

HANOI UNIVERSITY OF SCIENCE AND TECHNOLOGY

School of Information and Communications Technology

Software Design Document

Version 1.3

Media Application

Subject: ITSS Software Development

Group 15

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Hanoi, 2024

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1 Introduction

1.1 Objective

This Software Design Document (SDD) provides a comprehensive overview of the application's architecture, components, and functionalities developed using JavaFX. This application is designed to facilitate the sale of various products, specifically books, DVDs, and CDs. The SDD will serve as a detailed guide for the development, implementation, and maintenance phases of the project, specifically:

- Describe Objectives: Presents the basic goals of the sales application, providing an effective product management interface.
- Feature description: The application system with many features, including searching for products, viewing product details, adding to cart, changing the number of products in the cart, ordering, viewing invoices, and payments.
- Interface description: Describes the system's user interface, including the customer user interface and the administration interface designed specifically for managers. This section will discuss how users interact with the system to perform various tasks.
- System constraints: Identify constraints that must be adhered to during system development and operation, including security, performance, and availability requirements.

This document is aimed at stakeholders, managers, customers, and software developers.

1.2 Scope

The application product, tentatively named “Media Sales Applications,” aims to create an effective and convenient buying/selling environment anytime, anywhere. The main goal of this product is to develop an application that sells media products (books, DVDs, CDs) and facilitates interaction with customers. The system will provide a list of products with information such as price and available quantity.

First, customers will run the AIMS application on their computer, where they can view items on the home screen. If a customer wants to make a purchase, they can add items to the cart, confirm the order, fill in the required shipping address fields on the shipping screen, confirm the invoice, and proceed with payment.

If a customer wants to Place Rush Order, they can select "Delivery Fast" on the shipping method screen. The system will check whether the address the customer enters is in the

Hanoi area. If so, the system will allow the order to be processed urgently according to the customer's needs. However, if the address the customer enters is not in Hanoi, a message will appear: "Your location is not in Hanoi. Please choose Hanoi to use the Place Rush Order function."

1.3 Glossary

<i>STT</i>	<i>Term</i>	<i>Explanation</i>	<i>Example</i>	<i>Note</i>
1	role	A set of permissions that control access to areas and features available within the software	Customer, Manager, Admin	
2	Place order	Placing an order includes the processes of adding products to the cart, placing an order, confirming shipping address, and payment.		
3	Place rush order	The order shipping process happens faster, reaching the user quickly.		
4	Media	Media products such as Books, DVDs, CD		
5	Interbank	The organization in charge of performing payment and return deposit transactions in the system		
6	Shipping Fees	The amount to be paid to the unit that ships the order to the customer.		

7	VAT	A tax applied to increase the value of a product, by 10% of the item's original value.		
8	Subtotal	The original price of the item		
9	Amount	The total amount for all processes includes the original product price, VAT, and shipping fee.		
10	Shipping construction	Notes to the carrier for the order.		

1.4 References

- [1] Centers for Medicare & Medicaid Services, "System Design Document Template," [Online]. Available: <https://www.cms.gov/Research-Statistics-Data-and-Systems/CMS-Information-Technology/XLC/Downloads/SystemDesignDocument.docx>.

2 Overall Description

2.1 General Overview

E-Media application is designed for shopping without the need to go out. Through this application, users can view products, make purchases, or return them. We have designed a clear interface for users. Users can interact with the application by clicking on the interface, and requests are handled by the controller. Additionally, we have our own database to store information and data related to our system, as well as a subsystem for conducting payment transactions.

The figure below is a general use case diagram for our design:

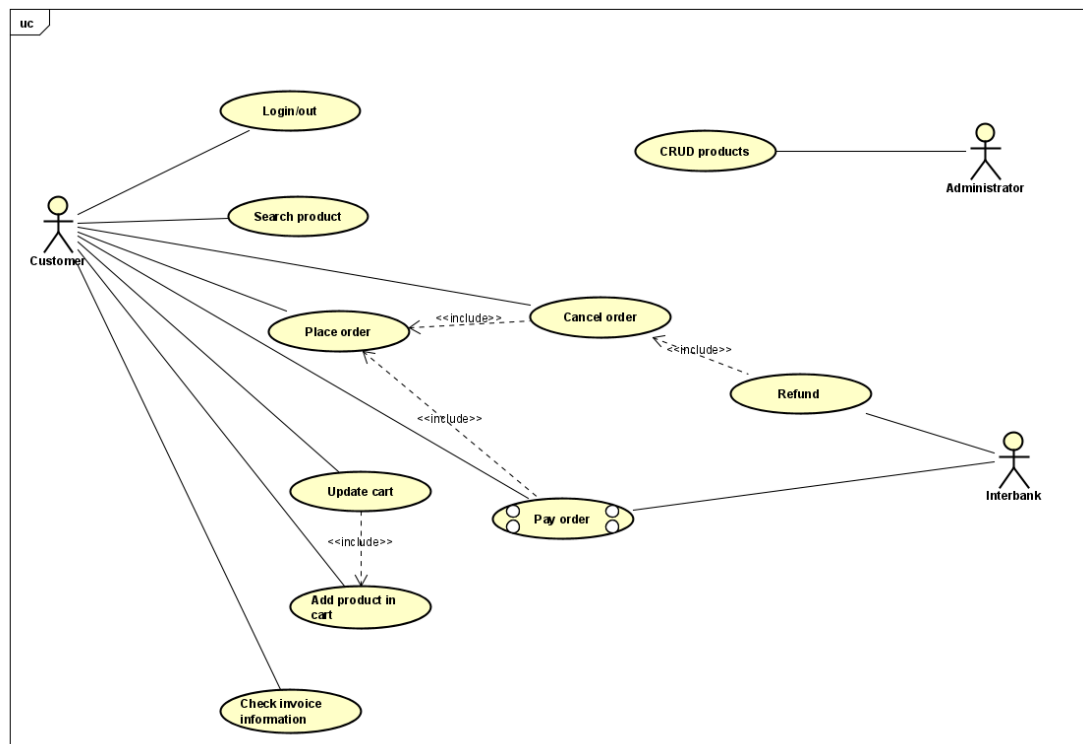


Figure 1.1: General use case diagram

2.2 Assumptions/Constraints/Risks

2.2.1 Assumptions

2.2.2 Constraints

- *Hardware or software environment*
- *End-user environment*
- *Availability or volatility of resources*
- *Standards compliance*
- *Interoperability requirements*
- *Interface/protocol requirements*
- *Licensing requirements*
- *Data repository and distribution requirements*
- *Security requirements (or other such regulations)*
- *Memory or other capacity limitations*
- *Performance requirements*
- *Network communications*
- *Verification and validation requirements (testing)*
- *Other means of addressing quality goals*
- *Other requirements described in the Requirements Document*

2.2.3 Risks

3 System Architecture and Architecture Design

3.1 Architectural Patterns

Specify and briefly describe the chosen architectural patterns and the reasons why they were chosen

- Hiện tại đang chọn MVC

- Lý do

- Tuy nhiên implement thực tế đang chưa chuẩn chỉ (phân tích kỹ hơn ở phần đánh giá design)

3.2 Interaction Diagrams

Theo UC

3.2.1. Communication Diagrams

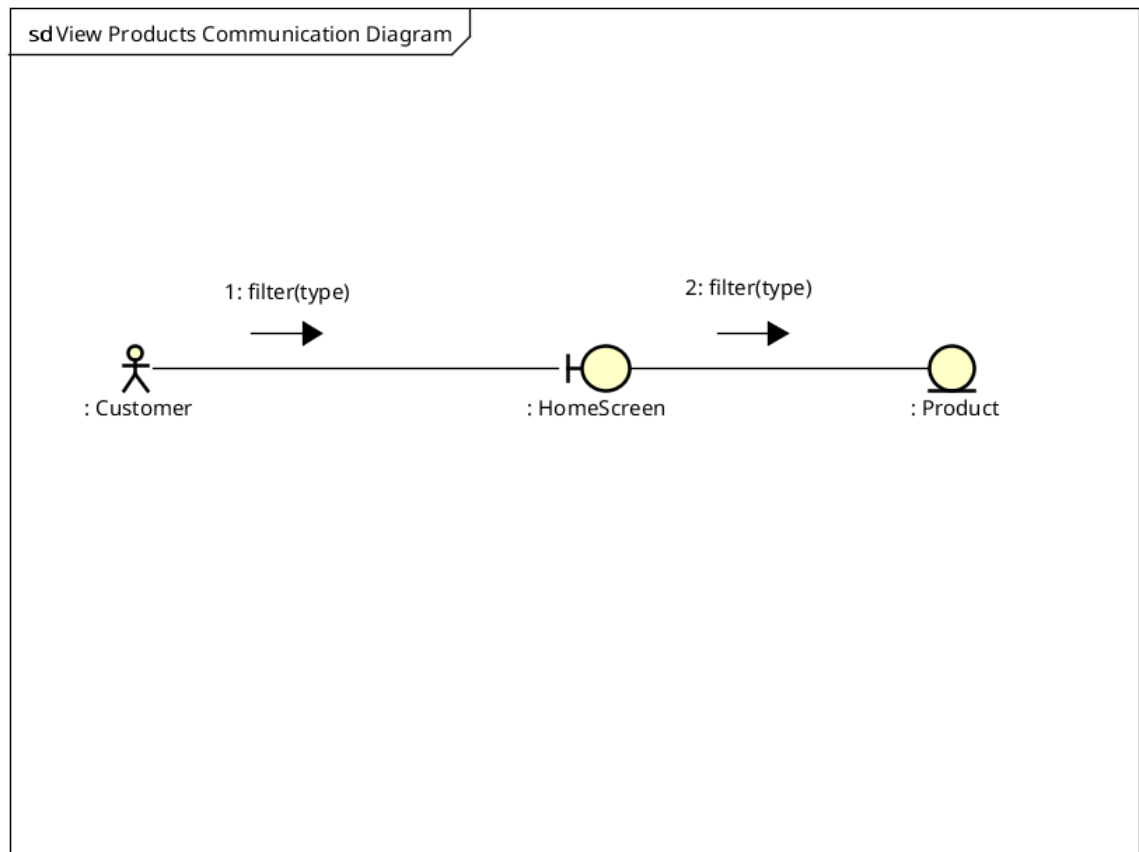


Figure 3.1: Communication Diagram for View Products Use Case

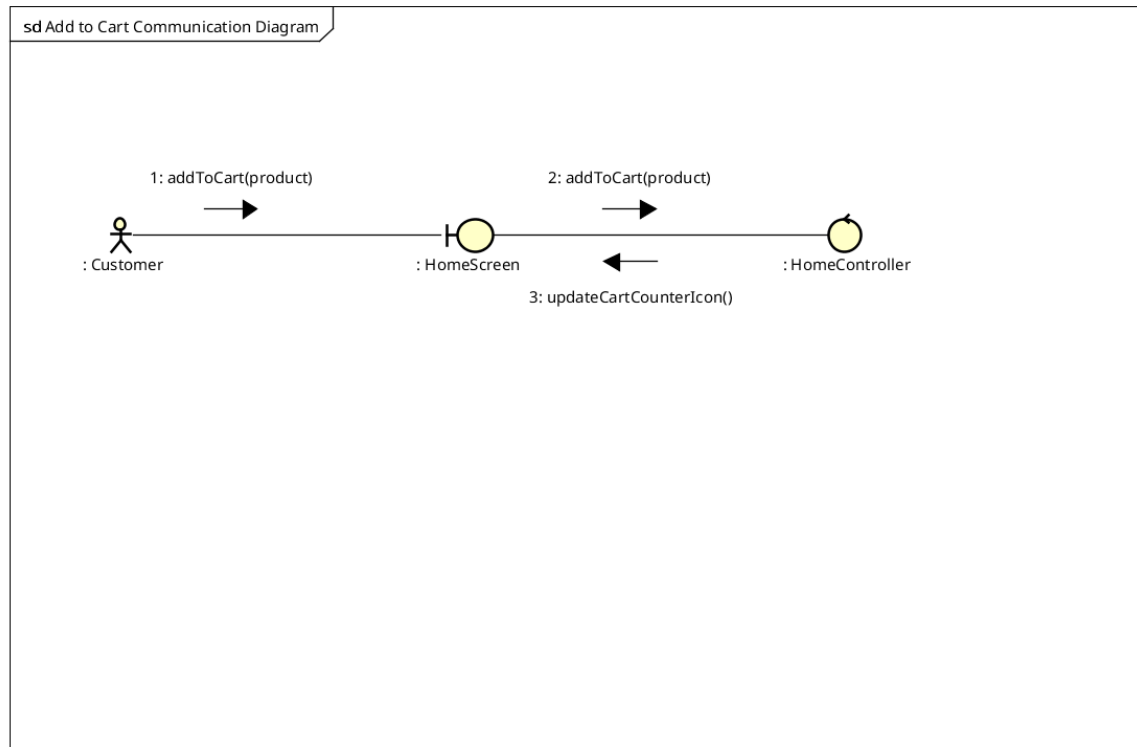


Figure 3.1: Communication Diagram for Add to Cart Use Case

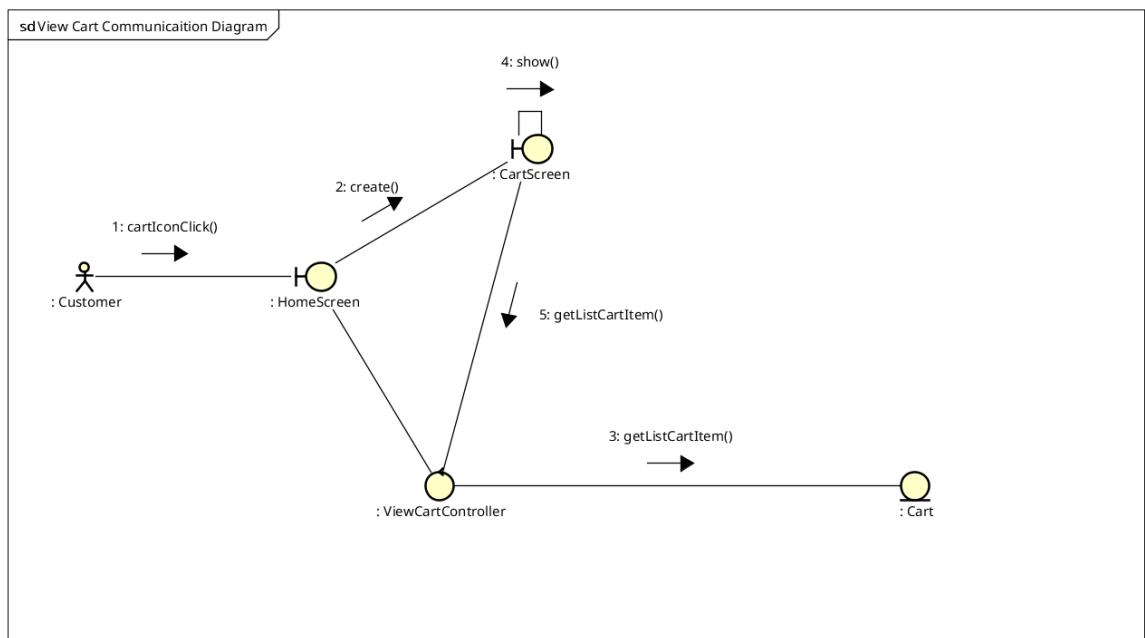


Figure 3.1: Communication Diagram for View Car Use Case

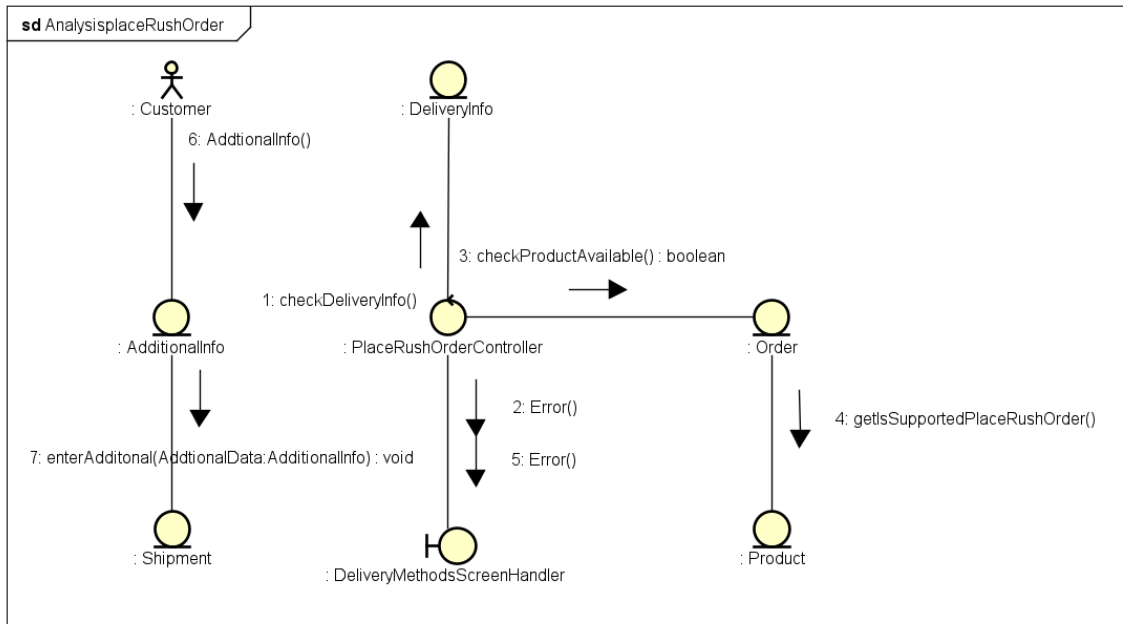


Figure: Communication Diagram for Place Rush Order

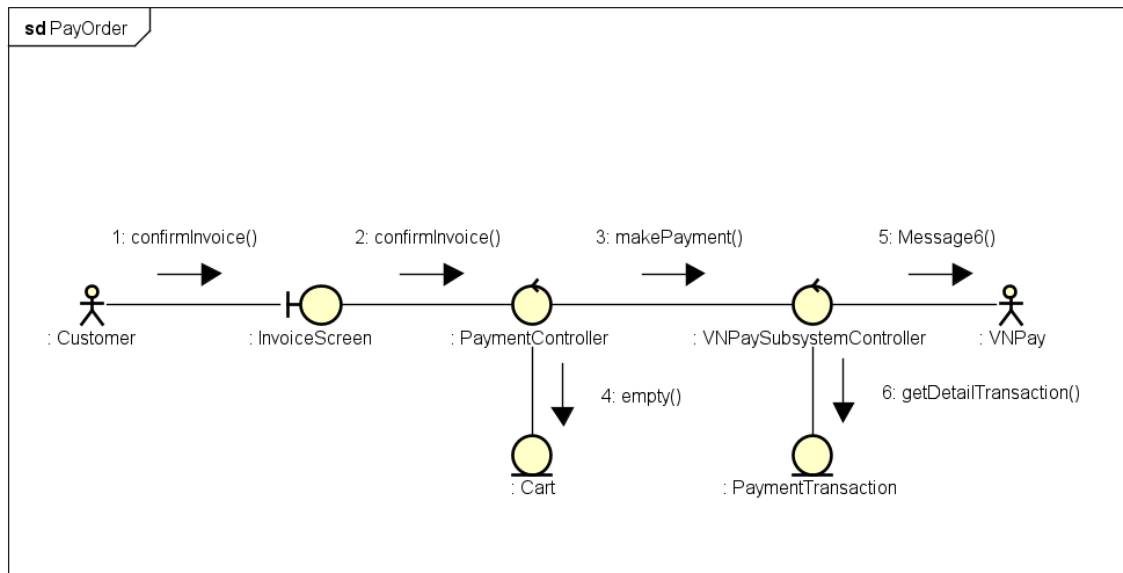
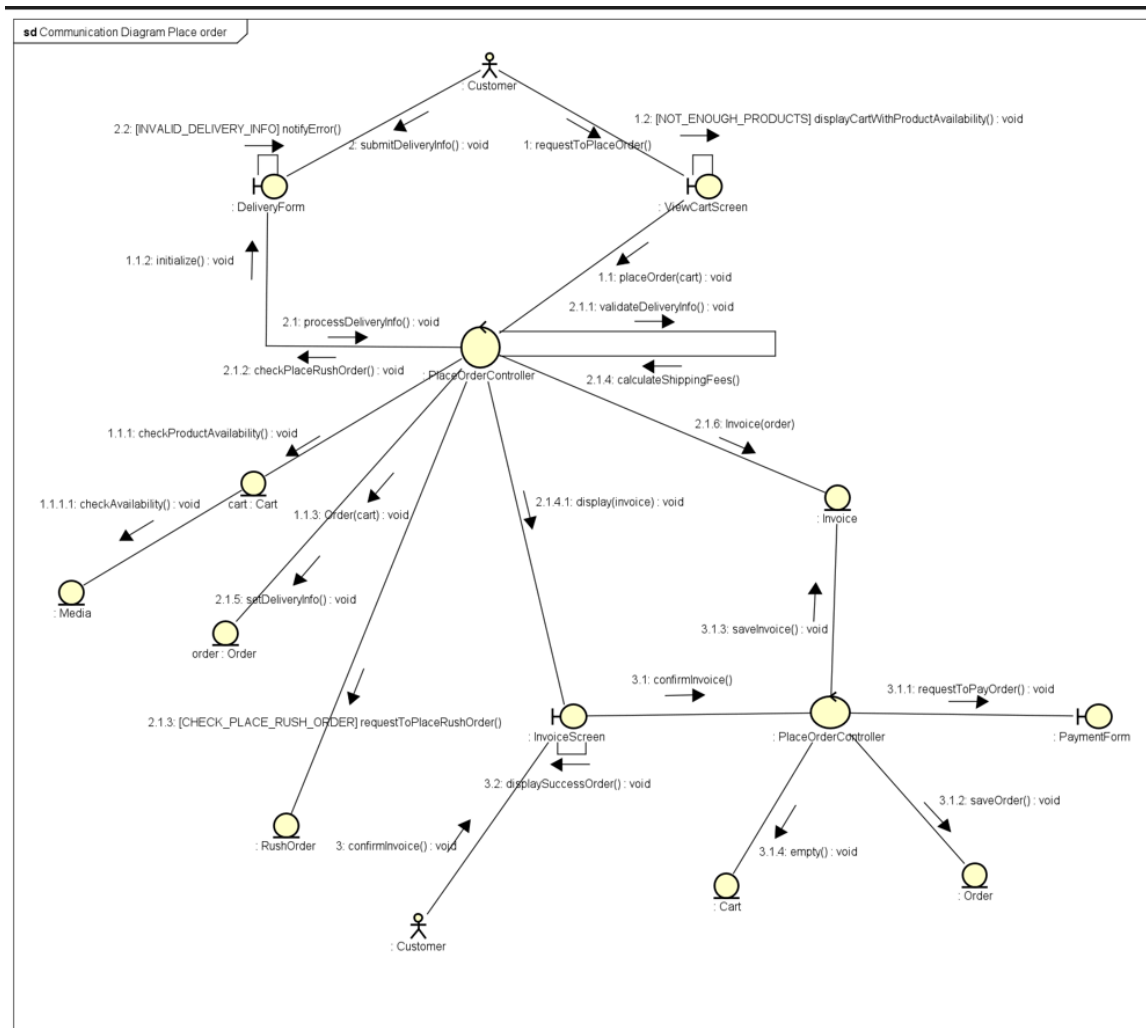
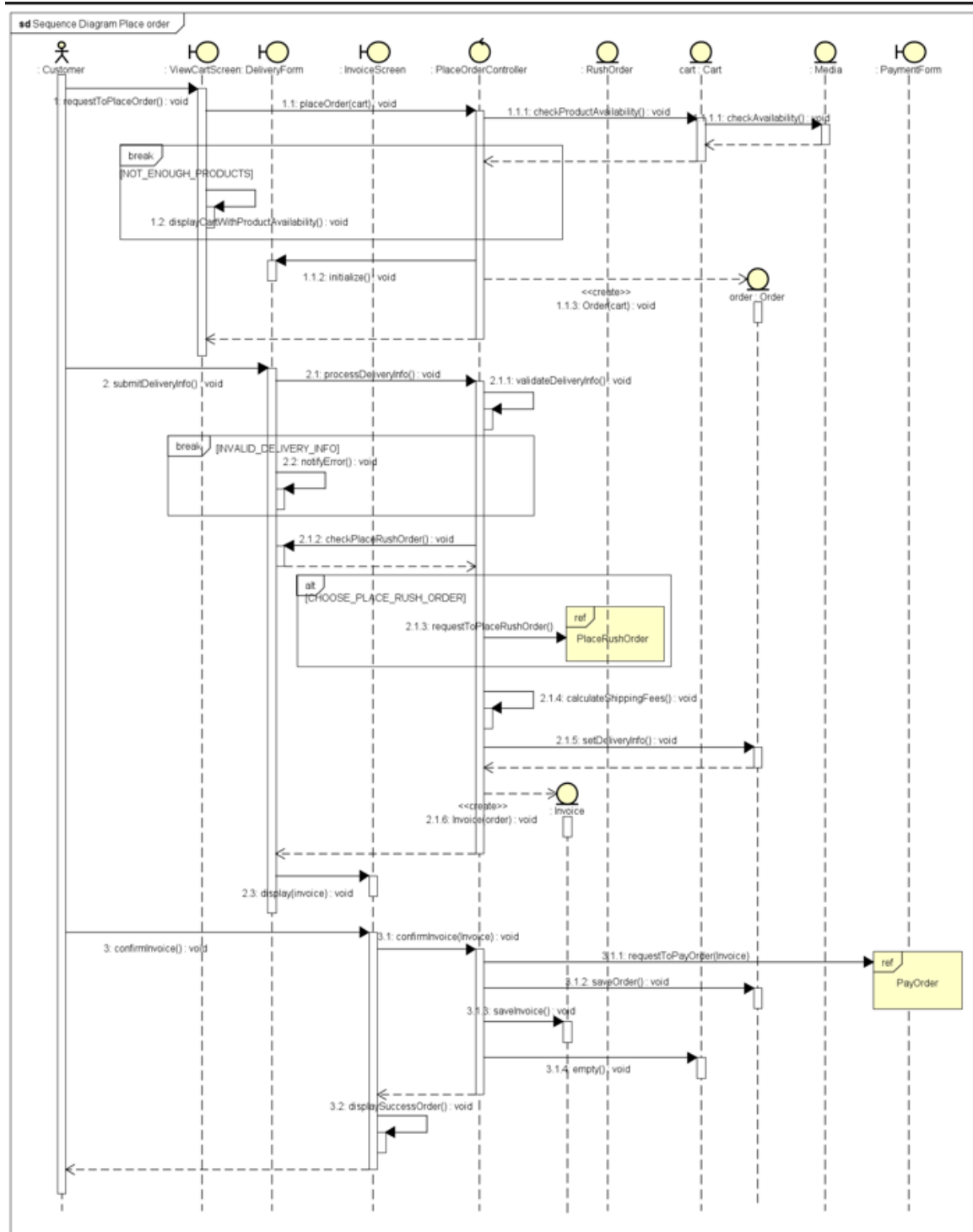


Figure: Communication Diagram for PayOrder



3.2.2 Sequence Diagrams



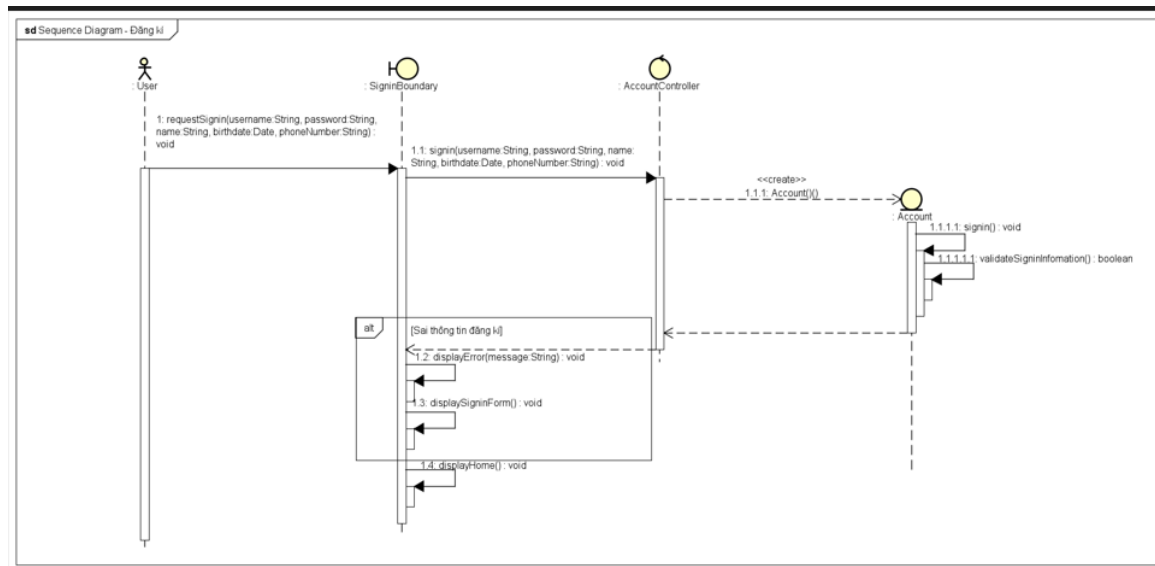


Figure 3.: Sequence Diagram for Sign-up Use Case

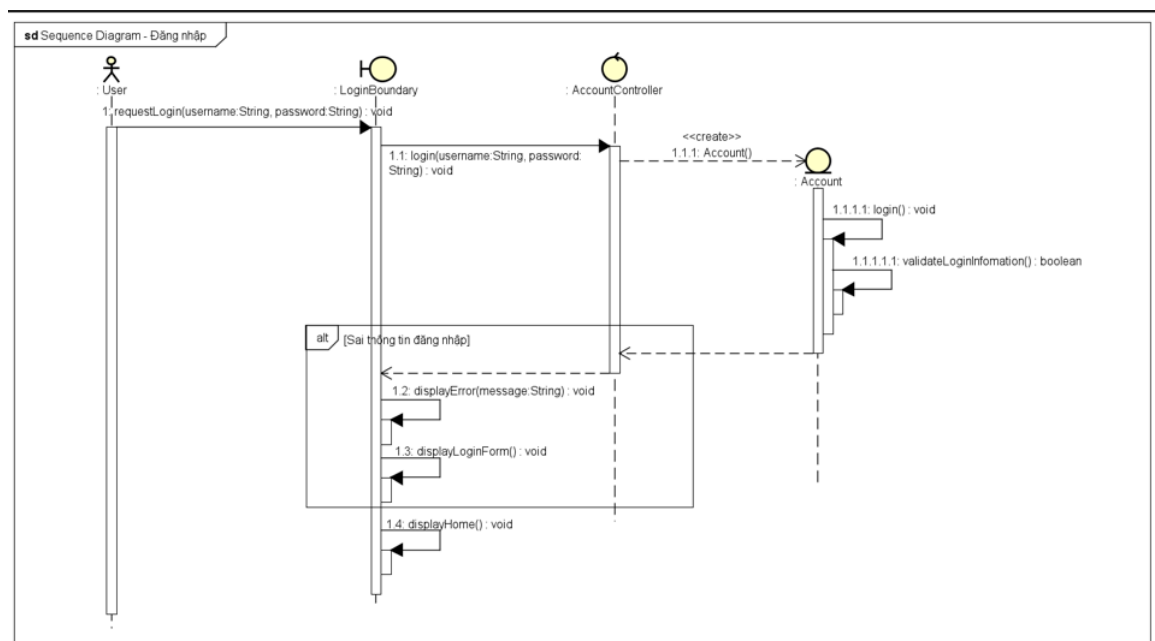


Figure 3.: Sequence Diagram for Log-in Use Case

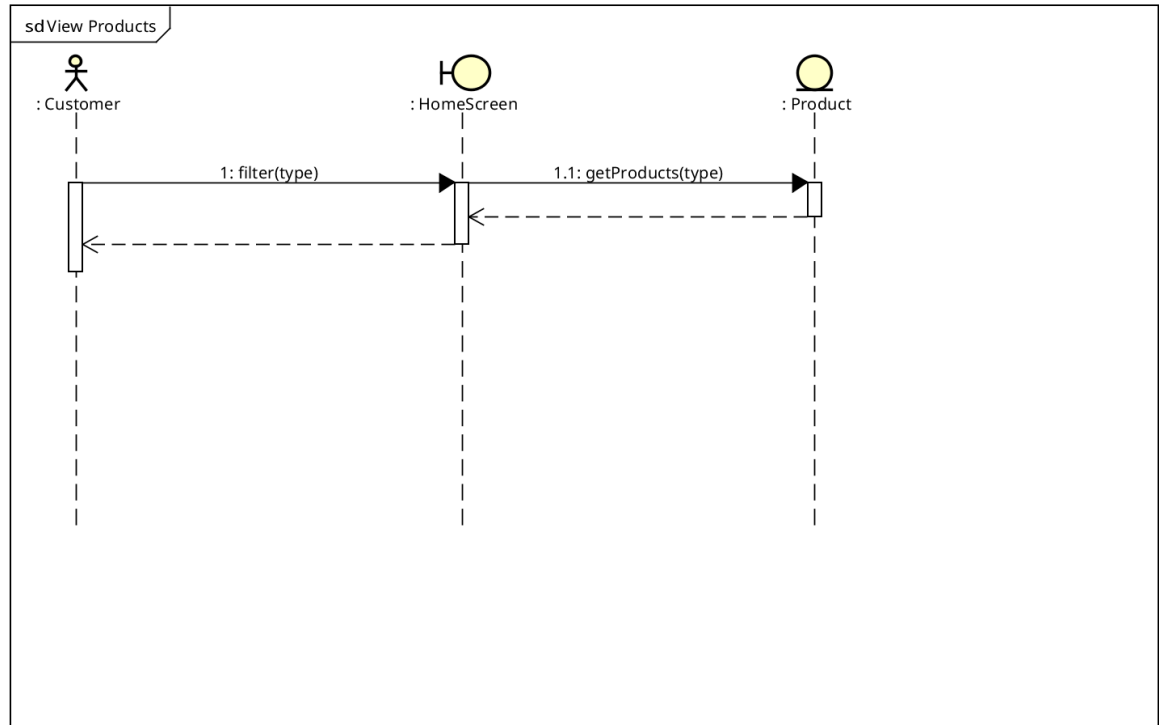


Figure 3.: Sequence Diagram for View Products Use Case

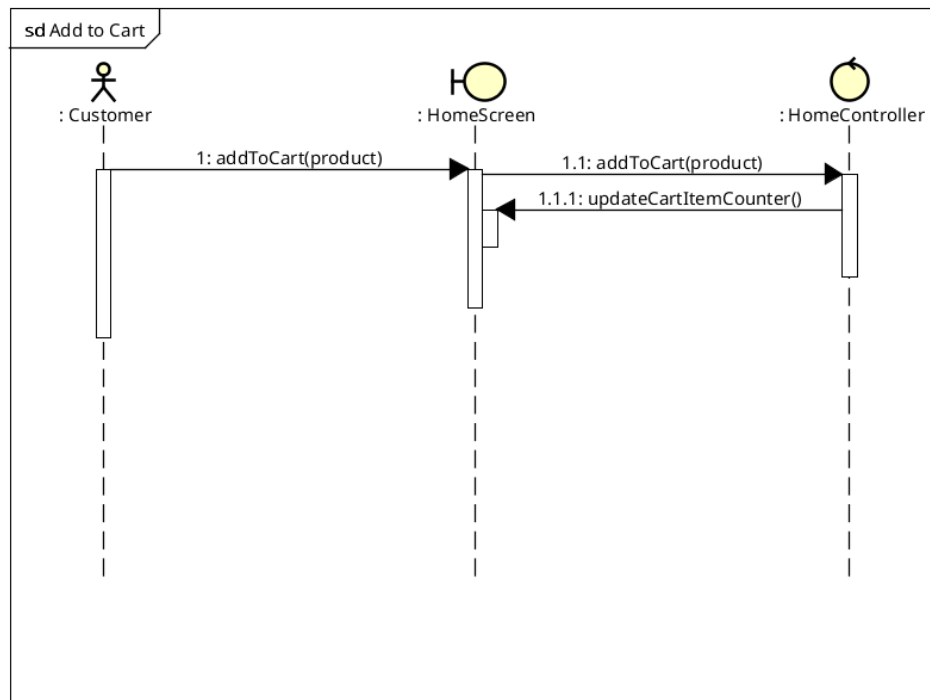


Figure 3.: Sequence Diagram for Add to Cart Use Case

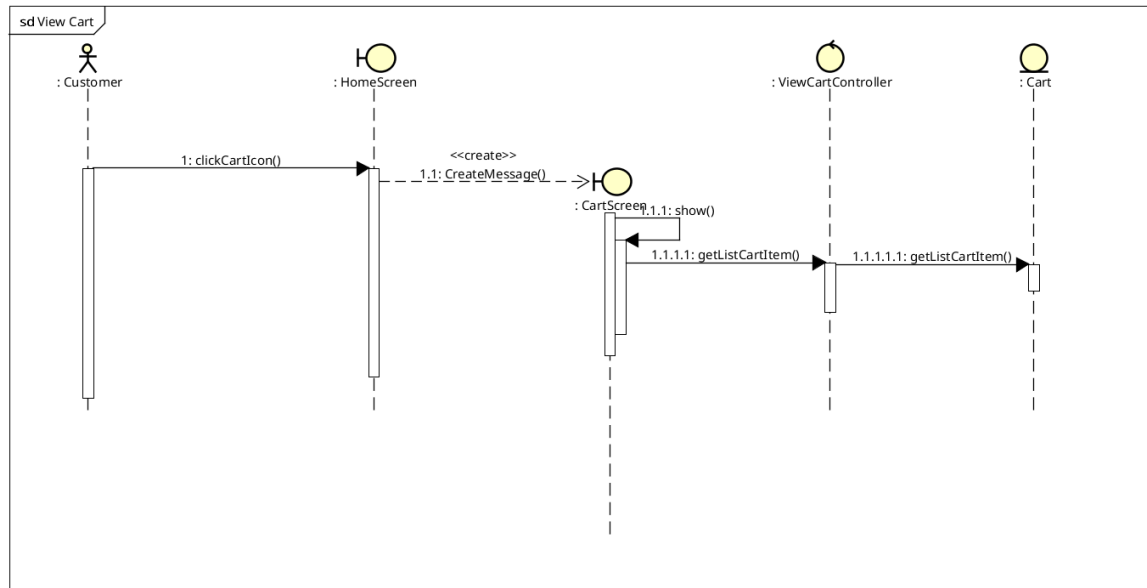


Figure 3.: Sequence Diagram for View Cart Use Case

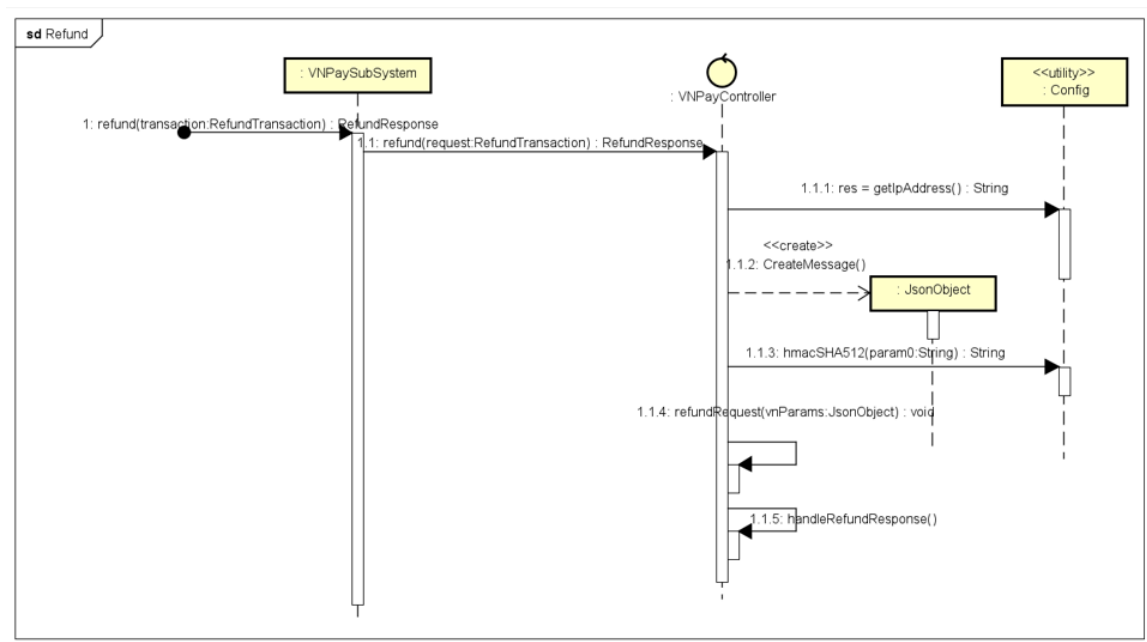


Figure 3.: Sequence Diagram for Refund Response Use Case

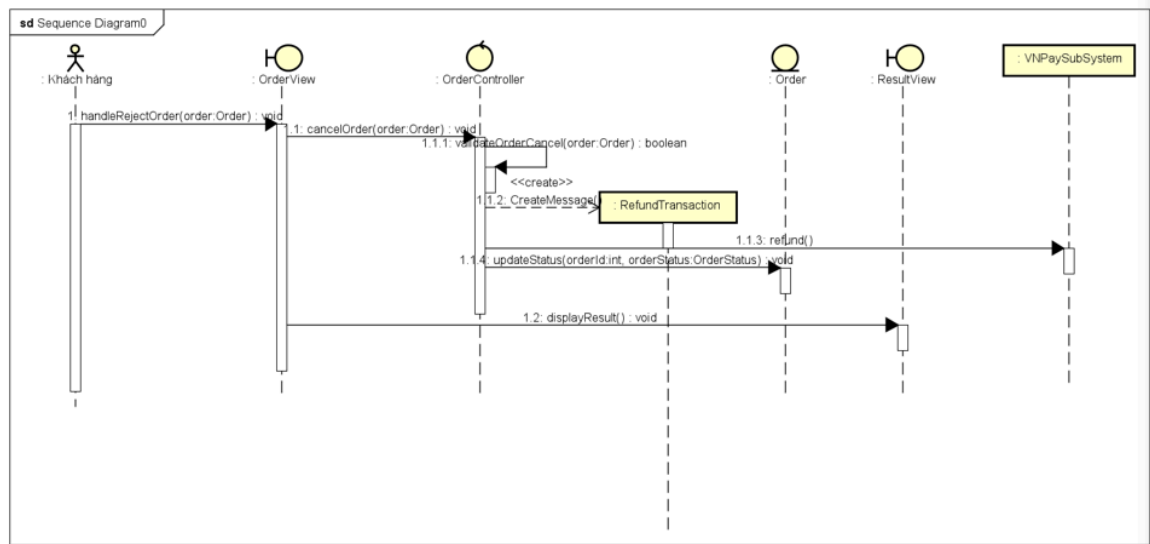


Figure 3.: Sequence Diagram for Cancel Order Use Case

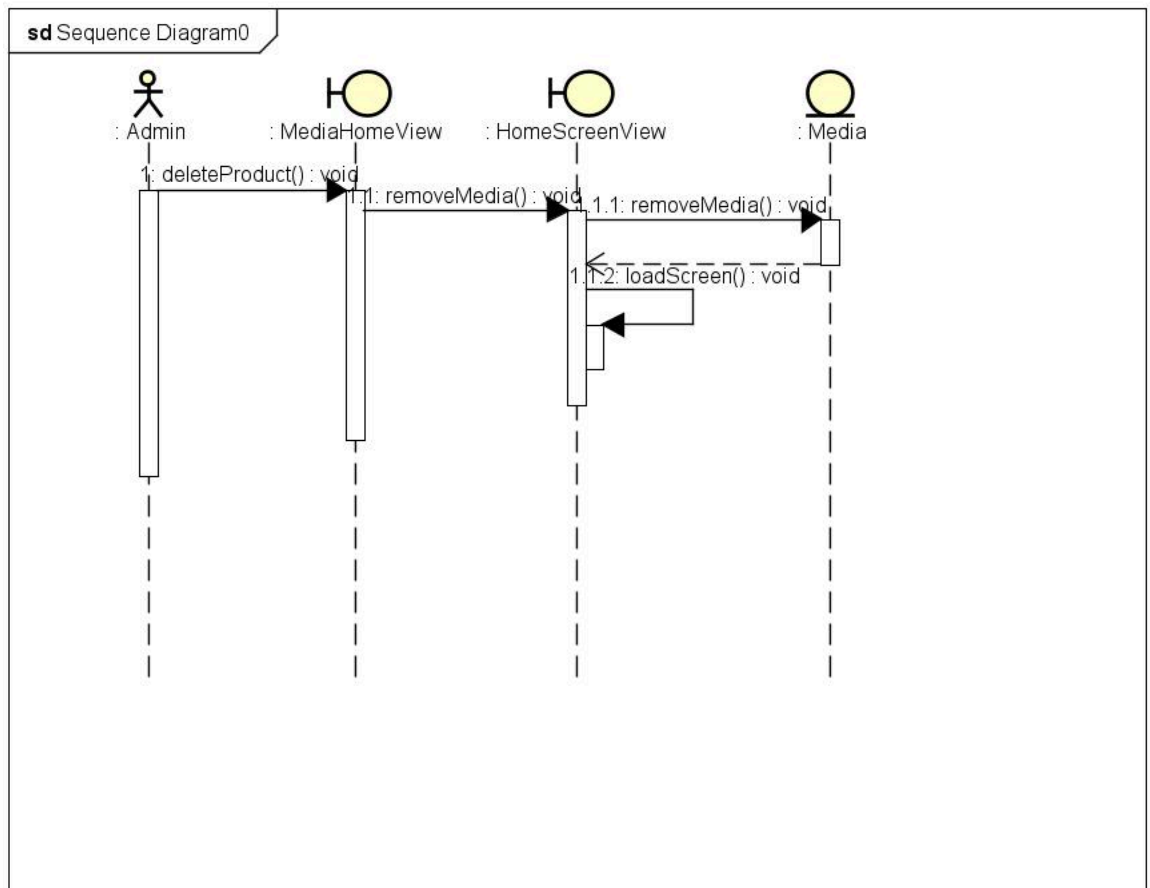


Figure 3.: Sequence Diagram for Delete Product Use Case

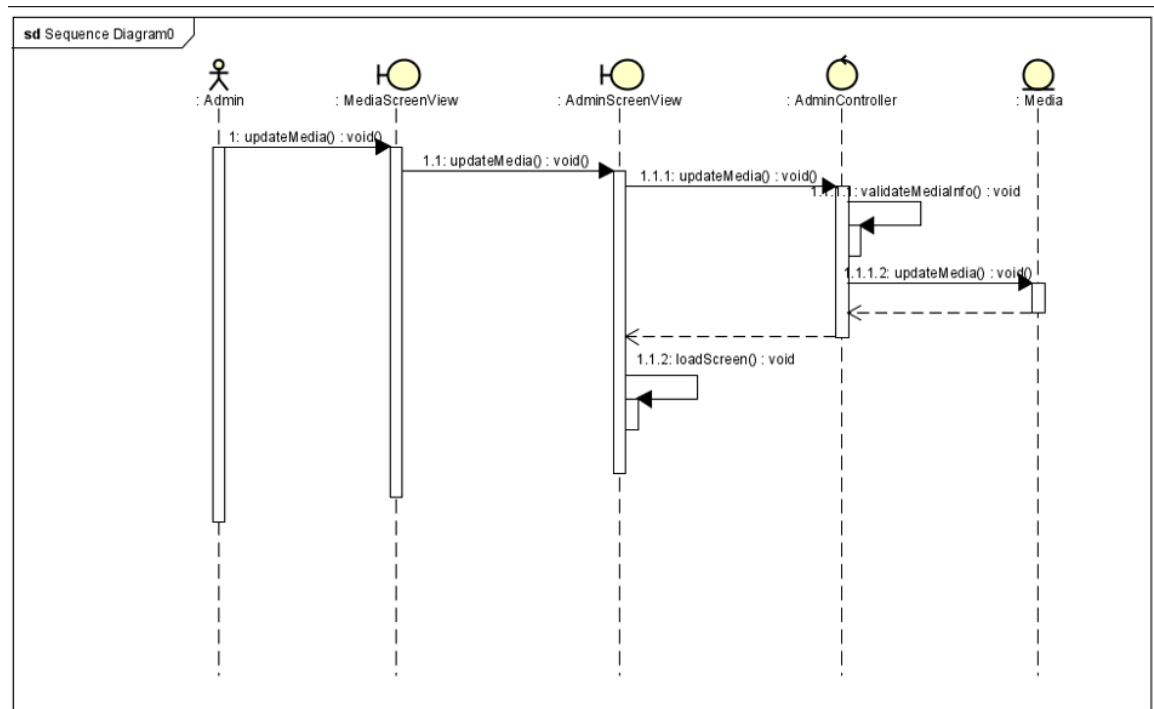


Figure 3.: Sequence Diagram for Update Media Use Case

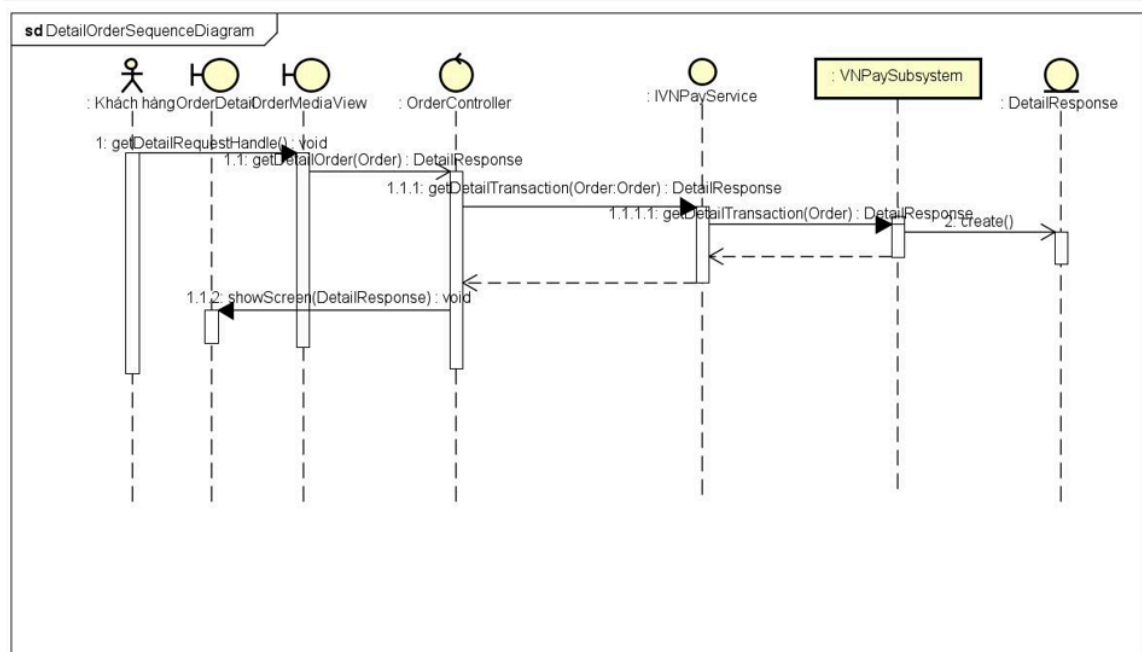


Figure 3.: Sequence Diagram for Order Detail Use Case

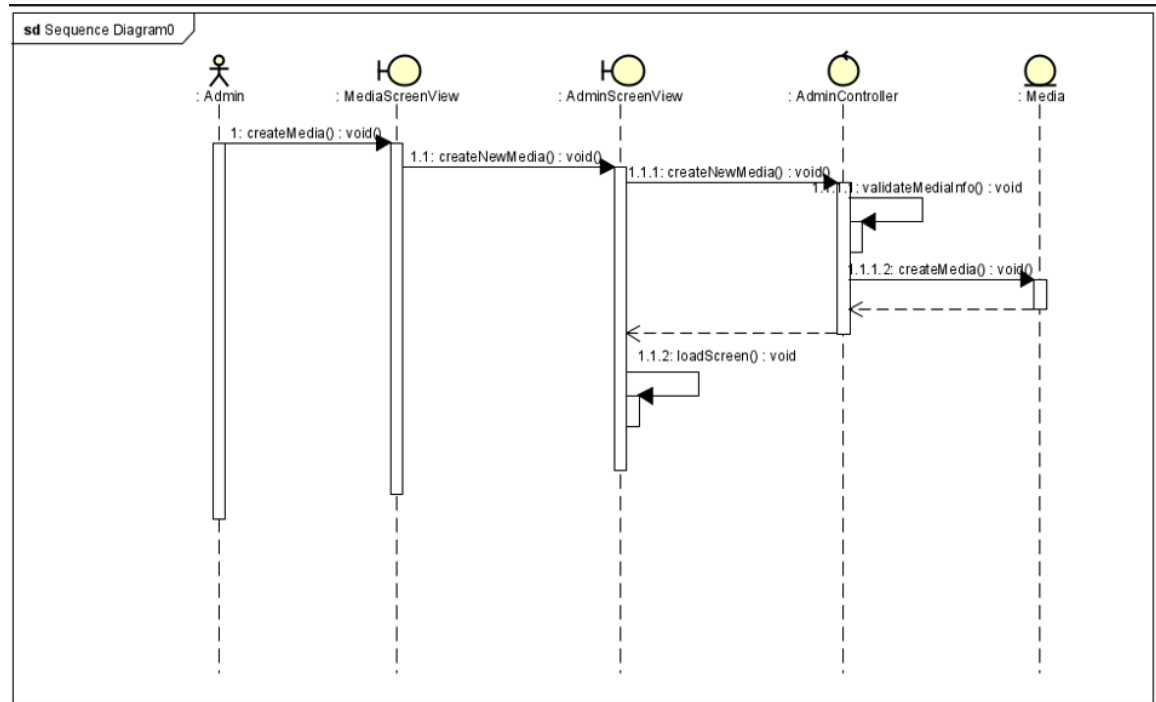


Figure 3.: Sequence Diagram for Create Media Use Case

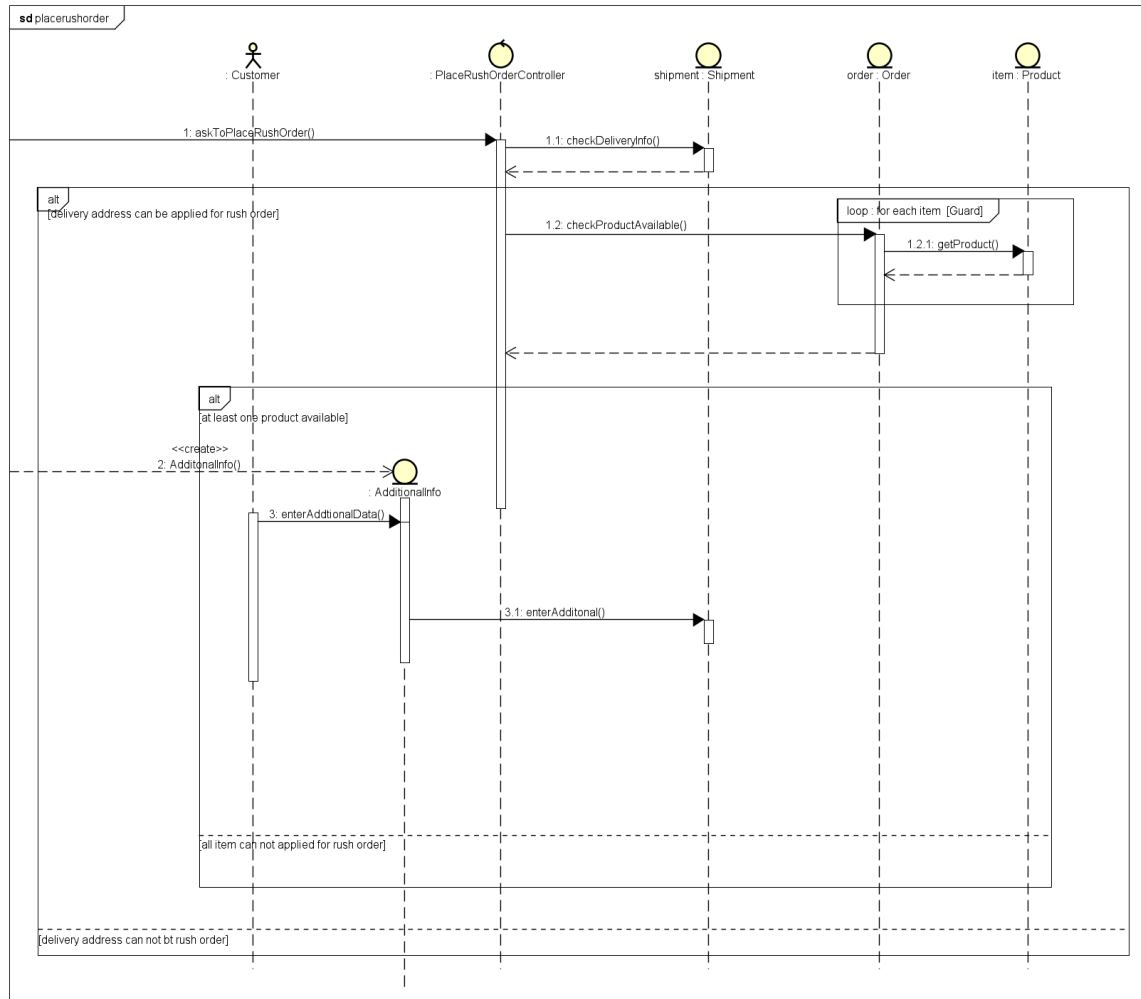
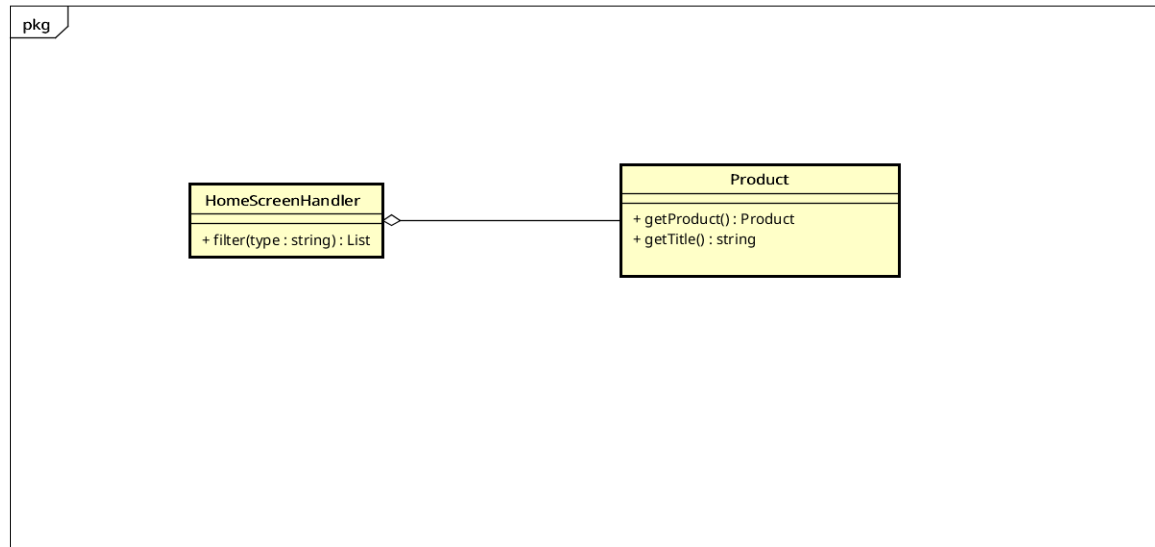


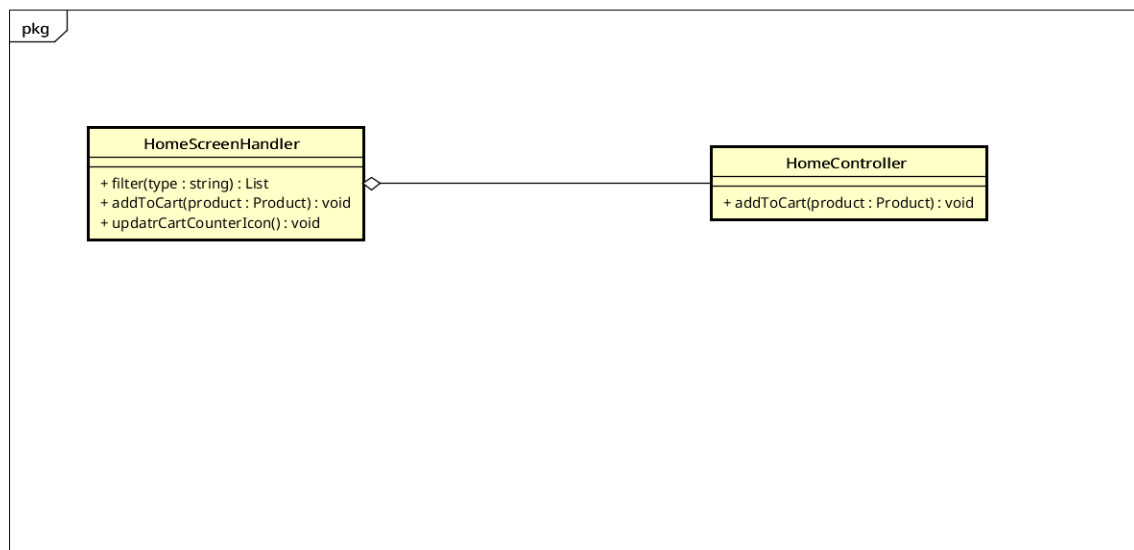
Figure 3.2.2.1: Sequence Diagram of Place Rush Order

3.3 Analysis Class Diagrams

Theo UC

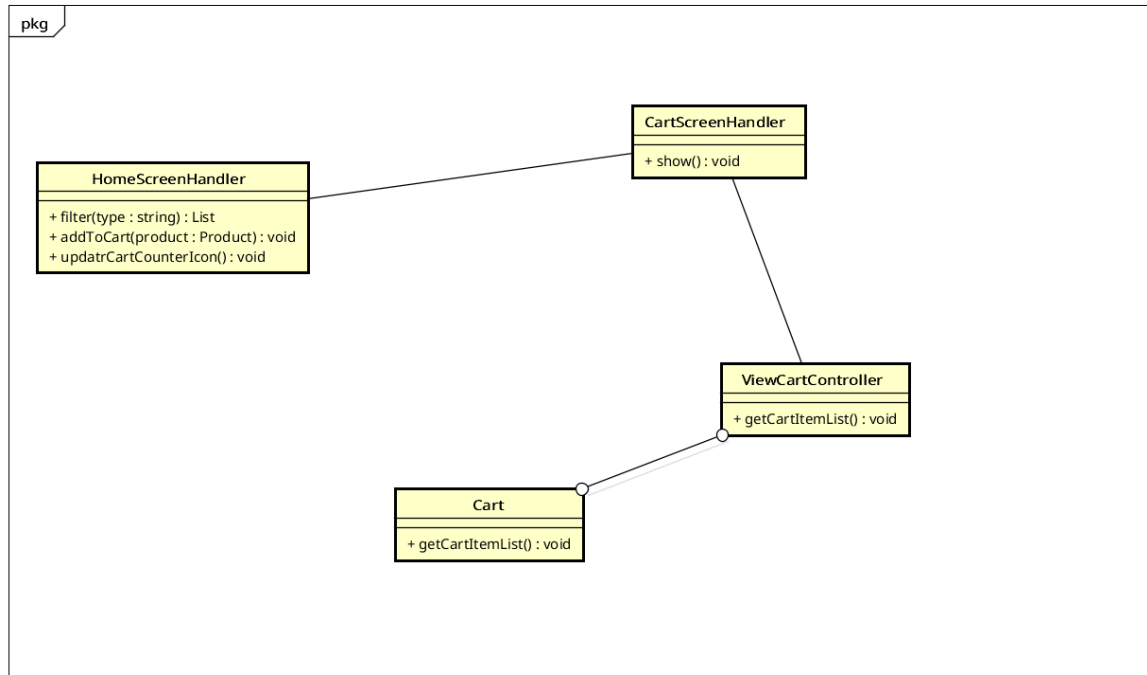


3.4 Figure 3.: Class Diagram for View Products Use Case



3.5

Figure 3.: Class Diagram for Add To Cart Use Case



3.6

Figure 3.: Class Diagram for View Cart Use Case

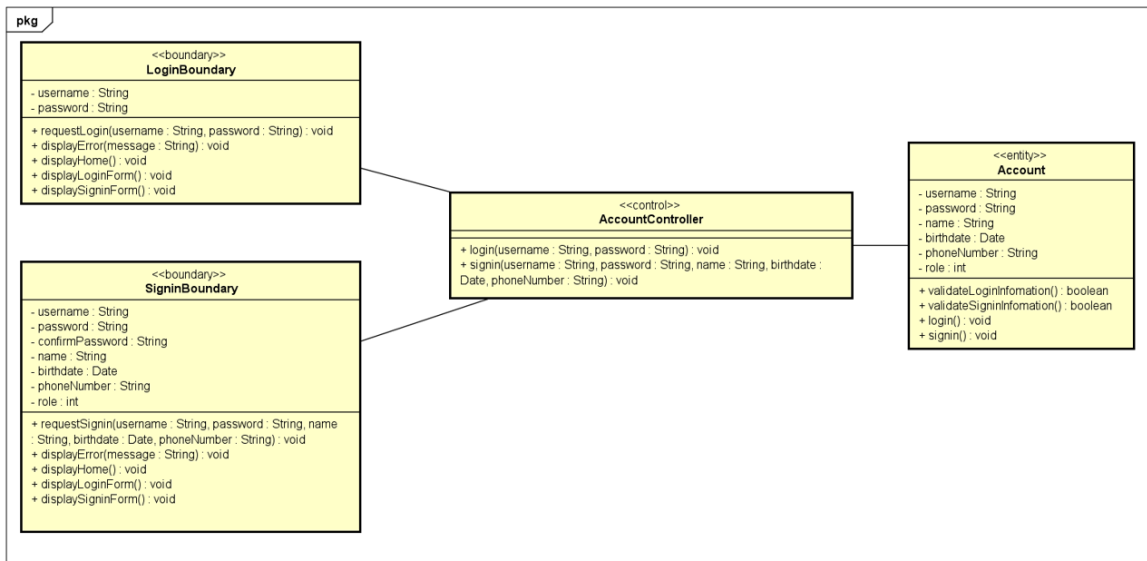


Figure 3.: Class Diagram for Sign-in & log in Use Case

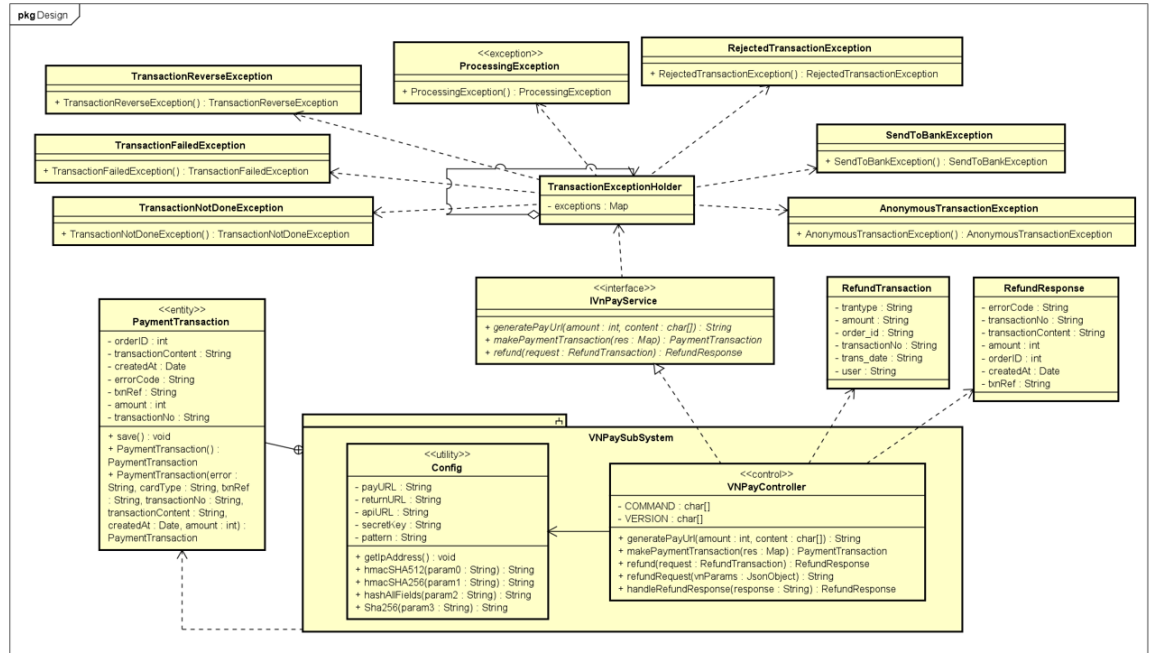


Figure 3.: Class Diagram for Refund Use Case

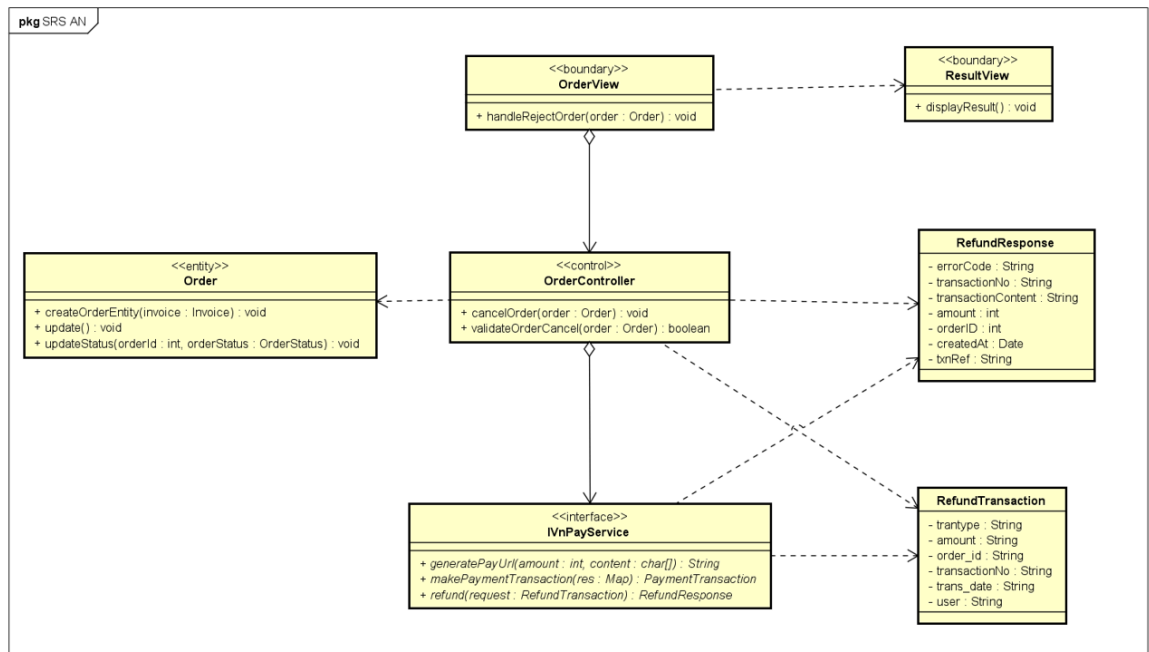


Figure 3.: Class Diagram for Cancel Order Use Case

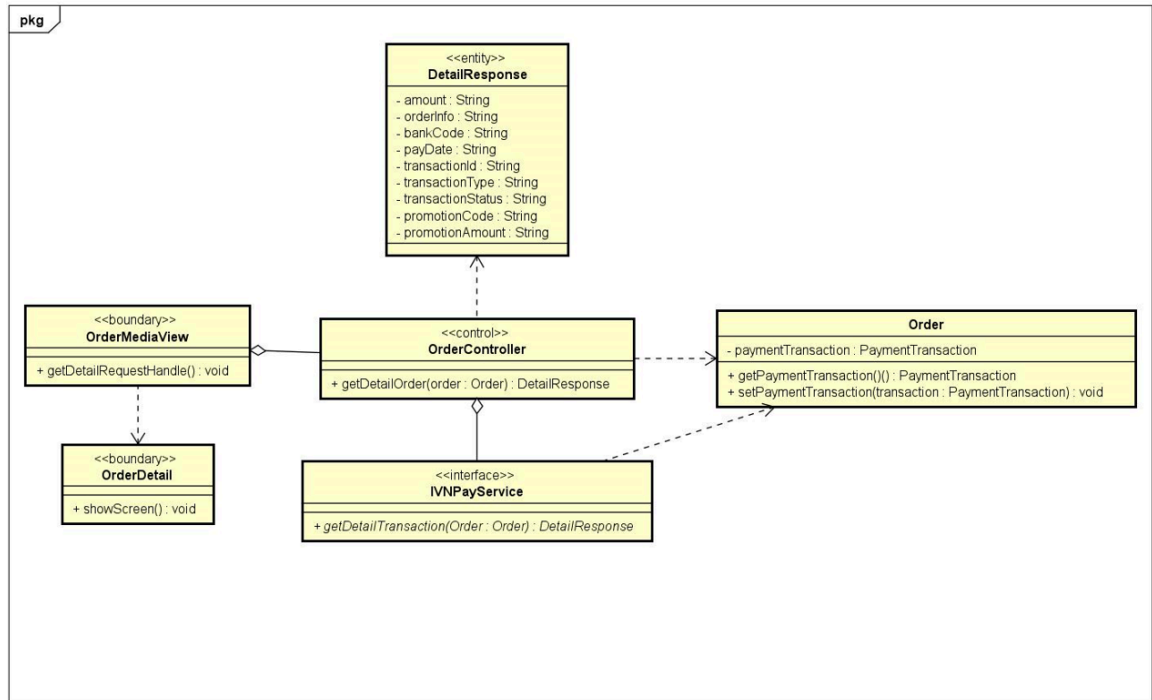


Figure 3.: Class Diagram for Detail Order Use Case

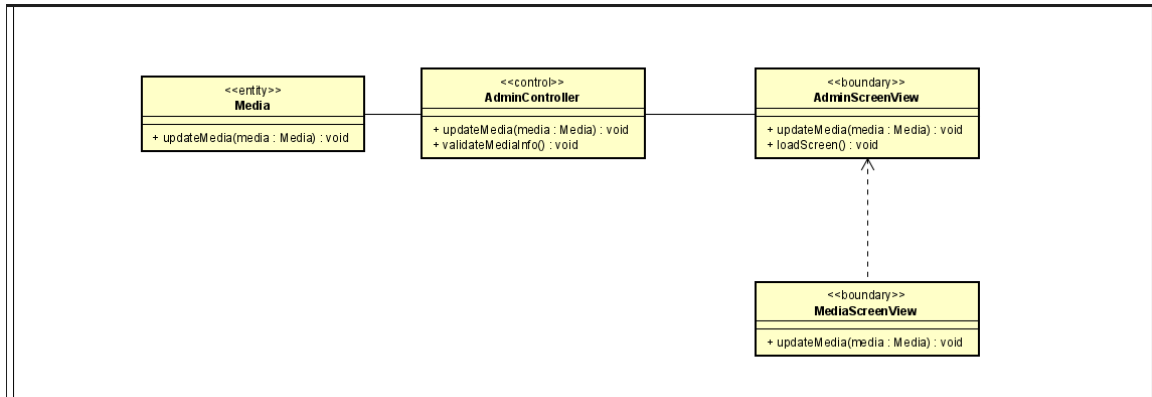


Figure 3.: Class Diagram for Update Media Use Case

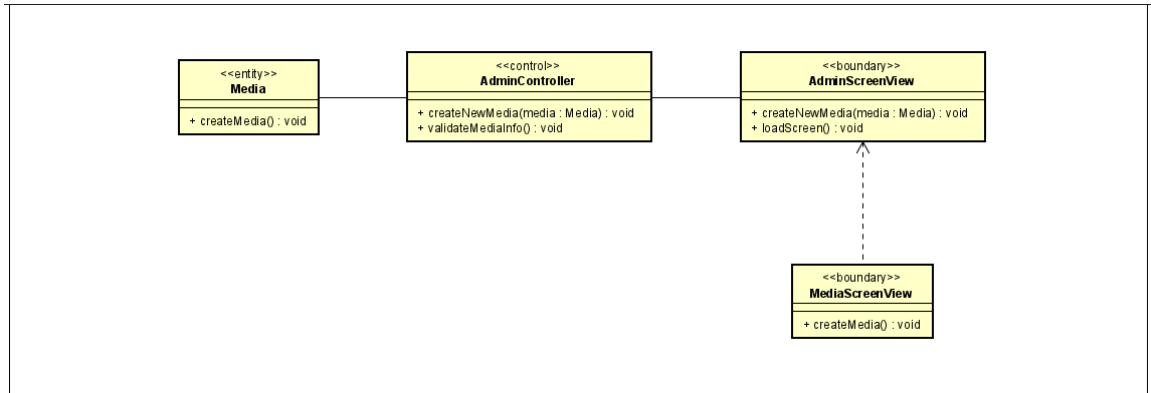


Figure 3.: Class Diagram for Add Media Use Case

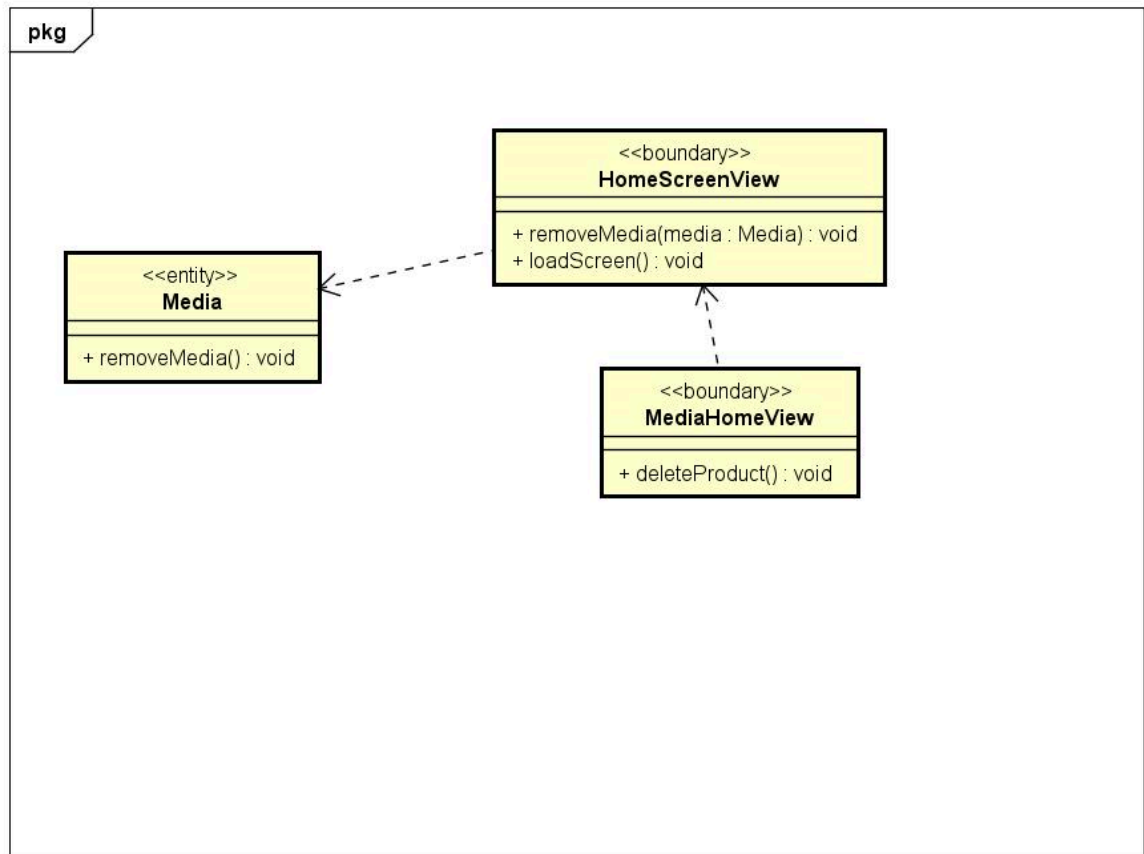


Figure 3.: Class Diagram for Remove Media Use Case

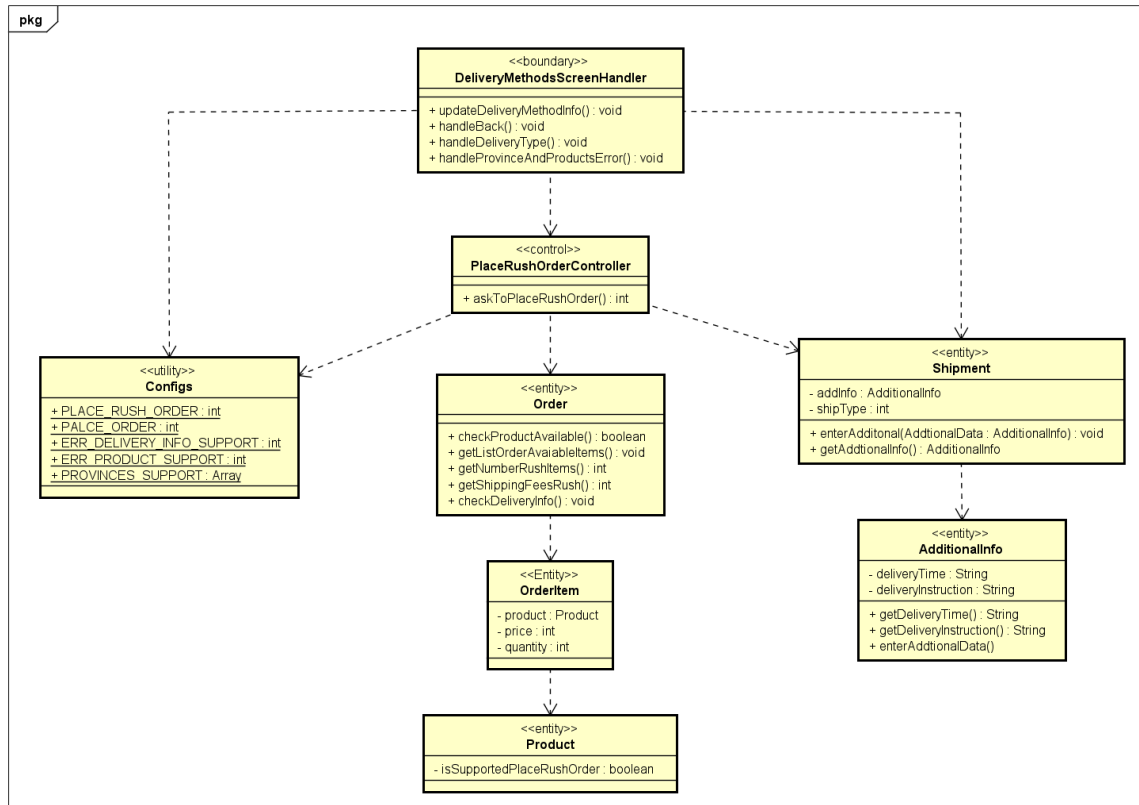


Figure 3.1.: class diagram for place rush order

3.7 Unified Analysis Class Diagram

3.8 Security Software Architecture

<Describe the software components and configuration supporting the security and privacy of the system. Specify the architecture for (1) authentication to validate user identity before allowing access to the system;(2) authorization of users to perform functional activity once logged into the system, (3) encryption protocol to support the business risks and the nature of information, and (4) logging and auditing design, if required.>

4 Detailed Design

4.1 User Interface Design

4.1.1 Screen Configuration Standardization

4.1.1.1 Display

- Number of colors supported: 16,777,216 colors
- Resolution: 1326 x 788 pixels

4.1.1.2 Screen

- Location of standard buttons: At the bottom (vertically) and in the middle (horizontally) of the frame
- Location of the messages: Starting from the top vertically and in the middle horizontally of the frame down to the bottom
- Display of the screen title: The title is located at the top-left of the frame.
- Consistency in expression of alphanumeric numbers: dot for separator of thousand while strings only consist of characters, digits, commas, dots, spaces, underscores, and hyphen symbol

4.1.1.3 Control

- Size of the text: medium size
- Input check process: Check if it is empty or not then check if the input is in the correct format or not
- Sequence of moving focus: There will be no stack frames. Each screen will be separated. However, the manual is considered a popup message, as the main screen cannot be operated while the manual screen is shown. After the opening screen, the app will start the splash screen, and then the first screen (home screen) will appear.

4.1.1.4 Direct input from the keyboard

- There will be no shortcuts
- There are back buttons to move back to the previous screen

4.1.1.5 Error

- A message will be given to notify to user.

4.1.2 Screen Transition Diagrams

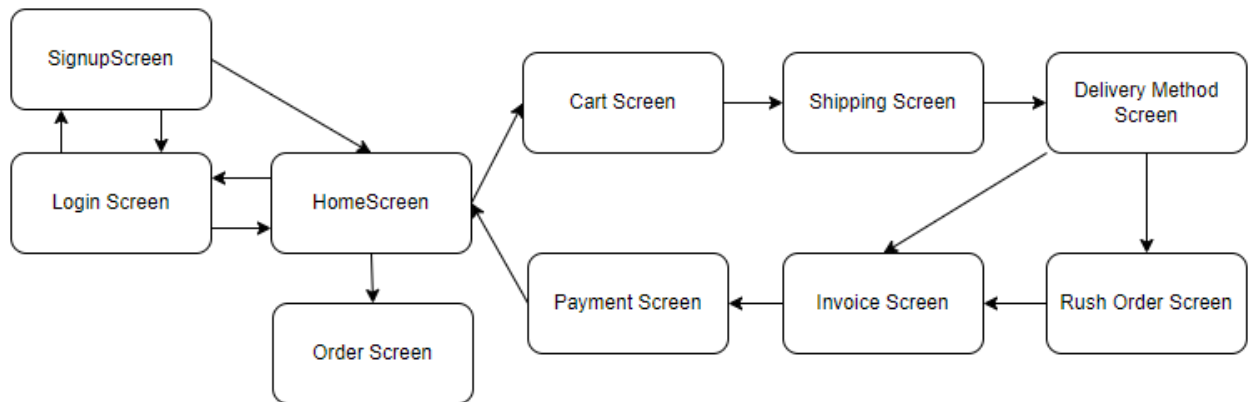
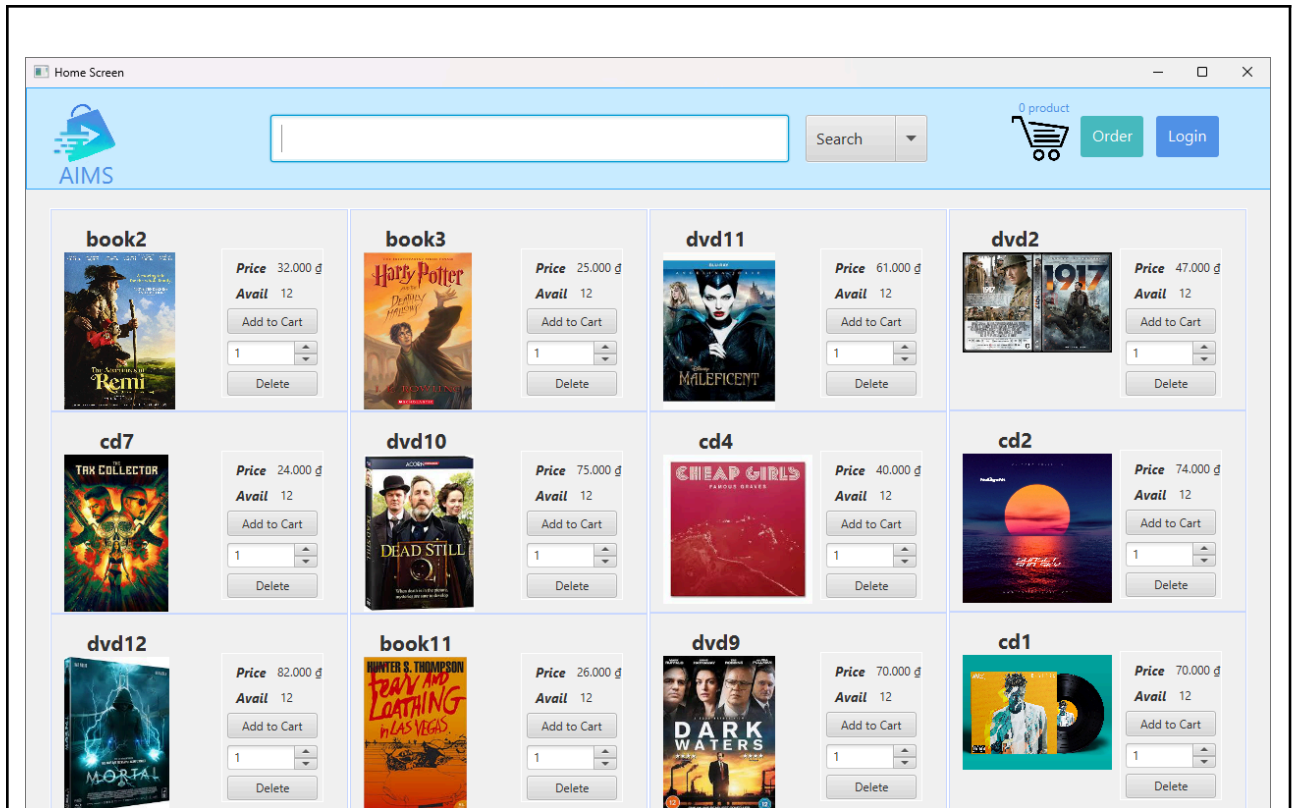


Figure 4.1: Screen Transition Diagrams of AIMS Software

4.1.2.1 Screen Specifications

4.1.2.2 Home Screen

AIMS Software		Person in charge
Screen specification	Home Screen	

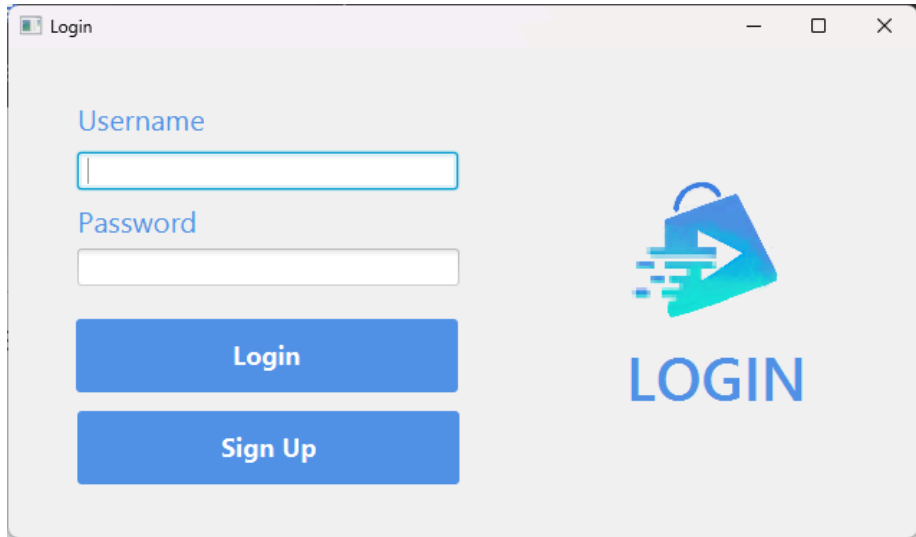


Control	Operation	Function
Area for displaying products	Initial	Display the product with corresponding information
Add to cart button	Click	Add corresponding product to cart
Filter product by options	Click	Display products corresponding with the filter option
Change quantity button	Click	Increase or decrease the quantity of product
Delete button	Click	Delete corresponding product from the list
Search field	Type	Input search content
Search button	Click	Search for content in search field
Login button	Click	Login to customer account

Screen name	Home Screen			
Item Name	Number of digits	Type	Field attribute	Remarks
Media title	50	Numeral	Black	Center

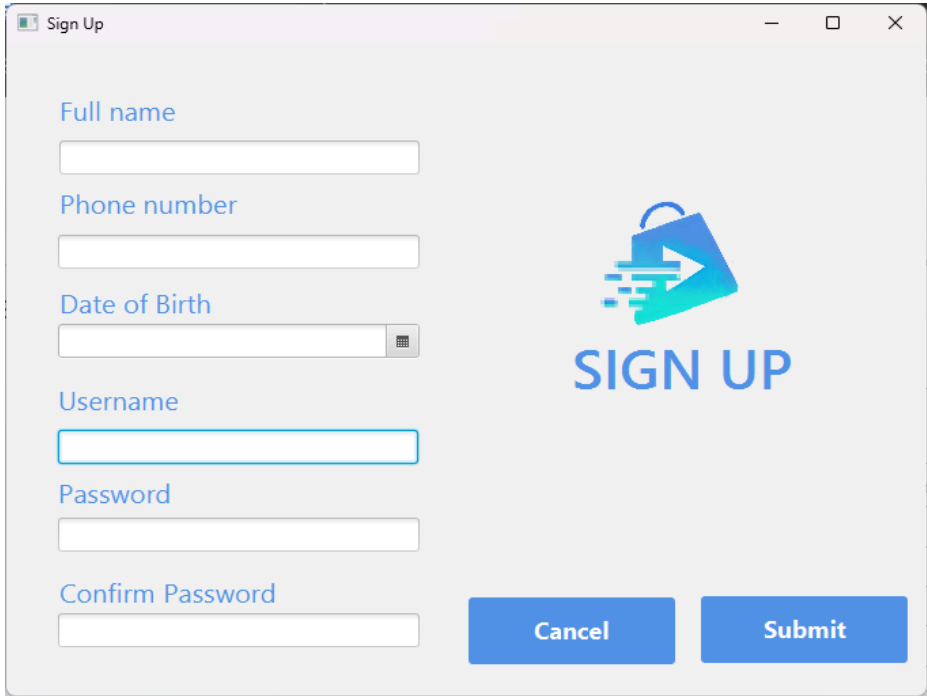
Add to cart button	0	Button		Center
Delete button	0	Button		
Media image	0	Image	Transparent	Center
Input Amount	0	Input		Center
Price	20	Numeral	Black	Center
Available	20	Numeral	Black	Center

4.1.2.3 Login Screen

AIMS Software		Date of creation
Screen specification	Login Screen	
		
Control	Operation	Function
Text area for input username	Input	Input the user name
Text area for input password	Input	Input the password
Login button	Click	Login to account
Sign up button	Click	Sign up new account

Screen name	Login Screen			
Item Name	Number of digits	Type	Field attribute	Remarks
Username	50	Input		Center-left
Password	50	Input		Center-left
Login	0	Button	Blue	Center-left
Sign in	0	Button	Blue	Center-left

4.1.2.4 Signup Screen

AIMS Software		Date of creation
Screen specification	Signup Screen	
		
Control	Operation	Function
Text area for full name	Input	Input the full name

Text area for phone number	Input	Input the phone number
Date picker for date of birth	Picker	Pick the date of birth
Text area for input username	Input	Input the user name
Text area for input password	Input	Input the password
Text area for confirm password	Input	Input the password
Cancel button	Click	Cancel sign up account
Submit button	Click	Submit the information of new account

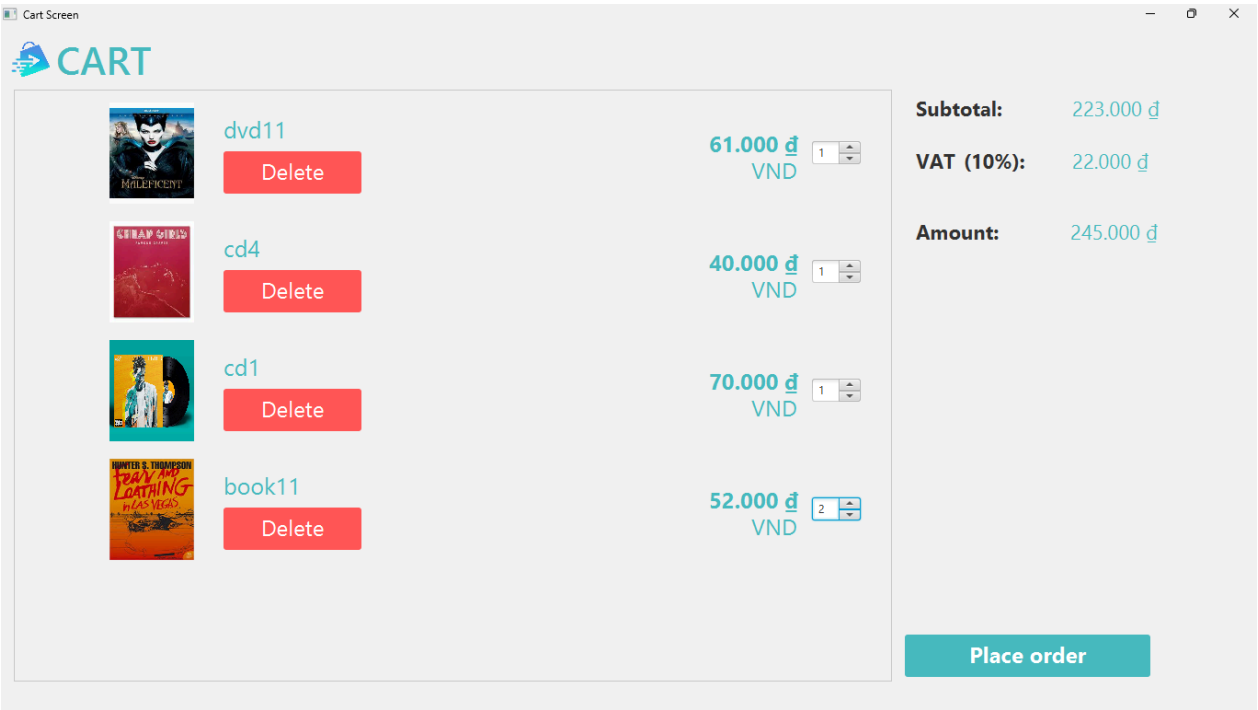
Screen name	Signup Screen			
Item Name	Number of digits	Type	Field attribute	Remarks
Name	50	Input		Center-left
Phone	50	Input		Center-left
Birthdate		Picker		Center-left
Username	50	Input		Center-left
Password	50	Input		Center-left
Cancel	0	Button	Blue	Center-left
Signup	0	Button	Blue	Center-left

4.1.2.5 Order Screen

AIMS Software		Date of creation
Screen specification	Order Screen	
Control	Operation	Function

Screen name	Order Screen			
Item Name	Number of digits	Type	Field attribute	Remarks

4.1.2.6 Cart Screen

AIMS Software		Date of creation
Screen specification	Cart Screen	
		
Control	Operation	Function
Area for displaying the subtotal	Initial	Display the subtotal
Area for displaying the VAT	Initial	Display the VAT

Area for displaying the amount	Initial	Display the amount
Area for display items in the cart	Initial	Display the media with the corresponding information
Place order button	Click	Display the Delivery form
Delete button	Click	Remove the item from the cart
Number input the quantity of product	Click or Input	Input the quantity of product

Screen name	Cart Screen			
Item Name	Number of digits	Type	Field attribute	Remarks
Media title	50	Numeral	Teal	Left-justified
Delete button	0	Button	Red	
Media image	0	Image	Transparent	Left-justified
Input Amount	0	Input		Left-justified
Price	20	Numeral	Teal	Right-justified
Subtotal	50	Numeral	Teal	Left-justified
Amount	50	Numeral	Teal	Left-justified

4.1.2.7 Shipping Screen

AIMS Software		Date of creation
Screen specification	Shipping Screen	

Shipping Screen

SHIPPING

* Name

(a-zA-Z)

* Phone

(0-9) 10 digits

* City

* Address

(a-zA-Z)

Shipping Instructions

(a-zA-Z)

Back

Confirm delivery

Control	Operation	Function
Text area for name	Input	Input the name
Text area for phone number	Input	Input the phone number
Province picker for city	Picker	Pick the city
Text area for address	Input	Input the address
Text area for shipping instructions	Input	Input the shipping instructions

Screen name	Shipping Screen			
Item Name	Number of digits	Type	Field attribute	Remarks
Name	50	Input		Center-left

4.1.2.8 Delivery Method Screen

AIMS Software		Date of creation
Screen specification	Delivery Method Screen	

Delivery method screen
— □ ×

File Help

AIMS DELIVERY METHOD FORM
Back

DELIVERY METHOD INFORMATION

Shipment Details

Delivery Instructions

Delivery time

Shipping method

☐ Fast delivery

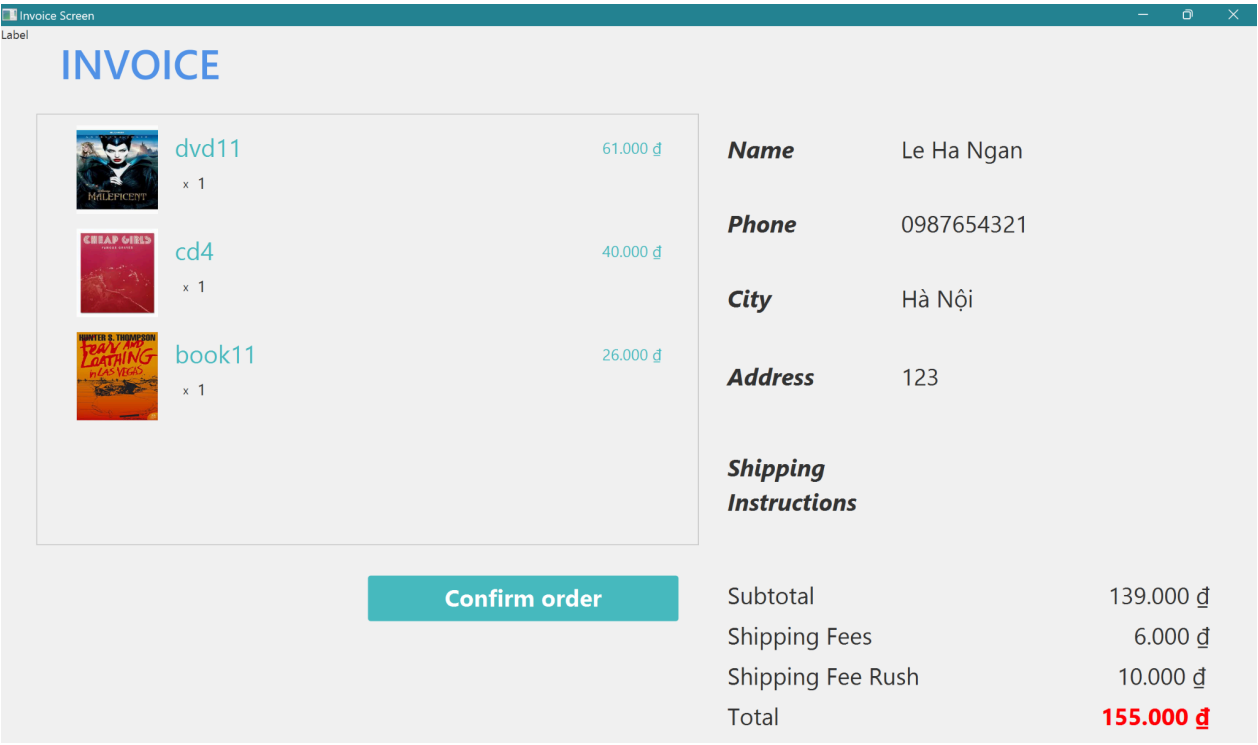
☒ Normal delivery

Update Delivery Method

Control	Operation	Function

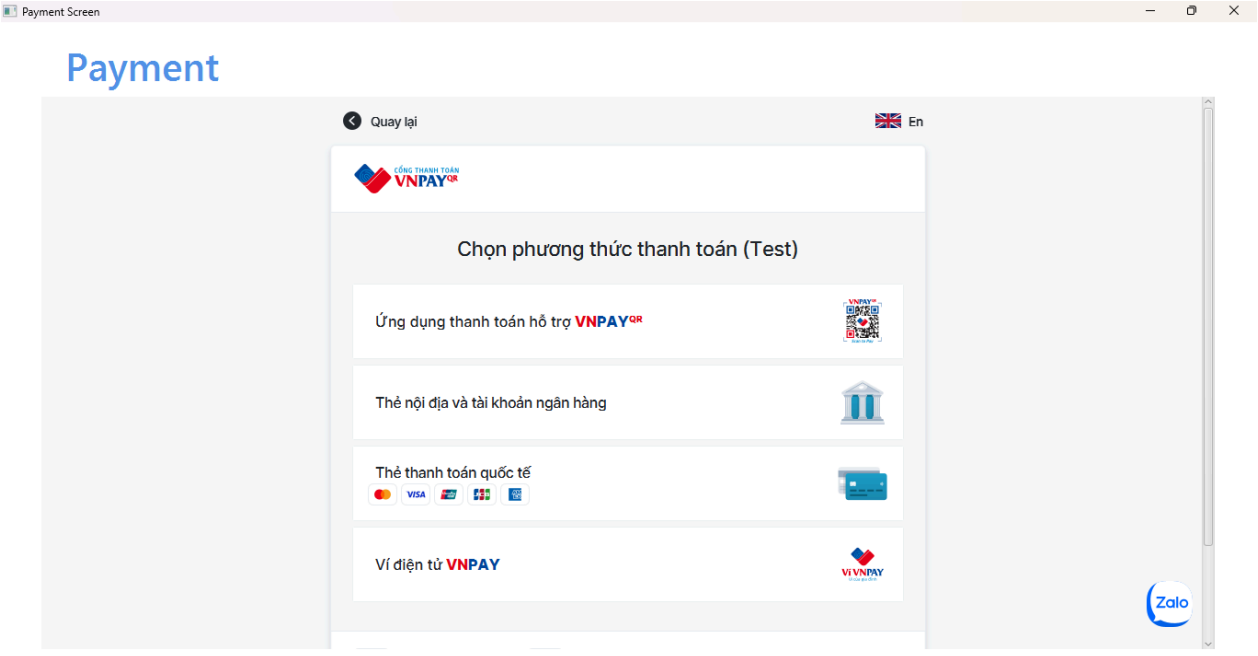
Screen name	Delivery Method Screen			
Item Name	Number of digits	Type	Field attribute	Remarks

4.1.2.9 Invoice Screen

AIMS Software		Date of creation
Screen specification	Invoice Screen	
		
Control	Operation	Function

Screen name	Order Screen			
Item Name	Number of digits	Type	Field attribute	Remarks

4.1.2.10 Payment Screen

AIMS Software		Date of creation
Screen specification	Payment Screen	
		
Control	Operation	Function

Screen name	Payment Screen			
Item Name	Number of digits	Type	Field attribute	Remarks

4.2 Data Modeling

4.2.1 Conceptual Data Modeling

<E-R Diagram image and description of entities and relationships>

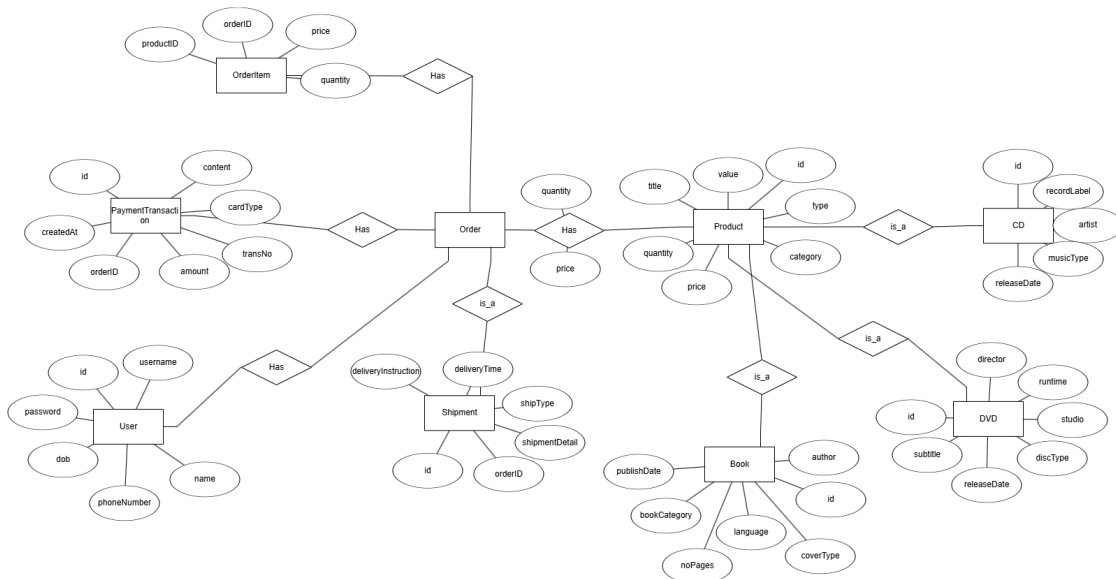
4.2.2 Database Design

4.2.2.1 Database Management System

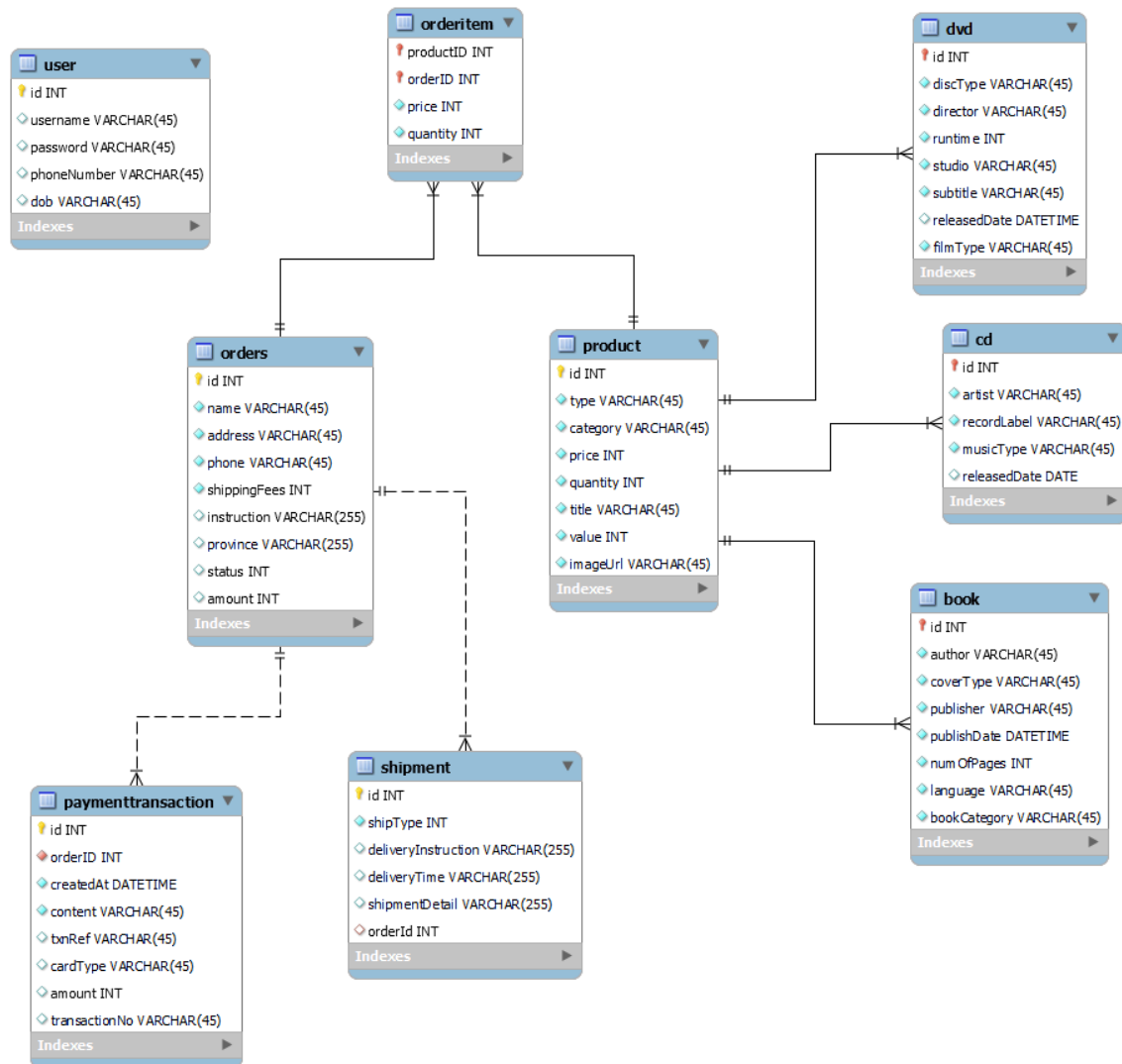
This project uses SQLite3 as the main Database Management System thanks to its portability. SQLite3 is lightweight, making it an excellent choice for applications requiring a simple, embedded database. It is contained within a single library, making it highly portable across different systems and platforms. Unlike traditional DBMSs, SQLite3 operates without a separate server process. It reads and writes directly to ordinary disk files, simplifying deployment and eliminating the need for a dedicated database server. SQLite3 also requires no setup or administration, making it easy to integrate into applications. SQLite3 supports ACID (Atomicity, Consistency, Isolation, Durability) properties, ensuring reliable transactions.

4.2.2.2 Database Diagram

- Entity Relationship Model:



- Logical data model:



4.2.2.3 Database Detail Design

Table 1. Example of table design

- User

#	Column Name	PK	FK	Data type	Mandatory	Description
1.	id	x		Integer	Yes	ID, auto increment
2.	username			Text	Yes	Username
3.	password			Text	Yes	Password

4.	name			Text	Yes	Name of user
5.	birthdate			Text	Yes	Birthdate of user
6.	phoneNumber			Text	Yes	Phone number of user
7.	role			Integer	Yes	Role of user

- Product

#	Column Name	PK	FK	Data type	Mandatory	Description
1.	id	x		Integer	Yes	ID, auto increment
2.	type			Varchar(45)	Yes	Type of media
3.	category			Varchar(45)	Yes	Category type
4.	quantity			Integer	Yes	The remain quantity of media
5.	price			Integer	Yes	Price
6.	title			Varchar(45)	Yes	Title of media
7.	value			Integer	Yes	The weight of the media
8.	imageUrl			Varchar(45)	Yes	Image Url of media

- Book

#	Column Name	PK	FK	Data type	Mandatory	Description
1.	id	x	x	Integer	Yes	ID, auto increment

2.	author			Varchar(45)	Yes	Author
3.	coverType			Varchar(45)	Yes	Cover name
4.	publisher			Varchar(45)	Yes	Publisher
5.	publicationDate			Date	Yes	Publication date
6.	language			Varchar(45)	Yes	Language
7.	numOfPages			Integer	Yes	Number page of the media
8.	genres			Varchar(45)	Yes	Genres
9.	bookCategory			Varchar(45)	Yes	Id from Media table

- DVD

#	Column Name	PK	FK	Data type	Mandatory	Description
1.	id	x	x	Integer	Yes	ID, auto increment
2.	discType			Varchar(45)	Yes	DVD type
3.	director			Varchar(45)	Yes	Director's name
4.	runtime			Integer	Yes	Duration
5.	studio			Varchar(45)	Yes	Studio
6.	subtitles			Varchar(45)	Yes	Subtitles
7.	releaseDate			Date	Yes	Release date
8.	filmType			Varchar(45)	Yes	genres

- CD

#	Column Name	PK	FK	Data type	Mandatory	Description
1.	id	x	x	Integer	Yes	ID, auto increment
2.	artists			Varchar(45)	Yes	Artists
3.	recordLabels			Varchar(45)	Yes	Record labels
4.	musicType			Varchar(45)	Yes	Type of music
5.	releaseDate			Date	Yes	Release date of the CD

- Order

#	Column Name	PK	FK	Data type	Mandatory	Description
1.	id	x		Integer	Yes	ID, auto increment
2.	name			Varchar(45)	Yes	Name of customer
3.	address			Varchar(45)	Yes	Address of customer
4.	phone			Varchar(45)	Yes	Phone number of customer
5.	shippingFees			Integer	Yes	Shipping fees
6.	instruction			Varchar(45)	Yes	Shipping instruction
7.	province			Varchar(45)	Yes	The province of customer
8.	status			Integer	Yes	Order status
9.	amount			Integer	Yes	Amount of media
10.	payDate			Varchar(45)	Yes	The date of payment

- OrderItem

#	Column Name	PK	FK	Data type	Mandatory	Description
1.	media_id	x	x	Integer	Yes	Id from Media table
2.	order_id	x	x	Integer	Yes	Id from order table
3.	price			Integer	Yes	Price
4.	quantity			Integer	Yes	Quantity of media

- PaymentTransaction

#	Column Name	PK	FK	Data type	Mandatory	Description
1.	id	x		Integer	Yes	ID, auto increment
2.	orderId		x	Integer	Yes	Id from Order table
3.	createAt			Datetime	Yes	Time create of the payment
4.	content			Varchar(45)	Yes	Content of the transaction
5.	txnRef			Varchar(45)	Yes	txnRef
6.	cardType			Varchar(45)	Yes	Type of card
7.	amount			Integer	Yes	Amount of payment
8.	transactionNo			Varchar(45)	Yes	Transaction

- Shipment

#	Column Name	PK	FK	Data type	Mandatory	Description
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1.	id	x		Integer	Yes	ID, auto increment
2.	shipType			Integer	Yes	Shipping type
3.	deliveryInstruction			Varchar(45)	No	Delivery instruction
4.	deliveryTime			Varchar(45)	No	Delivery time
5.	shipmentDetail			Varchar(45)	Yes	Detail of shipment
6	orderId		X	Integer	Yes	Id from Order table

4.3 Class Design

4.3.1 General Class Diagram

<General class diagram which shows the whole class diagram of the software. This diagram may have packages, subsystems and classes. Classes in this diagram may not have all attributes and operations>

4.3.2 Class Diagrams

<Detail class diagram with full attributes and operations>

4.3.2.1 Class Diagram for Package A

4.3.2.2 Class Diagram for Subsystem B

...

4.3.3 Class Design

<Detail design for each class>

4.3.3.1 Class “SampleClass1”

<SampleClass1 class image in UML>

Table 1. Example of attribute design

#	Name	Data type	Default value	Description
---	------	-----------	---------------	-------------

1				
2				

Table 1. Example of operation design

#	<i>Name</i>	<i>Return type</i>	<i>Description (purpose)</i>
1			
2			

Parameter:

- x: Default value, description
- y: Default value, description

Exception:

- AException if ...
- BException if ...

Method

How to use parameters / attributes

Flowchart / Sequence diagram if the method has a complex/special algorithm

State

State diagram if any

4.3.3.2 Class “SampleClass2”

...

5 Design Considerations

<Describe issues which need to be addressed or resolved before attempting to devise a complete design solution. Remember that, you have to refactor your source code to strictly follow the final design>

5.1 Goals and Guidelines

- We follow the Passive MVC Pattern to separate concerns.

5.2 Coupling and Cohesion

- *In the old design, the View had direct access to the Product, leading to high coupling. The View was responsible for both UI tasks and updating data, which violated the separation of concerns principle.*
- *The View was performing multiple unrelated tasks, resulting in low cohesion as it was handling both UI and data updates.*
- *The new design separates the UI from data updates by delegating data-related tasks to the Controller. The View no longer accesses the Product directly, which reduces coupling and adheres to the MVC pattern more strictly.*
- *By focusing the View solely on UI tasks and delegating data updates to the Controller, each component now has a single, clear responsibility, leading to higher cohesion.*

5.3 Design Principles

- *The current design follows SRP by using the MVC pattern, where the Model handles data, the View handles UI, and the Controller handles user input.*
- *The current implementation could be improved by adding a Service Tier. For example, `PlaceOrderService` may need to interact with multiple models like `ProductModel`, which will help in adhering to SRP and DIP better.*

5.4 Design Patterns

- *Observer: This app contains many UI interactions, making Active MVC more suitable. To ensure that views automatically update when the model's state changes. The model notifies the registered views (observers) whenever there is a change, allowing the views to update accordingly.*
- *Singleton: The requirement specifies only one Cart throughout the program. To ensure*

that there is a single instance of the Cart accessible globally. The Cart class has a private constructor and a static method to get the single instance, ensuring that only one instance exists.

- Decorator: We need to add new features to the payment module. To extend the functionalities of the payment process without modifying existing code. Wrap the payment object with decorator classes that add the new features dynamically.