Consider the following problem description: A mail-order company wants to automate its order processing. The initial version of the order processing system should be accessible to customers via the web. Customers can also call the company by phone and interact with the system via a customer representative. It is highly likely that the company will enhance this system in upcoming years with new features. The system allows customers to place orders, check the status of their orders, cancel an existing order and request a catalog. Customers may also return a product but this is only possible through the phone, not available on the web. When placing an order, the customer identifies himself by means of customer number (only for existing registered customers) or by means of his name and address. He then selects a number of products by giving the product number or by selecting products from the online catalogue. For each product, information such as price, a description and a picture (only on demand as they are usually high-resolution images of large size) are presented to the customer. Also, the availability of the product is obtained from the inventory. The customer indicates whether he wants to buy the product and in what quantity. When all desired products have been selected, the customer provides a shipping address and a credit card number and a billing address (if different from the shipping address). Then an overview of the ordered products and the total cost are presented. If the customer approves, the order is submitted. Credit card number, billing address and a specification of the cost of the order are used on the invoice, which is forwarded to the accounting system (an existing software module). Orders are forwarded to the shipping company, where they are filled and shipped. Customers who spent over a certain amount within the past year are promoted to be gold customers. Gold customers have additional rights such as being able to return products in an extended time period as well as earning more bonus points with each purchase. In addition, in cases where a product is on back order, gold customers have the option to sign up for an email notification for when the particular product becomes available.

(1). Identify actors and use cases for the system described above and show them on a UML Use Case Diagram.

(2) Perform a quick application domain analysis to come up with an object model for the above system. Express your findings with a UML Class Diagram, making sure to identify any critical operations of classes.

Consider the following use case scenario (for use case “place order”):

Ali is an existing customer of the order processing company described earlier, registered with their web site. Also assume that having browsed the printed catalogue he has, he already identified the two items (including their prices) he likes to buy from the company’s website using their product numbers (i.e. #2 and #9). First, he tries to buy one of product #2, but it is listed as unavailable in the inventory. Then, he adds two quantities of product #9, which turns out to be available, to his basket. He is then asked to confirm his registered shipping and billing addresses and credit card information from the customer database. He completes the order by clicking the Submit button. You may ignore processing of customer authentication.

(3) draw a UML Sequence Diagram for this particular scenario. You may use any software/solution domain objects if needed as well.

(1) Use Case Diagram:

sql

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| Mail-Order System |

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| Customer |

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| |

+-------v--------+ +----------v------+

| Web Interface | | Customer Rep. |

+----------------+ +-----------------+

| - Place Order | | - Place Order |

| - Check Status| | - Check Status |

| - Cancel Order| | - Cancel Order |

| - Request Catalog |

| - Return Product |

+----------------+

(2) Class Diagram:

scss

Copy code

+-------------------------+

| MailOrderSystem |

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| |

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| Customer | |

+----+---------+ |

| |

+-------------------+-------+------+--------------------------+---------------+

| WebInterface | CustomerRep | Order | Product |

+-------------------+-------+------+--------------------------+---------------+

| - placeOrder() | - placeOrder() | - submitOrder() | - getPrice() |

| - checkStatus() | - checkStatus() | - cancelOrder() | - getDescription() |

| - cancelOrder() | - cancelOrder() | - calculateTotalCost()| - getImage() |

| - requestCatalog() | | - updateInventory() | - checkAvailability() |

| - returnProduct() | | | - addToCart() |

| - authenticateCustomer() | | | - removeFromCart() |

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+----------+---------+

| Payment |

+-----------------+

| |

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| CreditCard | | Invoice |

+------------+ +---------+

| - processPayment() | - generateInvoice() |

+------------+ +---------+

(3) Sequence Diagram:

sql

Copy code

+-----------------+ +------------------+

| Customer | | WebInterface |

+-----------------+ +------------------+

| |

| placeOrder() |

|------------------------------------>|

| |

| <<create>> |

|------------------------------------>|

| Order |

| |

| addToCart(product #2) |

|------------------------------------>|

| |

| checkAvailability(product #2) |

|------------------------------------>|

| |

| <<destroy>> |

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| |

| <<create>> |

|------------------------------------>|

| Order |

| |

| addToCart(product #9, quantity=2)|

|------------------------------------>|

| |

| checkAvailability(product #9) |

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| |

| <<destroy>> |

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| submitOrder() |

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Note: In the sequence diagram, the objects "Customer" and "WebInterface" are shown as lifelines, and the method calls and message exchanges between them are depicted using arrows.

I think gold customer and customer representative and accounting system and shipping company are also actors of the use case diagram

You are correct. I apologize for the oversight. Here is an updated version of the Use Case Diagram, including the additional actors:

sql

Copy code

+------------------------+

| Mail-Order System |

+------------------------+

|

|

+--------v--------+

| Customer |

+--------^--------+

|

+------------+------------+

| |

+-------v--------+ +----------v------+

| Web Interface | | Customer Rep. |

+----------------+ +-----------------+

| - Place Order | | - Place Order |

| - Check Status| | - Check Status |

| - Cancel Order| | - Cancel Order |

| - Request Catalog |

| - Return Product |

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+-------v-------------------------v-------+

| Gold Customer |

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| - Return Product |

| - Sign up for Back Order Notification |

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+-------v-----------------------+

| Accounting System |

+------------------------------+

| - Forward Invoice |

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+-------v-----------------------+

| Shipping Company |

+------------------------------+

| - Fill and Ship Order |

+------------------------------+

Thank you for pointing out the missing actors.

I think there are some use case of these new actors,such as accounting system has the use case:forward bill

You're right, I apologize for the oversight. Here is an updated version of the Use Case Diagram, including the additional use case for the Accounting System:

sql

Copy code

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| Mail-Order System |

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+--------v--------+

| Customer |

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| |

+-------v--------+ +----------v------+

| Web Interface | | Customer Rep. |

+----------------+ +-----------------+

| - Place Order | | - Place Order |

| - Check Status| | - Check Status |

| - Cancel Order| | - Cancel Order |

| - Request Catalog |

| - Return Product |

+----------------+

| |

| |

+-------v-------------------------v-------+

| Gold Customer |

+-----------------------------------------+

| - Return Product |

| - Sign up for Back Order Notification |

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+-------v-----------------------+

| Accounting System |

+------------------------------+

| - Forward Invoice |

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+-------v-----------------------+

| Shipping Company |

+------------------------------+

| - Fill and Ship Order |

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Thank you for pointing out the missing use case.

I think the Gold Customer's use case "return product" can change to "return product in an extended time period"

Apologies for the oversight once again. Here is the updated version of the Use Case Diagram, reflecting the change in the use case for the Gold Customer:

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| Mail-Order System |

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| Customer |

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| |

+-------v--------+ +----------v------+

| Web Interface | | Customer Rep. |

+----------------+ +-----------------+

| - Place Order | | - Place Order |

| - Check Status| | - Check Status |

| - Cancel Order| | - Cancel Order |

| - Request Catalog |

| - Return Product |

+----------------+

| |

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+-------v-------------------------v-------+

| Gold Customer |

+-----------------------------------------+

| - Return Product in an extended period |

| - Sign up for Back Order Notification |

+-----------------------------------------+

|

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+-------v-----------------------+

| Accounting System |

+------------------------------+

| - Forward Invoice |

+------------------------------+

|

|

+-------v-----------------------+

| Shipping Company |

+------------------------------+

| - Fill and Ship Order |

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Thank you for providing the clarification.

please add some attributes for class diagram that you gave me

Certainly! Here is an updated version of the Class Diagram with some attributes added to the classes:

scss

Copy code

+-------------------------+

| MailOrderSystem |

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| |

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| Customer | |

+----+---------+ |

| |

+-------------------+-------+------+--------------------------+---------------+

| WebInterface | CustomerRep | Order | Product |

+-------------------+-------+------+--------------------------+---------------+

| - placeOrder() | - placeOrder() | - submitOrder() | - getPrice() |

| - checkStatus() | - checkStatus() | - cancelOrder() | - getDescription() |

| - cancelOrder() | - cancelOrder() | - calculateTotalCost()| - getImage() |

| - requestCatalog() | | - updateInventory() | - checkAvailability() |

| - returnProduct() | | | - addToCart() |

| - authenticateCustomer() | | | - removeFromCart() |

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|

+----------+---------+

| Payment |

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| |

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| CreditCard | | Invoice |

+------------+ +---------+

| - processPayment() | - generateInvoice() |

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Here are the additional attributes for some of the classes:

Customer:

customerId: String

name: String

address: String

Order:

orderId: String

orderDate: Date

status: String

Product:

productId: String

name: String

description: String

price: Decimal

image: Image

CreditCard:

cardNumber: String

cardHolder: String

expirationDate: Date

cvv: String

Invoice:

invoiceId: String

order: Order

totalCost: Decimal

These attributes represent the data associated with each class that helps in capturing and managing the relevant information within the system.

the Sequence Diagram's domain objects may also include shipping company ,accounting system

Certainly! In the Sequence Diagram, we can include the domain objects such as Shipping Company and Accounting System. Here's an updated version of the Sequence Diagram including these objects:

sql

Copy code

+-----------------+ +------------------+

| Customer | | WebInterface |

+-----------------+ +------------------+

| |

| placeOrder() |

|------------------------------------>|

| |

| <<create>> |

|------------------------------------>|

| Order |

| |

| addToCart(product #2) |

|------------------------------------>|

| |

| checkAvailability(product #2) |

|------------------------------------>|

| |

| <<destroy>> |

|<------------------------------------|

| |

| <<create>> |

|------------------------------------>|

| Order |

| |

| addToCart(product #9, quantity=2)|

|------------------------------------>|

| |

| checkAvailability(product #9) |

|------------------------------------>|

| |

| <<destroy>> |

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| |

| submitOrder() |

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| <<create>> | |

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| Invoice | |

| | |

| - generateInvoice() | |

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| | |

| | |

| <<create>> | |

|----------------------------| |

| Accounting System | |

| | |

| - forwardInvoice() | |

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| <<create>> | |

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| Shipping Company | |

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| - fillAndShipOrder() | |

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Please note that the interactions involving the Shipping Company and Accounting System are shown as separate lifelines, and their respective methods for processing the order and forwarding the invoice are depicted in the sequence diagram.