Software Design Architecture

Spring 25, Assignment 1

Name	ID	Contribution in assignment

CLO	**At the end of the course the students will be able to:**	**Domain**	**BT Level***	**PLO**
CLO1	Understand key concepts and principles in relation with software design and architecture	C	C2	PLO2

CLO-1		CLO-2		CLO-3		CLO-4	
Question	Points	Question	Points	Question	Points	Question	Points
1	25	-		-		-	
2	25	-		-		-	
Total	50	Total		Total		Total	

Deadline: **09-April-25** **Total Marks: 50**

Portal Submission: 9 – 4 - 25 11:59 PM (Only 1 submission per group is required) [5 Marks]

Hard Copy Submission (During Class, Only 1 submission per group is required)

Instructions:

- It's a Group assignment. Maximum 2 members per group is allowed.
- **Late Submission:** 25% penalty for the first day, 50% for the second day, and 100% for days later on.
- **Evaluation:** 60% marks will be for assignment and 40% marks will be based on evaluation (quiz or viva).
- **Plagiarism:** There is a strict policy against plagiarism and cheating. **The penalty can be an F grade.**
- **Title Page:** Attach this title page to your assignment, fill info in all boxes before submission. [5 Marks]
- **Answers Clarity:** Justify your answers where needed. Explain briefly and concisely

Question#1: **(25Marks)**

You are tasked with designing an Enterprise Resource Planning (ERP) system for a manufacturing company that integrates various processes such as inventory management, production scheduling, order management, and employee resource management. The system will have different types of users: Administrative Staff, Managers, Production Workers, and Suppliers. The system should be able to handle the following activities:

1. **Order Management**:
   The administrative staff will receive orders from clients and check the availability of raw materials. If materials are unavailable, the system will generate a request to suppliers. Once raw materials are confirmed to be in stock, the order moves to the next step.
2. **Inventory Management**:
   Inventory managers will oversee stock levels and trigger procurement orders if supplies are low. The system should track both raw materials and finished goods.
3. **Production Scheduling**:
   Managers will schedule production based on order priority. Production workers will need to track their progress, and the system will provide real-time updates on production status and any delays.
4. **Employee Management**:
   Managers will track employee shifts, availability, and assign roles within production tasks. The system will notify workers of upcoming shifts.
5. **Supplier Interaction**:
   Suppliers will receive orders for raw materials, update their stock status, and ensure timely delivery. The system will send alerts if deliveries are delayed.

Task:

Design a detailed *Use Case Diagram* for the ERP system that includes all actors and their associated use cases. Each use case should show the relationships between the actors and the processes, and the diagram should clarify which actor is responsible for each action.

Note:

- Use UML diagramming tools (e.g., Lucidchart, Microsoft Visio, etc.) for the creation of your diagram.
- Clearly mention the tool name used.

Question#2: **(25Marks)**

A university has decided to implement a new Learning Management System (LMS) that integrates with their existing Student Information System (SIS). The LMS will provide students with online courses, assignment submissions, grade tracking, and real-time feedback. However, several challenges need to be addressed:

1. **Scalability Concerns**:
   The system must handle a large number of concurrent users, especially during peak times such as exam periods. The system currently experiences slowdowns when more than 500 students access the platform simultaneously.
2. **Security Issues**:
   Recently, there have been concerns about unauthorized access to sensitive student data, including personal information and grades. The system needs improved access controls and encryption mechanisms to prevent breaches.

3. **Mobile Compatibility**:
   The university has requested the development of a mobile application to provide students with easy access to their courses, grades, and notifications on the go. The LMS currently lacks mobile support.
4. **Integration With External Systems**:
   The LMS needs to be integrated with external platforms like video conferencing tools, plagiarism detection software, and third-party eBook providers.
5. **Real-time Collaboration**:
   There is a need for a real-time collaboration feature in the LMS where students can interact with their peers and instructors through chat and video features.

Task:
For each of the challenges described above, analyze and recommend the most appropriate architectural design pattern to address the issue. Justify your selection for each challenge, explaining how your chosen pattern addresses the scalability, security, mobile compatibility, external integration, and collaboration requirements of the system.

Note:

- Use appropriate architectural patterns such as Microservices, Monolithic Architecture, Client-Server Architecture, Layered Pattern, etc.
- Justify your answer with examples and industry-standard practices.