Software Engineering

UE23CS341A

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STEP 1: SCENARIO REVIEW

Key functional requirements:

- The system shall allow a customer to select from 3 coffee types: Espresso, Americano, Latte
- The system shall allow the customer to choose from 2 drink sizes: Small, Large
- The system shall allow the customer to select add-ons: Extra shot, Soy/Almond milk, None
- The system shall allow customers to pay via credit card only
- The system shall print receipts with order details
- The system shall handle touch screen interface interactions
- The system shall connect to receipt printer hardware
- The system shall store menu data and pricing information

Key non-functional requirements:

- The system shall complete any order (selection to payment) in under 60s.
- The system shall be responsive and straightforward.
- The system shall have a password-protected admin mode that allows the café staff to refill ingredients, update prices and view sales reports.

Challenges:

- Handling card payment details securely
- Handling situations when network is down
- Handling situations when payment gateway is unavailable
- Keeping UI responsive when payment and printing is in progress.

STEP 2: ARCHITECTURAL STYLE ANALYSIS

1. **Layered Architecture:**
    - Structure: Organized in horizontal layers (Presentation, Business, Data)
    - Pros: Clear separation of concerns, easy to understand, good for traditional applications
    - Cons: Performance overhead, tight coupling between layers, difficult to scale individual components
2. **Microservices Architecture**
    - Structure: Small, independently deployable services
    - Pros: Independent scaling, fault isolation, technology diversity, independent deployment
    - Cons: Operational complexity, network latency, data consistency challenges
3. **Client-Server Architecture**
    - Structure: Centralized server with multiple clients
    - Pros: Centralized control, simple deployment, easy data consistency
    - Cons: Single point of failure, scalability bottleneck, limited fault tolerance

STEP 3: ARCHITECTURE SELECTION & COMPONENT IDENTIFICATION

Architecture Selection: Layered Architecture

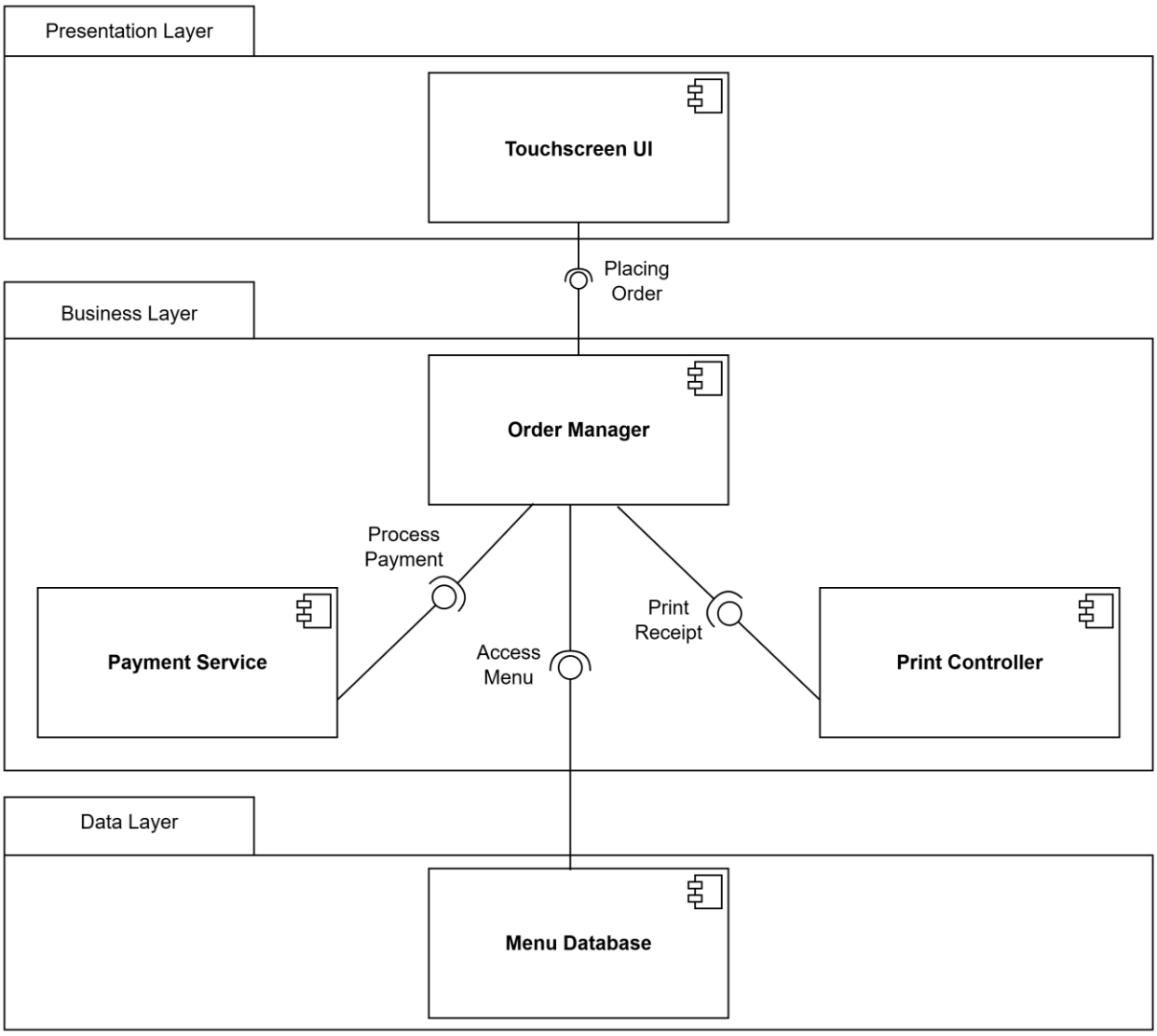
Reasoning: The coffee kiosk is a small and simple application. It doesn't require independent scaling of components. It is a small-scale system and hence, using a microservices model would be overkill. Assuming that this kiosk works independently at one location, there is no need for central server-based management system. Thus, we don't use a client-server architecture.
After consideration towards all the above architectures, I chose Layered Architecture for the coffee kiosk application.

Component Identification:

- Order Manager Component
- Payment Service Component
- Menu Database Component
- Printer Controller Component
- Touchscreen UI Component

STEP 4: COMPONENT DIAGRAM CREATION

Component Diagram:



Key Interfaces:

- Touchscreen UI ↔ Order Manager: Processing orders
- Order manager ↔ Payment Service: Payment processing requests
- Order manager ↔ Menu Database: Querying and accessing menu from the database
- Order Manager ↔ Print Controller: Processing print requests for receipts