Software Engineering

Lab 6

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Problem: Given a description for the POS system, perform the following tasks:

1. **Develop Use Case Textual Description for "Process Sale" and "Handle Return" use cases.**
2. **Identify Entity/Boundary Control Objects**
3. **Develop Sequence Diagrams**
4. **Develop Analysis Domain Models**
5. **Develop activity diagram for "Process Sale" and "Handle Return" use cases.**

Solution:

1. Use Cases:

Process Sale Use case:

Actors: Customer, cashier, catalog system

Pre conditions:

1. Cashier has logged into the system

2. Sufficient inventory is available

Post conditions:

All transactions are captured in the backend

Inventory levels are accordingly updated

Customer receipt is printed and handed over

Basic flow:

1. The customer arrives at the checkout with items to purchase.

2. The cashier initiates a new sale and scans each item's barcode.

3. The POS system requests item details (name, price) from the Catalog System.

4. The POS system updates the inventory to reflect the sale. Steps 2-4 are repeated for all items.

5. The POS system calculates the total amount.

6. The cashier informs the customer of the total amount due.

7. The customer chooses a payment method (cash or credit card).

8. For cash payments, the cashier verifies the amount. For credit card payments, the system checks authorization.

9. Upon successful payment, the system prints a receipt and updates financial records.

10. The customer receives their receipt and purchased items.

<u>Alternate Flows:</u>

3a. Item Not Found:

- If an item is not found in the Catalog system, the system alerts the cashier, and the transaction cannot proceed until the issue is resolved.

3-6a. Item Removal:

- If the customer asks the cashier to remove an item from the purchase:
    - The cashier removes the item.
    - The total amount is updated.

3-6b. Transaction Cancellation:

- If the customer decides to cancel the sale:
    - The cashier cancels the sale in the system.

8a. Payment Declined:

- If the payment is declined, the system notifies the cashier:
    - The cashier asks the customer to use an alternative payment method.
    - The customer uses the alternative payment method.

8b. Insufficient Cash:

- If the customer pays in cash but does not provide enough money:
    - The customer uses an alternative payment method.

- If the customer decides to cancel the sale, the cashier cancels the sale in the system.

Handle Return Use case:

Actors: Customer, cashier, catalog system

Pre conditions:

1. Customer must have proof of purchase (like a receipt)
2. Cashier is logged into POS system
3. Item must be sealed/have intact tag

Post conditions:

1. Return transaction must be recorded in backend
2. Inventory levels need to be updated accordingly

Basic flow:

1. The customer presents the item and receipt for a return.
2. The cashier scans the receipt to verify the purchase.
3. The POS system requests item details from the Catalog System.
4. The Catalog System provides the item details to the POS system.
5. The cashier checks if the return meets the policy requirements (time limit, item condition).
7. If eligible, the system processes the return and updates the inventory.
8. The cashier processes the refund according to the customer's preferred payment method.
9. The system prints a return receipt.
10. The customer receives the return receipt and the refund.

Alternate flows:

2a. Receipt Verification Failure:

- If the scanned receipt cannot be verified:
    - The system informs the cashier that the receipt is not found.
    - The cashier asks the customer to provide the receipt again or additional purchase details.
    - If resolved, the return process continues; if not, the return is aborted.

5a. Item Not Eligible for Return:

- If the item is not eligible for return:
    - The system informs the cashier that the item does not meet return criteria.
    - The cashier communicates this to the customer.
    - The return process is halted, and the customer may choose to keep the item.

7a. Refund Processing Error:

- If there is a refund processing error:
    - The system notifies the cashier of the error.
    - The cashier checks the system for issues. If resolved, the refund is processed; if not, the customer is informed of the delay or a different payment method is used.

2. Identification of entity/boundary/control objects.

Entity Objects:

1. Transaction

2. Payment System

3. Receipt

4. Coupon

5. Cashier

6. Catalog System

7. Inventory System

8. Item

Boundary Objects:

1. POS Interface

- Display scanned item details and prices
- Show total amount due
- Input coupon codes
- Print receipt

Payment Interface

- Accept cash and credit card payment details
- Confirm payment processing status

Return Interface

- Accept return requests from customers
- Display return eligibility and policies
- Show refund amounts

Barcode Scanner

- Device used to scan product barcodes, interacting with the POS system to retrieve product information.

Control Objects:

1. SaleController

- Manages the sale process flow

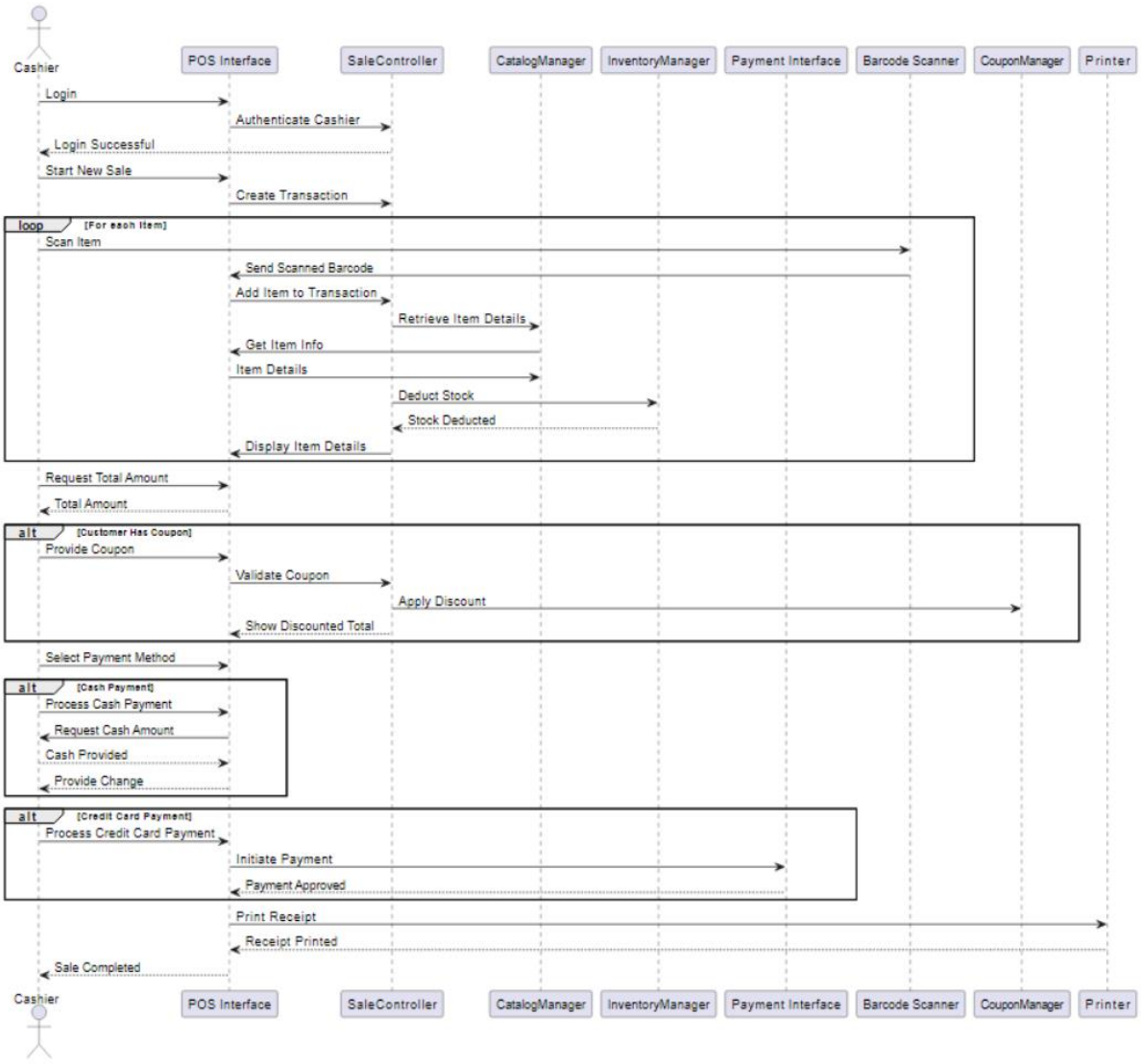
2. InventoryManager
   - Updates stock levels for sold items
   - Checks item availability

3. CatalogManager
   - Retrieves item details from the Catalog System
   - Validates item information against inventory

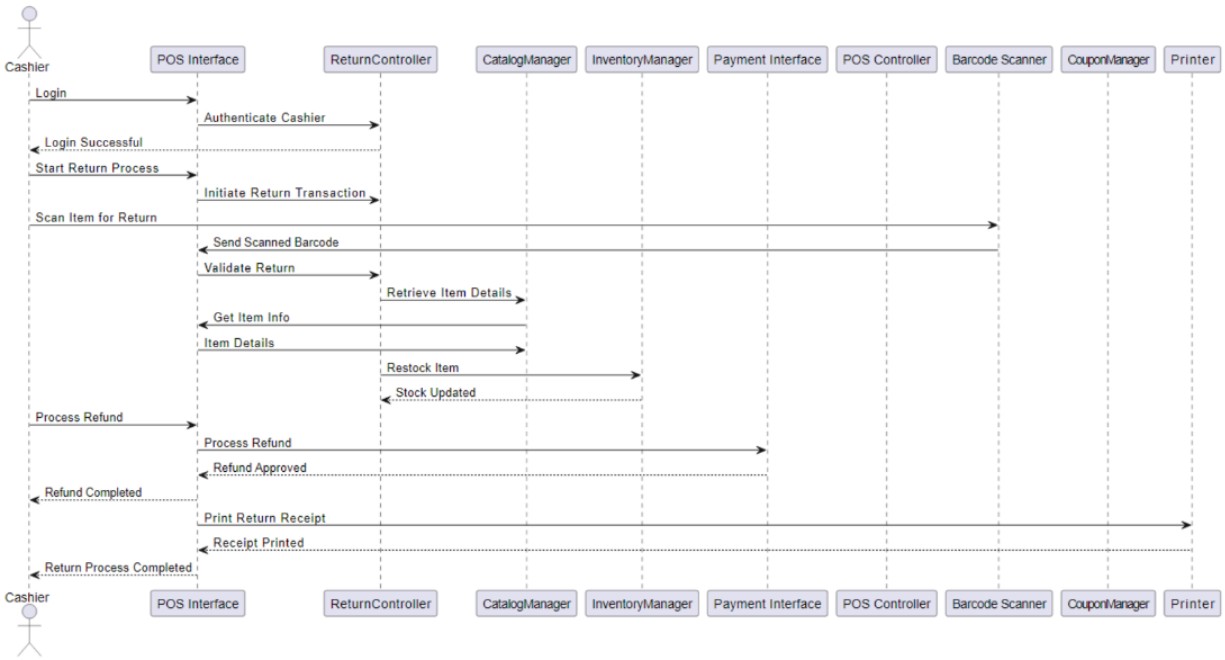
4. ReturnController
   - Manages the return process flow
   - Verifies receipt and item eligibility
   - Processes refunds and adjusts inventory

3. Sequence diagrams

Process Sales use case:

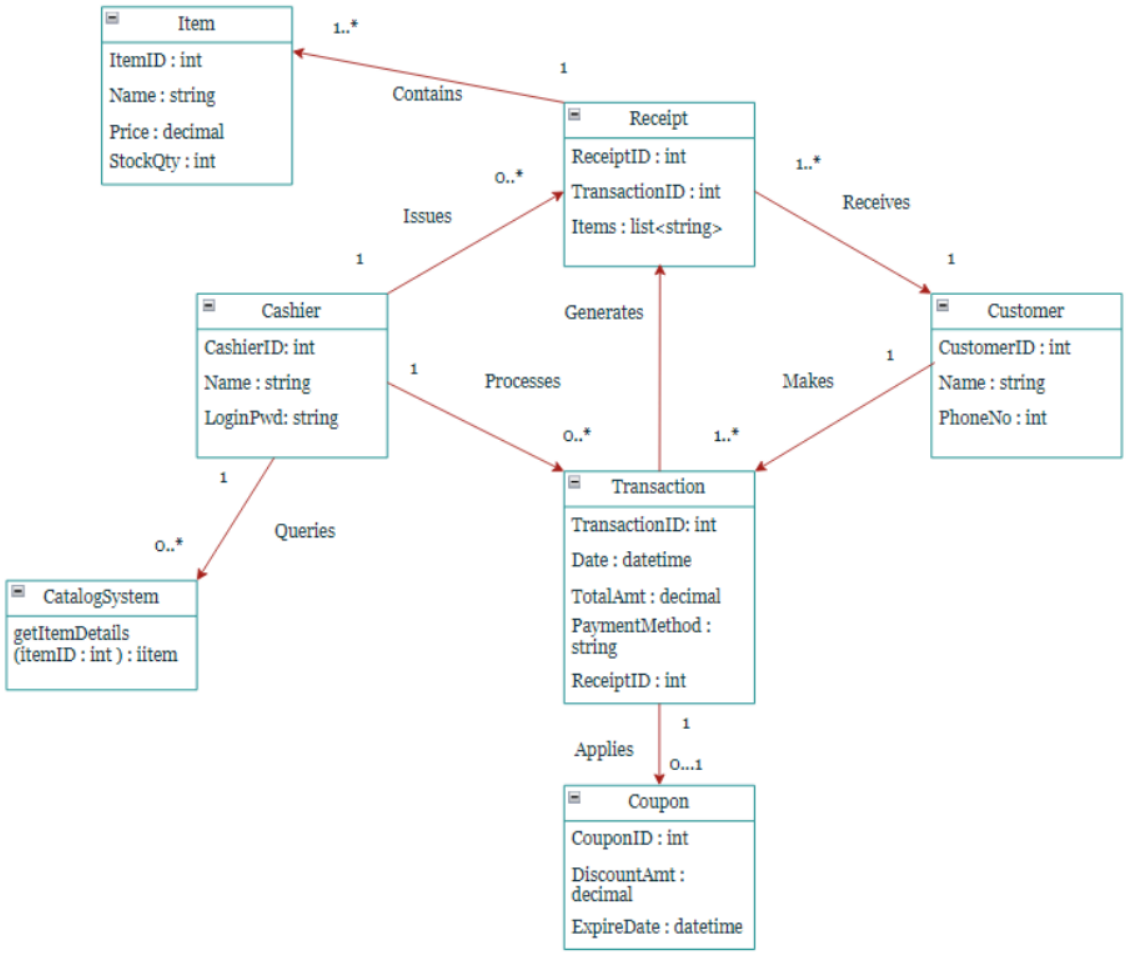


Handle Returns use case:

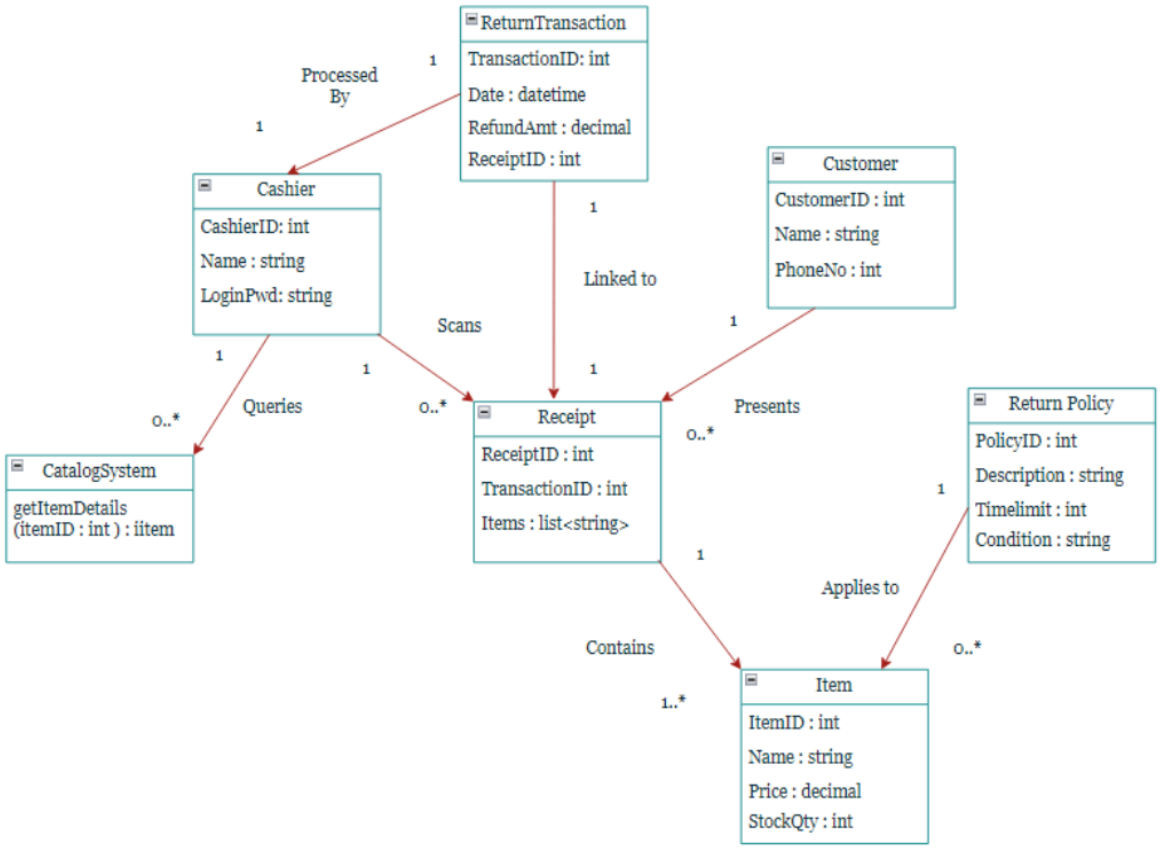


4. Analysis domain model

Process Sales use case domain model:

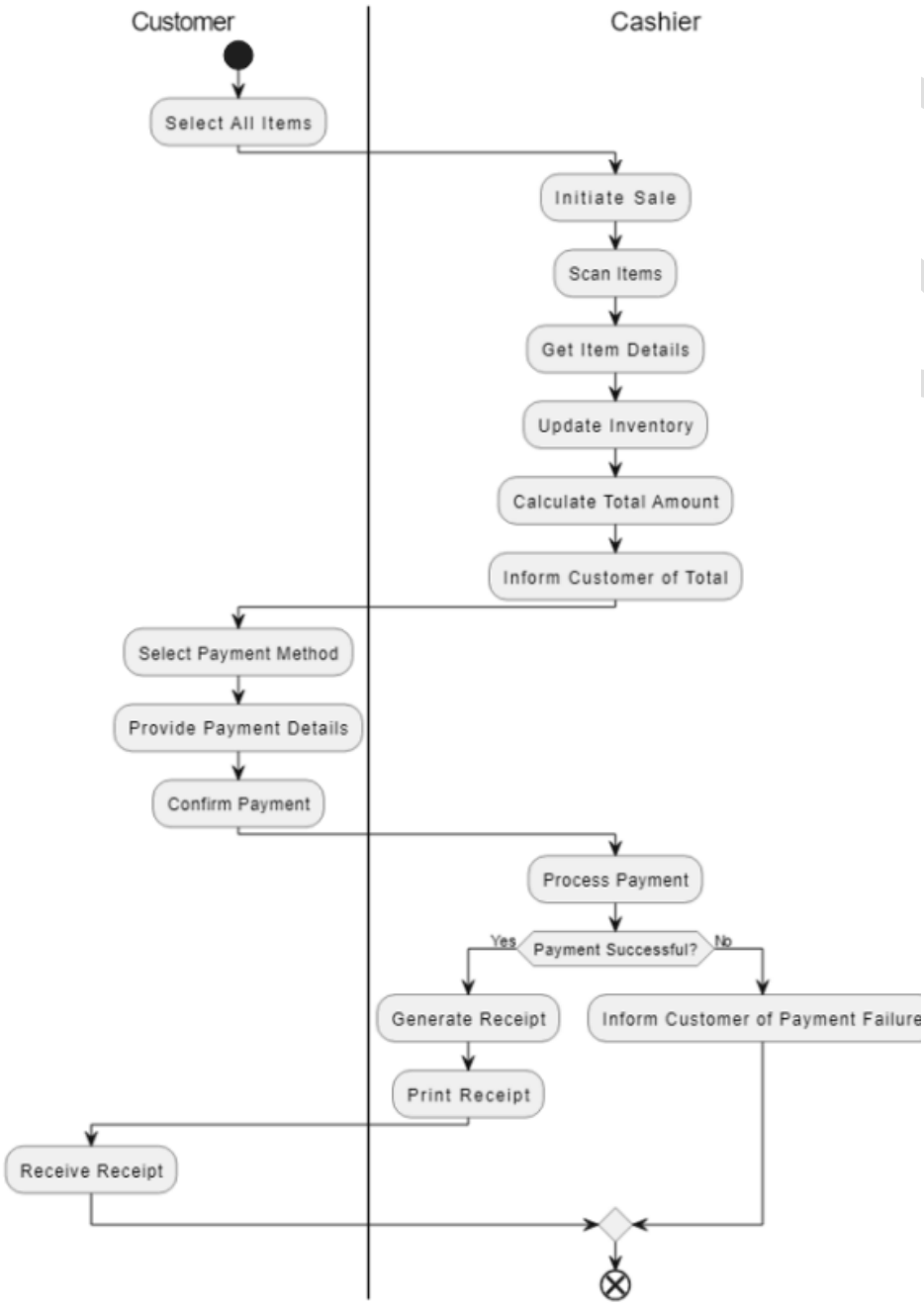


Handle Returns use case domain model:



5. Activity diagrams

Process Sales activity diagram:



Handle Returns activity diagram: