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Lab 6 : Modeling Class Diagram and Activity Diagram (Point of Sale System)

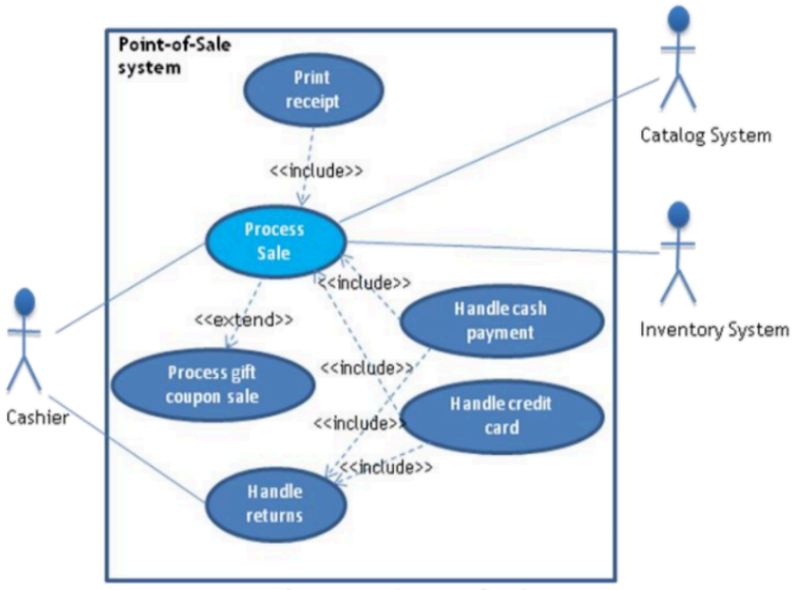
A Problem Description

A POS (Point-Of-Sale) system is a computer system typically used to manage the sales in retail stores. It includes hardware components such as a computer, a bar code scanner, a printer and also software to manage the operation of the store.

The most basic function of a POS system is to handle sales. When a customer arrives at a POS counter with goods to purchase, the cashier will start a new sale transaction. When the barcode of a good is read by the POS system, it will retrieve the name and price of this good from the backend catalog system and interact with the inventory system to deduce the stock amount of this good. When the sale transaction is over, the customer can pay in cash, credit card or even check. After the payment is successful, a receipt will be printed. Note that for promotion, the store frequently issues gift coupons. The customer can use the coupons for a better price when purchasing goods.

Another function of a POS system is to handle returns.... [The details of which are not given here]

A user must log in to use the POS. The users of a POS system are the employees of the store including cashiers and the administrator. The administrator can access the system management functions of the POS system including user management and security configuration that cashiers can't do.



- **Develop Use Case Textual Description for "Process Sale" and "Handle Return" use cases.**

1. Use Case: Processing a Sale

Primary Actor :

- Cashier

SSecondary Actors :

- Catalog System
- Inventory System

Preconditions:

- The cashier is authenticated and logged into the POS system.
- Connections to the Catalog System and Inventory System are established and active.

Postconditions:

- The sale is successfully finalized, and inventory levels are adjusted in real-time.
- A customer receipt is generated and printed.
- The transaction details are stored in the POS system for future reference and reporting.

Normal Flow :

1. The cashier starts a new transaction using the POS system.
2. Each item's barcode is scanned:
    - The Catalog System sends the item name and price to the POS.
    - The Inventory System adjusts stock levels by subtracting the sold quantity.
3. Once all items have been added to the sale, the cashier proceeds to checkout.
4. The customer selects a payment option, such as cash, credit card, or check.
5. The system handles the payment and processes the transaction.
6. Upon successful payment, a receipt is printed for the customer.
7. The transaction data, including item details and payment method, is saved in the POS.

Alternate Flows :

- **At Step 2: Unable to Scan Barcode**
    - If the barcode scan fails, the cashier manually enters the product details.
- **At Step 4: Customer Uses Gift Coupon**
    - If a customer presents a gift coupon:
        - The cashier scans or enters the coupon code.
        - The system applies the discount related to the coupon.
        - The cashier proceeds with the regular payment process.
- **At Step 4: Payment Declined**
    - If the payment is unsuccessful (e.g., card declined):
        - The cashier is alerted by the system.
        - The cashier notifies the customer and retries the payment or chooses a different method.
        - If no payment method succeeds, the sale is canceled.

Exceptional Flow :

- **At Step 2: Item Out of Stock**
    - If the item being scanned is out of stock, the system notifies the cashier.
    - The cashier can remove the item from the transaction or suggest ordering the item for the customer.

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2. Use Case: Processing a Return

Primary Actor :

- **Cashier**

Secondary Actors :

- **Inventory System**

Preconditions:

- The cashier is logged into the POS system.
- The return request follows the store's return policy, including time limits and item conditions.

Postconditions:

- The item is returned, and inventory is updated in the Inventory System.
- The return is recorded in the POS system.
- The customer is either refunded or issued store credit, depending on the payment method and store policy.

Normal Flow :

1. The customer provides the item to be returned along with the receipt.
2. The cashier begins the return process in the POS system.
3. The item is scanned by the cashier:
    - The system retrieves the original transaction details from the sale.
4. The system proceeds with the return:
    - The inventory is increased to reflect the item being returned.
    - The customer receives a refund in the original payment method or is given store credit.
5. The return is documented in the POS system for record-keeping.

Alternate Flows:

- At Step 4:
    - **Partial Return**:
      The customer returns only part of the original purchase. The cashier selects the items being returned, adjusts the inventory, and processes a refund or

store credit for those items. The remaining items are unaffected, and the partial return is logged.

- **Return with Damaged Item**:
  If the item is damaged, the system alerts the cashier that a full refund may not be applicable. The cashier inspects the item and decides if it qualifies for a partial refund, store credit, or no refund based on store policy. The cashier informs the customer and either proceeds or cancels the return.
- **Item Replacement**:
  If the customer requests a replacement instead of a refund, the cashier processes the return and updates the inventory. A sale is processed for the replacement, and any price difference is handled. A new receipt is provided to the customer for the exchanged item.

Exceptional Flows :

- **At Step 1: Missing or Invalid Receipt**
  - If the customer does not have a valid receipt or proof of purchase:
    - The cashier may reject the return following store policy.
    - The customer is informed that the return cannot be processed.
- **At Step 3: Ineligible Item for Return**
  - If the item does not meet return criteria (e.g., expired return period, item is damaged), the system informs the cashier.
  - The cashier notifies the customer that the return cannot proceed.
- **Inventory Issue**
  - If there is an issue with updating inventory during the return (e.g., system mismatch), the cashier is notified.
  - The cashier may need to manually adjust the stock levels or seek help from the store manager.

- **Identify Entity/Boundary Control Objects**

Actors:

1. Cashier
2. Catalog System
3. Inventory System

Entity Objects:

1. User (includes Cashier, Administrator)
2. Payment Transaction
3. Coupon (Gift Coupon)
4. Item (Product)
5. Payment Details
6. Sales Transaction
7. Return Transaction

Boundary Objects:

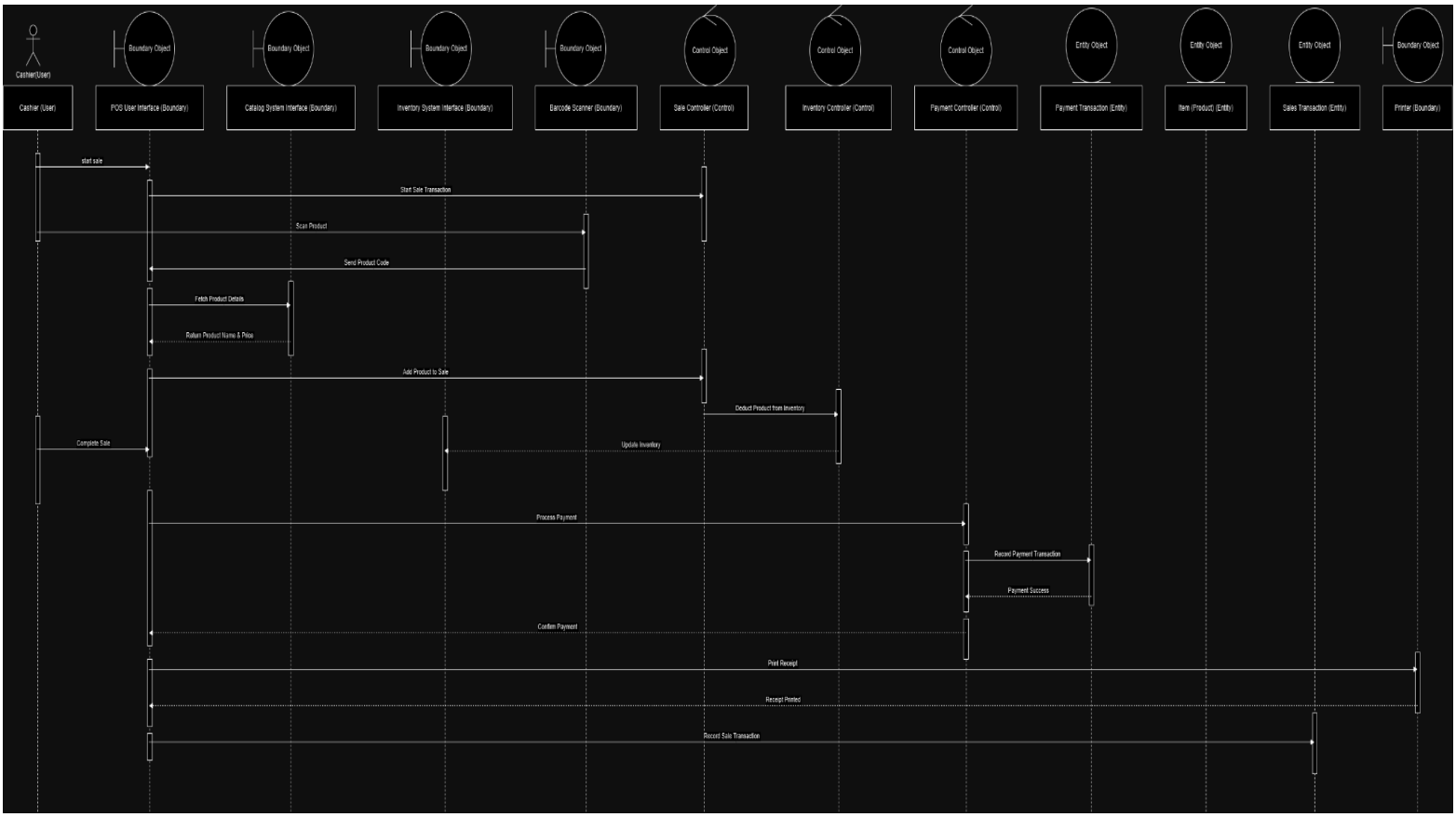
1. POS User Interface
2. Catalog System Interface
3. Inventory Management Interface
4. Payment Gateway Interface
5. Barcode Scanner Device
6. Receipt Printer

Control Objects:

1. User Management Controller
2. Inventory Management Controller
3. Payment Processing Controller
4. Sales Management Controller
5. Return Processing Controller

- **Develop Sequence Diagrams**

SEQUENCE DIAGRAM FOR : PROCESS SALE



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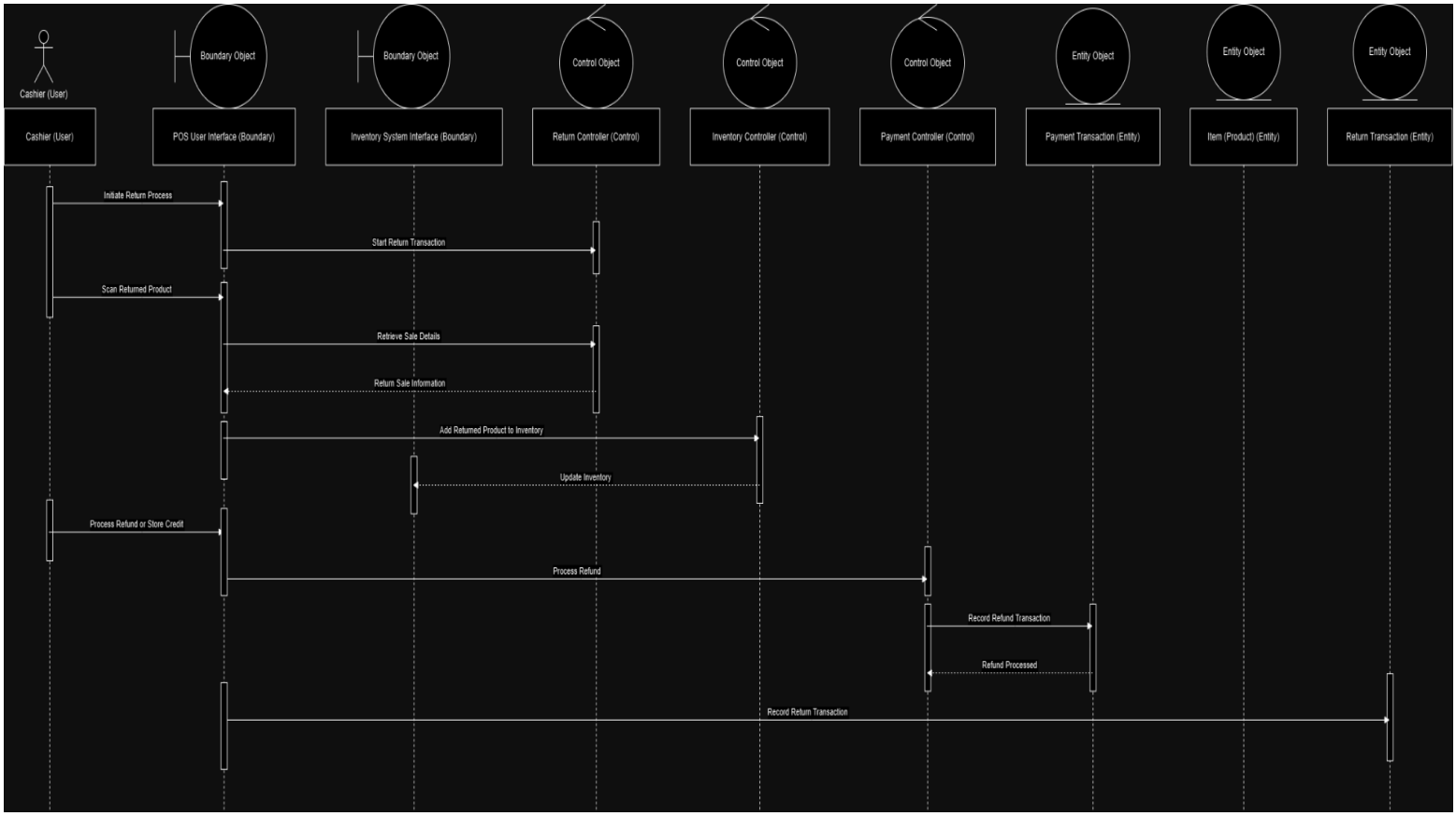
SEQUENCE DIAGRAM FOR : PROCESS RETURN



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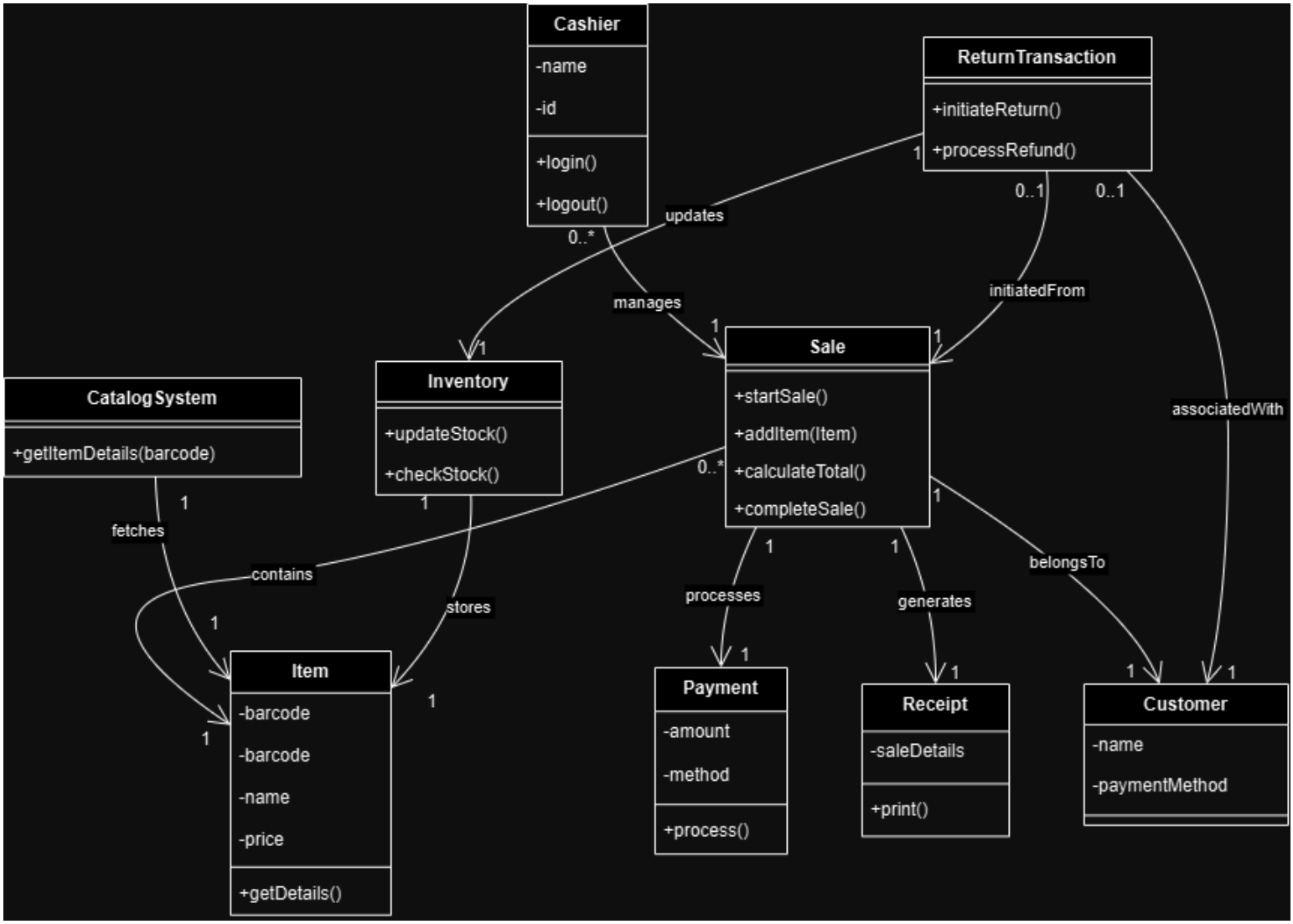
- **Develop Analysis Domain Models**

Class Diagram



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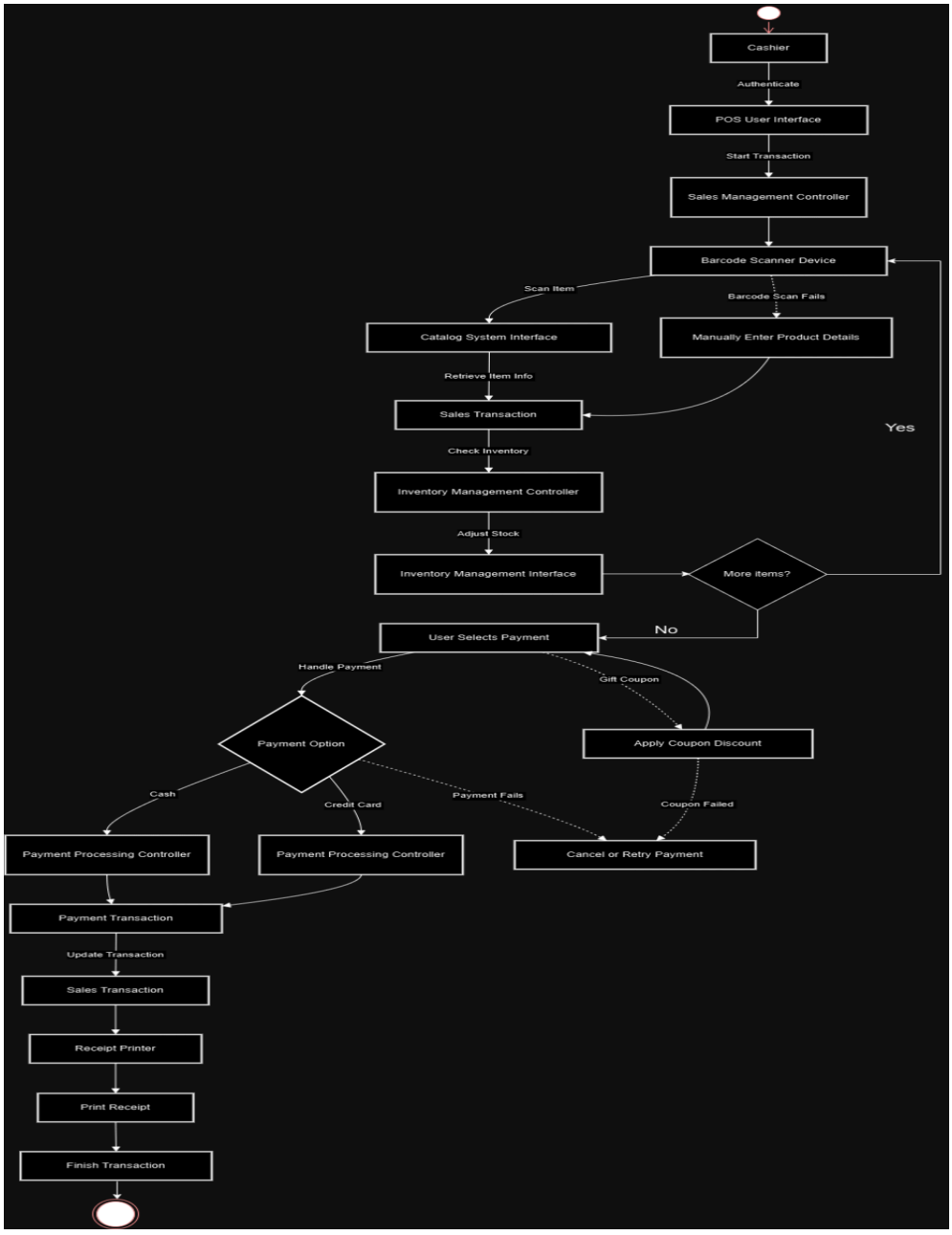
- **Develop activity diagrams for "Process Sale" and "Handle Return" use cases.**

ACTIVITY DIAGRAM : PROCESS SALE



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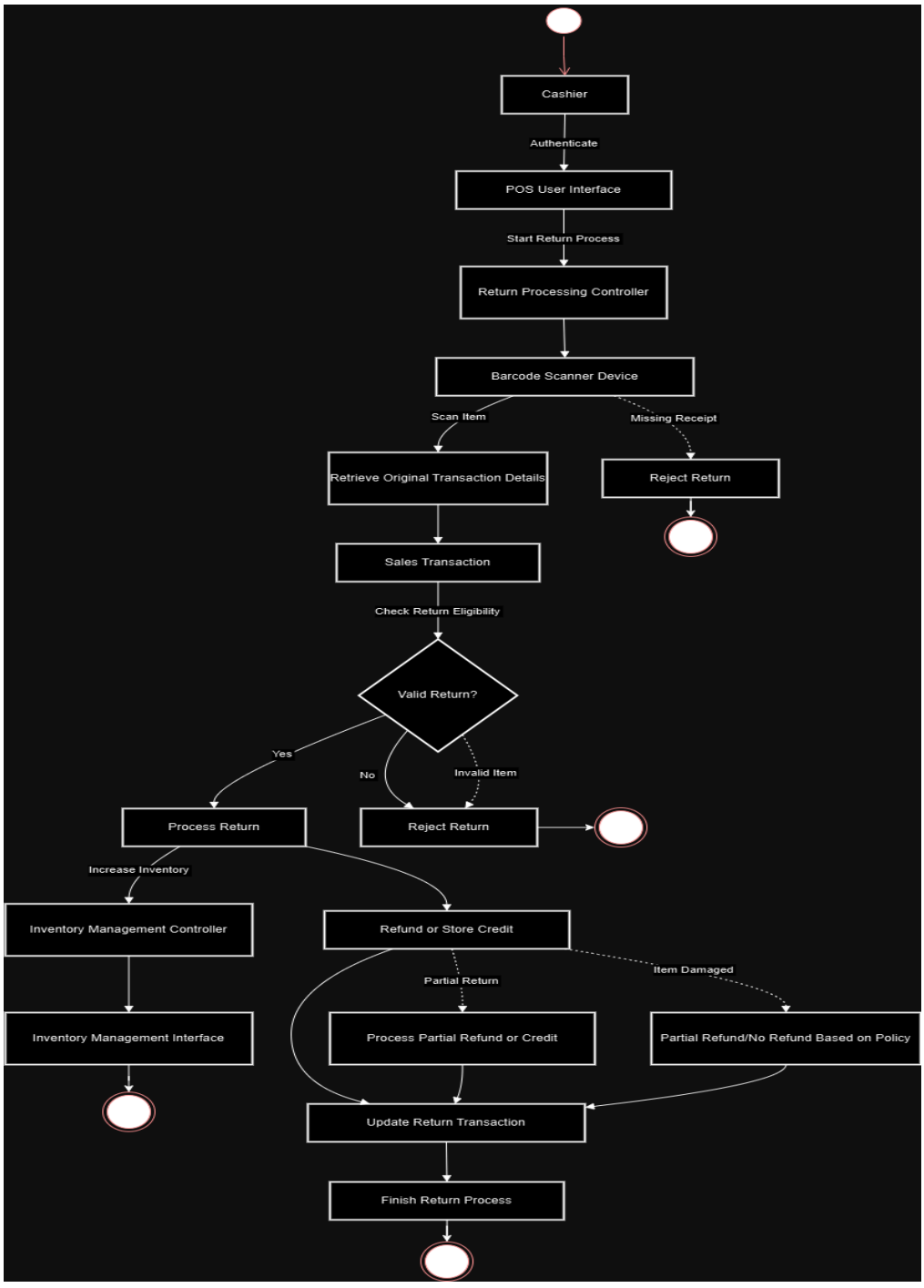
ACTIVITY DIAGRAM : PROCESS RETURN



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