



PES UNIVERSITY

Department of Computer Science & Engineering

Software Engineering

UE23CS341A

Assignment 3 Submission

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Lab 3: Component Modelling & Architectural Pattern Selection

Objective:

Evaluate different architectural styles, select the most appropriate one for a given scenario, and create a comprehensive UML Component Diagram showing modules, interfaces, and dependencies. This lab focuses on understanding how components interact within a system and how architectural decisions impact system design.

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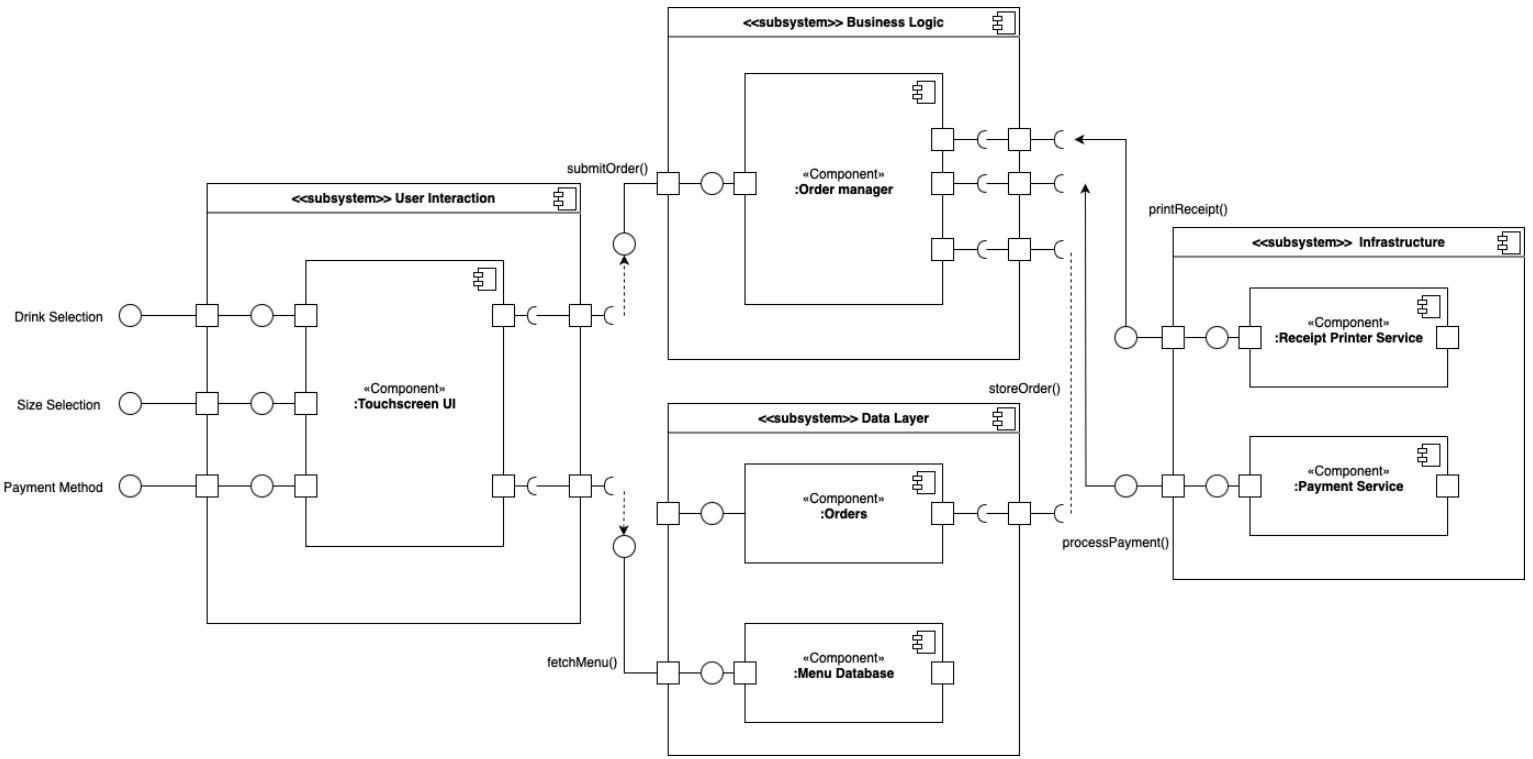
- 1. Component Diagram**
- 2. Architecture Selection**
- 3. Subsystems and Components**
- 4. Advantages of the Design**

Scenario: Self-Service Coffee Kiosk

You are designing the software architecture for a Self-Service Coffee Kiosk system in a busy café. The kiosk must provide a complete coffee ordering experience with the following requirements:

1. Core Functionality:
 - a. Customers can select from 3 coffee types (Espresso, Americano, Latte)
 - b. Customers can choose from 2 drink sizes (Small, Large)
 - c. Customers can pay via credit card only
 - d. System prints receipts with order details
2. Technical Constraints:
 - a. Must handle touch screen interface interactions
 - b. Must connect to receipt printer hardware
 - c. Must store menu data and pricing information

Component Diagram:



Component Diagram Justification:

Architecture Selection:

I chose the Layered Architecture for the Self-Service Coffee Kiosk System.

Architectural Choice:

The component diagram for the Self-Service Coffee Kiosk System organizes the solution into four subsystems with five core components, each responsible for a clear set of functions. This modular layout supports maintainability, security, scalability, and efficient system performance.

1. User Interaction Subsystem

Component: Touchscreen UI

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Handles all customer interactions, including drink selection, size choice, and payment method input. Isolating the customer interface ensures that UI updates or design changes do not affect backend logic or payment processing.

2. Business Logic Subsystem

Component: Order Manager

Coordinates the end-to-end order workflow. It validates selections, retrieves menu data, stores orders, requests payment authorization, and triggers receipt printing. Centralizing this logic simplifies maintenance and enforces consistent business rules.

3. Data Layer Subsystem

Components: Orders, Menu Database

- Orders stores transaction details for reporting and auditing.
 - Menu Database maintains menu items and pricing, supplying data to both the UI and the Order Manager.
- Separating persistent data handling improves reliability and makes it easy to update menu items without disrupting active services.

4. Infrastructure Subsystem

Components: Payment Service, Receipt Printer Service

- Payment Service securely processes credit-card transactions and returns confirmation to the Order Manager.
 - Receipt Printer Service generates a physical receipt after successful payment.
- Grouping these hardware- and payment-specific services in an isolated subsystem reduces the attack surface and simplifies hardware integration.

Advantages of the Design:

1. Separation of Concerns: Each component focuses on a single responsibility, which simplifies debugging and future enhancements.
2. Security: Sensitive operations such as payment processing are confined to the Payment Service, while menu management resides safely in the Menu Database.
3. Maintainability: Updates to menu data, printer drivers, or payment APIs can occur independently of other components.
4. Performance: Direct interfaces between Touchscreen UI, Order Manager, and supporting services enable orders to be completed quickly, satisfying the café's real-time service needs.

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5. Scalability: Additional kiosks or new payment options can be added without re-architecting the system.