Software Architecture & Design Assignment #5

Software Design using a UML Sequence & Activity Diagrams

Assignment#5 Detailed Design: Group 1

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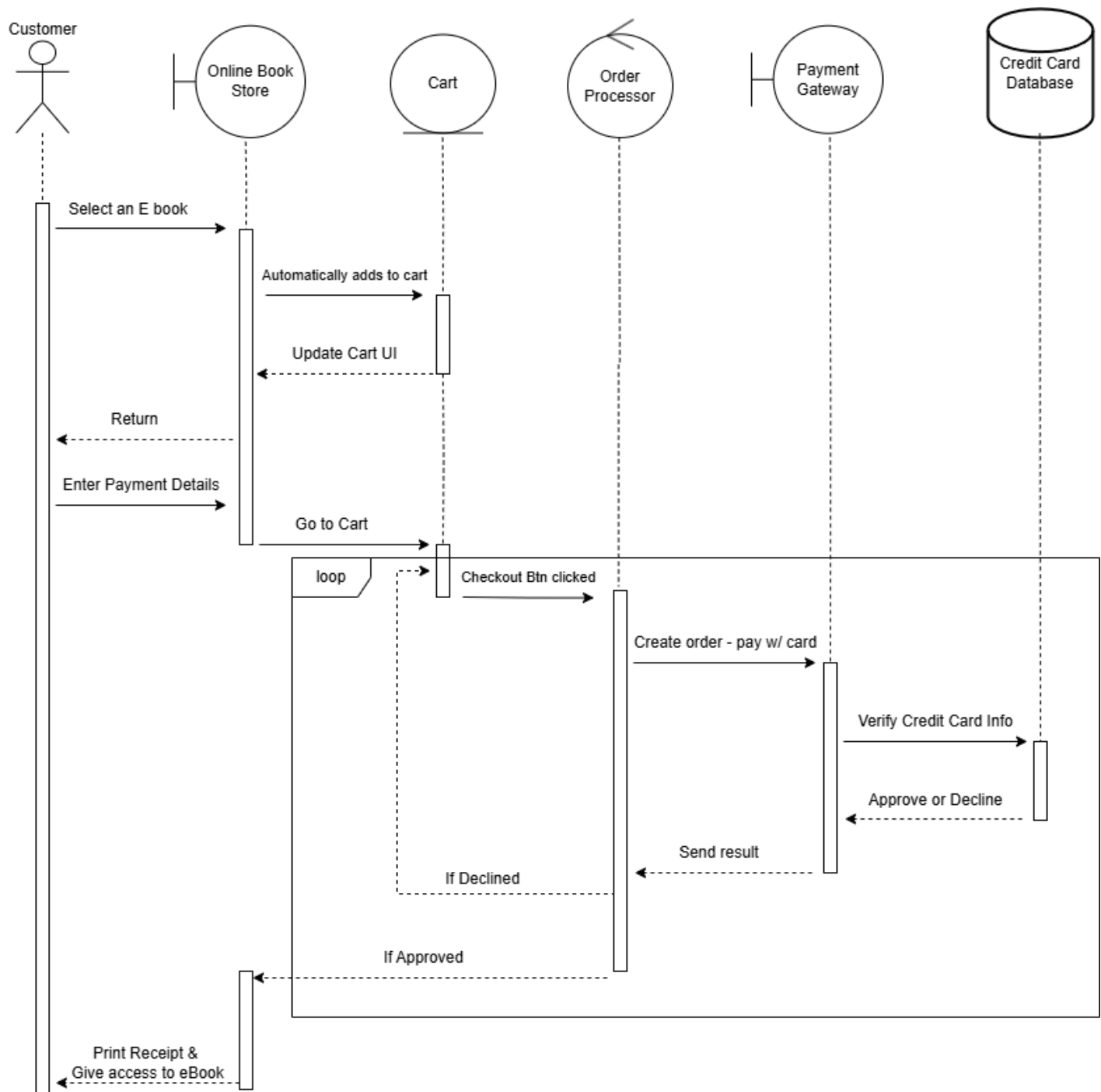
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Software Architecture & Design Assignment #5

Question 1. Create a UML sequence diagram that describes the steps required to purchase an e-book online using a credit-card. (10 points)

Sequence Diagram Description:

A. Stereotypes Explained –

1. **Customer** (Actor): Represents the user initiating interactions with the system.
2. **Online Book Store** (Boundary): Serves as the system's interface for user interactions.
3. **Cart** (Entity): Stores and manages the eBook selection data.
4. **Order Processor** (Control): Coordinates the flow of actions during checkout and payment.
5. **Payment Gateway** (Boundary): Interfaces with external payment systems.
6. **Credit Card Database** (Database): Verifies and stores credit card information.

B. Description of the Sequence -

1. **Customer Interaction**:
   - The process begins with the customer selecting an e-book from the online bookstore. This action adds the selected book to the shopping cart. The customer is represented as an Actor in the diagram.

2. **Cart Update**:
   - The cart interface is updated to reflect the new addition.

3. **Navigate to Cart**:
   - The customer navigates to the cart to review the items they wish to purchase. Here the Online Bookstore is represented as a Boundary element.

4. **Checkout Initiation**:
   - The customer clicks the "Checkout" button in the cart to complete the purchase.

5. **Order Processing**:
   - Upon clicking checkout an order is created, and the customer is prompted to enter their payment details. The Order Processor is a Control element.

6. **Payment Gateway Interaction**:
   - The order processor sends the payment details to the payment gateway.
   - The payment gateway communicates with the credit card database to verify the credit card information. The Payment Gateway is another Boundary element.
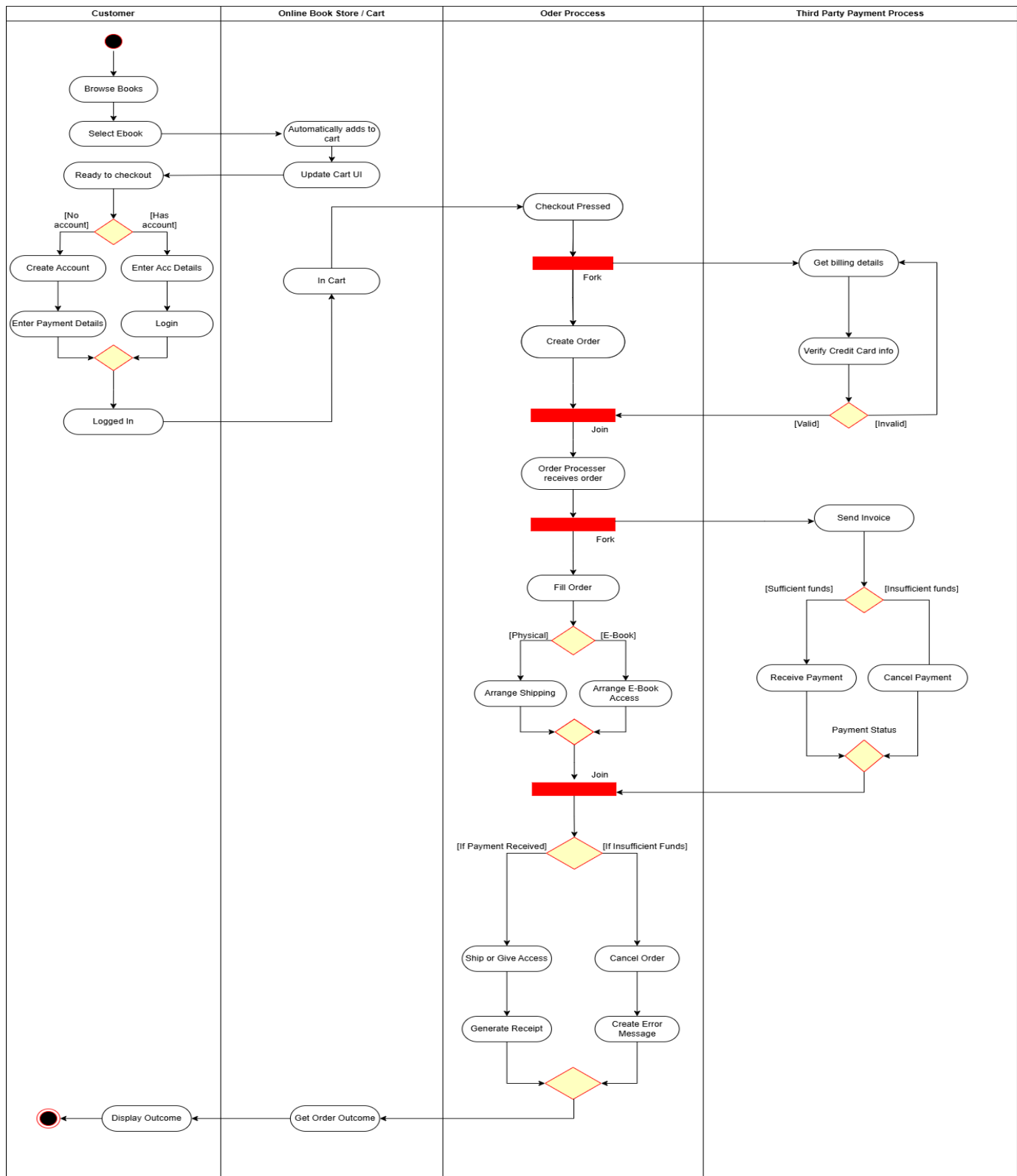
7. **Validate or Repudiate**:
   - The credit card information is either approved or declined.
   - If the transaction is declined, the process sends a message back to the customer with a decline notification, allowing them to update payment details or retry.
   - If the transaction is approved, the process proceeds to completion.

8. **Order Completion**:
   - Upon approval, a receipt is printed, and access to the e-book is granted to the customer, finalizing the transaction. This data is stored in the customer database which is represented by the Database element

Question 2. Create a UML activity diagram that describes the steps required to purchase an e-book online using a credit-card. (10 points)

Customer	Online Book Store / Cart	Oder Proccess	Third Party Payment Process

Browse Books

Select Ebook → Automatically adds to cart

Update Cart UI

Ready to checkout

Checkout Pressed

[No account] / [Has account]

Create Account / Enter Acc Details

In Cart

Fork

Get billing details

Enter Payment Details / Login

Create Order

Verify Credit Card info

Logged In

Join

[Valid] / [Invalid]

Order Processer receives order

Fork

Send Invoice

Fill Order

[Sufficient funds] / [Insufficient funds]

[Physical] / [E-Book]

Receive Payment / Cancel Payment

Arrange Shipping / Arrange E-Book Access

Payment Status

Join

[If Payment Received] / [If Insufficient Funds]

Ship or Give Access / Cancel Order

Generate Receipt / Create Error Message

Display Outcome ← Get Order Outcome

Activity Diagram Description

A. Swimlane Explained –

1. **Customer**: Represents the user interacting with the system.
2. **Online Book Store / Cart**: Handles the browsing, cart management, and checkout processes.
3. **Order Processor**: Manages order creation and processing.
4. **Third-Party Payment Provider**: Verifies payment details and handles transactions.

B. Description of Activity –

1. **Browsing and Selecting**: The Customer begins by browsing books and selecting an e-book to purchase.
2. **Account Handling**: If the customer does not have an account, they are prompted to create one by entering account details. If an account exists, they log in to continue the process.
3. **Cart and Checkout**: The selected e-book is added to the cart, and the cart UI is updated. When the customer is ready, they proceed to checkout by pressing the checkout button.
4. **Order Creation**: The system triggers the Order Processor to create an order. This action initiates a fork for parallel processing.
5. **Payment Processing**: The Customer enters payment details, which are sent to a third-party payment provider to verify credit card information. If the payment is valid and funds are sufficient, the system processes the payment, generates a receipt, and sends an invoice. If the payment fails or funds are insufficient, an error message is created, and the order is canceled.
6. **Order Fulfillment**: After successful payment, the system forks to arrange either e-book access or shipping (for physical books). Both activities join to complete order fulfillment, either by granting e-book access or preparing physical shipping.
7. **Final Outcome**: The customer is presented with a digital receipt and the ebook is added to their account.

References

What Is Sequence Diagram?, www.visual-paradigm.com/guide/uml-unified-modeling-language/what-is-sequence-diagram/.

What Is Activity Diagram?, www.visual-paradigm.com/guide/uml-unified-modeling-language/what-is-activity-diagram/.

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