

Final Exam

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Important Notes:

- There are 6 questions in the exam paper; please make a note of the points distribution
- Type your answers below every question (**No Hand-Writing will be accepted**), and please make sure you distribute your time wisely to cover all questions.
- The Exam is an individual-work not team-work; please do NOT communicate the exam content in any shape or form to anyone except myself

Your Final Exam is due on D2L as SINGLE PDF document at 11:55pm tomorrow, Friday, 6/8/18.

1. **(5 points)** What are the artifacts produced in order to capture and document the requirements, analysis and design when following the unified development process?

- Analysis model, architectural model, and design model
- Understanding and analyzing the requirements of the system
- Defining a candidate architecture for system
- Constructing a prototype or proof-of-concept to validate a candidate architecture
- Design of components, services, and modules
- Design of interfaces (network, users, and database).
- Use Case Model
- Vision
- Supplementary specification
- Glossary

2. **(5 points)** Give an example to illustrate the difference between the functional requirement and non-functional requirement.

A functional requirement describes what a software system should do, while non-functional requirements place constraints on how the system will do so. The functional requirement is describing the behavior of the system as it relates to the system's functionality. The non-functional requirement elaborates a performance characteristic of the system.

Example of a functional requirement would be:

- A system must send an email whenever a certain condition is met (e.g. an order is placed, a customer signs up, etc).

Some non-functional requirement examples:

- Emails should be sent with a latency of no greater than 12 hours from such an activity.
- Paychecks distributed no more than 4 hours after initial data is read
- System limits access to senior managers

3. **(5 points)** What is the difference between code reuse and design reuse?

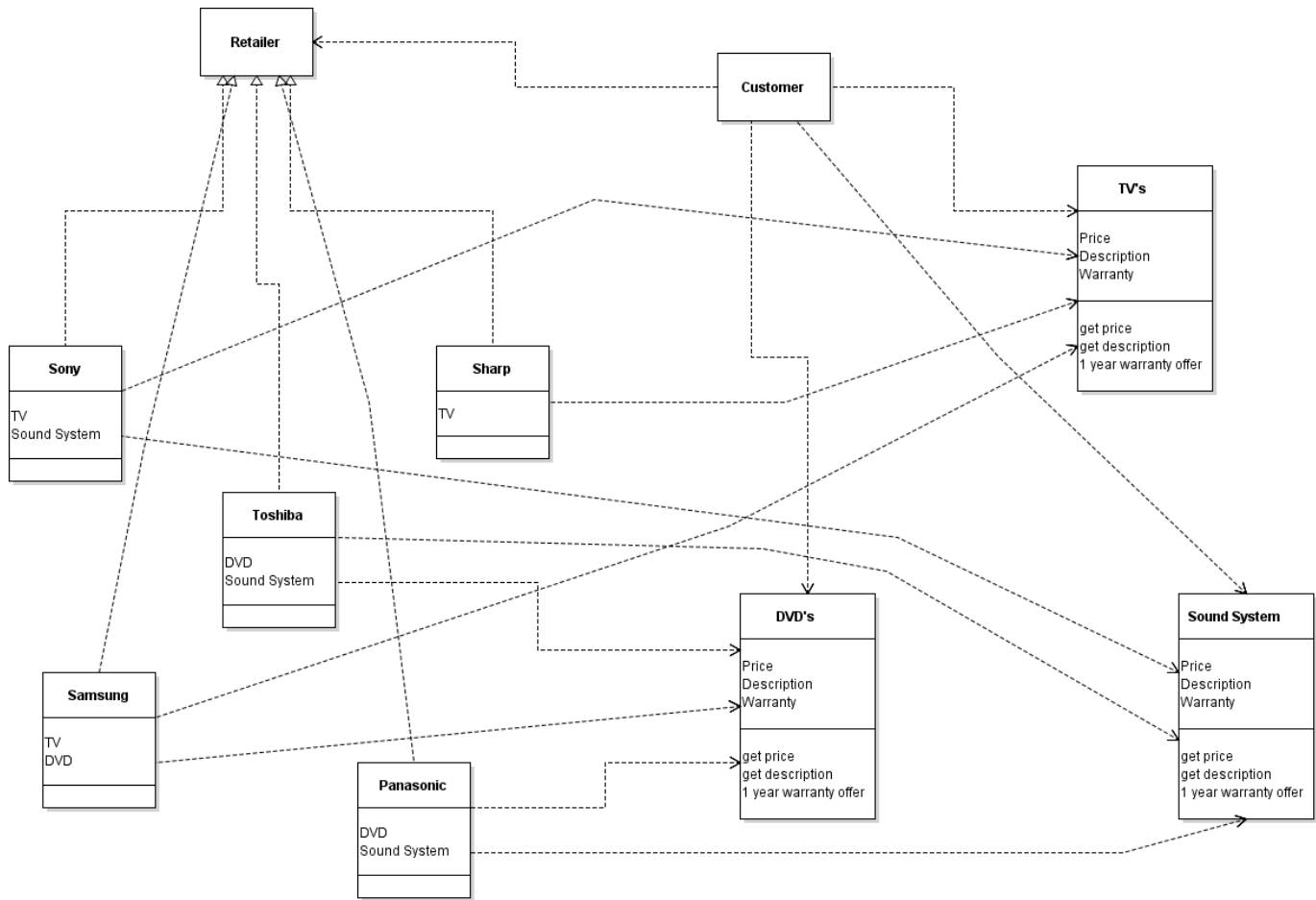
Code reuse is the reuse of classes and methods of the program, whereas design reuse is the reuse of the design and components of a

program.

4. **(20 points)** A retailer sells electronic entertainment centers. The customers have the choice to choose their TV, DVD player, and the sound-system. For simplicity, assume each of these components has the following properties: price, description, and warranty cost per year. We have the following manufactures for the different parts, assume each manufacturer has only one model for each of the following components:

TV	DVD Player	Sound System
Sony	Panasonic	Sony
Samsung	Toshiba	Panasonic
Sharp	Samsung	Toshiba

The customer buys an entertainment center composed of the 3 components bundle listed above, however, it is the customer who decides which manufacturer/model to choose to be part of the 3-components bundle. Show the **UML Design class diagram** for the above. Name and document the **design pattern/patterns** used in your application. Use the OO design/modeling methods covered during the class, and take into consideration that a new manufacturer may emerge in the future.



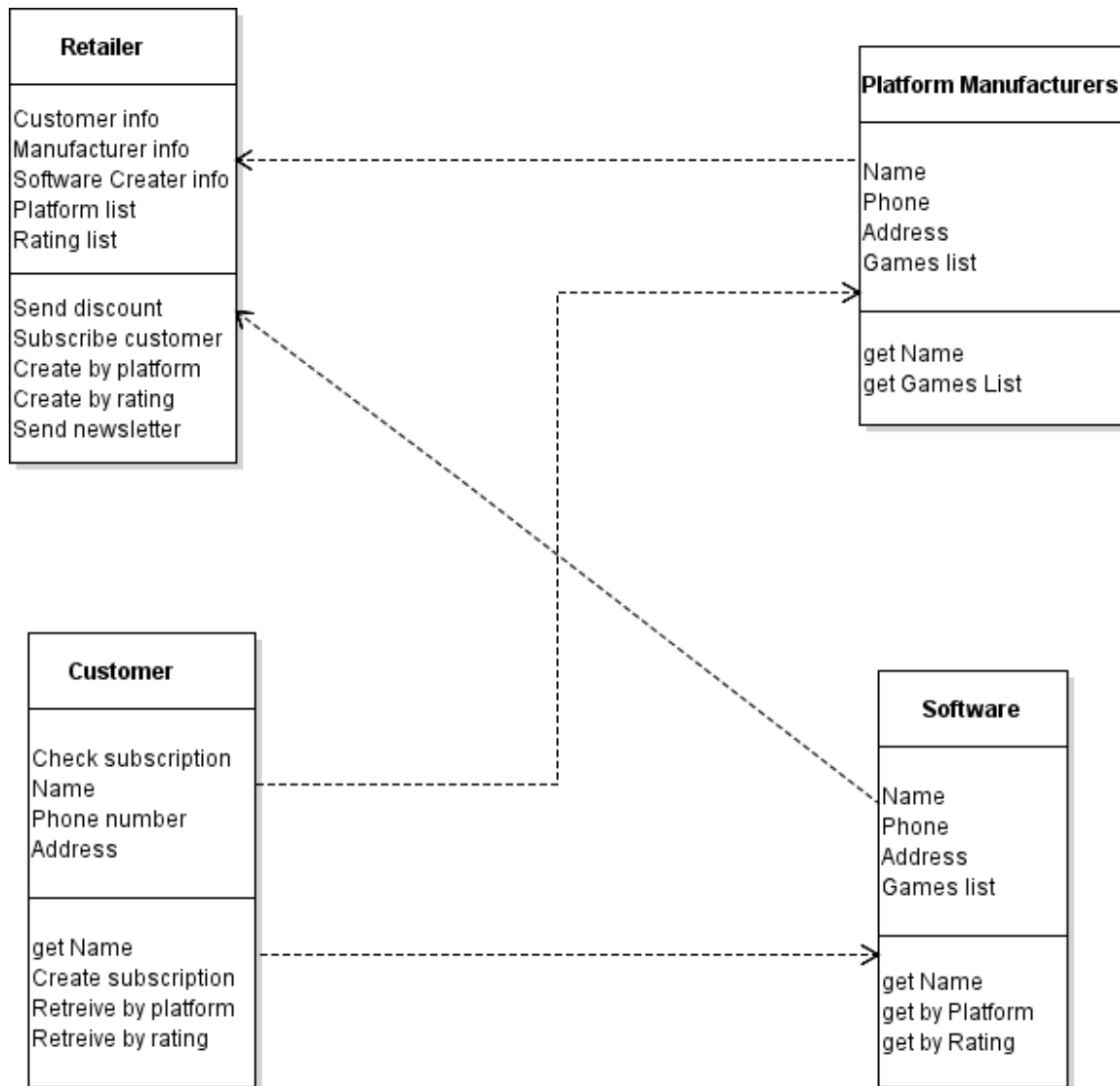
Abstract Factory Design Pattern is used.

(15 points) A retailer sells video-games for a number of platforms: Xbox, Wii, and PlayStation. The games have three rating categories: Everyone, Teen, and Mature. The retailer would like you to write an object-oriented application that will meet the following requirements:

1. The ability to create and retrieve the games for every platform
2. The ability to create and retrieve the games for every rating category
3. The ability to retrieve games for every rating category of a particular platform
4. Customers may subscribe with the retailer to be notified of new game releases
5. Retailer sends 20% discount coupons for randomly selected 10 customers every day
6. The retailer keeps the name, address, and phone number of the customers

7. The retailer keeps the name, address, and phone number of the platform manufacturers
8. The retailer keeps the name, address, and phone number of the software company creator for every game.

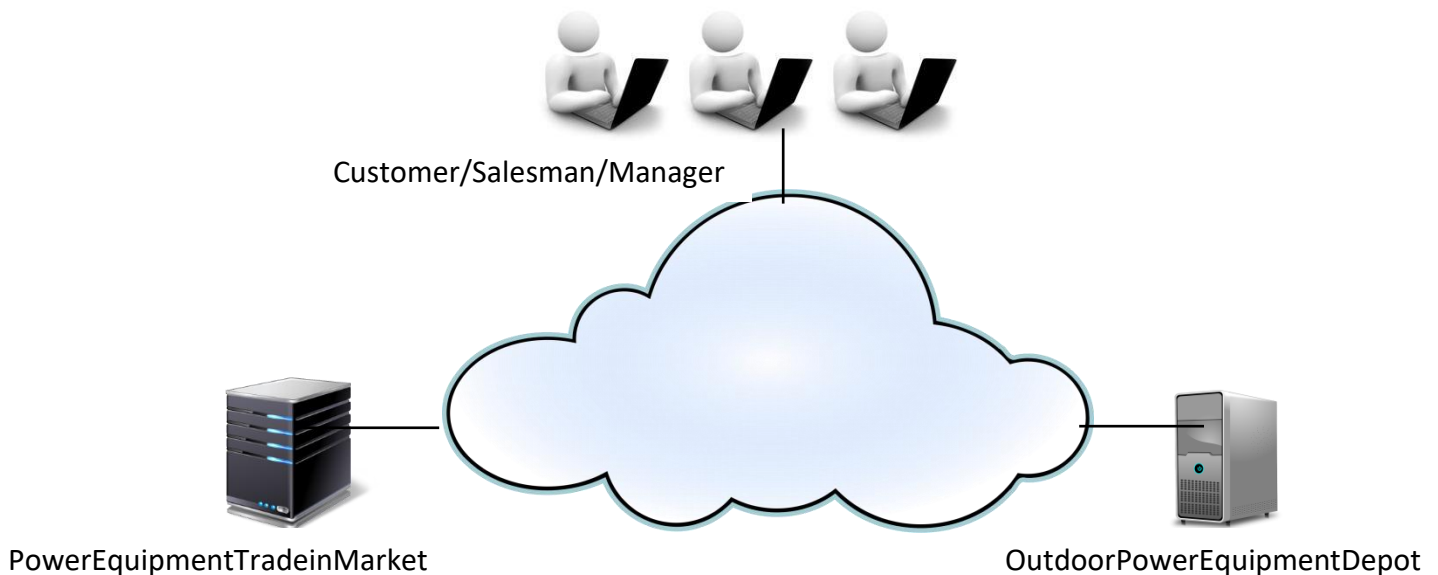
Create the **UML Analysis class diagram** that will satisfy the above requirements.



5. **(50 points)** Based on the description and high level requirements listed below for **OutdoorPowerEquipmentDepot** retailer , provide your answers for the following:
- a. Create the UML use-case diagram
 - b. Create the UML design class diagram
 - c. Name and document 2 design patterns that are used in your design class diagram

High-Level Requirements:

OutdoorPowerEquipmentDepot retailer would like to have an application that will give it the competitive advantage over its rivals to offer its customers maximum flexibility, speed, simplicity, and freedom to buy, trade-in, and lease outdoor power Equipment. Using the newly introduced online PowerEquipmentTradeinMarket software, the retailer employees and customer can determine the current market value of the trade-in equipment in a matter of seconds.



Software Product High-Level Description:



Consider the following high-level description for OutdoorPowerEquipmentDepot retailer:

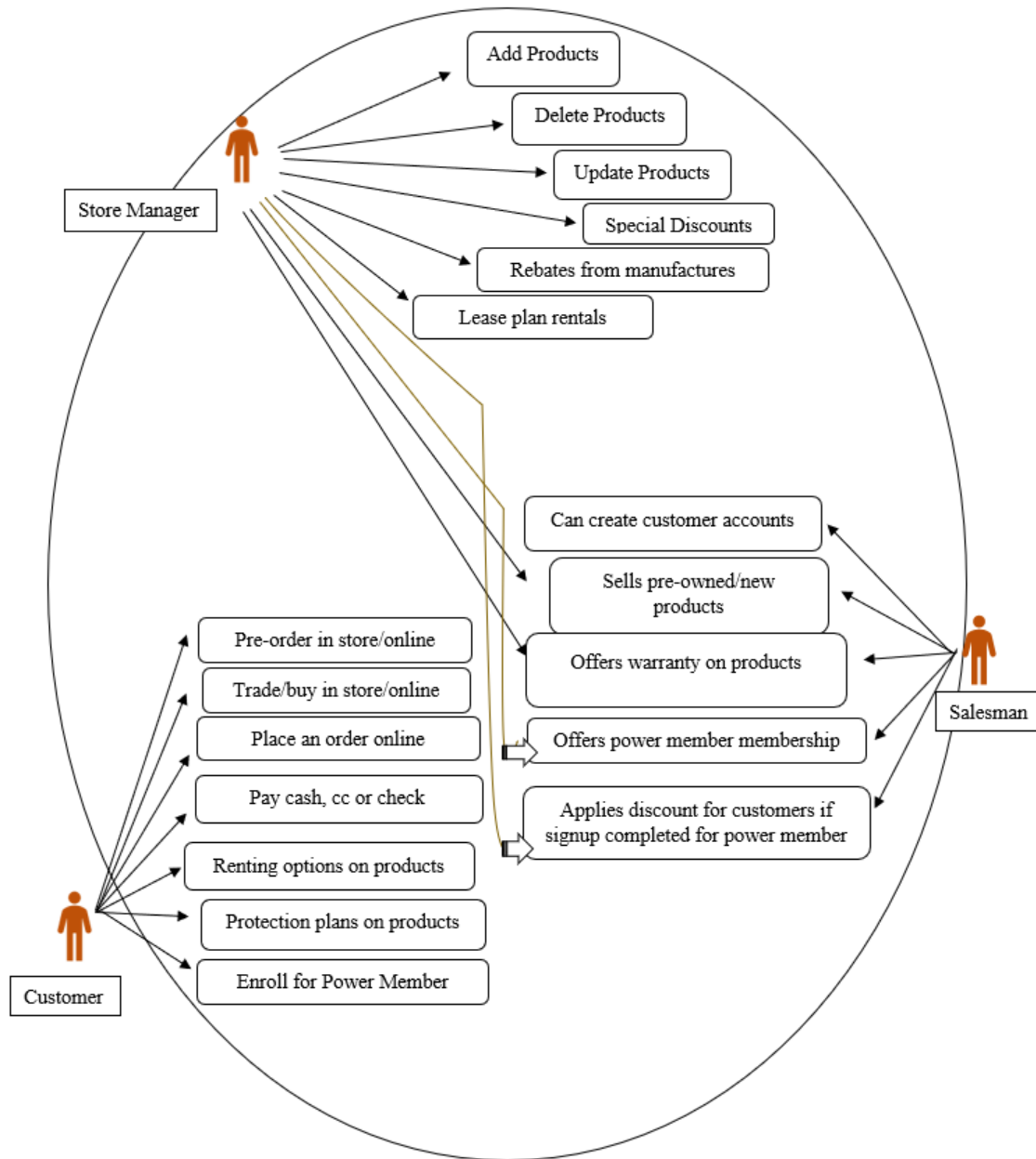
- The intent is to build an object-oriented application that will allow the customer to buy, trade-in, or rent equipment from the retailer either in-store or online
- The store has a StoreManager, Customers, and Salesmen
- The retailers sells, trade-in, lease new and pre-owned products
- The StoreManager can Add/Delete/Update products
- Only the StoreManager can create special-discounts for the different products
- Salesmen and StoreManager can create Delete/Update customer accounts and orders
- Marketing staff can execute queries to generate reports about the products, orders, customers, etc.
- Manufacturer can offer rebates for certain products
- Some of the products may have store special-discounts
- Some of the products may have manufacturer rebates
- There are number of equipment Manufacturers and each offers its own models.
- Every equipment has an extended warranty plan that could be bought separately from the retailer
- The customer can choose one of the following options when buying a new equipment
 1. Buy the new equipment with no replacement

2. Buy the new equipment with 1 year replacement for 50% fee of the equipment retail price; under this plan the customer can replace the equipment by a new one any time during the year (Equipment can be replaced only once for the customer).
 3. Buy the new equipment with lifetime replacement for 65% fee of the equipment retail price; under this plan the customer can replace the equipment by another new one any time (Equipment can be replaced only once for the customer).
- The customer can trade-in equipment
 - The customer can rent equipment. However, there are a number of lease plans that the store like to offer its customers
 1. Limited duration rental (for example renting an equipment for 2 days)
 2. Single season rental (for example rent a snow blower for the entire winter season for a \$100 fee per season)
 3. All seasons rental (for example the customer gets a snow blower for winter and a lawn mower for spring/summer for \$150 fee annually)
 - The customer can place an order, check the status of an order, or cancel an order.
 - The customer can choose home-deliver or in-store pickup for the equipment rental. Equipment delivery or pick up shall be done within a reasonable amount of time after order is placed by the customer.
 - The customer can pay in cash, check, or credit card
 - Customers who are renting equipment must be at least 25 years old, have a valid ID and credit card.
 - The customer has the choice to enroll (or cancel) and become PowerMember in order to receive 5% discount for every item purchased or leased for an annual fee of \$30
 - Some of the equipment may have store special-discounts
 - Some of the equipment may have manufacturer rebates
 - The Customer or salesman can determine the current market-value of the trade-in equipment through the PowerEquipmentTradeinMarket using the serial number of the equipment, date bought, and current condition (excellent, average, poor)
 - Due to storage space limitation, the store requires to have at least 50% of its rental equipment be leased out to its customers at any time. If that threshold is violated, the store will send 25% discount promotional lease offers through email to its customers

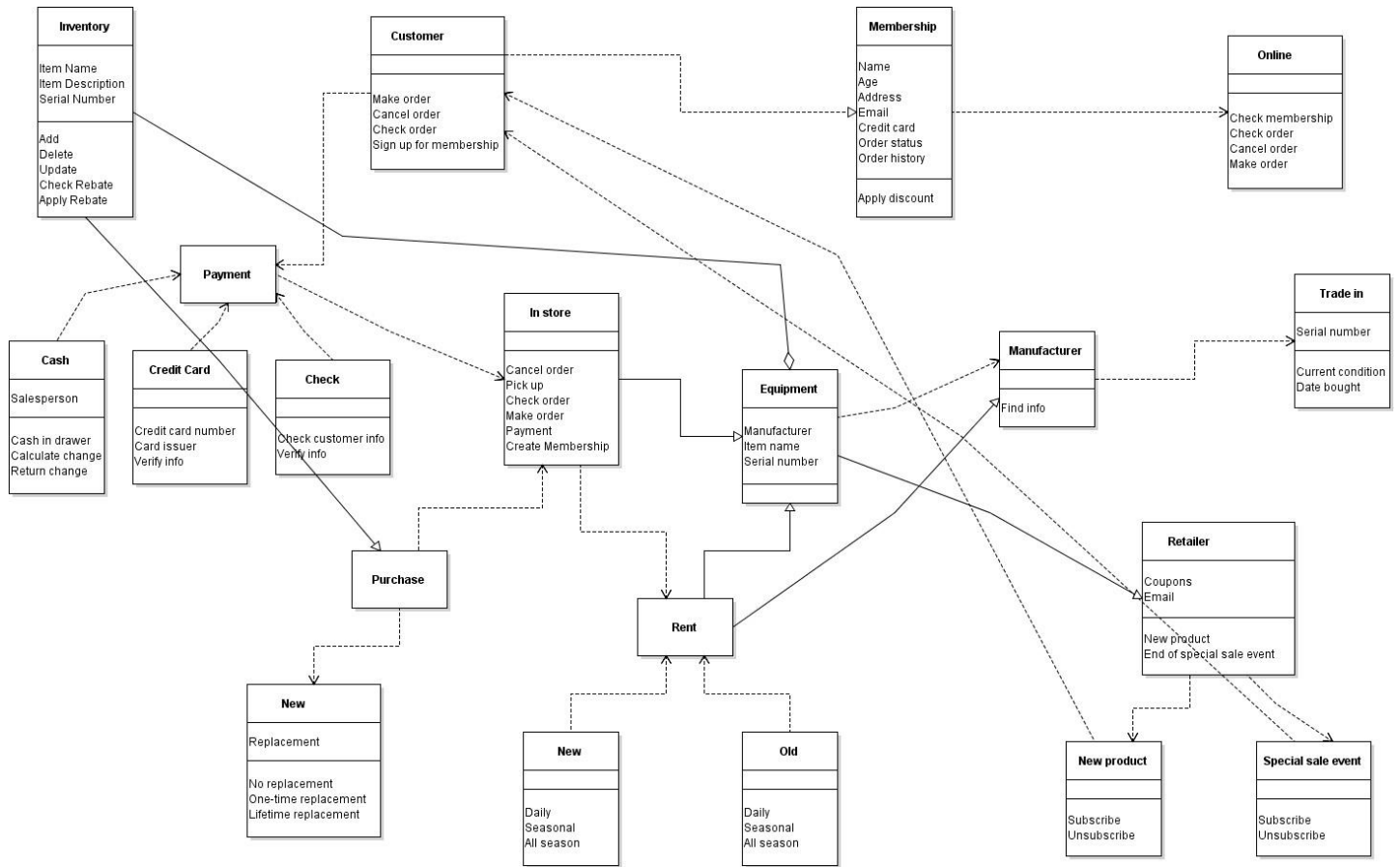
in an attempt to reduce the number of equipment in its rental storage

- To minimize the cost of restocking new equipment at the end of every season (winter and summer mainly), the retailer email its customers about the 20% discount for the clearance event at the end of every season.

Use-Case Diagram:



Design Case Diagram:



- Abstract Factory Method is used for Customer to Payment.
- Composite Design Pattern is used for Equipment to Inventory where Inventory is the Super Class.