
Lecture 3

Use Cases

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Agenda

- Use Cases
- UML Use Case Diagrams
- Example: Extended POST Use Cases

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References

- Sinan Si Alhir. *UML in a Nutshell*. O'Reilly, 1998.
 - pp. 71-75
 - Chapter 8, pp. 159-166
- C. Larman. *Applying UML and Patterns* Prentice-Hall, 1998.
- D. Rosenberg. *Use Case Driven Object Modeling*. Addison-Wesley, 1999. Chapter 3.
- B. Oestereich. *Developing Software with UML*. Addison-Wesley, 1999. Chapter 6.
- D. F. D'Souza, A.C. Wills. *Objects, Components and Frameworks with UML*. Addison Wesley, 1999. Chapter 4.
 - Mixes narrative or textual use cases with sequence and collaboration diagrams.

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Simple Use Case Example

- Point-of-Sale System
 - computerized system used to record sales and handle payments
 - typically used in a retail store
 - hardware and software components
 - computer
 - bar code scanner
 - software to run the system
- Problem
 - create software to run a point-of-sale terminal
 - using an interactive-incremental development strategy
 - requirements
 - object oriented analysis
 - design
 - implementation

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Simple Use Case Example Textual Use Case Heading

Use Case: Buy Items with Cash
Actors: Customer (initiator), Cashier
Purpose: Capture a sale & it's cash payment
Overview: A customer arrives at a checkout with items to purchase. The cashier records the purchase items and collects payment. On completion, the customer leaves with the items.
Type: Primary and essential.
Cross Refs: R1.1, R1.2, R1.3, R1.7, R1.9, R2.1, R2.2, R2.3, R2.4

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Typical Sequence of Events

Actor Action	System Response
1. Customer arrives at a POST checkout with items to purchase.	
2. Cashier records the identifier from each item. If there is more than one of the same item, the Cashier can enter the quantity as well.	3. Determines the item price and adds the item information to the running sales transaction. The description and price of the current item are presented.
4. On completion of item entry the Cashier indicates to the POST that item entry is complete.	5. Calculates and presents the sales total.

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Typical Sequence of Events - 2

Actor Action	System Response
6. Cashier tells Customer the total.	
7. Customer gives a cash payment -- "cash tendered" -- possibly greater than the sale total.	
8. Cashier Records the cash received amount	9. Shows the balance due back to the Customer
10. Cashier deposits the cash received and extracts the balance owing Cashier gives the balance owing and the printed receipt to customer.	11. Logs the completed sale.

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Typical Sequence of Events -- 3

- Final Actor Action
 - 12. The Customer leaves with the items purchased

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UML Use Case Diagrams

- Use Case
 - Use case is shown as an ellipse with the name of the use case in the oval or under the oval.
 - Extension points
 - place where action sequences from other use cases may be inserted
 - See use case diagram in Cayenne Web ad
 - May be listed in a part of the use case document or diagram



Purchase Item

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UML Use Case Diagram - 2

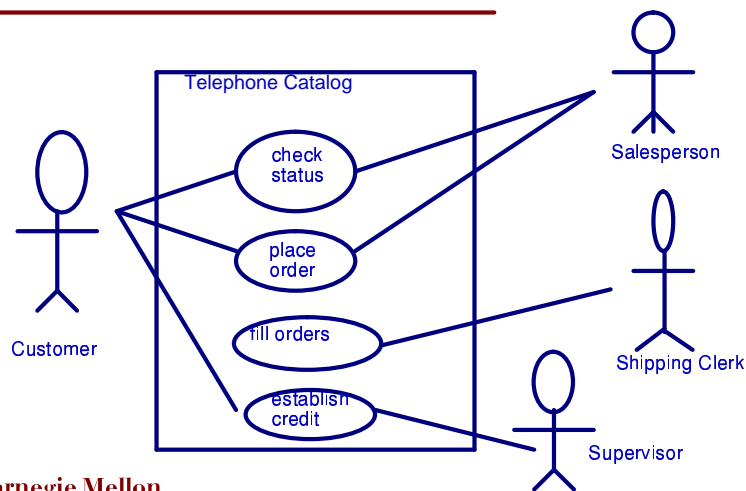
- Actor
 - Role of object or objects outside of a system
 - interacts directly with it as part of a work unit (use case)
 - characterizes the role played by an outside object
 - one physical object may play several roles and be modelled by several actors
 - Notation
 - class rectangle with the stereotype "actor"
 - stick figure



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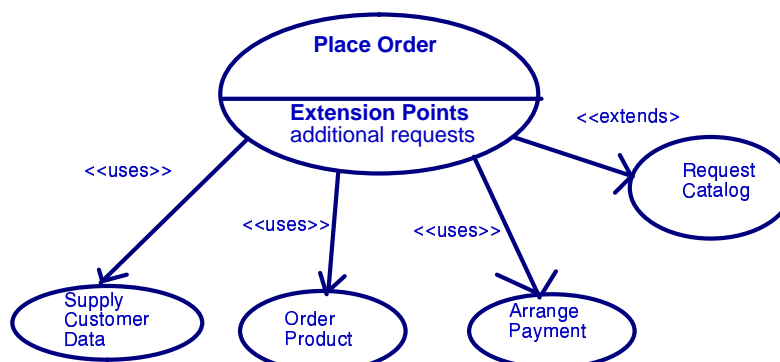
Example Use Case Diagram



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Example Use Case Diagram - 2



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Common Mistake with Use Cases

- Common Use Case Identification:
 - represent individual steps, operations or transactions as use cases
 - In POST system, "Printing the Receipt" as a Use Case instead of part of use case process "Buy Items"
- Can break down activities or portions of a use case into sub-use cases (called abstract use cases) -- even down to one step -- but this is not the norm. Might discuss later.

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Identifying Use Cases

- Actor Based
 - Identify the actors related to a system or organization
 - For each actor, identify the processes they initiate or participate in.
- Event Based
 - Identify the external events that a system must respond to
 - Relate the events to actors and use cases
- Example: Point of Sale Application
 - Actors
 - Cashier, Customer
 - Events
 - Cashier initiated
 - ▲ Log In
 - ▲ Log Out
 - Customer
 - ▲ Buy Items
 - ▲ Refund Items

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Use Case and Domain Process

- Use case describes a process, e.g., a business process
- A process describes, from start to finish, a sequence of
 - events
 - actions
 - transactions
- required to produce or complete something of value to an organization or actor.
- Example processes:
 - Withdraw cash from an ATM
 - Order a product
 - Register for a course at school
 - Check the spelling of a document in a word processor
 - Handle a telephone call

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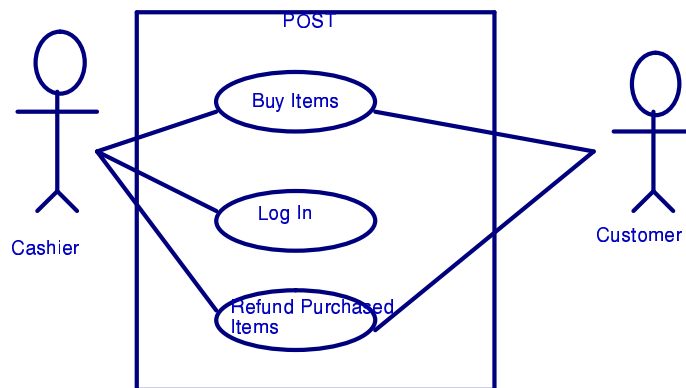
Use Cases and Requirements

- Some people have formal requirements and then construct use cases from the requirements.
 - Common when there is a textual representation of requirements in the contract at the start of work.
 - Becoming used less frequently because it's labor intensive and slow.
 - Add tracing information between requirements and use cases
- Use cases to discover requirements
 - Meet with customer to discuss requirements
 - Create Use Cases based on initial requirements
 - Review with customer
 - Design and implement
 - Iterate
- Use cases can be a set of requirements for software to be developed -- frequently very efficient and leads to good communication between customer and developers.

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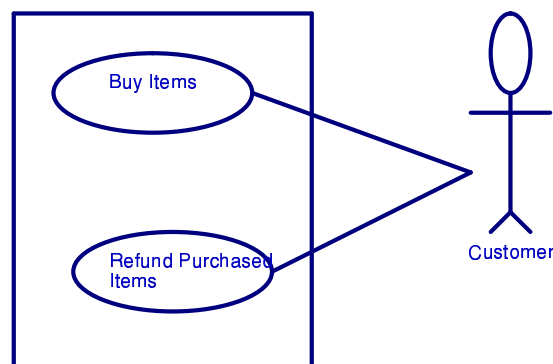
Use Case: POST is System



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Use Case: Store is System



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Categorizing Use Cases

- Primary Use Cases
 - Major Common Processes
 - e.g., Buy Items in above example
- Secondary Use Cases
 - Minor or Rare Processes
 - e.g., Request for Stocking New Product
- Optional Use Cases
 - Processes that may not be tackled

- Implement
 - All primary use cases
 - Some secondary use cases
 - Few, if any, optional use cases

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Essential vs. Real Use Cases

Essential Use Cases

Essential use cases are expanded use cases that are expressed in an ideal form that remains relatively free of technology and implementation details; design decisions are deferred and abstracted, specially those related to the user interface. An essential use case describes the process in terms of its essential activities and motivation. The degree of abstraction by which one is described exists on a continuum; use cases may be more or less essential in their description.

High-level use cases are always essential in nature, due to their brevity and abstraction.

- Constantine, L. The Case for Essential Use Cases. "Object Magazine", May 1997. Ny. NY: SIGS Publications



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Essential and Real Use Case (ATM)

Actor Action (essential)

1. The Customer identifies themselves.
3. and so on

Actor Action (real)

1. Customer inserts their card.
3. Enters PIN on keypad.
5. and so on

System Response (essential)

2. Presents Options
4. and so on

System Response (real)

2. Prompts for PIN
4. Displays Options menu
6. and so on.

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Essential Buy Items Use Case

Actor Action

1. Cashier records the identifier from each item

If there is more than one of the same item, the cashier can enter the quantity as well.

3. and so on.

System Response

2. Determines the item price and adds the item information to the running sales transaction

The description and price of the current item are presented.

4. and so on

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Real Buy Items Use Case

Actor Action

1. For each item, the Cashier types in the Universal Product Code (UPC) in the UPC input field of Window1. They then press the "Enter Item" button with the mouse or by pressing the <Enter> key.

3. etc.

System Response

2. Displays the item price and adds the item information to the running sales transaction.

The description and price of the current item are displayed in Textbox2 of Window1.

4. etc.

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Naming and Grammar

- Name a use case starting with a verb to emphasize it is a process
 - Buy Item
 - Enter an Order
- Starting an Expanded Use Case
 - 1. This use case begins when <Actor> <initiates an event>
 - Example:
 - 1. This use case begins when a Customer arrives at a POST with items to purchase.
 - Encourages a clear identification of the initiating actor and event.

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