

Team Alpha Final Project

E-commerce system becomes stable Shopping Model

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Introduction

The following is most, but not all, of the original final report as required for this particular project by the instructor in a UML design class. The final solution should not be viewed alone. I have included the original OOPSLA problem statement as an appendix, and would refer any reader to that appendix prior to examining the final solution.

The final solution diagrams, with the exception of class diagrams, are not a complete record, but only a sample.

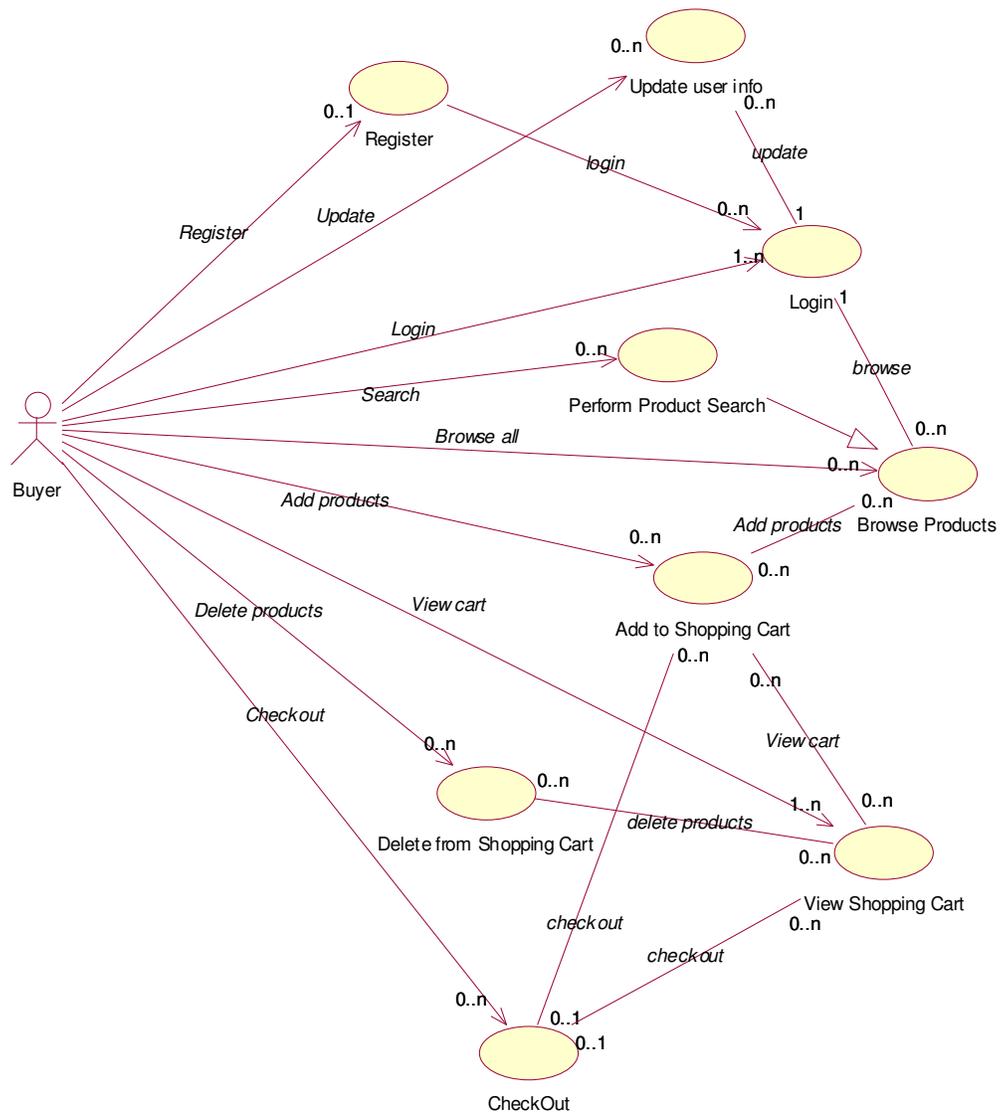
The instructor introduced the concept of a “stable” model with a core of highly abstract analysis level “enduring business theme” classes that will never change, a design level of “business object” classes that change only with implementation, and an implementation level of “industrial object” classes that come and go depending on the particular implementation requirements.

The concept is that reuse should be based on a system with a stable core. That system can then be reused for different implementations without change to its core.

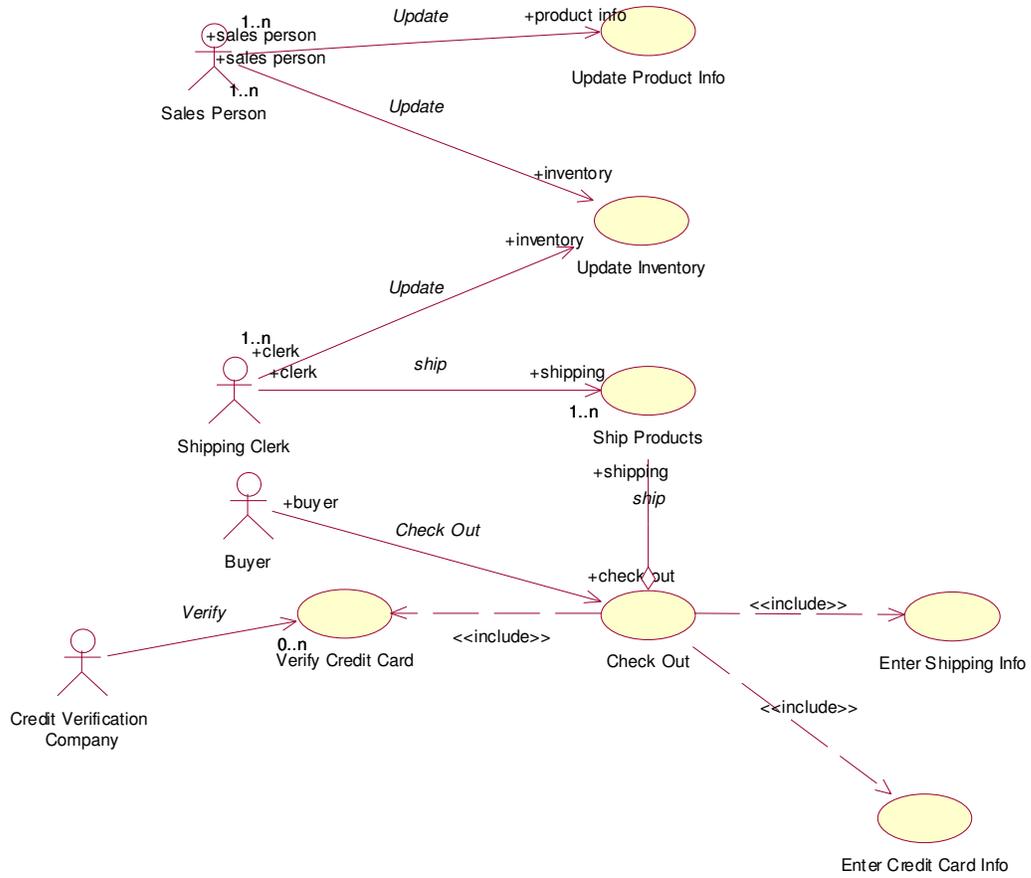
Use Cases

Diagrams

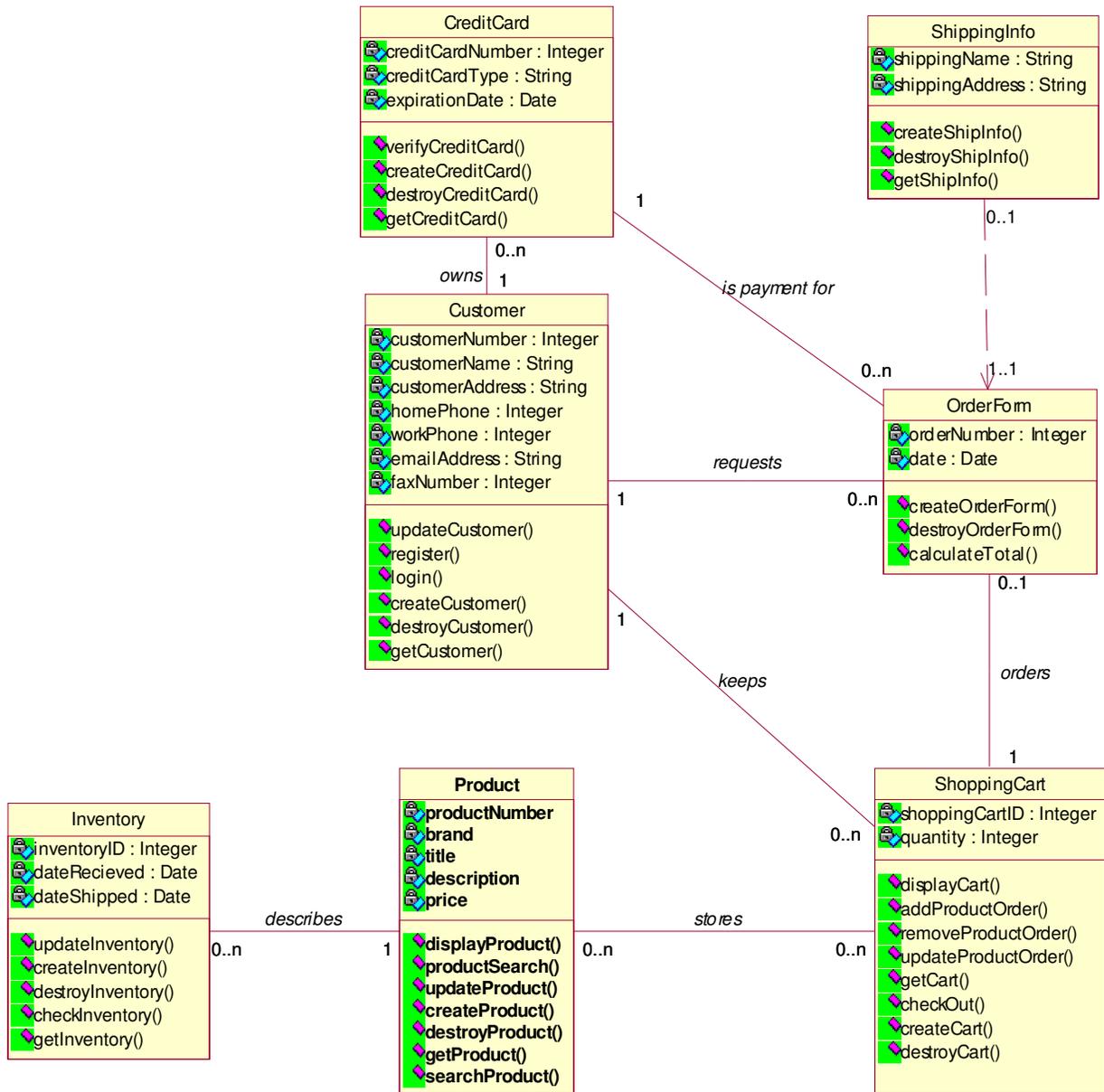
Product Selection



Buying



Class Diagram (Traditional Model)



Description:

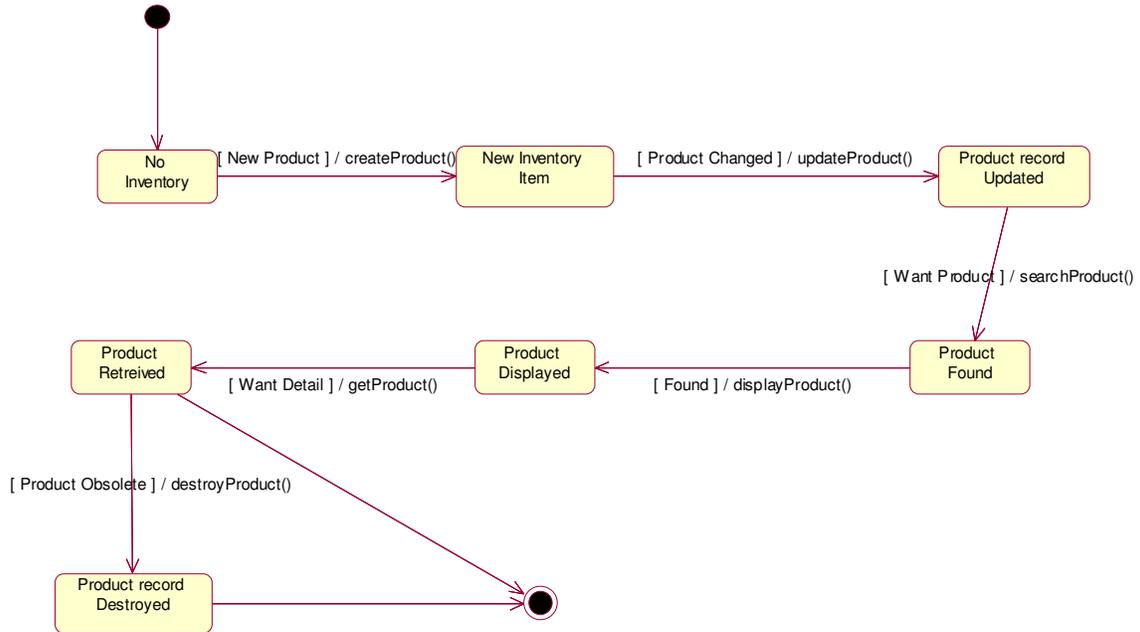
The traditional model is made up of mostly industrial objects as is typical of a model developed without stability in mind. It shows the relationships among the various traditional classes. These classes are self explanatory. Naming of the relationships among the classes makes the traditional model more clear and understandable.

Description:

In the stability model we have made all traditional model classes industrial objects with the singular exception of “Product”. We feel that Product is properly a business object because anything can be a product. In the specific problem domain a product is something sold by the electronics store. However with a stable and reusable core, product could become any thing that is bought and sold (e.g. a car, a house, a dog, etc.). The enduring business themes are all quite stable over time. Shopping, buying and selling apply to any purchase relationship or item. The business objects are stable externally as they relate to the enduring business themes, and change only with their internal implementation. The industrial objects are a specific implementation of the model for our specific problem domain.

Behavior Model – State Transition Diagram (STD)

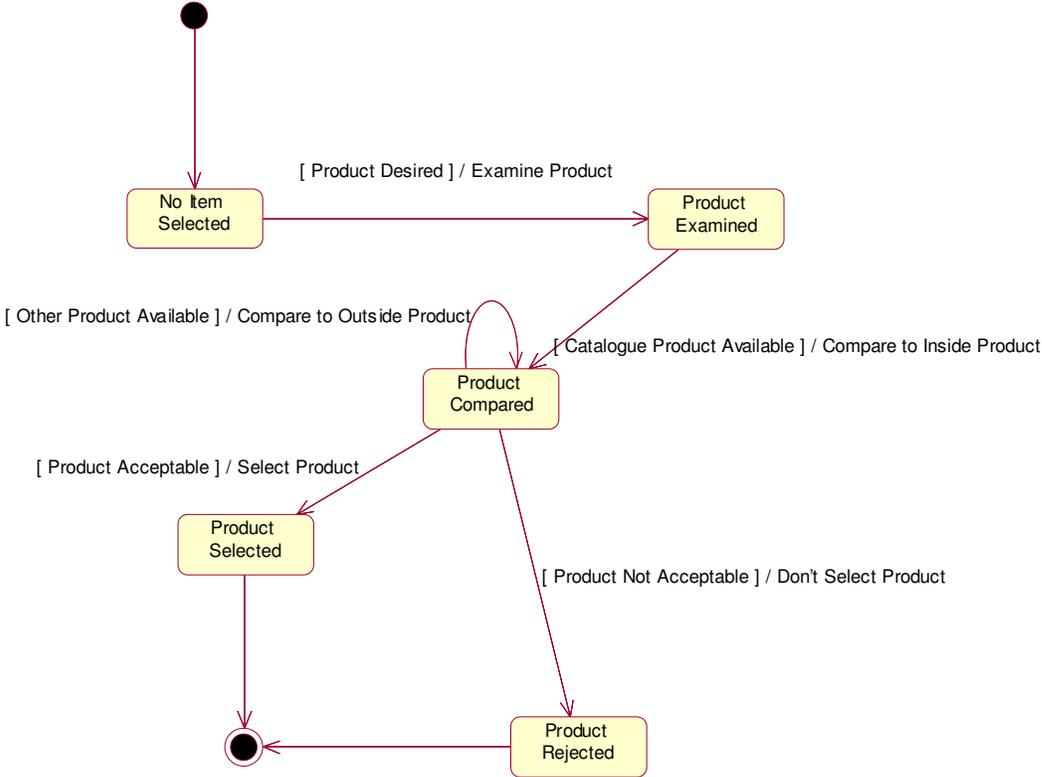
Product



Description:

Product transitions through several states in the system as it is entered in inventory, updated, and destroyed. Additionally the product class can be displayed or retrieved from the catalogue which is implicit in our system.

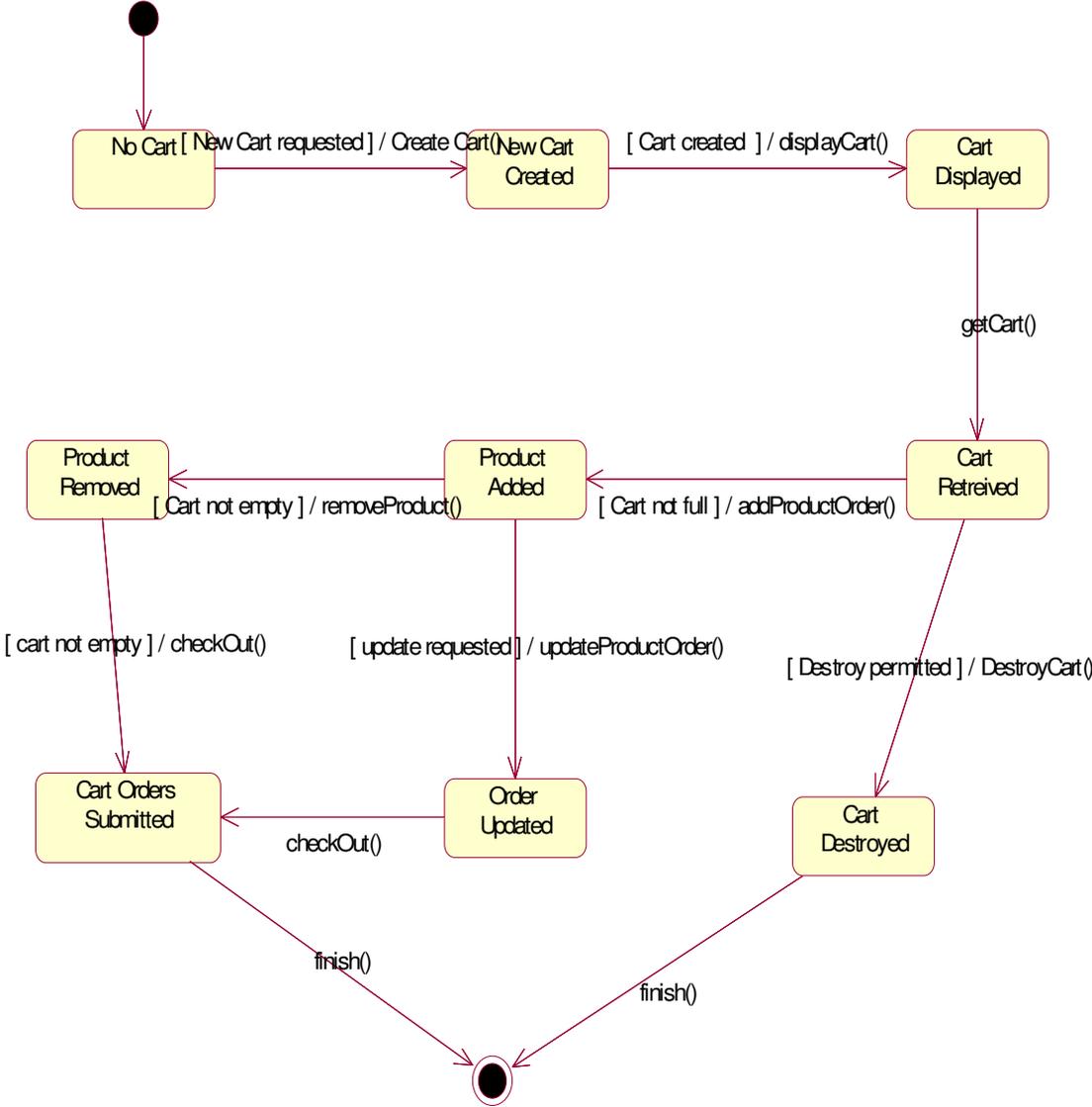
Shopping



Description:

Shopping is one of our enduring business themes it allows browsing of products, comparison of products with others in our system and selection or rejection of any product.

Shopping Cart

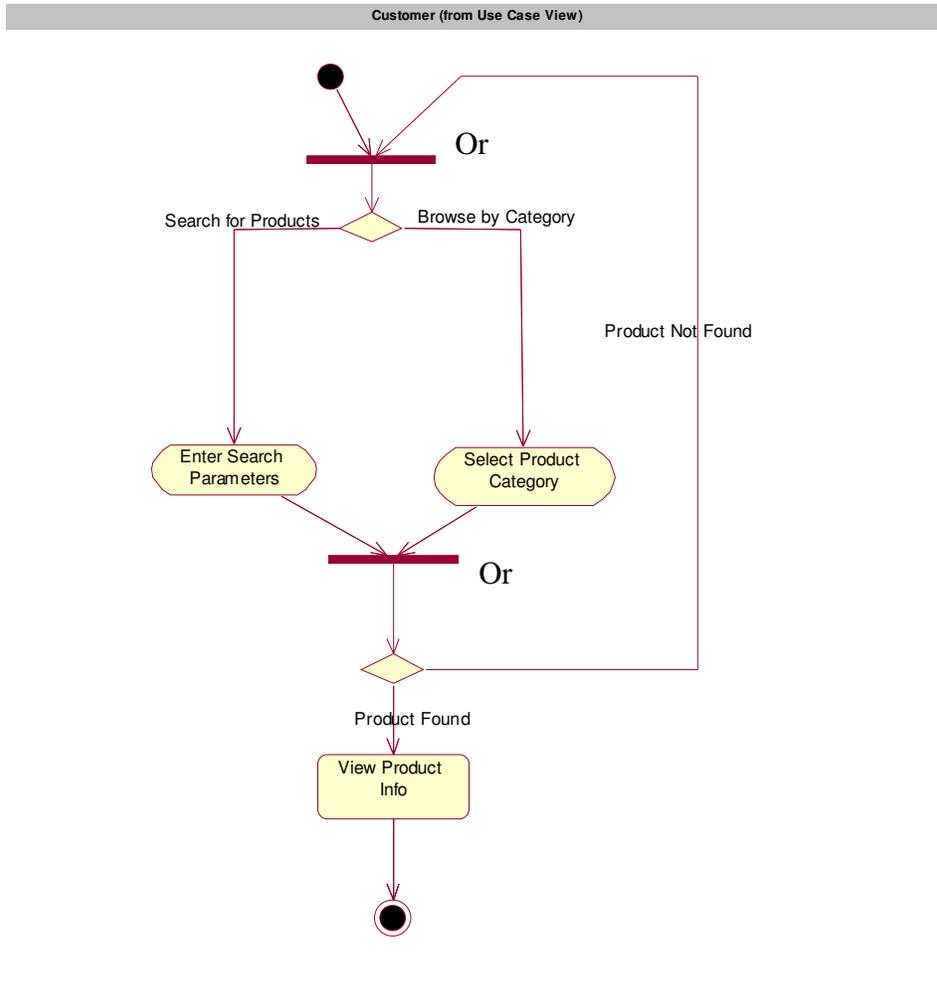


Description:

Shopping cart is one of our industrial objects. It allows creation and destruction of instantiations. Other states include adding and removing products, updating orders, display or retrieval of the cart, and submission of the entire cart of orders.

Behavior Model – Activity Diagram

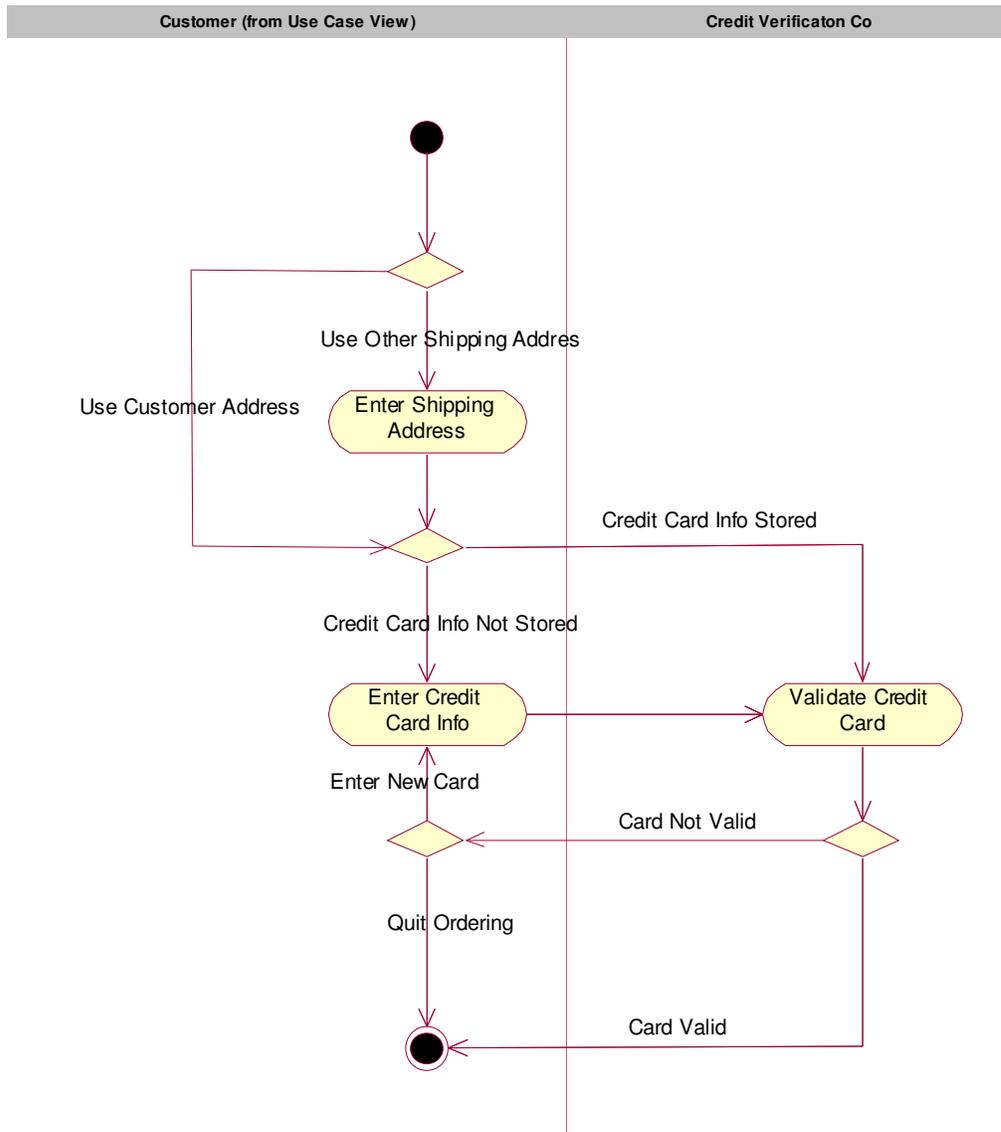
Activity diagram – buyer (customer) browsing activities



Description:

Customer browsing allows a search for a specific product or an examination of an entire product category. If a product is found it can be viewed, if not found the customer is allowed to search or brows again.

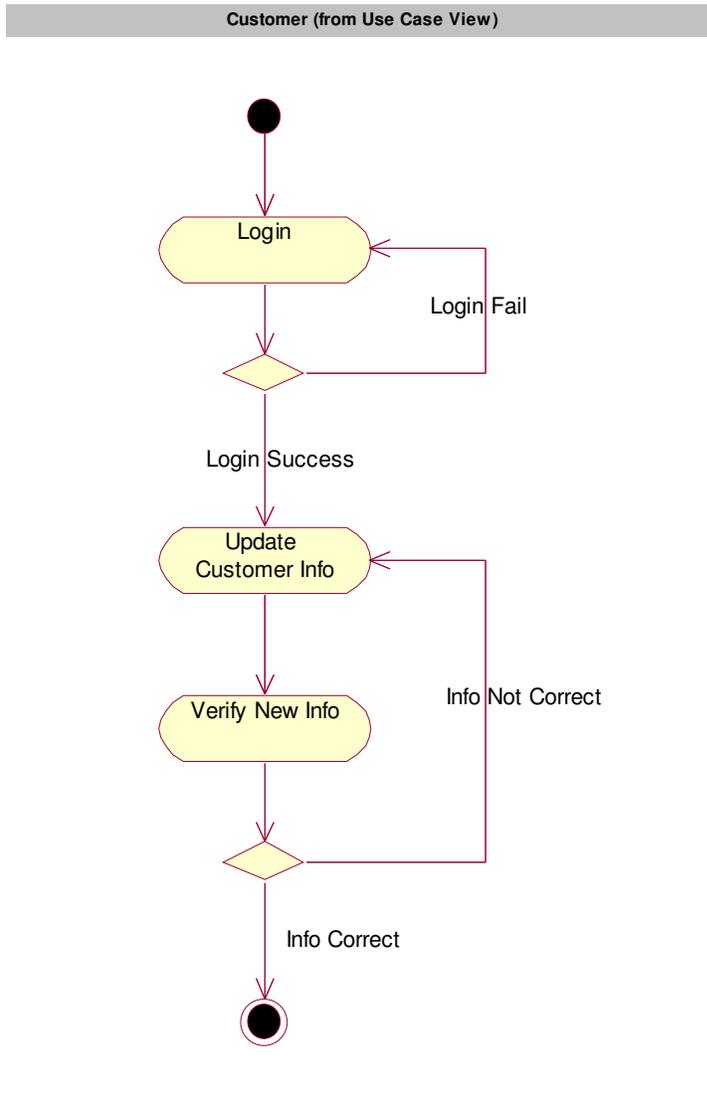
Activity diagram – buyer (customer) checkout activities



Description:

Customer checkout first allows identification and entry of the shipping address, then entry or retrieval of credit card information, and finally validation of the credit card.

Activity diagram – Buyer (customer) login and update activities



Description:

Customer login and update allows an update and verification of customer information after a valid login process.

Appendix

Rewrite of Problem Statement

Our original problem statement dealt with the specific problem domain in a traditional manner. After analyzing our model with stability in mind we see that a stable model has little to do directly with Doe's Electronics e-commerce. Rather the problem becomes the stable, abstract, and intuitive "shopping". Shopping does not necessarily require a purchase, but does require both buying and selling which are our other two enduring business themes. Shopping involves some type of product, any type of product, which is one of our business objects. If a purchase is made then an order, invoice and delivery are required which are our other three business objects.

Only when we get to the actual implementation of the system do we then deal with the original Doe's Electronics traditional problem domain. There we implement our design (business objects) with industrial objects from our traditional model. The implementation is specific to the immediate problem domain.

The stable model is enduring, adaptable, reusable, and scalable. Doe's Electronics can begin selling products other than electronics, or could change its business entirely from retail electronics to wholesale commodities, or real estate, or any number of other selling activities.

Original Problem Statement

Abstract

Doe's Electronics was founded in the rural town of Burwell, NE and currently serves the electronics needs of the local community, ranchers and farmers. Customers have been known to travel up to 100 miles to shop at the store. The store has very few employees and handles all operations in house. Computer information systems are currently being used for bookkeeping and inventory.

To eliminate the disadvantages (far away store, very few employees to handle all operations) and increase its business, Doe's Electronics decides to build an e-Commerce shopping system.

Domain

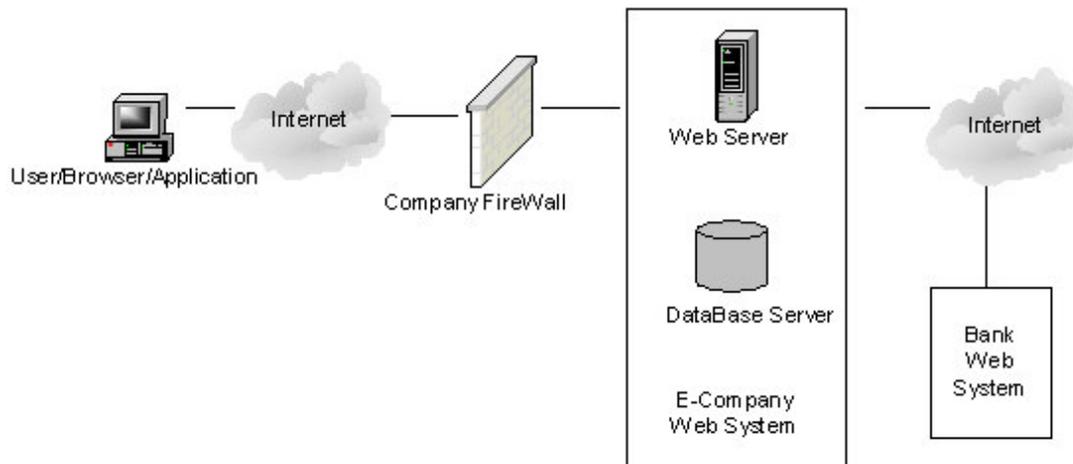


Figure 1. e-Commerce System on Internet.

There are four actors for the proposed system: customer, sales person, shipping clerk, and Credit Verification Company. Figure 1 shows the relationships among the customer (user/Browser/Application), E-company system and Bank. The Customer interacts directly to the system via the Doe's Electronics website when connecting to the Internet. The internal part of the e-Commerce system has two roles, the sales person and the shipping clerk. The Sales Person is in charge of updating the product information while the shipping clerk is in charge of product shipments. The Credit Verification Company's responsibility is to ensure that credit cards used in purchase are valid.

Description of the desired program

The e-Commerce shopping system that is desired by Doe's Electronic should meet the following System and information Requirements:

System Requirements

- Allow customers to view products from their home
- Allow customers to make purchases and receive products from their home
- Customers are able to make payments from credit card
- Product descriptions must be easily maintained and updated by store employees
- Fast distribution of product descriptions so that customers have accurate portrayal of what Doe's Electronics has to offer
- Inexpensive distribution of product descriptions
- Fast customer ordering system that is as simple as possible

Information Requirements

- Information needed to create order form
- Product selections
- Customer information
- Billing information (credit card)
- Shipping information (if different from customer)

Interfaces

Customer accesses the e-Commerce shopping system via Internet. So the Website of Doe's Electronics, which hosts the e-Commerce shopping system, must be able to be accessed via Internet. The e-Commerce shopping system needs an interface to the Credit Verification Company's system. If Doe's Electronics Company uses extra systems to manage its finance or accounting, the e-Commerce shopping system may need interfaces to these systems too.

Use Cases and User Context

User Context

Users are in an agricultural area, farmers, ranchers, and those who support farm and ranch businesses. Burwell is also a hunting and fishing destination. The users are in remote locations, sometimes many (as in 50 or more) rural miles (dirt roads) from any population center. A population center in rural Nebraska may be as few as 100 people, with a gas station, a bar, and if lucky a grocery store.

Do not make the mistake of thinking these people are backward. All of them keep up on current world events, and can articulately discuss international issues. Some of these farmers and ranchers use the very latest technology in running their businesses. They use computer controlled machinery on a daily basis. Some equipment requires wireless (radio or satellite) communication, and many of them can fix the equipment themselves. They are, by necessity, an independent and self-reliant bunch.

They regularly use sophisticated futures markets to lock in profits. These guys sell hog belly futures when they have the hogs, and intend to deliver the bellies. The users will obviously have internet access. That access may be quite slow and unreliable if via phone lines, or quite fast and reliable if via satellite.

It is a diverse group not easily generalized.

Shipping Clerk

The shipping clerk receives the order form after a purchase has taken place. The shipping clerk must be able to update the inventory to reflect the shipment of products. The shipping clerk is also

responsible of shipping the ordered products to the customer.

Sales Person

When a purchase is finished, the sales person needs to process the order form to shipping Clerk.

Use cases diagram

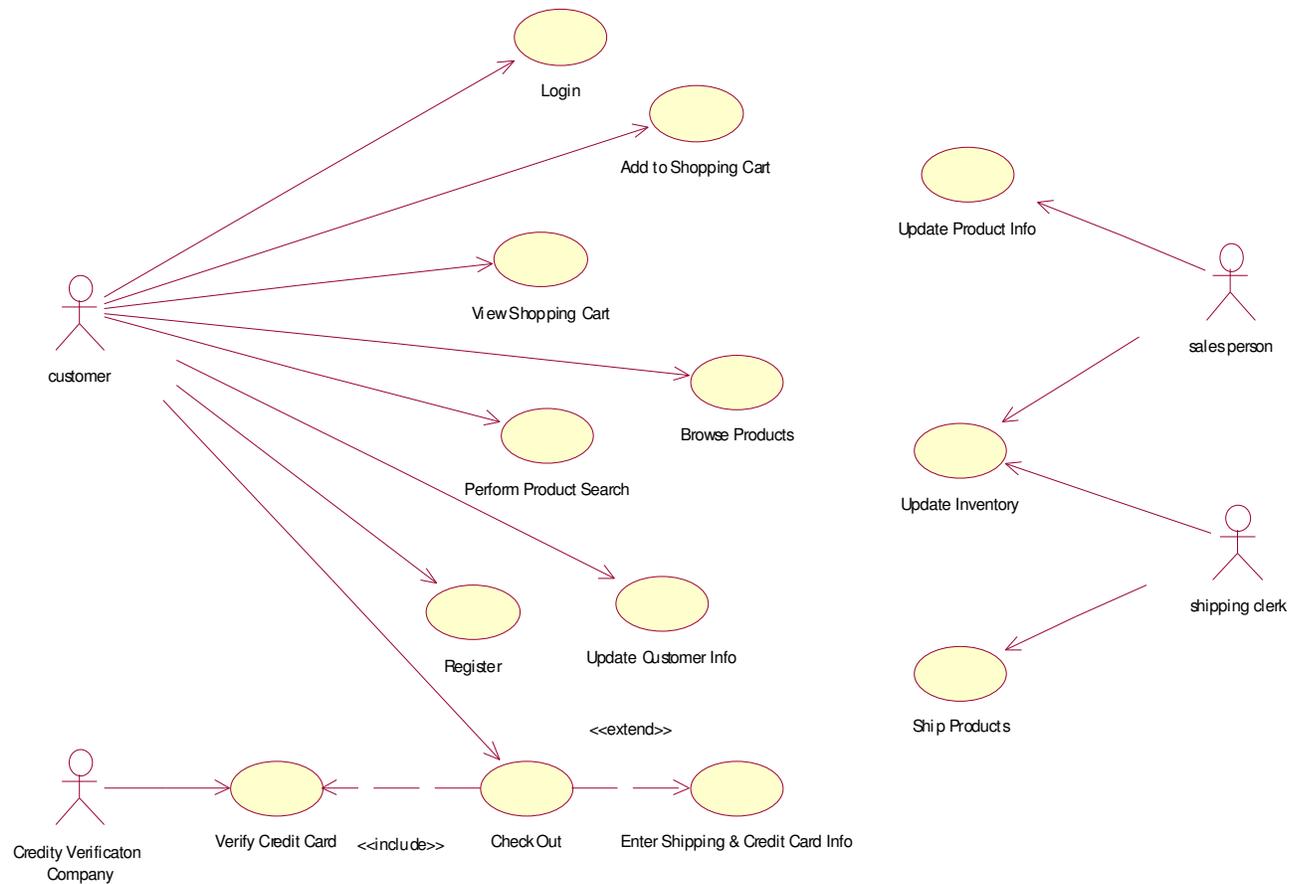


Figure 2: Use case Diagram of e-Commerce system.

Use Cases Description

Login

The customer can login to the e-Commerce shopping system by enter his user name and password. The system will verify that the login name matches the login password. If they do not match, error message will be indicated to the customer.

Add to Shopping Cart

When the customer finds the products he wants, he adds them to the shopping carts. The system will store and keep track the information of the products that have been added into shopping cart.

View Shopping Cart

The customer can request to view the contents of the shopping cart. The system will return the contents of the shopping cart to the customer; the unit price and total price will be shown as well.

Update Customer Info

The customer can request to update their customer info. Customer information includes the relative information of customer such as username, password, address, etc. The system will display the current customer info to the customer. The customer updates the customer information and the system will store the updated customer info in the system database. After one successful purchase, the payment information is also stored in customer information.

Register

If the customer is a new user, he can request to register with the system. The system displays a registration page and asks the customer to choose a login name (email address of the customer) and password. The customer is also required to enter their name and address. Shipping information and credit card information are optional entries at this point.

Enter Shipping & Credit Card Info

When the customer requests to checkout and he does not have credit card information stored at this point (system can not find his payment information), the system will prompt credit card information page. The customer will be given a choice on whether he wants the item shipped to his stored address or to an alternative address. The input payment information will be save into the order form.

Verify Credit Card

When the customer checks out, the credit verification company validates the customer's credit card when given the customers name, credit card number, and expiration date, and then returns the validation result to checkout department (sales

person). If the response shows that the credit card is invalid, the customer will be asked to re-input his payment information.

Update Product Info

The sales clerk requests to update products information. This includes the products price, description, brand, title, or number. The system will save the updated product information in the database.

Update Inventory

The sales clerk or shipping clerk requests to update inventory. The system will update the product information in the database.

Ship Products

After getting the order request, the sales clerk ships the order products to the customer within three to five business days.

Checkout

When the customer finishes shopping, he requests to checkout. If the payment information of this customer already exists, the system prompts the customer to review or input a new one. The system then forwards the credit card information to credit Verification Company. If the credit card is invalid, the customer is given the option to use another credit card or just cancel the order. If the credit card is valid, the order form will be processed by the system and checkout is complete.

Browse Products

The customer requests to view the products in a product category. The system will display the product information of the selected category.

Perform Products Search

The customer enters product search parameters and requests a product search. The system will search through the products category in its database and return the matches to the customer. If there are no matches, the system will display a fail message.

References for further study

Riel, Arthur J., Object-Oriented Design Heuristics, Addison Wesley Longman, Inc. 1996.

Oestereich, Bernd, Developing Software with UML, Addison Wesley Longman Ltd, 2001.

Jacobson, Ivar, Magnus Christerson, Patrik Jonsson, Gunnar Overgaard. Object Oriented Software Engineering: A Use Case Driven Approach, Addison-Wesley, 1995.

Jacobson, Ivar. "The Confused World of OOA & OOD," J. Object-Oriented Programming, Sigs Publications, September 1995.

Pattern Documentation

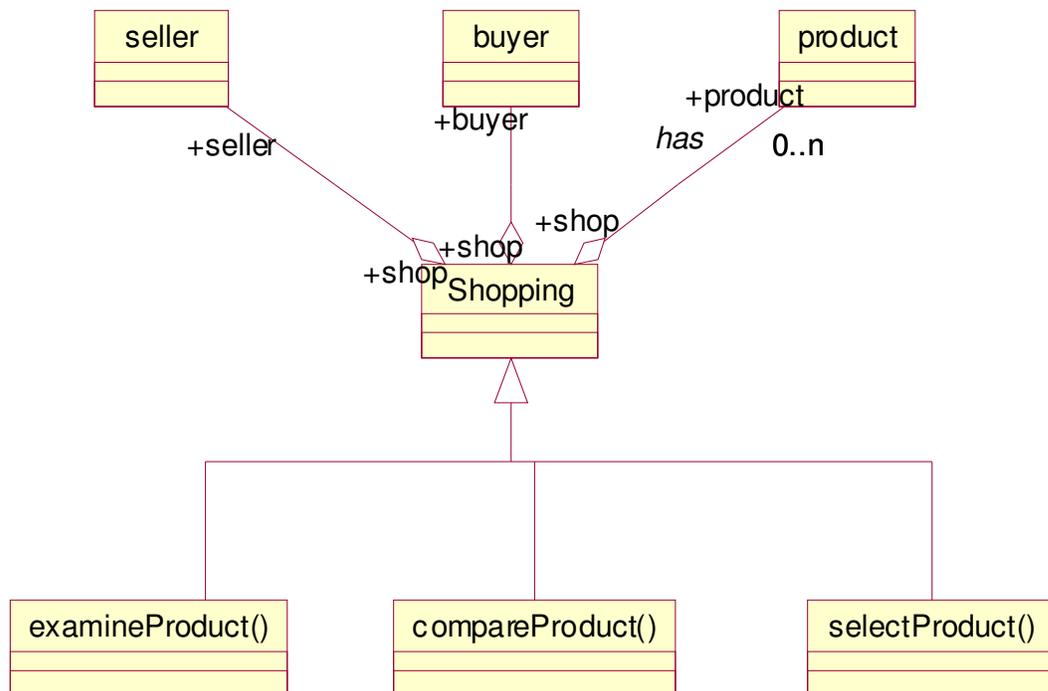
Note to OOPSLA design fest and code fest participants:

Pattern Documentation was a new concept to me at the time of this class assignment. Meta models or “models of models” can be analogized to meta data. What type of things (objects) make up the model.

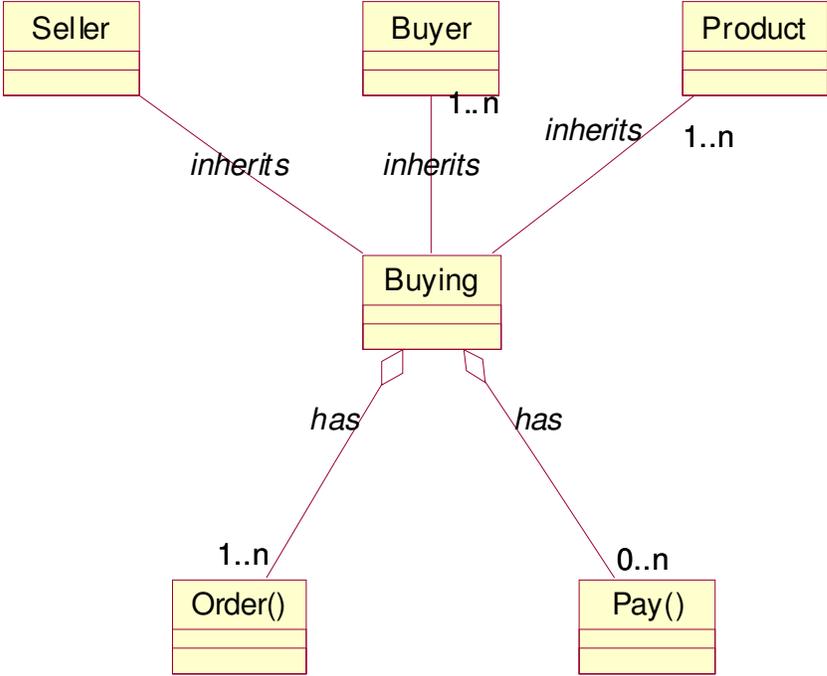
We used rational rose to draw the diagrams and each component is a class. The periphery classes constitute attributes or methods of the primary class (one of the classes in our design). The primary class we represent is shown here in the center of a ring of objects that belong in each primary class. Each periphery class is a component of the primary class shown, but the periphery classes each also have or can have attributes and/or methods of their own. The periphery “classes” are the type of stuff that makes up the primary, central class.

Reference to our “stable” class diagram should track to the meta models below.

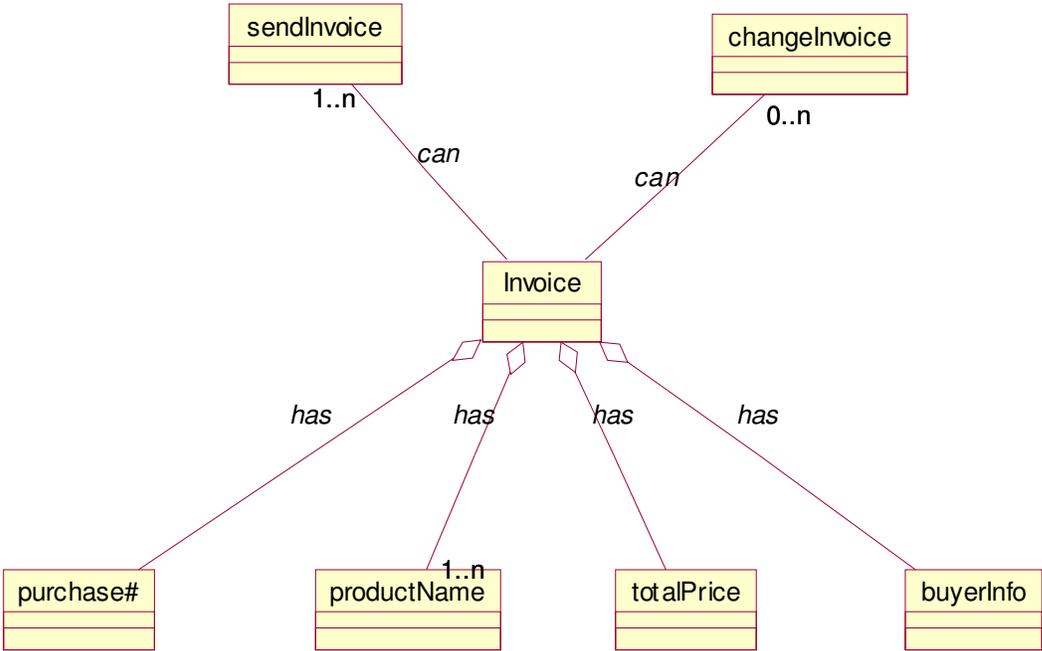
Meta Model Shopping (EBT)



Meta Model Buying (EBT)



Meta Model Invoice (BO)



Meta Model Product (BO)

