic and lack meaningful commit messages.
30-39 Fail	Displays limited proficiency, with significant deficiencies in the programming.	Demonstrates inadequate communication skills, struggling to articulate ideas and concepts.	Inadequate adherence to code conventions and other relevant industry practice. Minimal evidence of version control.
0-29 Fail	Demonstrates severely inadequate skills, unable to create a basic functional program.	Poor communication skills, unable to provide clear summary.	Poor adherence to code conventions and other relevant industry practice. Little or no evidence of version control.

Learning Outcomes

This assessment will enable students to demonstrate the following learning outcomes as stated in the module outline:

[Module Learning Outcome 2]

- Demonstrate a comprehensive understanding and professional practice of utilising databases in diverse contexts, such as web and mobile applications, data warehousing, and business intelligence, while considering their ethical implications.

How is this learning outcome addressed?

The assessment requires designing and implementing a centralised database system for a logistics company, reflecting practical understanding of database usage in real-world contexts. Integrating database functionalities for inventory and transportation management addresses diverse applications. Implementing data security measures demonstrates consideration for ethical implications.

[Module Learning Outcome 3]

- Apply normalisation and denormalisation techniques to design efficient and effective databases.

How is this learning outcome addressed?

Individuals apply normalisation and denormalisation techniques to design an efficient database system for the logistics company. This aligns with the learning outcome by ensuring the database schema minimises redundancy and dependency issues while enhancing query performance as needed.

[Module Learning Outcome 4]

- Critically evaluate the performance, security and privacy issues related to database systems.

How is this learning outcome addressed?

The assessment mandates implementing data security measures and evaluating system performance, addressing security, privacy, and performance concerns. This aligns with the learning outcome by necessitating critical evaluation of these aspects in the context of database systems.

[Module Learning Outcome 6]

- Create and deploy a database system for a practical application, considering ethical implications and adherence to professional standards throughout the design and implementation process.

How is this learning outcome addressed?

The assessment involves creating and deploying a practical database system, considering ethical implications throughout the process. Adherence to professional standards is implicit in developing a robust solution for the logistics company.

[Module Learning Outcome 7]

- Independently plan and execute a computer-based system project, utilising effective problem-solving and information management skills, numeracy, communication skills, and a commitment to ongoing professional development.

How is this learning outcome addressed?

Individuals plan and execute the database system project, demonstrating problem-solving, information management, numeracy, and communication skills. The commitment to ongoing professional development is encouraged through practical application in logistics and supply chain management.

Regulations, Policies, and Guidelines

Guidance for online submissions
https://www.stmarys.ac.uk/policies/online-submissions.aspx

Academic Misconduct
Any submission must be students' own work and, where facts or ideas have been used from other sources, these sources must be appropriately referenced. Please find a link to the academic misconduct policy below:
https://www.stmarys.ac.uk/policies/academic-regulations.aspx

Ethics Policy
The work being carried out by students must be in compliance with the Ethics Policy. Where there is an ethical issue, as specified within the Ethics Policy, then students will need ethical approval prior to the start of the project. Please find a link to the ethics policy below:
https://www.stmarys.ac.uk/research/students/ethical-review-process.aspx

Extenuating Circumstances
The University's Extenuating Circumstances procedure helps students facing challenges in assessment submission. To request an extension or deferment, submit an EC application with evidence. Approved cases will not incur academic penalties. For longer-term issues, contact Student Services. Please find a link to the EC policy below:
https://www.stmarys.ac.uk/policies/extenuating-circumstances.aspx