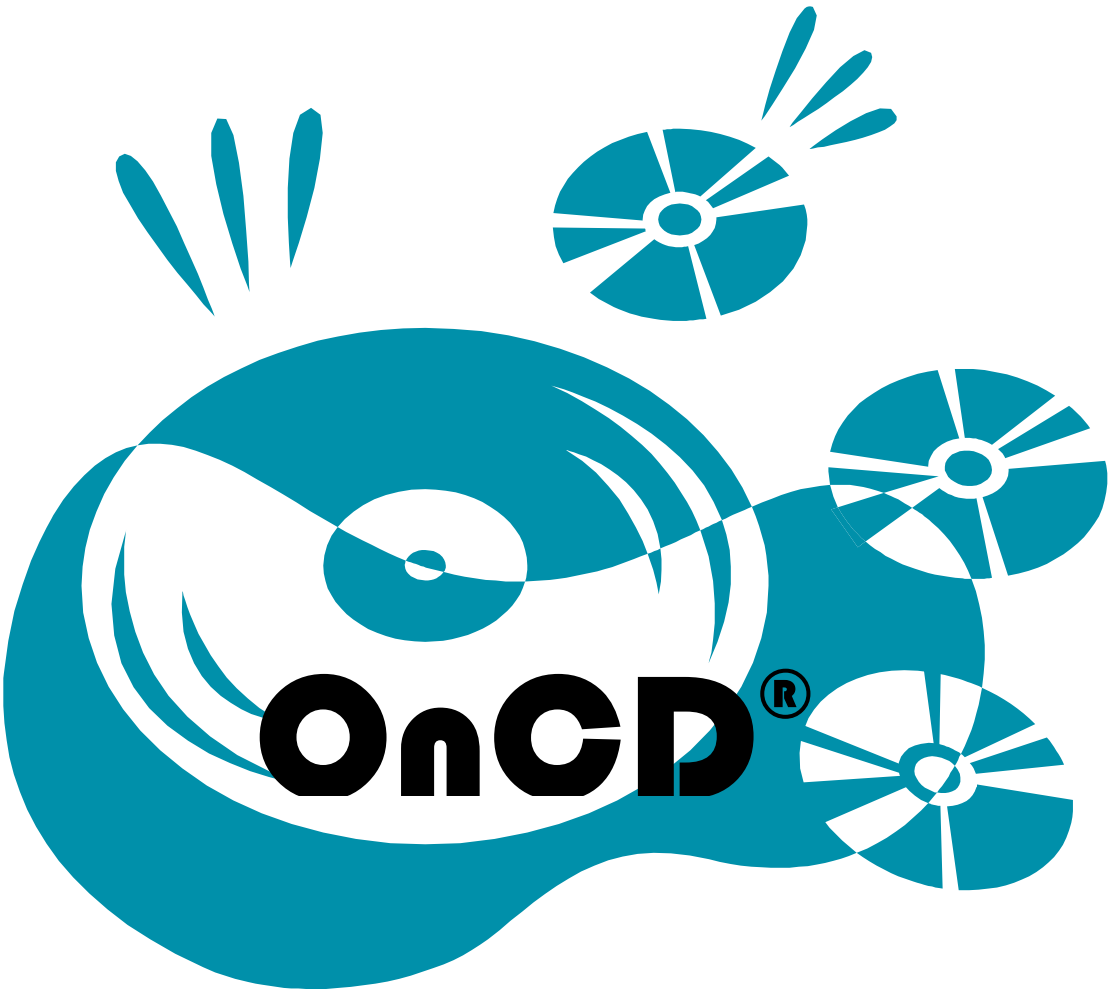

Analysis and design of an online CD sales and inventory system

INFO620: Information Systems Analysis and Design
Term Project
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Introduction

Most Americans are familiar with online merchandise ordering systems in one form or another. There has been such a rapid growth of electronic commerce over the past few years that buying many goods online has become the norm for a large portion of the American population. It is not uncommon for someone to do his entire holiday gift shopping online, not having to set foot in a store to find that perfect gift for everyone on his list. This growth and flourish of online purchasing has been fueled not only by America's large companies, but also by many smaller, local businesses.

This analysis and design project has been focused on creating an online ordering system for one such smaller, local business. In this case, the business is a CD retail store. The system that is being created is called OnCD. The main functionality of the OnCD system is concerned with the placing and fulfilling of purchase orders, the purchase of merchandise, that are shipped to homes or are held for in-store pick-up. The system is web-enabled, allowing customers to place their own purchase orders online. As such, it also must be able to manage customer records, allowing customers to create and modify user accounts so that staff members can accurately handle purchase orders.

The OnCD system is also charged with keeping track of store inventory. Thus, the system must have the capacity to store information about CDs, the merchandise offered by the store, artists and music in general. Because it is managing inventory, it also must allow staff members to monitor inventory levels and order more stock when inventory is low. In order to maintain inventory information, the OnCD system must be able to track information about distributors, inventory orders, merchandise purchases and merchandise returns. The OnCD system must also successfully interface with the existing physical point of sale system that exists to handle in store purchase transactions in order to maintain accurate inventory information.

This project has been approached using an iterative object-oriented analysis and design methodology. This paper represents the work that has been done over the first two iterations of this project. The first iteration was used to discover and describe at a superficial level, many of the use cases that are important to the functionality of the OnCD system. The second iteration was a typical second iteration in that it focused on a single important primary use case and its associated included use cases. It was not typical in that it encompassed a large amount of both analysis and design work on that single primary use case.

This project documentation is separated into three main sections: System Analysis, System Design and Physical Design. The System Analysis section presents the diagrams and documentation that were produced as part of the analysis phase of this project. The section begins with a short overview of the problem space and high-level general system requirements. It then presents a use case diagram that is accompanied by high-level actor and use case descriptions. A detailed used case description of the chosen primary use case follows. The analysis section concludes with the presentation of a domain model.

The second major section, System Design, contains all the models and documentation that were produced as part of the design phase of this project. It begins with a high-level system sequence diagram for the chosen use case. This diagram is then elaborated upon within the seven detailed sequence diagrams that follow. A design class diagram follows this; this diagram includes the operations identified in the detailed sequence diagrams as well as navigability and reference attributes. Finally, a state diagram is shown for the 'Order' class. The final section, Physical Design, contains limited information regarding the physical design of the OnCD system. This section includes a relational database schema and a deployment diagram. Please note that all models that appear in this project documentation were produced using the Unified Modeling Language (UML) standard on either Microsoft Visio or Rational Rose software.

These major sections are followed by a few minor sections. The first of these is a short analysis of the project. The second offers some information about what I learned from completing this project. The last section of the paper is a list of references that were used during this project. The two appendices to this paper contain copies of the original project description and original project proposal to help the reader better understand the problem space.

System Analysis

This section contains models and written documentation that are associated with the system analysis phase of this project.

Problem Space

A local CD retail store would like to create an online ordering system to allow customers to order CDs online. The system will also be responsible for keeping track of inventory.

Overall goals of the system: The overall goals of the system are to allow for the placement, tracking and fulfillment of online customer orders and to track inventory.

Importance of the system: The OnCD system is important for two main reasons. The first is that the system will allow the local CD store to get more business by tapping into the online music sales market. Second is that the system will help the store keep track of inventory, a daunting and important task for any retailer.

Scope of the project: The OnCD system will handle the placement, fulfillment and tracking of all online orders and returns. The system will also be responsible for keeping track of the inventory for the store, both online and in store. Handling the placement and fulfillment of stock orders will also be the responsibility of the OnCD system. The system will not be responsible for tracking in store orders and returns

Please note: A copy of the original problem statement can be found in Appendix A and a copy of the original project proposal can be found in Appendix B.

Requirements

Functional Requirements

The OnCD system is a multi-user system that will be accessed using password protected logins. The following is a list of functions that the OnCD system needs to be able to perform:

(1) Login/Logout
(2) Create customer account
(3) Manage customer account
    a. Manage addresses
    b. Manage credit cards
    c. Manage email address
(4) Create staff account
(5) Manage staff account
    a. Change job function
(6) Create distributor record
(7) Manage distributor record
    a. Manage address
    b. Manage telephone number
    c. Manage fax number
(8) Create CD record

(9) Manage CD record
(10) Create Artist record
(11) Manage Artist record
(12) Place purchase order
(13) Check purchase order status
(14) Place inventory order
(15) Check inventory order status
(16) Process return
(17) Back-up system
(18) Start/stop system
(19) Restore system
(20) Generate reports
    a. Monthly online sales report
    b. Weekly current customer report
    c. Daily unfulfilled purchase orders report
(21) Search inventory
    a. Search by artist
    b. Search by title
    c. Search by genre
(22) Browse inventory
    a. Browse by artist
    b. Browse by genre
(23) Play sample tracks
(24) Create CD reviews
    a. Review by customer
    b. Review by staff
    c. Review by artist
(25) View CD reviews
(26) Track email communication with customers

Business Rules

The following is a list of the high level business rules that will govern the OnCD system:

- All discounts and promotions that are available in store will be made available online.
- Returned products, if not damaged, will be added back into the salable inventory.
- Each product will be supplied by one and only on distributor.
- The total order charge of an online purchase order includes the product subtotal, applicable taxes and appropriate shipping charges.
- In-store pick-up is available as a delivery option at no charge.
- Credit cards accepted by OnCD are Visa, Mastercard, American Express and Discover.

Important Assumptions

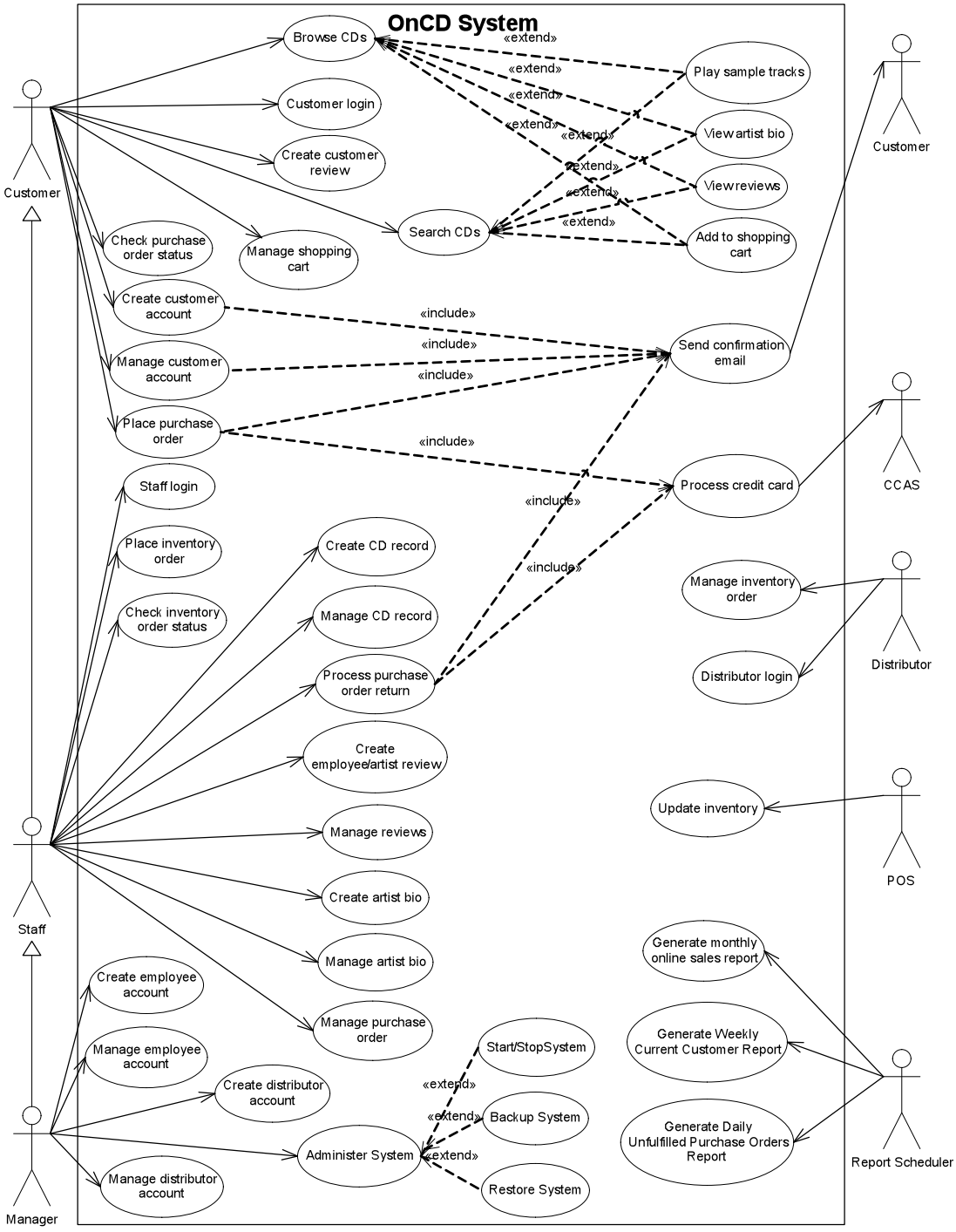
- It is assumed that all payments will be made by credit card.
- It is assumed that the local CD store has only one physical location.
- It is assumed that the OnCD system will have to interface with a pre-existing in-store point-of-sale system for the purposes of maintaining store inventory.
- It is assumed that all merchandise sold by the store is CDs and all merchandise will be made available for purchase online.

Use Case Diagram

The following use case diagram is for the entire OnCD system. It includes all use cases identified during the analysis phase of this project. As can be seen in the model, there are two ways that a customer is able to locate and access information about CDs in the OnCD system, browsing and searching. These two use cases are distinguished mainly by their modes of interaction; as can be seen by their extending use cases, both are concerned with access to the same functionality.

Important assumptions used in the Use Case Diagram

- The manager shall have access to all functionality that a general staff member does.
- Staff members should have access to all functionality that a customer does.
- The 'manage purchase order' use case is mainly for purchase order fulfillment purposes.
- Inventory orders are those orders that are placed by staff members to maintain in store inventory; purchase orders are those that are placed by customers or staff members to purchase products from the available inventory.
- A confirmation email should be sent to the customer whenever:
    - A customer account is created
    - An address that is associated with a customer record is changed
    - Credit card information that is associated with a customer record is changed
    - A purchase order is placed
    - A return is processed


OnCD System
Browse CDs
Customer login
Create customer review
Search CDs
Check purchase order status
Manage shopping cart
Create customer account
Manage customer account
Place purchase order
Staff login
Place inventory order
Check inventory order status
Create CD record
Manage CD record
Process purchase order return
Create employee/artist review
Manage reviews
Create artist bio
Manage artist bio
Manage purchase order
Create employee account
Manage employee account
Create distributor account
Manage distributor account
Administer System
Start/StopSystem
Backup System
Restore System
Play sample tracks
View artist bio
View reviews
Add to shopping cart
Send confirmation email
Process credit card
Manage inventory order
Distributor login
Update inventory
Generate monthly online sales report
Generate Weekly Current Customer Report
Generate Daily Unfulfilled Purchase Orders Report
«extend»
«include»
Customer
Staff
Manager
CCAS
Distributor
POS
Report Scheduler

Actor Descriptions

The follow is a list of the actors that appear in the Use Case Diagram and in the descriptions that follow. Each entry is accompanied by a short description of the actor's role or importance.

Customer

This actor is the main online customer of OnCD. Customer is able to open an account and place purchase orders for delivery or pick-up in store.

Staff

This is the general staff category. These staff members will keep track of inventory, process returns and ship purchase orders.

Manager

This is the manager/owner of the store. This person controls employee and distributor access to the system and is responsible for the general administrative system functionality.

CCAS

This is the credit card authorization system. It is an external system with which the OnCD system must be able to interact.

Distributor

This actor represents the representatives of CD distribution companies that are given access to the OnCD system to receive inventory orders and update the orders when shipped.

Report Scheduler

This is another in-house system that takes care of running and distributing regularly scheduled reports. The OnCD system must be able to interface with this system.

POS

This is the point-of-sale system that exists in-house to handle in-store purchases and returns. The OnCD system must be able to interface with this system.

High Level Use Case Descriptions

The following are short, high level descriptions of all the use cases that appear in the Use Case Diagram. Each entry provides the use case number, use case name (appears in the Use Case Diagram), the primary actor or actors, the goal or purpose of the use case and a very brief overview of the use case.

Use Case #: 1
Use Case Name: Customer login
Actor(s): Customer
Goal/Purpose: To authenticate Customer identity
Overview: The customer authenticates his/her identity in order to gain access to his/her account information. This authentication helps control access to personal information. Once authenticated, the customer can create, view and update account information.

Use Case #: 2
Use Case Name: Browse CDs
Actor(s): Customer
Goal/Purpose: To allow Customer to browse inventory
Overview: The customer is able to browse the CD collection by genre or artist.

Use Case #: 3
Use Case Name: Play sample tracks
Actor(s):
Goal/Purpose: To allow Customer to play a sample track
Overview: The customer is able to listen to sample tracks from the album or artist that he/she is viewing at the moment.

Use Case #: 4
Use Case Name: View artist bio
Actor(s):
Goal/Purpose: To allow Customer to view an artist biography
Overview: The customer is able to view the artist biographical information including any combination of album history, tour history, and personal history.

Use Case #: 5
Use Case Name: View reviews
Actor(s):
Goal/Purpose: To allow Customer to view CD reviews
Overview: The customer is able to view reviews about the current CD. These reviews can come from OnCD employees, other customers and artists.

Use Case #: 6
Use Case Name: Create customer review
Actor(s): Customer
Goal/Purpose: To allow Customer to create a CD review
Overview: The customer is able to add his/her own CD review. The customer must choose the album to which the review will be associated. The customer enters a rating our of 5 stars and has the ability to enter narrative, descriptive text to accompany the rating.

Use Case #: 7
Use Case Name: Check purchase order status
Actor(s): Customer
Goal/Purpose: To allow Customer to check the status of orders
Overview: The customer is able to view the status of the purchase orders he/she has placed. The status should show whether the items have been shipped. If the merchandise has been shipped, the customer should have access to the tracking information and the estimated arrival date.

Use Case #: 8
Use Case Name: Create customer account
Actor(s): Customer
Goal/Purpose: To allow Customer to create an account
Overview: The customer is able to create an account. The customer chooses a username and password. The customer also enters information such as name, shipping address(es), billing address(es), contact telephone number, email address, music preferences and credit card information.

Use Case #: 9
Use Case Name: Manage customer account
Actor(s): Customer

Goal/Purpose: To allow Customer to change account information
Overview: The customer is able to manage the information in his/her account. The customer can make changes to the name, shipping address(es), billing address(es), contact telephone number, email address, music preferences and credit card information.

Use Case #: 10
Use Case Name: Place purchase order
Actor(s): Customer
Goal/Purpose: To allow Customer to order CDs
Overview: The customer is able to place an order for CDs, chose a shipping method, destination and payment option.

Use Case #: 11
Use Case Name: Send confirmation email
Actor(s):
Goal/Purpose: To send email to Customer confirming orders and account changes
Overview: Confirmation emails should be sent to confirm the placing of an order. A confirmation email should also be sent when any change is made to a customer account.

Use Case #: 12
Use Case Name: Process credit card
Actor(s):
Goal/Purpose: To process payment by credit card
Overview: Information about payments by credit card need to be recorded.

Use Case #: 13
Use Case Name: Staff login
Actor(s): Staff
Goal/Purpose: To authenticate Staff identity
Overview: The staff member authenticates his/her identity in order to gain access to the OnCD system. This authentication helps control access to personal information. Once authenticated, the staff member can change customer information, purchase order information and inventory information and place inventory orders.

Use Case #: 14
Use Case Name: Place inventory order
Actor(s): Staff
Goal/Purpose: To allow Staff to order inventory from distributors
Overview: The staff member is able to place an inventory order with distributors.

Use Case #: 15
Use Case Name: Check inventory order status
Actor(s): Staff
Goal/Purpose: To allow Staff to check the status of an inventory order
Overview: The staff member is able to check the status of the inventory orders that have been placed. The staff member should be able to see whether the order has shipped and, if it has, its estimated arrival date.

Use Case #: 16
Use Case Name: Process purchase order return
Actor(s): Staff
Goal/Purpose: To allow Staff to process the return of items
Overview: The staff member is able to process the return of items and issue refunds to customers. The reason for return should also be noted in order to update inventory correctly and keep track of customer needs/wants.

Use Case #: 17
Use Case Name: Create CD record
Actor(s): Staff
Goal/Purpose: To allow Staff to add a new CD record
Overview: The staff member is able to enter all information pertaining to a particular CD. This information should include at least the artist name, album title, release date, price and distributor.

Use Case #: 18
Use Case Name: Manage CD record
Actor(s): Staff
Goal/Purpose: To allow Staff to view, update and delete CD records
Overview: The staff member is able to view, update and delete CD records. This will be used most often when distributors change.

Use Case #: 19
Use Case Name: Create employee/artist review
Actor(s): Staff
Goal/Purpose: To allow Staff to create a review of his/her own or by an artist
Overview: The staff member is able to create a new review. This review can be the staff member's personal review or he/she could be entering a review OnCD received from an artist.

Use Case #: 20
Use Case Name: Manage reviews
Actor(s): Staff
Goal/Purpose: To allow Staff to view, update and delete CD reviews
Overview: The staff member should be able to manage the CD reviews. A common reason to update a review is to correct grammatical mistakes. Some reviews may be deleted because they are inappropriate or offensive.

Use Case #: 21
Use Case Name: Create artist bio
Actor(s): Staff
Goal/Purpose: To allow Staff to create an artist biography
Overview: The staff member is able to create and artist biography. This biography will be viewable from each CD record during browsing and should include at least the artist name and general musical description.

Use Case #: 22
Use Case Name: Manage artist bio
Actor(s): Staff
Goal/Purpose: To allow Staff to view, update and delete an artist biography
Overview: The staff member is able to view, update and delete any information in an artist biography.

Use Case #: 23
Use Case Name: Manage purchase order
Actor(s): Staff
Goal/Purpose: To allow Staff to view and update purchase orders
Overview: The staff member is able to view purchase orders and their statuses. The are also able to update aspects of the purchase order because of corrections and/or because the CDs have been shipped.

Use Case #: 24
Use Case Name: Create employee account
Actor(s): Manager
Goal/Purpose: To allow Manager to create an employee account

Overview: The manager is able to create a new employee account. This should include at lease the employee name and hire date.

Use Case #: 25
Use Case Name: Manage employee account
Actor(s): Manager
Goal/Purpose: To allow Manager to view, update or delete an employee account
Overview: The manager is able to view, update or delete any information in an employee account.

Use Case #: 26
Use Case Name: Create distributor account
Actor(s): Manager
Goal/Purpose: To allow Manager to create a distributor account
Overview: The manager is able to create a distributor account. The account should include at least the distributors name, address and contact information.

Use Case #: 27
Use Case Name: Manage distributor account
Actor(s): Customer
Goal/Purpose: To allow Manager to view, update or delete a distributor account
Overview: The manager is able to view, update or delete information in a distributor account.

Use Case #: 28
Use Case Name: Manage inventory order
Actor(s): Distributor
Goal/Purpose: To allow Distributor to view and update inventor orders
Overview: The distributor is allowed to view inventory orders from OnCD. The distributor may also update the status of an order, such as when the order shipped and its expected arrival date.

Use Case #: 29
Use Case Name: Distributor login
Actor(s): Distributor
Goal/Purpose: To authenticate Distributor identity
Overview: The distributor agent authenticates his/her identity in order to gain access to the OnCD system. This authentication helps control access to personal information. Once authenticated, the distributor agent can view and update inventory orders they have received.

Use Case #: 30
Use Case Name: Generate monthly online sales report
Actor(s): Report Scheduler
Goal/Purpose: To automatically generate and distribute a monthly online sales report
Overview: The scheduler automatically generates a monthly online sales report. The report is then emailed to the manager.

Use Case #: 31
Use Case Name: Search CDs
Actor(s): Customer
Goal/Purpose: To allow Customer to search the inventory
Overview: The customer is able to search for a specific CD by title, artist or genre.

Use Case #: 32
Use Case Name: Administer System
Actor(s): Manager
Goal/Purpose: To allow Manager to perform various administrative functions

Overview: The manager is able to perform several high-level administrative functions. This includes access to the following high-level functionality: starting the system, stopping the system, backing up the system and restoring the system.

Use Case #: 33
Use Case Name: Start/Stop System
Actor(s):
Goal/Purpose: To allow Manager to start and stop the system
Overview: The manager is able to start and stop the system.

Use Case #: 34
Use Case Name: Backup System
Actor(s):
Goal/Purpose: To allow Manager to backup the system
Overview: The manager is able to back up all data on the system and save it to a disk external to the main server.

Use Case #: 35
Use Case Name: Restore System
Actor(s):
Goal/Purpose: To allow Manager to restore the system from a backup
Overview: The manager is able to restore the system from a backup copy located on an external disk.

Use Case #: 36
Use Case Name: Generate daily unfulfilled purchase orders report
Actor(s): Report Scheduler
Goal/Purpose: To automatically generate and distribute a daily report of all purchase orders that have yet to be fulfilled
Overview: The scheduler automatically generates a daily report of all purchase orders that have yet to be fulfilled. The report is then emailed to the manager.

Use Case #: 37
Use Case Name: Generate weekly current customer report
Actor(s): Report Scheduler
Goal/Purpose: To automatically generate and distribute a weekly report of current customers
Overview: The scheduler automatically generates a weekly report of current customers. A current customer is one who has placed an order within the past two months. The report is then emailed to the manager. These customers will receive an email with a 10% off promotional coupon.

Use Case #: 38
Use Case Name: Add item to shopping cart
Actor(s):
Goal/Purpose: To allow Customer to add an item to the Shopping Cart
Overview: Once an item has been located by browsing or searching, the customer is able to add it to his/her shopping cart. The current price and quantity are recorded.

Use Case #: 39
Use Case Name: Manage shopping cart
Actor(s): Customer
Goal/Purpose: To allow Customer to view and update current Shopping Cart
Overview: The customer is able to view the items currently in the shopping cart. The view will provide the CD title, Artist name, unit price and quantity for each item in the shopping cart. The customer is also able to update the quantity and/or delete items from the shopping cart.

Use Case #: 40
Use Case Name: Update inventory
Actor(s): POS
Goal/Purpose: To allow the POS to update the available inventory
Overview: The existing in-store point-of-sale system must be able to update inventory for in-store purchases and returns.

Detailed Use Case Descriptions

The following are detailed use case descriptions for the primary use case 'place purchase order' as well as its two associated included use cases: 'send confirmation email' and 'process credit card'. This primary use case was chosen due to its critical position in the main functionality of the OnCD system. Please note that due to lack of data on actual usage of systems such as the OnCD system, the frequency information that appears in the following descriptions has been estimated for a small operation. Actual usage numbers could be much higher.

Important assumptions used in the detailed use case descriptions

- Because of their cross functionality, the included use cases, 'send confirmation email' and 'process credit card', will be designed as generic as possible, returning mainly status flags and messages to allow for wider reuse.
- In light of this, each primary use case that uses these included use cases must be designed to handle their returns.
- Changes to the content of an order must be made to the shopping cart prior to the start of a purchase order. This activity would be handled by the use case 'manage shopping cart'.

Place purchase order

USE CASE #	10
USE CASE Name	Place purchase order
ACTOR	Customer
Goal (1 phrase)	To allow Customer to order CDs
Overview and scope	The customer is able to place an order for CDs, chose a shipping method, destination and payment option.
Level	Primary
Preconditions	The Customer is logged into the system. There is at least one product in the "cart" to be purchased.
Postconditions	An order record has been created and associated with the correct shopping cart record. A subtotal for each line item has been calculated and recorded (unit price multiplied by the line item quantity). A product order subtotal has been calculated and recorded (summation of each component line item subtotal). The shipping/pick-up option has been chosen and recorded. If the shipping option has been chosen, the correct shipping address has been recorded. The correct shipping charges, applicable taxes and order total have been calculate and recorded. An associated payment record has been created and recorded. An associated email record has been created and recorded. The inventory has been updated correctly.
Trigger	Customer chooses checkout option.

Included Use Cases	Process credit card, Send confirmation email	
Extending Use Cases	N/A	
MAIN SUCCESSFUL SCENARIO	**Actor Action**	**System Action**
	1. Customer chooses the checkout option	2. System displays all items in cart for customer verification
	3. Customer verifies that these are the items to be ordered	4. System displays all saved addresses associated with Customer record
	5. Customer picks shipping address from list of saved addresses	6. System sets shipping indicator to "ship"
		7. System calculates shipping charges and taxes
		8. System calculates total order charge
		9. System displays shipping address, order details and all charges for verification
	10. Customer verifies shipping address, order details and all charges	11. System displays all saved credit cards associated with Customer record
	12. Customer chooses credit card from list to which all charges will be charged	13. Display final order summary
	14. Customer verifies final order summary	15. **INCLUDE** *Process credit card*
		16. System records all order and payment information
		17. System displays printable confirmation of order including shipping address, order details, all charges and payment information
		18. **INCLUDE** *Send confirmation email*
		19. System changes shopping cart status to closed.
		20. System displays message: "Thank you for your order. A confirmation email has been sent to the email address you have on file."
OTHER SUCCESSFUL SCENARIOS	**Step**	**Branching Action**
	3a. Customer decides to remove items from the order	3a.1. Customer checks "remove" option next to item 3a.2. System disables "proceed" option 3a.3. Customer chooses "update order" option 3a.4. Return to step 2

	3b. Customer decides to change the quantity of an order item	3b.1. Customer changes the quantity next to an item 3b.2. System disables “proceed” option 3b.3. Customer chooses “update order” option 3b.4. Return to step 2
	5a. Customer chooses to add a new address	5a.1. System displays address option form 5a.2. Customer chooses to enter a domestic address 5a.3. System displays domestic address entry form 5a.4. Customer enters street line 1, street line 2, street line 3, city, state and zip code 5a.5. System verifies zip code and city match 5a.6. System saves new address
	5a.2a. Customer chooses to add a foreign address	5a.2a.1. Customer chooses to enter a foreign address 5a.2a.2. System displays foreign address entry form 5a.2a.3. Customer enters street line 1, street line 2, street, line 3, city, postal code and nation code 5a.2a.4. System saves new address
	5a.5a. Zip code and city do not match	5a.5a.1. System displays error message and ask customer to reenter address. 5a.5a.2. System displays domestic address entry form. 5a.5a.3. Customer enters street line 1, street line 2, street line 3, city, state and zip code 5a.5a.4. System verifies zip code and city match 5a.5a.5. System saves new address
	5b. Customer chooses to make this a gift order	5b.1. Customer chooses “send order as gift” option 5b.2. System displays recipient name entry form 5b.3. Customer enters recipient’s name 5b.4. System records name 5b.5. Return to step 4
	5b.3a. Customer chooses to cancel making order a gift	5b.3a.1. Customer chooses “cancel making gift” option 5b.3a.2. Return to step 4

	5c. Customer chooses to pick-up items in store	5c.1. Customer chooses “in-store pick-up” option 5c.2. System prompts for confirmation of in-store pick-up option 5c.3. Customer confirms in-store pick-up option 5c.4. System records shipping indicator as “pick-up” 5c.5. System calculates taxes 5c.6. Return to step 8
	5c.2a. Customer chooses to cancel in-store pick-up option	5c.2a.1. Customer chooses “cancel pick-up” option 5c.2a.2. Return to step 4
	10a. Customer decides to change shipping address	10a.1. Customer chooses “change/edit shipping address” option 10a.2. Return to step 4
	10b. Customer decides to remove item from order	10b.1. Customer checks “remove” option next to item 10b.2. System disables “proceed” option 10b.3. Customer chooses “update order” option 10b.4. Return to step 7
	10c. Customer decides to change the quantity of an order item	10c.1. Customer changes the quantity next to an item 10c.2. System disables “proceed” option 10c.3. Customer chooses “update order” option 10c.4. Return to step 2
	10d. Customer chooses to use a coupon code	10d.1. Customer enters a coupon code 10d.2. System validates coupon code 10d.3. System calculates discount 10d.4. System calculates total order charge 10d.5. System displays shipping address, order details, coupon details and all charges for verification 10d.6. Return to step 10
	10d.2a. Coupon code is invalid	10d.2a.1. System displays error message 10d.2a.2. Return to step 10

	12a. Customer chooses to add a new credit card	12a.1. Customer chooses the “add new credit card” option 12a.2. System displays credit card entry screen 12a.3. Customer enters name on card, card type (Visa, Mastercard, American Express, Discover), account number and expiration date 12a.4. System displays all saved addresses associated with Customer record 12a.5. Customer chooses billing address from list of saved addresses 12a.6. System saves credit card information
	12a.3a. Customer chooses to cancel adding of credit card	12a.3a.1. Customer chooses the “cancel credit card add” option 12a.3a.2. Return to step 12
	12a.5a. Customer chooses to add a new address	12a.5a.1. System displays address option form 12a.5a.2. Customer chooses to enter a domestic address 12a.5a.3. System displays domestic address entry form 12a.5a.4. Customer enters street line 1, street line 2, street line 3, city, state and zip code 12a.5a.5. System verifies zip code and city match 12a.5a.6. System saves new address
	12a.5a.2a. Customer chooses to add a foreign address	12a.5a.2a.1. Customer chooses to enter a foreign address 12a.5a.2a.2. System displays foreign address entry form 12a.5a.2a.3. Customer enters street line 1, street line 2, street, line 3, city, postal code and nation code 12a.5a.2a.4. System saves new address
	12a.5a.5a. Zip code and city do not match	12a.5a.5a.1. System displays error message and ask customer to reenter address. 12a.5a.5a.2. System displays domestic address entry form. 12a.5a.5a.3. Customer enters street line 1, street line 2, street line 3, city, state and zip code 12a.5a.5a.4. System verifies zip code and city match 12a.5a.5a.5. System saves new address

	15a. *Process credit card* returns "failure" flag and error message	15a.1. System increases credit card error counter by 1 15a.2. System checks credit card error counter 15a.3. System displays returned error message and the options to "cancel order" or "try again" 15a.4. Customer chooses "try again" 15a.5. Return to step 12
UNSUCCESSFUL SCENARIOS	**Conditions**	**Actions**
	*a. Customer chooses to cancel order	1. Customer chooses "cancel order" option 2. System displays message: "This transaction has been cancelled." 3. Abort transaction
	5a.5a.4a. Zip code and city do not match	5a.5a.4a.1. System displays error message: "Problem encountered with address. Order cannot be completed at this time. Please call our customer service center to resolve issue." 5a.5a.4a.1. Abort transaction
	12a.5a.5a.4a. Zip code and city do not match	12a.5a.5a.4a.1. System displays error message: "Problem encountered with address. Order cannot be completed at this time. Please call our customer service center to resolve issue." 12a.5a.5a.4a.2. Abort transaction
	15a.2a. Credit card error counter is equal to 3	15a.2a.1. System displays message: "Problem encountered with payment transaction. Order cannot be completed at this time. Please call our customer service center to resolve issue." 15a.2a.2. Abort transaction
	15a.4a. Customer chooses to cancel the order	15a.4a.1. Customer chooses "cancel order" 15a.4a.2. System displays message: "This transaction has been cancelled." 15a.4a.3. Abort transaction
	15b. *Process credit card* returns "stolen" flag.	15b.1. System displays message: "Problem encountered with payment transaction. Order cannot be completed at this time." 15b.2. Abort transaction
Priority in scheduling	First	
Frequency	170 times a day (high)	
Other non-functional requirements	1. Only one coupon code can be used per order.	
Developer	Chad Morris	
Creation date and last modified date	Created on: 15 November 2006	

Other Comments	

Send confirmation email

USE CASE #	11	
USE CASE Name	Send confirmation email	
ACTOR		
Goal (1 phrase)	To send email to Customer confirming orders and account changes	
Overview and scope	Confirmation emails should be sent to confirm the placing of an order. A confirmation email should also be sent when any change is made to a customer account.	
Level	Included	
Preconditions	A customer account has been created or changed, a purchase order has been placed or a return has been processed.	
Postconditions	The customer has received an email confirmation with the correct information. The email template name, send date and correct status have been recorded.	
Trigger	A customer account has been created or changed, a purchase order has been placed or a return has been processed.	
Included Use Cases	N/A	
Extending Use Cases	N/A	
MAIN SUCCESSFUL SCENARIO	**Actor Action**	**System Action**
		1. System creates a confirmation email for the creation of a customer account
		2. System sets subject line to: “Welcome to OnCD”
		3. System sets delivery email address to current email address in Customer record
		4. System fills in Customer Name, account login ID and password
		5. System sends email
		6. System sets emailTemplateName to filename of template used
		7. System sets emailSentDate to current date
		8. System sets emailStatusFlag to “sent”
OTHER SUCCESSFUL	**Step**	**Branching Action**

SCENARIOS	1a. The email is about a change to a credit card	1a.1. System creates a confirmation email for a change in credit card information 1a.2. System sets subject line to: "OnCD: Change in credit card information" 1a.3. System sets delivery email address to current email address in Customer record 1a.4. System fills in Customer Name 1a.5. System fills in old credit card information 1a.6. System fills in new credit card information 1a.7. System sends email 1a.8. System sets emailTemplateName to filename of template used 1a.9. System sets emailSentDate to current date 1a.10. System sets emailStatusFlag to "sent"
	1a.10a. Email bounces back	1a.10a.1 System sets email Status Flag to "need letter"
	1b. The email is about a change to an address	1b.1. System creates a confirmation email for a change to an address 1b.2. System sets subject line to: "OnCD: Change in address information" 1b.3. System sets delivery email address to current email address in Customer record 1b.4. System fills in Customer Name 1b.5. System fills in old address information 1b.6. System fills in new address information 1b.7. System sends email 1b.8. System sets emailTemplateName to filename of template used 1b.9. System sets emailSentDate to current date 1b.10. System sets emailStatusFlag to "sent"
	1b.10a. Email bounces back	1b.10a.1 System sets email Status Flag to "need letter"

	1c. The email is about the placement of a purchase order	1c.1. System creates a confirmation email for the placement of a purchase order 1c.2. System sets subject line to: "OnCD: Order confirmation" 1c.3. System sets delivery email address to current email address in Customer record 1c.4. System fills in Customer Name 1c.5. System includes invoice of all order information and payment information 1c.6. System sends email 1c.7. System sets emailTemplateName to filename of template used 1c.8. System sets emailSentDate to current date 1c.9. System sets emailStatusFlag to "sent"
	1c.9a. Email bounces back	1c.9a.1 System sets email Status Flag to "need letter"
	1d. The email is about a return	1d.1. System creates a confirmation email for a return 1d.2. System sets subject line to: "OnCD: Order return" 1d.3. System sets delivery email address to current email address in Customer record 1d.4. System fills in Customer Name 1d.5. System includes invoice of all return information and refund information 1d.6. System sends email 1d.7. System sets emailTemplateName to filename of template used 1d.8. System sets emailSentDate to current date 1d.9. System sets emailStatusFlag to "sent"
	1d.9a. Email bounces back	1d.9a.1 System sets email Status Flag to "need letter"
	8a. Email bounces back	8a.1. System sets email Status Flag to "need letter"
UNSUCCESSFUL SCENARIOS	**Conditions**	**Actions**
Priority in scheduling	First	
Frequency	250 times a day (high)	
Other non-functional requirements		
Superordinates	Create customer account, Manage customer account, Place purchase order, Process purchase order return	

Developer	Chad Morris
Creation date and last modified date	Created on: 15 November 2006
Other Comments	

Process credit card

USE CASE #	12	
USE CASE Name	Process credit card	
ACTOR	N/A	
Goal (1 phrase)	To process payment/refund by credit card	
Overview and scope	Information about payments and refunds by credit card need to be recorded.	
Level	Included	
Preconditions	The amount to be charged or refunded has been correctly calculated. Credit card information, billing address and charge/credit amount have been made available.	
Postconditions	The credit card charge/credit has been verified and recorded. The status flag has been set correctly. The payment date has been recorded correctly. The payment has been associated with the correct order or return record.	
Trigger	There is a credit card charge/credit that needs to be processed.	
Included Use Cases	N/A	
Extending Use Cases	N/A	
MAIN SUCCESSFUL SCENARIO	**Actor Action**	**System Action**
		1. System sends credit card information, billing address and charge/credit amount to the Credit Card Authentication System
		2. System sets status flag to "successful"
OTHER SUCCESSFUL SCENARIOS	**Step**	**Branching Action**
	2a. It is determined that the credit card number provided is invalid	2a.1. System sets status flag to "failure" 2a.2. System sets error message to: "The credit card number provided is invalid."
	2b. It is determined that the name on the credit card that was provided is invalid	2b.1. System sets status flag to "failure" 2b.2. System sets error message to: "The name provided does not match the name on record for this credit card."

	2c. It is determined that the billing address provided is invalid	2c.1. System sets status flag to "failure" 2c.2. System sets error message to: "The billing address that was provided does not match the address on record for this credit card."
	2d. It is determined that the expiration date provided is invalid	2d.1. System sets status flag to "failure" 2d.2. System sets error message to: "The expiration date provided does not match the one on record for this credit card."
	2e. It is determined that the credit card being used is over its credit limit	2e.1. System sets status flag to "failure" 2e.2. System sets error message to: "The credit card you are trying to use is currently over its credit limit."
	2f. It is determined that the credit card that is being used has been reported stolen	2f.1. System sets status flag to "stolen"
UNSUCCESSFUL SCENARIOS	**Conditions**	**Actions**
Priority in scheduling	First	
Frequency	200 times a day (high)	
Other non-functional requirements		
Superordinates	Place purchase order, Process purchase order return	
Developer	Chad Morris	
Creation date and last modified date	Created on: 15 November 2006	
Other Comments		

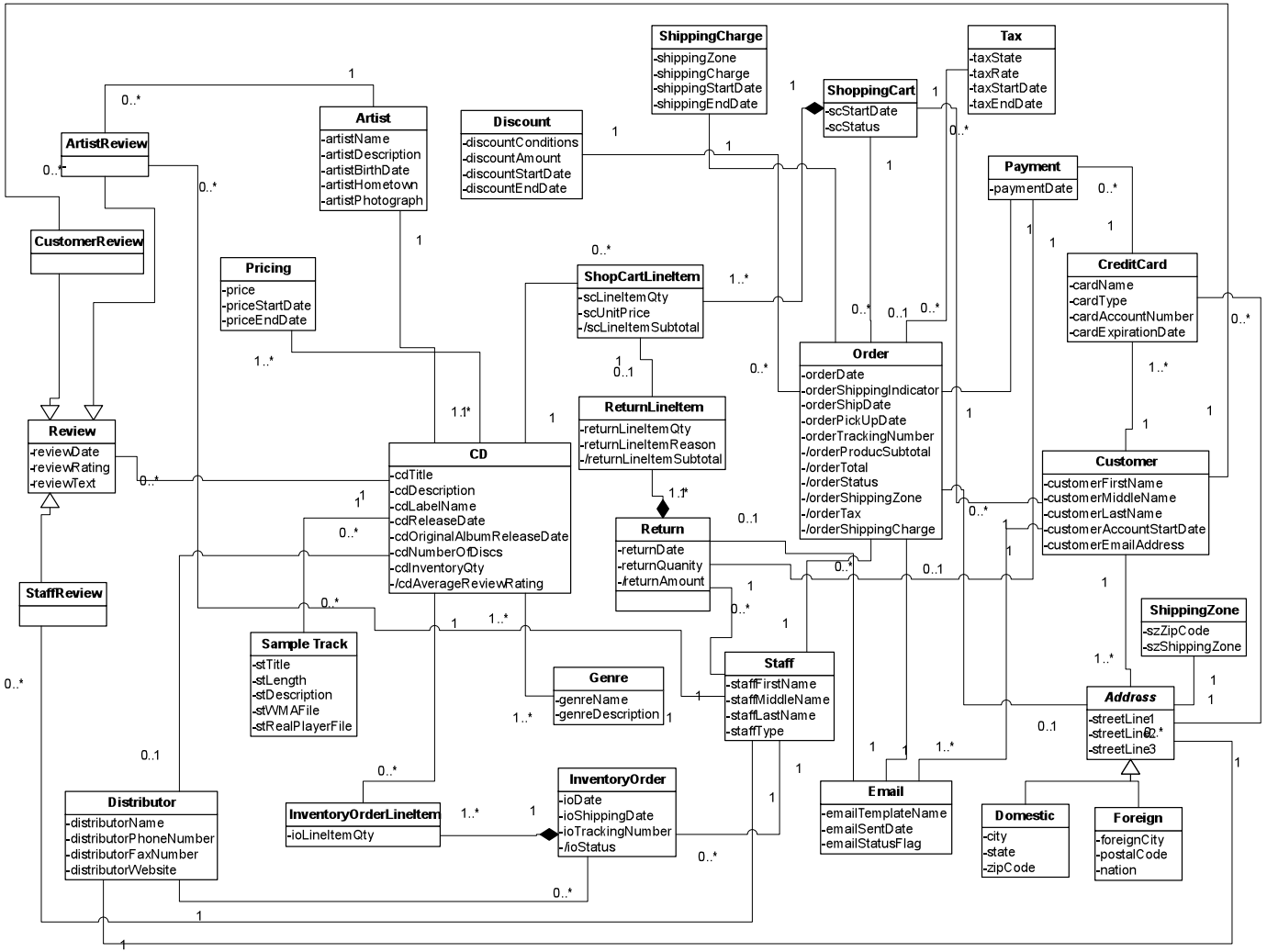
Domain Model

This domain model represents all the classes that were discovered during the analysis phase of this project. Important attributes that could be identified from the problem statement and use cases were also included. A modified version of the Taxonomic Class Modeling (TCM) method was used to create this diagram. Noun classes were identified while reading through the problem statement, project proposal and use cases. Class elimination rules from the TCM method were applied to each class as the documentation was read through. No complete list of candidate classes was created and thus will not appear in this section.

These noun classes were then sketched on a piece of paper and appropriate transformed classes, such as 'Payment' and 'Return', were added by rereading the problem statement, project proposal and use cases. Discovered classes, such as 'Shipping Zone' and 'Pricing, were added by applying programming and database knowledge to the problem space. The diagram was then checked against the sample inputs and outputs given in the project proposal.

Important assumptions used in the Domain Model

- Email history should be kept for all customers
- System must track which staff member fulfilled a purchase order
- System must track which staff member has handled a return
- For each new artist, a CD record will be made for every known album released
- An artist's discography will be pulled from the attached CD records
- A shopping cart is created when the first item is added; ShoppingCart.scStatus set to "open".
- ShoppingCart.scStatus set to "closed" (no more ShopCartLineItems can be added) when order is placed.
- Sample tracks are to be offered in WMA and RealPlayer format.


ShippingCharge
-shippingZone
-shippingCharge
-shippingStartDate
-shippingEndDate
Tax
-taxState
-taxRate
-taxStartDate
-taxEndDate
ShoppingCart
-scStartDate
-scStatus
Artist
-artistName
-artistDescription
-artistBirthDate
-artistHometown
-artistPhotograph
Discount
-discountConditions
-discountAmount
-discountStartDate
-discountEndDate
ArtistReview
Payment
-paymentDate
CustomerReview
Pricing
-price
-priceStartDate
-priceEndDate
ShopCartLineItem
-scLineItemQty
-scUnitPrice
-/scLineItemSubtotal
CreditCard
-cardName
-cardType
-cardAccountNumber
-cardExpirationDate
Order
-orderDate
-orderShippingIndicator
-orderShipDate
-orderPickUpDate
-orderTrackingNumber
-/orderProducSubtotal
-/orderTotal
-/orderStatus
-/orderShippingZone
-/orderTax
-/orderShippingCharge
ReturnLineItem
-returnLineItemQty
-returnLineItemReason
-/returnLineItemSubtotal
Review
-reviewDate
-reviewRating
-reviewText
CD
-cdTitle
-cdDescription
-cdLabelName
-cdReleaseDate
-cdOriginalAlbumReleaseDate
-cdNumberOfDiscs
-cdInventoryQty
-/cdAverageReviewRating
Customer
-customerFirstName
-customerMiddleName
-customerLastName
-customerAccountStartDate
-customerEmailAddress
Return
-returnDate
-returnQuanity
-/returnAmount
StaffReview
ShippingZone
-szZipCode
-szShippingZone
Sample Track
-stTitle
-stLength
-stDescription
-stWMAFile
-stRealPlayerFile
Genre
-genreName
-genreDescription
Staff
-staffFirstName
-staffMiddleName
-staffLastName
-staffType
Address
-streetLine1
-streetLine2
-streetLine3
Distributor
-distributorName
-distributorPhoneNumber
-distributorFaxNumber
-distributorWebsite
InventoryOrderLineItem
-ioLineItemQty
InventoryOrder
-ioDate
-ioShippingDate
-ioTrackingNumber
-/ioStatus
Email
-emailTemplateName
-emailSentDate
-emailStatusFlag
Domestic
-city
-state
-zipCode
Foreign
-foreignCity
-postalCode
-nation

Class Descriptions

The following are short narrative descriptions of the classes that appear in this domain model. Hopefully, this will facilitate the interpretation of the model.

Customer

As the name would suggest, this is a class to hold information regarding customers.

Address

This is a derived class that holds address information that is common to both domestic and foreign addresses.

Domestic

This class holds information specific to domestic addresses.

Foreign

This class holds information specific to foreign addresses.

CreditCard

As the name would suggest, this is a class to hold information regarding credit cards that can be used to pay for purchase orders.

ShippingZone

This is basically a look-up table. It holds a list of zip codes and corresponding shipping zones. These shipping zones have been established by OnCD. All international address are assigned to a single shipping zone.

Payment

This is class that holds information about payments. A payment can be either a charge for a purchase order or a refund for a return.

Tax

This is a look-up table. It lists all the state codes and their corresponding sales tax rate. The table is set up to keep track of sales tax rate history.

ShippingCharge

This is a look-up table that contains a list of the shipping zones set out by OnCD. Each zone has a corresponding shipping rate. This table is set up to track the history of shipping rates.

Discount

This table contains information about discounts that are offered to customers. It is able to keep track of the history of discounts that have been offered.

ShoppingCart

This is a class that keeps track of line items before they become an order. An order is the purchase of a static shopping cart.

ShopCartLineItem

This class represents the individual line items that are contained by the shopping cart.

Order

As the name would suggest, this is a class that tracks information regarding orders; in this case, purchase orders.

Email

This class holds information about the status, send date and template used to send emails. This class is designed in such a way as to allow for keeping an email correspondence history for each customer.

Staff

This is simply a class to track the name and function of employees that will use the OnCD system.

Return

As the name would suggest, this is a class that stores information regarding returns; in this case, of purchase orders or parts thereof.

ReturnLineItem

This class represents the individual line items that make up a return.

InventoryOrder

This class holds information regarding inventory orders that are placed with distributors. Inventory orders are orders that are placed by staff members to replenish stock or order stock of new items. A separate inventory order needs to be created for each distributor.

InventoryOrderLineItem

This class represents the individual line items that make up an inventory order.

CD

This class stores basic information regarding CDs, the only merchandise sold by the OnCD system. This is also where inventory for each item is tracked.

Genre

This class holds information about music genres. Each CD that is entered into the system is associated with at least one music genre.

SampleTrack

Most CDs have sample tracks that can be listened to while customers browse the collection. This class holds information about these tracks.

Artist

As the name suggests, this class holds information about artists, or musicians. Each CD that is in the system must be associated with a single artist.

Pricing

This class holds information regarding CD pricing. It is set up in such a way as to allow tracking of pricing history. Each pricing record can be associated with only one CD.

Review

This class holds information about reviews that are done of the CDs that OnCD sells. The reviews, besides offering narrative text, provide a numerical rating system.

ArtistReview

This is a subclass of review, designed to hold information about reviews by artists.

CustomerReview

This is a subclass of review, designed to hold information about reviews by customers.

StaffReview

This is a subclass of review, designed to hold information about reviews by staff members.

Distributor

This class holds information about CD distributors. These are the CD vendors that supply the CDs that OnCD sells. Each CD can only be supplied by a single vendor.

System Design

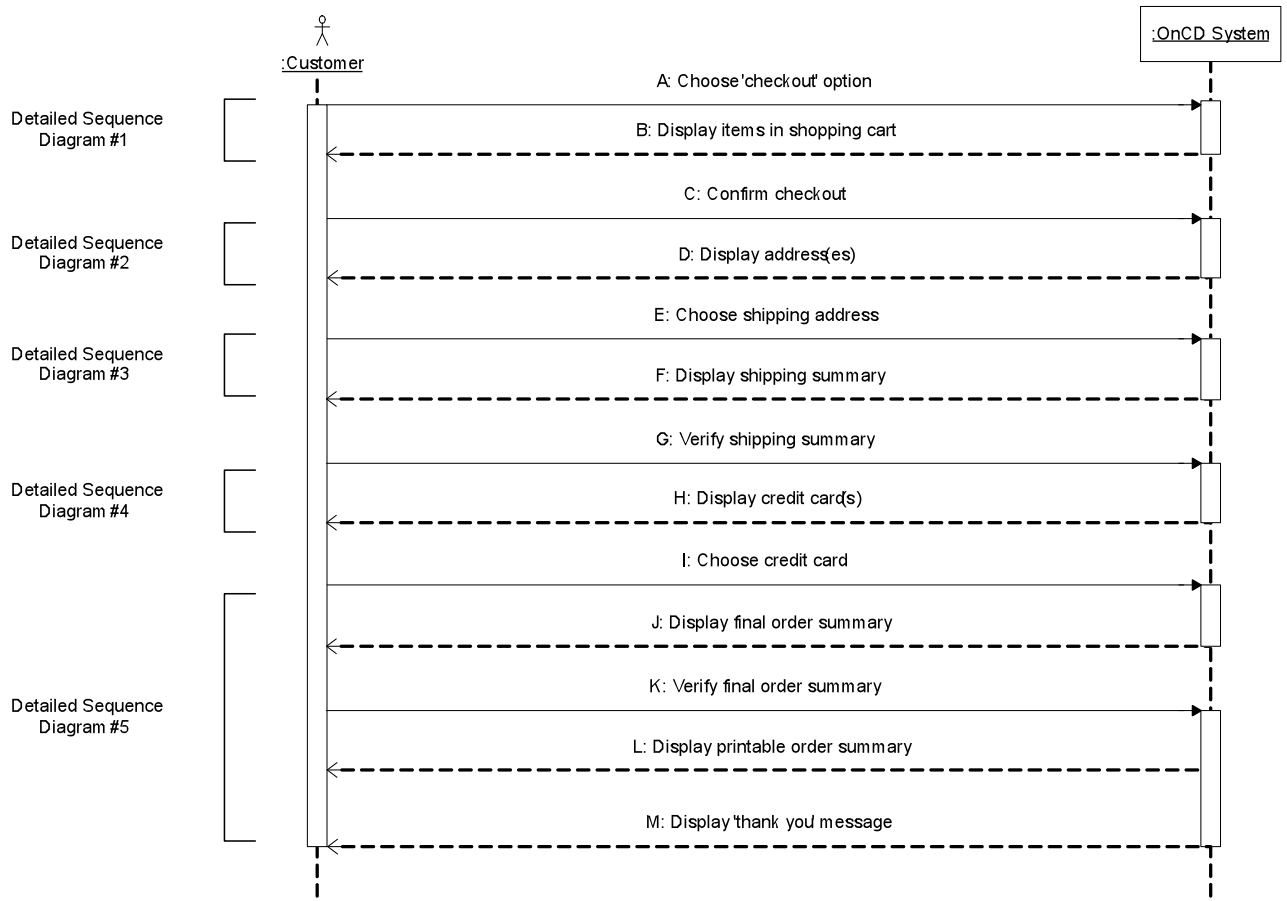
This section contains models and written documentation that are associated with the system design phase of this project.

System Sequence Diagram: Place purchase order

This is a high level (system-level) sequence diagram for the use case ‘place purchase order’. In this diagram the OnCD system is treated as a black box. No internal workings are shown, only input and output, or system events. These systems events are further elaborated upon in five of the detailed sequence diagrams that follow. The last two detailed sequence diagrams elaborate on the two included use cases, ‘process credit card’ and ‘send confirmation email’ in the context of the primary use case, ‘place purchase order’.

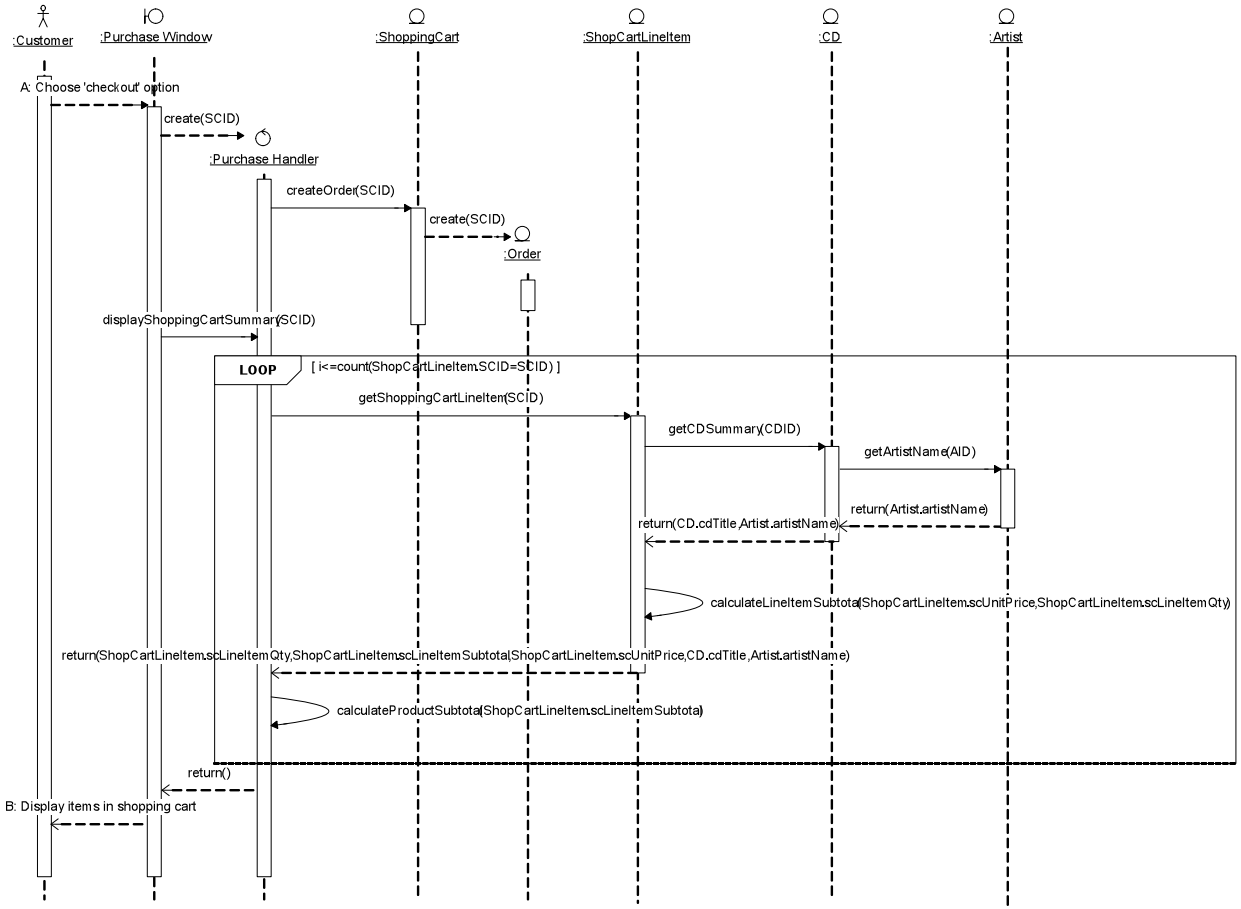
Important assumptions used in the sequence diagrams

- Shipping address and credit card selection will take place in their own window.
- Most of the function calls will be controlled by the main purchase handler.
- Any parameters that are identified with the designation of ‘ID’ are assumed to stand for the passing of some identifying parameter for a record of the appropriate class.

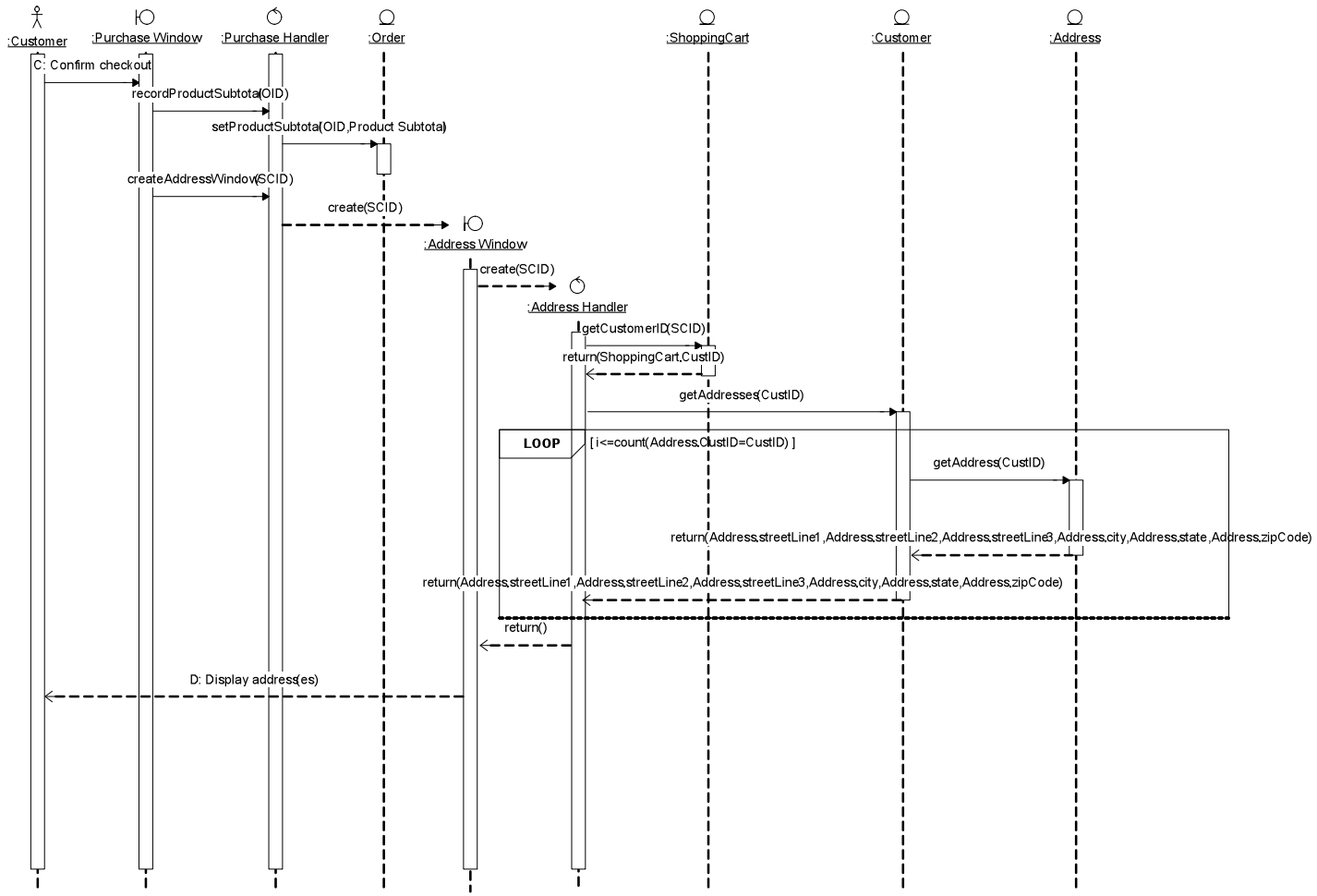

:Customer
:OnCD System
A: Choose 'checkout' option
B: Display items in shopping cart
C: Confirm checkout
D: Display address(es)
E: Choose shipping address
F: Display shipping summary
G: Verify shipping summary
H: Display credit card(s)
I: Choose credit card
J: Display final order summary
K: Verify final order summary
L: Display printable order summary
M: Display 'thank you' message
Detailed Sequence Diagram #1
Detailed Sequence Diagram #2
Detailed Sequence Diagram #3
Detailed Sequence Diagram #4
Detailed Sequence Diagram #5

Detailed Sequence Diagrams: Place purchase order

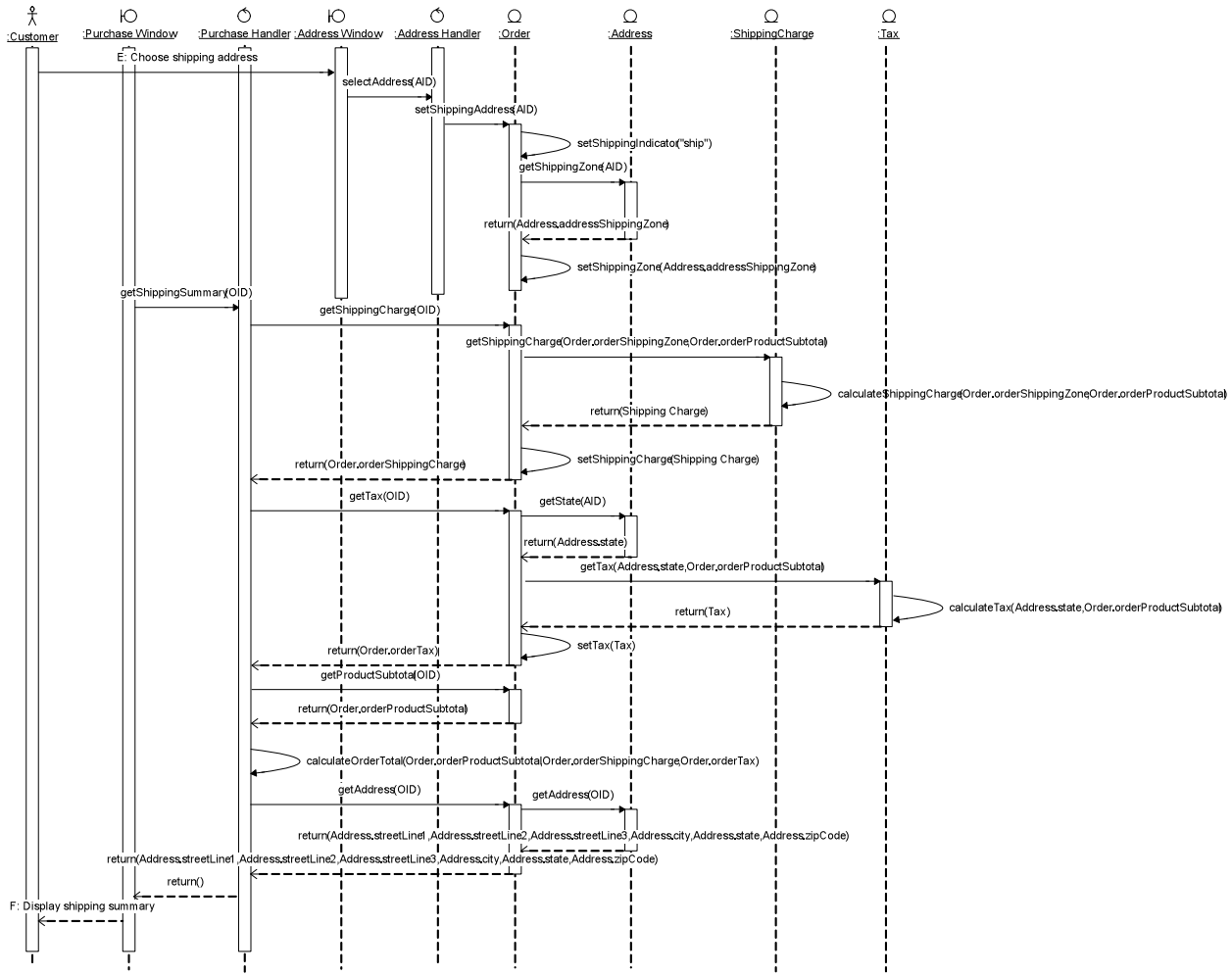
Detailed Sequence Diagram #1: A-B



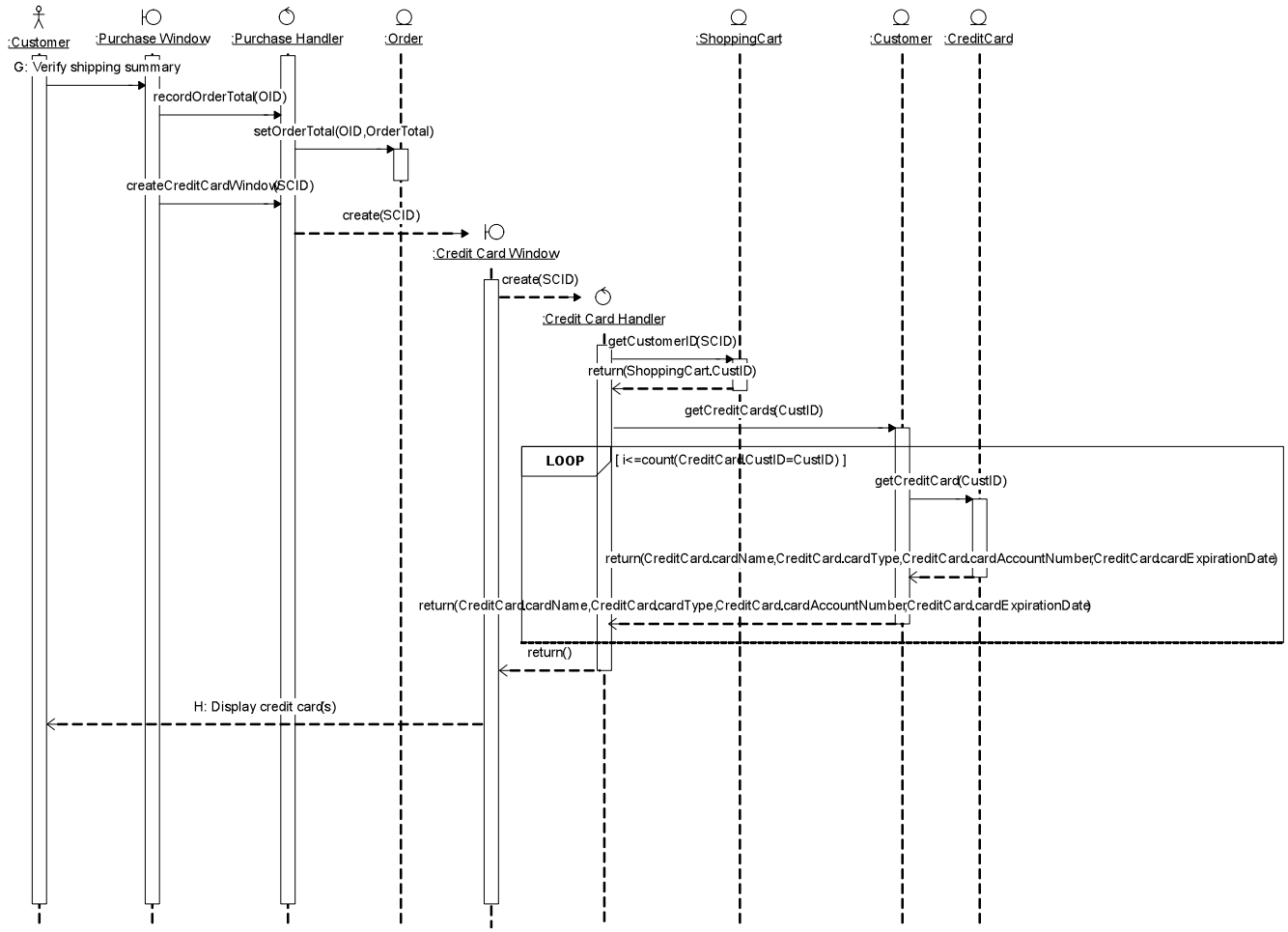
Detailed Sequence Diagram #2: C-D



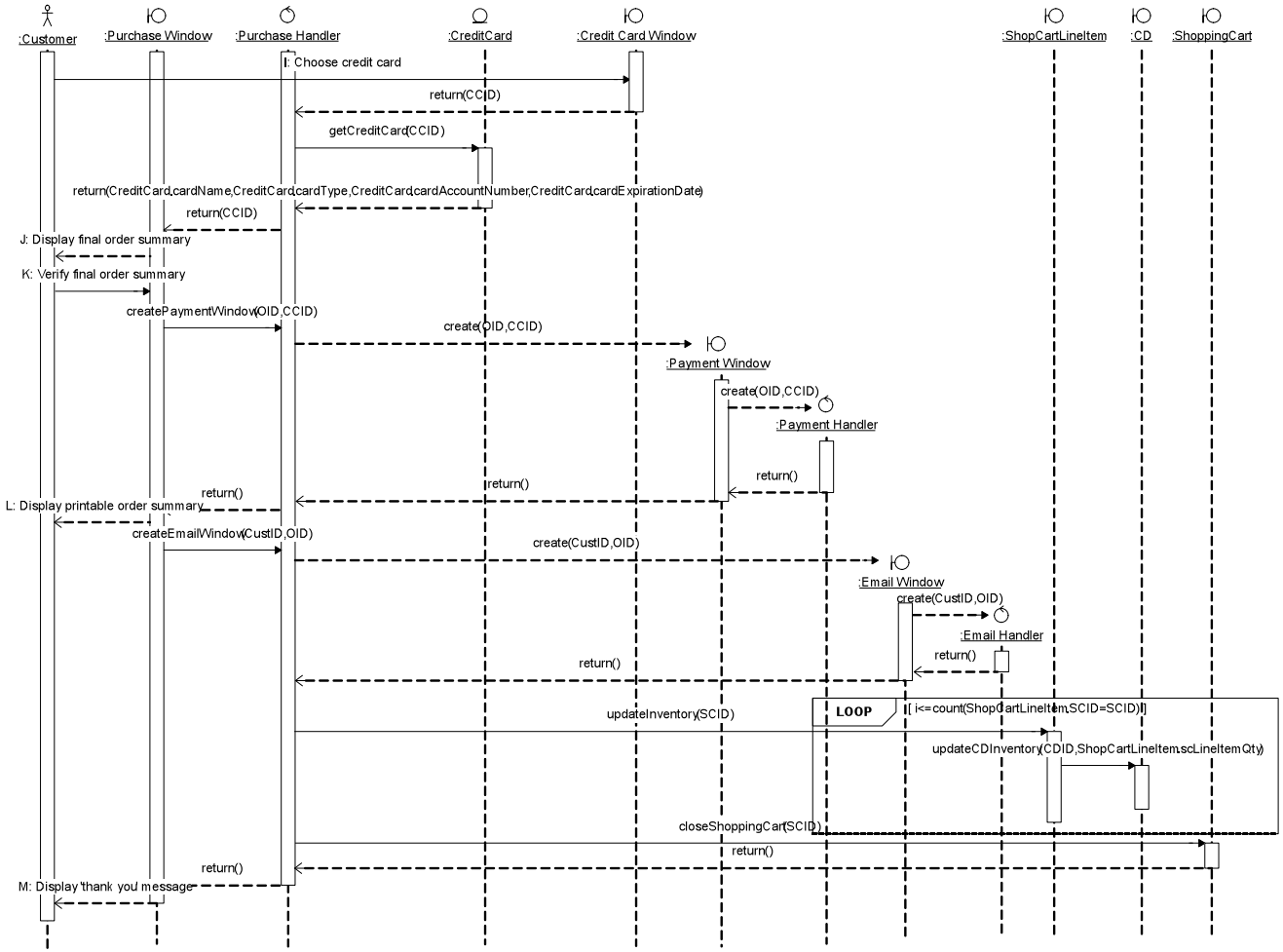
Detailed Sequence Diagram #3: E-F



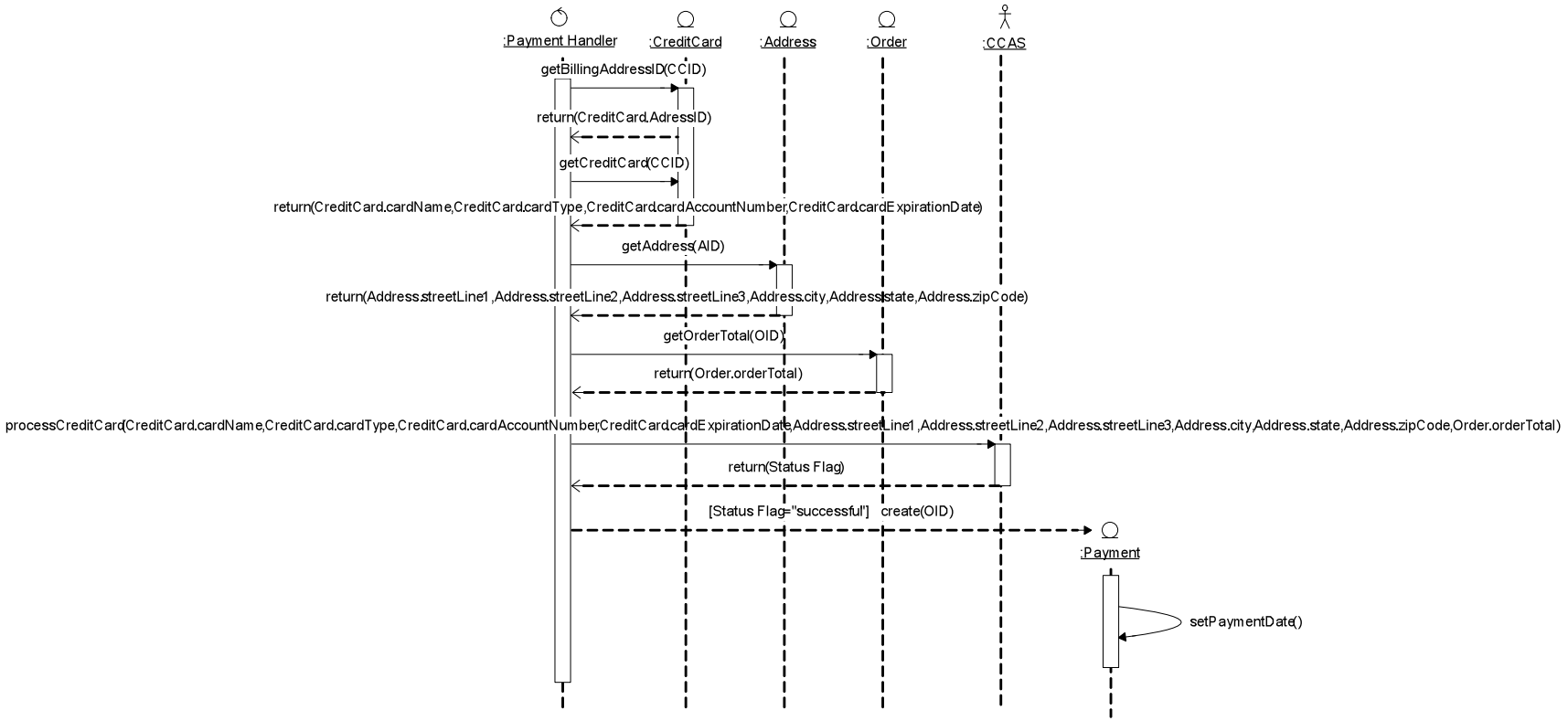
Detailed Sequence Diagram #4: G-H



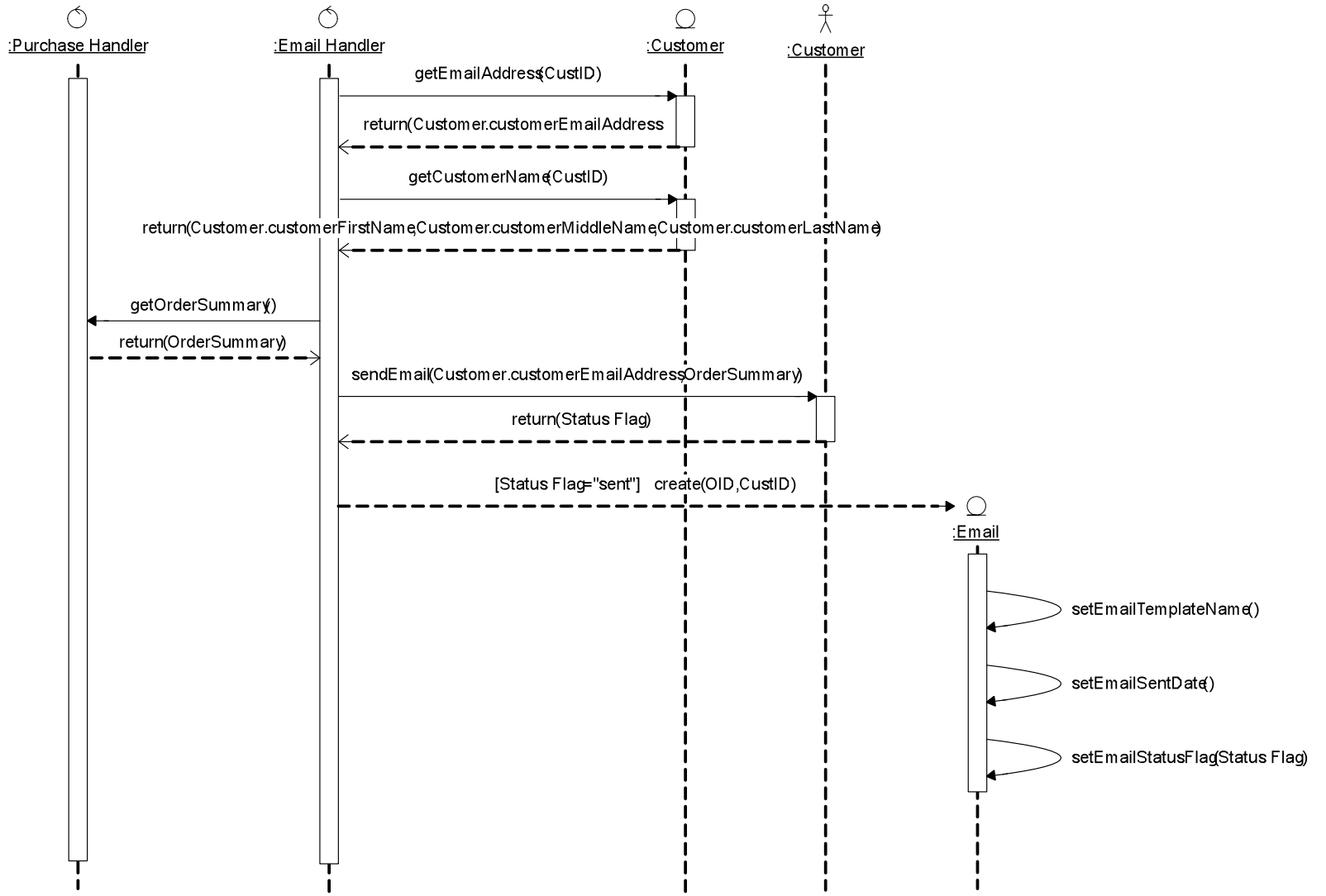
Detailed Sequence Diagram #5: I-M



Detailed Sequence Diagram #6: Process credit card

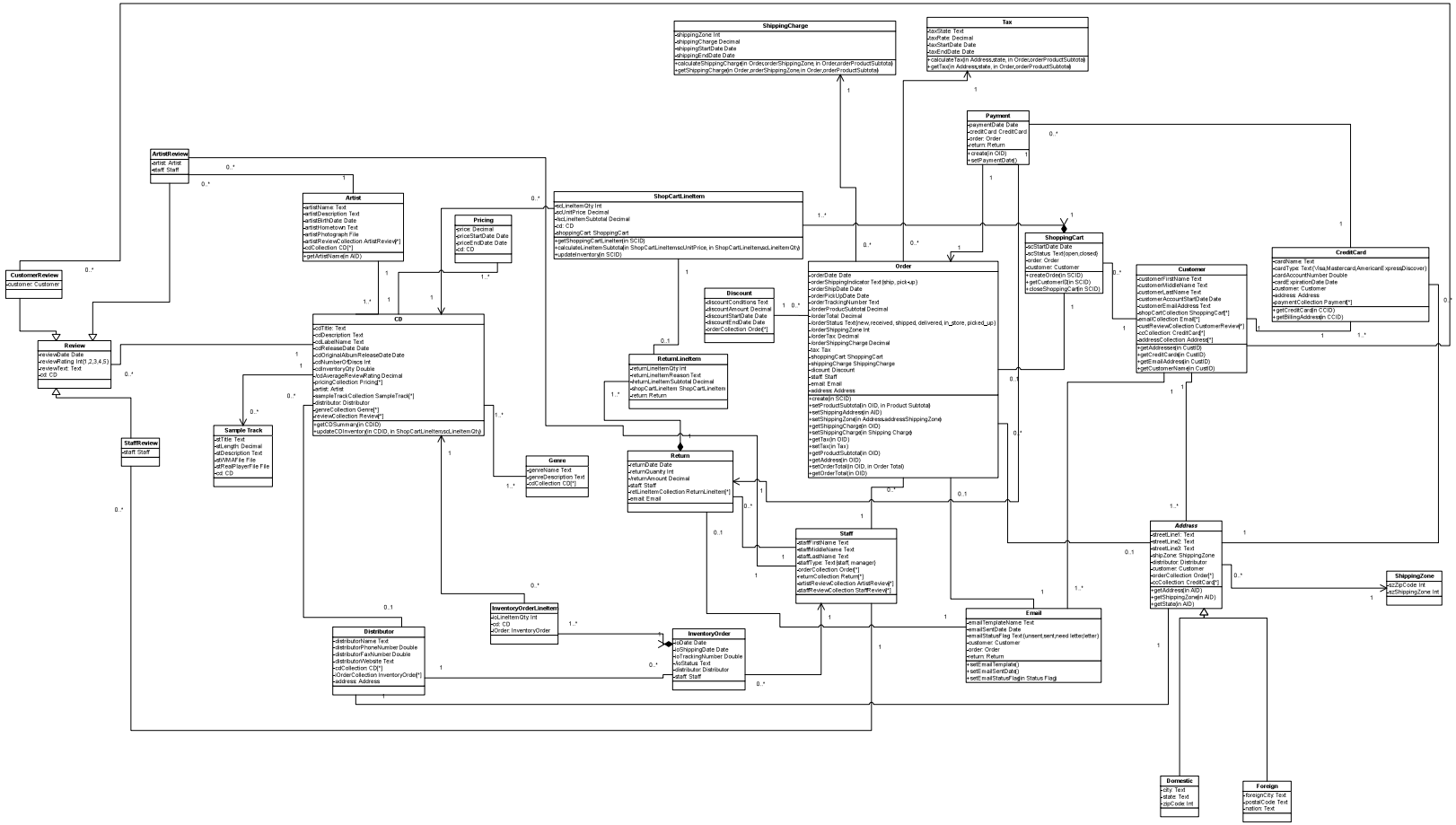


Detailed Sequence Diagram #7: Send confirmation email



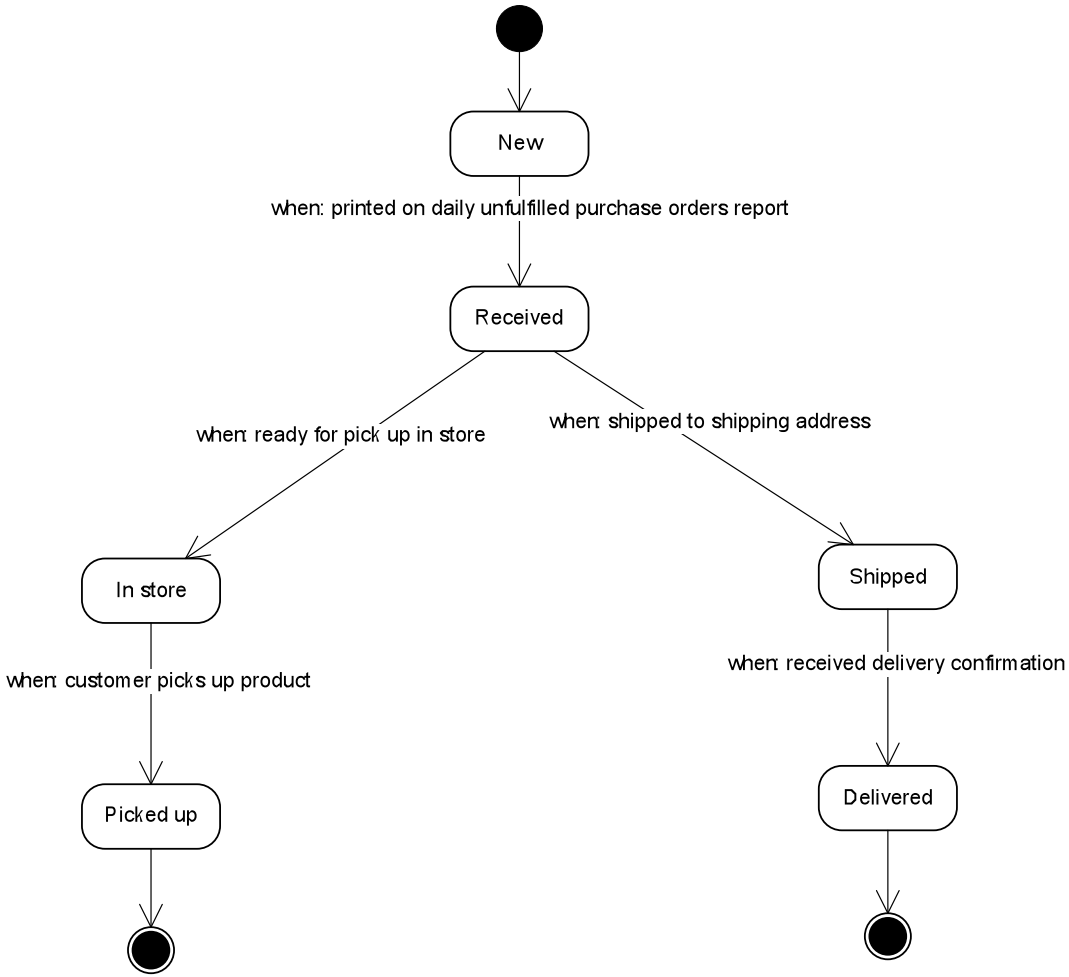
Design Class Diagram

The following design class diagram was based on the domain model that was developed during the analysis phase of this project. Operations from the detailed system sequence diagrams have been added to the appropriate classes. Navigability has also been added for those relationships where it could be determined from existing documentation and knowledge. Other navigability could be added once more sequence diagrams are produced. Finally, reference attributes have been added to each class to represent the relationships between each class.



State Diagram: Order

This is a state diagram for the 'Order' class. Note that all instances of the 'Order' class start out in the "new" state. There are, however, two different ending states depending on whether the order was shipped or picked-up in the store.



Physical Design

This section contains models and written documentation that are associated with the physical design phase of this project.

Relational Database Schema

The following is a relational database schema that has been developed based on the domain model presented earlier in this documentation. Notice that a new generalization hierarchy was created with 'ShippedOrder' and 'PickedOrder' being subclasses of 'Order'. This was done to reduce the number of null fields that would appear in a table created on the original 'Order' class. The entity CDGenre has also been created to deal with the possibility of a single CD belonging to multiple genres.

Important assumptions used in the Relational Database Schema

- A standardized zip code database will be purchased for the purposes of error checking.

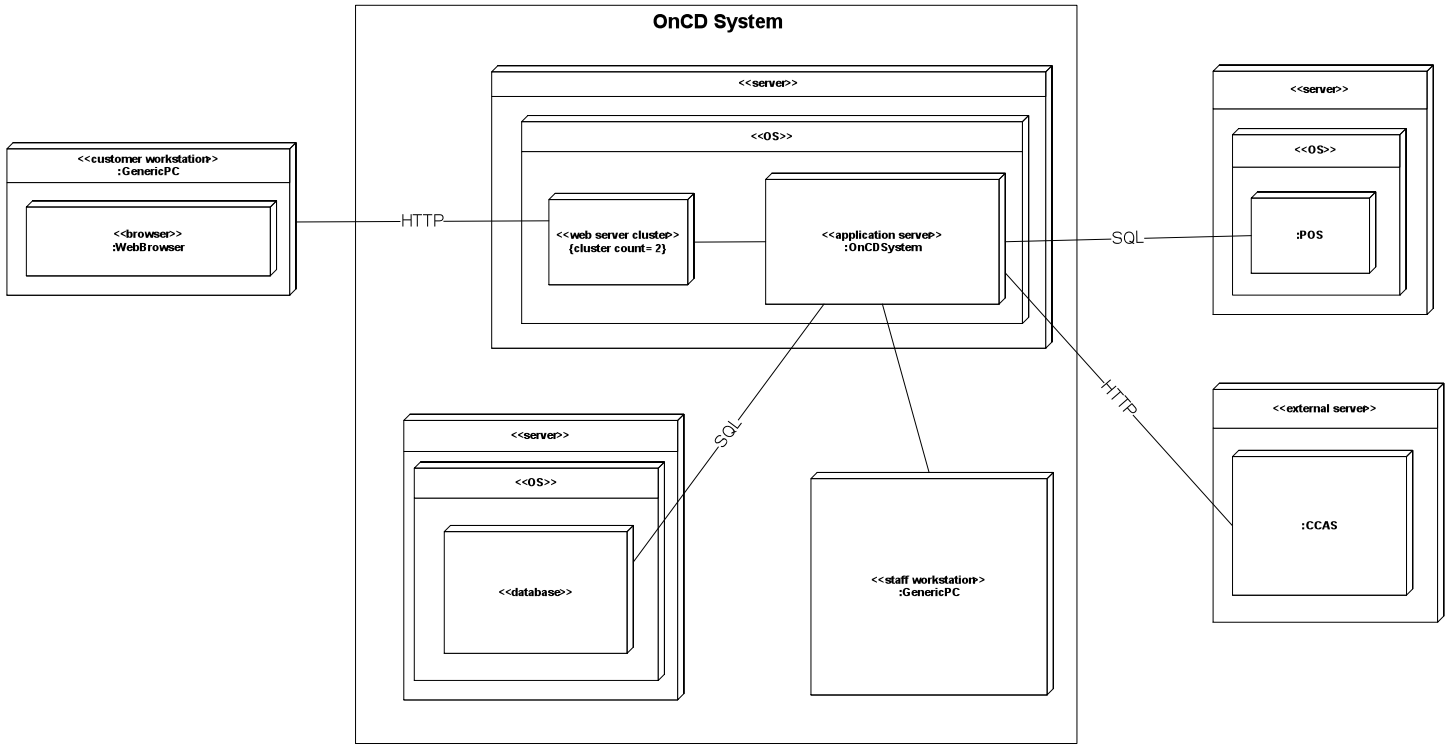
Customer (CustID, CustFName, CustMName, CustLName, CustEmailAdd)
CreditCard (CCID, CCName, CCType, CCAcctNumber, CCExpDate, CustID*, AddID*)
Address (AddID, StreetLine1, StreetLine2, StreetLine3, ShipZone*, CustID*)
DomAdd (AddID, ZipCode*)
ZipCode (ZipCode, City, State)
ForAdd (AddID, ForeignCity, PostalCode, Nation)
ShippingZone (ShipZone, ZipCode*)
Order (OID, OrderDate, OrderShippingInd, OrderProdSubtotal, OrderTotal, OrderStatus, OrderShipCharge, OrderTax, ShipZone*, SCID*, TaxID*, ShipChID*, AID*, EID*, StaffID*, DisID*)
ShippedOrder (OID*, OrderShipDate, OrderTrackNumber)
PickedOrder (OID*, OrderPickDate)
Discount (DisID, DisConditions, DisAmount, DisStartDate, DisEndDate)
ShippingCharge (ShipChID, ShipZone*, ShipChStartDate, ShipChEndDate)
Tax (TaxID, TaxState, TaxStartDate, TaxEndDate)
Email (EID, ETemplateName, ESentDate, EStatusFlag, CustID*)
Staff (StaffID, StaffFName, StaffMName, StaffLName, StaffType)
Return (RID, ReturnDate, ReturnQty, ReturnAmount, StaffID*, EID*)
ReturnLineItem (RID*, SCID*, CDID*, RLIQty, RLIReason, RLISubtotal)
Payment (PayID, PaymentDate, CCID*, OID*, RID*)
ShoppingCart (SCID, SCStartDate, SCStatus)
ShopCartLineItem (SCID*, CDID*, SCLIQty, SCLIUnitPrice, SCLIItemSubtotal)
CD (CDID, CDTitle, CDDescription, CDLabelName, CDReleaseDate, CDOrigAlbReleaseDate, CDNumberOfDiscs, CDInventoryQty, CDAveReviewRate, AID*, DistID*)
CDGenre (CDID*, GID*)
Genre (GID, GName, GDescription)
SampleTrack (STID, STTitle, STLength, STDescription, STWMAFile, STRealPlayerFile, CDID*)
Pricing (PriceID, PPrice, PStartDate, PEndDate, CDID*)
Artist (AID, AName, ADescription, ABirthDate, AHometown, APhotograph)
Review (ReviewID, ReviewDate, ReviewRating, ReviewText)
StaffReview (ReviewID*, StaffID*)
ArtistReview (ReviewID*, AID*, StaffID*)
CustomerReview (ReviewID*, CustID*)
Distributor (DistID, DistName, DistPhoneNumber, DistFaxNumber, DistWebsite, AID*)
InvetoryOrder (IOID, IODate, IOShipDate, IOTrackNumber, IOStatus, StaffID*, DistID*)
InvOrderLineItem (IOID*, CDID*, IOLIQty)

Deployment Diagram

The following deployment diagram was developed for the OnCD system. This diagram is necessarily vague due to my lack of understanding of system architecture and communication protocols.

Important assumptions used in the Deployment Diagram

- The database is housed on a separate server than the application layer to help reduce the impact of necessary changes.
- The OnCD system will have to interface with the existing point-of-sale (POS) system that the CD store has. It has been shown in this diagram outside of the system boundary.
- The same is true of the credit card authorization system.
- As customer PCs must interact with the OnCD system but are not the responsibility of the CD store, they have also been shown as outside the system.



Evaluation of Analysis and Design

This analysis and design project has provided several challenges. The first of these challenges was simply inherent in the nature of the project. Although this project is supposed to simulate a real world project, it lacks a major factor, access to people. There are no clients with whom to work. In a real world project, the analyzer/designer has access to real people who know the domain and who will use the system on a daily basis. Having access to real people off of whom one can bounce ideas and with whom one can talk out problems that are encountered during the analysis and design process makes working through parts of the process easier.

The second major challenge that was faced during the process of completing this project is lack of real domain knowledge. Of course, almost everyone in America has had at least some sort of consumer end user experience with online sales systems; however, knowledge of this user experience only provides insight into the needs of one of the many stakeholders in a project such as this one. Due to the nature of business, there is very little information about the specifications that go into the business side of an online ordering system available to the general public. Thus, the functionality of the system from the point of view of the customer has been fleshed out well; the functionality that will facilitate business processes has not been as developed as would be possible in a real world setting.

The initial specification given in the project problem description also caused a few problems during the process. I found the initial problem description to be too short to adequately explain the problem domain. It does give a general sense of the project at hand but it does not do a good job of defining scope and providing functional details. I feel that it would be better to have a more well-defined problem space for this project. Having a well-defined problem space would allow students to spend more time learning and working with the analysis and design concepts and techniques and less time trying to define and redefine problem space throughout the duration of the project. This would also allow for better and quicker feedback because there would be a more defined solution to a well-defined problem space; there would be less variation in the solutions that are developed, allowing the student to have a stronger focus on mastering the modeling techniques and methodology.

A lack of object oriented programming knowledge also contributed to my inability to master UML techniques. I feel that the programming preparation that is required of students in the Master's degree in Information Systems (MSIS) program at Drexel University is insufficient to prepare them for later, more involved coursework. A stronger grasp of the concepts and techniques behind object-oriented programming would greatly enhance the effectiveness and completeness of many UML models, most notably design class diagrams, sequence diagrams, design phase state diagrams, activity diagrams and component diagrams. My incomplete understanding of object-oriented programming, made it especially difficult to identify operations and flow for the detailed sequence diagrams presented in this project. Another area of mastery that I feel needs to be a prerequisite for UML is computer networking and architecture. A good grasp of these concepts is needed to produce such diagrams as the deployment diagram.

The final major challenge that I faced in the completion of this project was a lack of formal training on Microsoft Visio and/or Rational Rose. The MSIS program does not offer a course on how to use the common software programs that are used throughout the program. The model for learning is kind of a trial and error sort of method with no formal instruction. I feel that some sort of formal course instruction on commonly used industry software packages for MSIS students would greatly enhance the experience that most students have in their other courses. The "throw the students into a software program without formal training" model means that most students, myself included, spend more time trying to learn a new software package than on developing the content of their coursework. I am sure that there are ways that Visio and Rose can be used to make completing some of the diagrams that appear in this project easier; however, my lack of training in how to use these programs did not allow me to take advantage of these benefits.

As far as the material presented in this report goes, there is much more work that would need to be completed if this was a real world project. Almost all of the diagrams presented in this project have been developed with a strong bias towards the sole primary use case, ‘place purchase order’, and its included use cases, ‘send confirmation email’ and ‘process credit card’, that were chosen for detailed use case description development. Many of the models put forth by the UML are based heavily on the information that is presented in the detailed use case descriptions. Thus, the limited detailed use case description development that was part of this project limited the extent to which the rest of the models and diagrams produced for this project could be developed.

The next iteration of this project would see several detailed use case descriptions developed for other important use cases, such as ‘create customer account’ and ‘create CD record’. From these, attributes could be added to the domain model and design class diagram. Detailed sequence diagrams could then be developed and operations from these could then be added to the design class diagram. Other appropriate documentation could also be developed such as relevant state diagrams, for complex multi-state objects, and activity diagrams as well as screen and interaction design.

If I was able to do the project over again, there are a few adjustments that I would make to the approach that I took to the project this time around. The first and most important of these changes would have been to my timeline. Too much time was spent on earlier pieces of the project, such as the use case diagram and high level use case descriptions, and not enough time was spent on the latter portions, such as the class and sequence diagramming.

What I have learned from this project

Working on this project has taught me a great deal about UML, its standards and its models. It has forced me to try a little bit of everything and because of that I have had broad exposure to the entirety of UML techniques. I'm sure that this is what everyone will say, and it is true for me as well. This project has also forced me to learn more about using Microsoft Visio and Rational Rose. While I'm sure there are many, many, many more things to learn about using these programs, working on this project has given me an inkling of what it is like to use these products to produce UML models. This project has also forced me to rethink my time management skills and my need to read ahead for class. Reading ahead would have allowed me to start some of the models earlier and would have allowed me to not rush to get most of the work done at the end. Lastly, this project has taught me that it is not always good to have a blank slate to work with when tackling a term project. For this project, in particular, it would have been more helpful to have a more descriptive and restrictive problem definition. Overall, working on this project has been a great learning experience. I have appreciated it, even if I don't want to have to do it over.

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Appendix A: Problem description

The following is the original problem description that appeared in the project handout:

A local CD store would like to open a new online CD sales system called OnCD. Here, all existing CDs will be displayed in the web and customers could choose CDs and pay by credit cards. OnCD will allow customer search CDs by title, artist, and category such as Rock, Jazz, or Classical, etc. The marketing information for CDs includes reviews on CDs by well-known musicians or customers, artist information such as their bio or well-known performances, and sample clips of each music piece. Staffs in the store can also use the OnCD to place orders. The store allows customers to hold CDs to be picked up later. The store receives from the vendors when new CDs are released and thus store will maintain its inventory.

Appendix B: Project Propsal

INFO620: Information Systems Analysis and Design
Term Project Proposal
Chad Morris (10863503)
10 October 2006
Project Category: Analysis and Design

Analysis and design of an online CD sales and inventory system

Problem statement

A local CD retail store would like to create an online ordering system to allow customers to order CDs online. The system will also be responsible for keeping track of inventory.

Overall goals of the system: The overall goals of the system are to allow for the placement, tracking and fulfillment of online customer orders and to track inventory.

Importance of the system: The OnCD system is important for two main reasons. The first is that the system will allow the local CD store to get more business by tapping into the online music sales market. Second is that the system will help the store keep track of inventory, a daunting and important task for any retailer.

Scope of the project: The OnCD system will handle the placement, fulfillment and tracking of all online orders and returns. The system will also be responsible for keeping track of the inventory for the store, both online and in store. Handling the placement and fulfillment of stock orders will also be the responsibility of the OnCD system. The system will not be responsible for tracking in store orders and returns.

Functional requirements (partial list)

The OnCD system is a multi-user system that will be accessed using password protected logins. The following is a partial list of the functions that the OnCD system needs to be able to perform:

(1) Create customer account
(2) Create employee account
(3) Create distributor record
(4) View/edit distributor record
(5) Delete distributor record
(6) Create CD record
(7) View/edit CD record
(8) Delete CD record
(9) View/edit customer account:
    (9.a) Add address
    (9.b) Edit address
    (9.c) Delete address
    (9.d) Add credit card
    (9.e) Edit credit card
    (9.f) Delete credit card
(10) View/edit employee account
(11) Generate invoice
(12) Place customer order
(13) Place stock order
(14) Check order status

(15)Login and Logout
(16)Process online order return
(17)Back up data
(18)Generate reports
  (18.a) Customer order history
  (18.b) Distributor order history
  (18.c) Monthly online sales
  (18.d) Quarterly online sales
  (18.e) Yearly online sales
  (18.f) Current inventory
(19)Search CDs:
  (19.a) Search by artist
  (19.b) Search by title
  (19.c) Search by genre

Data requirements and business rules (partial list)

Data requirements

The following is a partial list of the kinds of data that the OnCD system needs to collect/store.

- Customer: customer name, customer user ID, password, shipping address(es), billing address(es), credit card type (Visa, Mastercard, American Express, Discover), credit card number, credit card expiration date
- CD: title, artist, genre, reviews, sample clips, artist information, qty in stock, price
- Employee: employee name, employee user ID, password
- Order: customer name, titles and prices of ordered CDs, product subtotal, tax, shipping and handling charges, shipping address, billing information, total order charge

Business rules

The following is a partial list of the business rules that will govern the OnCD system.

- All discounts and promotions that are available in store will be made available online.
- Returned products, if not damaged, will be added back into the salable inventory.
- Each product will be supplied by one and only one distributor.
- The total order charge of an online customer order includes the product subtotal, applicable taxes and shipping and handling charges.

Assumptions

It is assumed that all payments will be made by credit card.

It is assumed that the local CD store has only one physical location.

It is assumed that the OnCD system will have to interface with a pre-existing in-store point-of-sale system for the purposes of maintaining store inventory.

It is assumed that all merchandise sold by the store is CDs and all merchandise will be made available for purchase online.

Examples of system input/output

Some examples of the types of input that the OnCD system will be required to handle:

- A customer purchases 3 CDs and wants them delivered
- A customer purchases 1 CD and wants to pick it up in the store
- A staff member adds a new CD to the system
- A staff member places an order with a distributor for 300 CDs

Some examples of the types of output that the OnCD system will be required to produce:

- Inventory report
- Invoice for customer orders
- Pending customer orders
- Reports of online sales
- Pending distributor orders

Knowledge acquisition

Although I have not worked in a situation where an online ordering system was used, I am familiar with the retail environment and I am familiar with the type of system being built from the customer perspective. I have also had experience working on similar online retail system projects as part of other classes in my degree program.

Software and hardware

The OnCD system will be PC-based system run on Windows XP.

Proposed deliverables and work plan

I intend to submit a full set of UML diagrams and supporting documentation as outlined in the project guidelines. I will also submit a report that describe my experiences during this project and outlines any remaining questions related to the project or any recommendations for future improvement of the system that was designed.

Software/tools used in analysis and development

Microsoft Visio or Rational Rose will be used to produce all project diagramming documentation. Microsoft Access will be used to produce any necessary prototyping.

Known references

Larman, Craig. *Applying UML and Patterns*, 3rd edition. Prentice Hall: 2005.

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