Object oriented Analysis &Design
面向对象分析与设计

需求模型
Use Case & Requirements
Text CH6

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掌握的重点-用例

- 什么是用例的本质?
- 如何评价用例?
- 如何写出好的用例?

用例的本质是什么?

1. Definition: (must understand)

- What Scenarios, and Use Cases?
- What is Actors?
- What is Usecase Diagram?
- What is Usecase Model?

Use Case Elements

- *Scenario* (use-case instance)
  - **A sequence of actions and interactions between actors and the system in the course of particular story, transaction, or use of the system**
  - **it is also called a use case instance**
- *Use Case*
  - **A collection of** related **scenarios, some successful some exceptional or failures, describing actors interacting with the system to support a** specific **goal**

Use Case Elements

Actor

Entity with behavior, usually external to our system (some are more obviously external, others not), and interact with system

Can be people, organization, software, and machine

There are three types:

Primary – user has goals fulfilled through using services of the SuD (主要参与者)

Why identify? To find user goals, which drive the use cases

For example, the cashier in POS

Supporting – provides supports such as external systems（协助参与者）

Example, the automated payment authorization service.

Often a computer system, but could be an organization or person.

Why identify? To clarify external interfaces and protocols

Offstage – has interest in the system's behavior（幕后参与者）,but is not primary or supporting;

for example, a government tax agency

Why identify? To ensure that all necessary interests are identified and satisfied. Offstage actor interests are sometimes subtle or easy to miss unless these actors are explicitly named

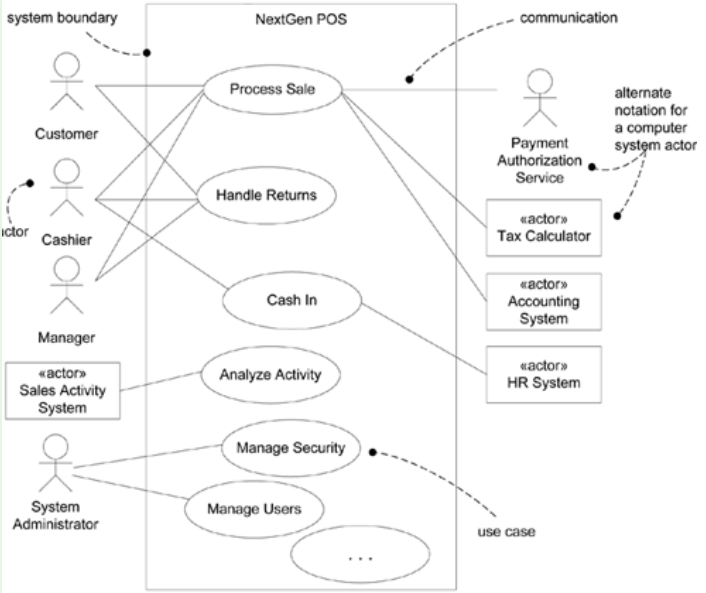
Use Case Elements

- Usecase diagram
  - The relation among actors, usecases, and show the system boundary
- Use case diagrams and use case relationships are secondary in use case model.

Use cases are text documents, not diagrams, and use-case modeling is primarily an act of writing text, not drawing diagrams.

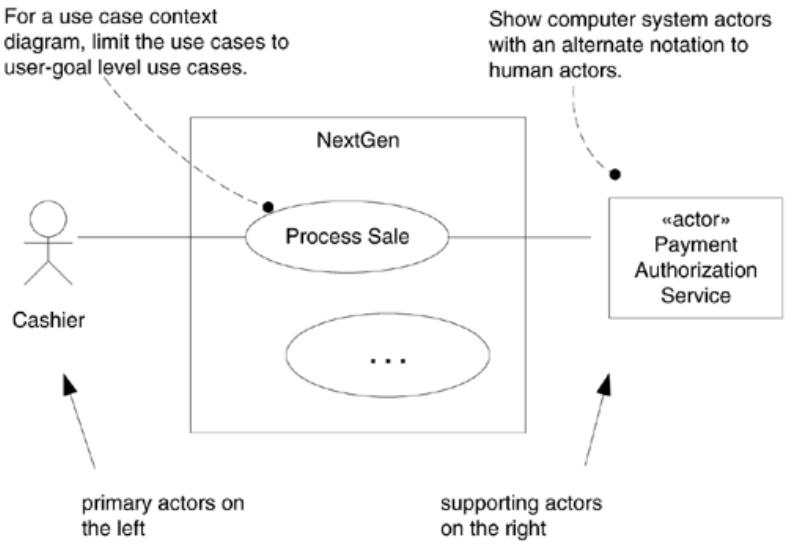
Use Case Diagrams

Figure 6.3. Partial use case context diagram



Use Case Diagrams

Figure 6.4. Notation suggestions.



Use Case Elements

- Use case Model
  - The use-case model should serve as a communication medium and can serve as a contract between the customer, the users, and the system developers on the functionality of the system, which allows:
    - Customers and users to validate that the system will become what they expected.
    - System developers to build what is expected.
- use-case modeling is primarily an act of writing text, not drawing diagrams.

如何去评价用例是否是好的用例?

2.4 How to Identify Good Use Cases

- Which of these is a valid use case?
  - Negotiate a Supplier Contract
  - Handle Returns
  - Log In
  - Move Piece on Game Board
- Ways：
  - Boss test
    - Can you excuse your time doing THIS?
  - EBP test
    - A task performed by one person in one place at one time, in response to a business event, which adds measurable business value and leaves the data in a consistent state
      - e.g., Approve Credit or Price Order [original source lost].
  - Size test
    - Remember that use case(s) will be processed in your time boxes
    - Seldom a single action or step

Example: Applying the Tests

- "Negotiate a Supplier Contract"
  - Much broader and longer than an EBP. Could be modeled as a business use case, rather than a system use case.
- "Handle Returns"
  - OK with the boss. Seems like an EBP. Size is good.
- "Log In"
  - Boss not happy if this is all you do all day!
  - But seems meet EBP
- "Move Piece on Game Board"
  - Single step fails the size test.

Use case description的形式

2. Use Case

- Three Common Use Case Formats
  - brief
    - Terse one-paragraph summary, usually of the main success scenario.
    - **Useful during inception and early analysis in general to identify scope and risks**
  - casual
    - Informal paragraph format. Multiple paragraphs that cover various scenarios.
  - fully
    - dressed All steps and variations are written in detail, and there are supporting sections, such as preconditions and success guarantees
    - **Needed in Inception for the important use cases to establish glossary, extract concepts, assess risk**
    - **Needed in Elaboration/construction when iterating on**
    - **10% of the critical use cases would be written this way**

2.1 Use Case Example

- Brief or Casual format
  - For example, use case “Process Sale”:
    - A customer arrives at a checkout with items to purchase.
    - The cashier uses the POS system to record each purchased item.
    - The system presents a running total and line-item details.
    - The customer enters payment information, which the system validates and records.
    - The system updates inventory.
    - The customer receives a receipt from the system and then leaves with the items.

2.1 Use Case Example

- Fully dressed Process Sale
  - **Notice the template**
  - **shows the ability of use cases to capture complex real-world requirements, and deeply branching scenarios**

如何写出更好的用例？？

3. Guideline

- 3.1 (ch6.11) Write use cases in an essential style; keep the user interface out and focus on actor intent.
  - 1/ Find “the goal of the goal “. Example, “Log on”
    - thinking of a GUI, dialog box, user ID, and password .
    - But this is the mechanism, not the goal
    - the system analyst arrives at a mechanism-independent goal :
      - "identify myself and get authenticated “
      - "prevent theft …".
  - 2/ essential style, example
    - “Manage Users” use case
      - …
      - Administrator identifies self.
      - System authenticates identity.
      - …
    - 针对这种意图和职责的设计,可以非常灵活:生物信息读取、GUI 等

3. Guideline

- 3.1 (ch6.11) Write use cases in an essential style; keep the user interface out and focus on actor intent.
  - 3. Concrete Style
    - may be avoid during early requirements Work, example,
      - …
      - Adminstrator enters ID and password in dialog box.
      - System authenticates Administrator.
      - System displays the "edit users" window.
      - …
    - 这种方式可以用, 但尽量不要在需求分析的早期!

3. Guideline

- 3.2 (ch6.12) Write Terse(简洁的)Use Cases
  - 用词简洁
    - “System authenticates…” □> “The system authenticates… ”
- 3.3 (ch6.13) Write Black-Box Use Cases
  - do not describe the internal workings of the system, its components, or design.
  - Rather, the system is described as having responsibilities
  - one can specify what the system must do (the behavior or functional requirements) without deciding how it will do it (the design).
  - Example

Black-box style	Not
The system records the sale.	The system writes the sale to a database. …or (even worse): The system generates a SQL INSERT statement for the sale…

3. Guideline

3.4 (ch6.14) Take an Actor and Actor-Goal Perspective

"an observable result of value to a particular actor" is a subtle but important concept that Jacobson considers critical, because it stresses two attitudes during requirements analysis:

- Write requirements focusing on the users or actors of a system, asking about their goals and typical situations.
- Focus on understanding what the actor considers a valuable result

3. Guideline

- 3.5 (ch6.15) How to Find Use Cases
  1. Choose the system boundary.
  2. Identify the primary actors
  3. Identify the goals for each primary actor.
  4. Define use cases that satisfy user goals; name them according to their goal.

System boundary

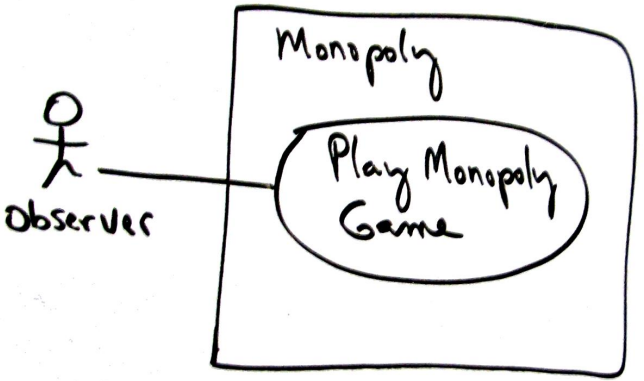
- For POS system, in/out Sys?
  - Cashier?
  - payment authorization service:
    - No, there is an external payment authorization service actor
  - Ask About Actor Goals Rather Than Use Cases
    - "What are the system tasks?“
    - "Who uses the system and what are their goals?"
    - "What do you do?" (roughly a task-oriented question, not good) or,
    - "What are your goals whose results have measurable value?"
      - Prefer the second question
  - Is the Cashier or Customer the Primary Actor?

Three important questions

- To sponsors and users
  - Is this what you want (need)?
  - Will you be able to tell, upon delivery, whether you got this?
- To the developers:
  - Can you implement this?

4. Example. Monopoly Game

- significant use case : Play Monopoly Game



4. Example- Monopoly Game

- **Scope**: Monopoly application
- **Level**: user goal
- **Primary Actor**: Observer
- **Stakeholders and Interests**:
  - Observer: Wants to easily observe the output of the game simulation.
- **Main Success Scenario**:
  1. Observer requests new game initialization, enters number of players.
  2. Observer starts play.
  3. System displays game trace for next player move (see domain rules, and "game trace" in glossary for trace details).
  Repeat step 3 until a winner or Observer cancels.
- **Extensions**:
- *a. At any time, System fails:
  (To support recovery, System logs after each completed move)
  1. Observer restarts System.
  2. System detects prior failure, reconstructs state, and prompts to continue.
  3. Observer chooses to continue (from last completed player turn).
- **Special Requirements:**
  - Provide both graphical and text trace modes.

需求

- Requirements Analysis
  - the process of understanding what is needed or wanted, and expressing the results in writing
- 需求模型
  - 用例模型
  - 系统顺序图
  - 操作契约

重点掌握：

- 问题列表：
- 需求=功能?
- 需求=用例?
- 如何从用例到功能?

1. 需求是什么？需求的定义：

- In systems engineering, a requirement can be a description of what a system must do, reffered to as a Functional Requirement

- ----------Wikipedia

- 需求==功能?/用例?

Definition by IEEE Standard

A requirement is:

1. A condition or capability needed by a user to solve a problem or achieve an objective.
2. A condition or capability that must be met or possessed by a system or system component to satisfy a contract, standard, specification, or other formally imposed document.
3. A documented representation of a condition or capability as in 1 or 2.

User view

Developer view

需求与功能

- POS：买单是需求，商品扫描，收银是功能
- 汽车：驾驶是需求，刹车、加速是功能
- 打印机：打印是需求，进纸、设定、与电脑相连是功能
- ATM：取款、存款、查询余额是需求，密码验证、识别卡是功能

- 需求的重要性
  - Garbage in, garbage out!
- 需求分析的目的
  - 我要一只羊
    - 饥肠辘辘的人说，
    - 慈爱的父亲说，
    - 农场主说，
  - 需求背后的问题
  - 挖掘客户的问题，实现客户价值！

- 需求分析的三层境界
  - 记录员，记录客户需求
  - 分析员，与客户一起分析问题，完善需求
  - 引导员，能够引导客户需求

需求分析的方法

- 518(5W1H8C)(此处阅读葵花宝典63-69页)
- 5W: When, Where, Who, What, Why
- 1H: How
- 8C(Constraints): Performance, Cost, Time, Reliability, Security, Compliance, Technology, Compatibility

过程

- Requirement-function-write them

Example: The kennel or dog house

- Inception: the starting idea
  - the client wants a kennel
  - – a dog house
- We want to provide a **high quality** doghouse- one that is fit for its purpose
- the "purpose" may not be quite what the client or the designer thinks at first look
  - depends on where the house and kennel are
  - depends on owner's use of or relationship with dog

Example: what requirements?

- The kennel must
  - keep the dog alive in freezing Canberra堪培拉winter *or* dry and cool in Brisbane布里斯班
  - provide satisfactory (to owner) level of dog happiness
  - anchor the dog to the home base
    - to provide security and visitor announcement services
  - have good enough appearance to satisfy owner's family, and increase or maintain house property value
  - be easy for the owner to keep clean, remove fleas etc.
  - be "right size" for the number and size of dogs
  - be maintainable: materials should need attention no more than once in 3 years in the intended location

Example: Dog house requirements

These requirement statements are

- not expressed well: too broad and too vague to enable us to create a design
- not logically organised
- can be managed easily because there are very few requirements listed

2. Use Cases与需求分析

- Capturing functional requirements using use cases

CASE STUDY 1: NextGen POS

系统包括计算机、条码扫描仪等硬件。

记录销售信息；

处理支付过程；

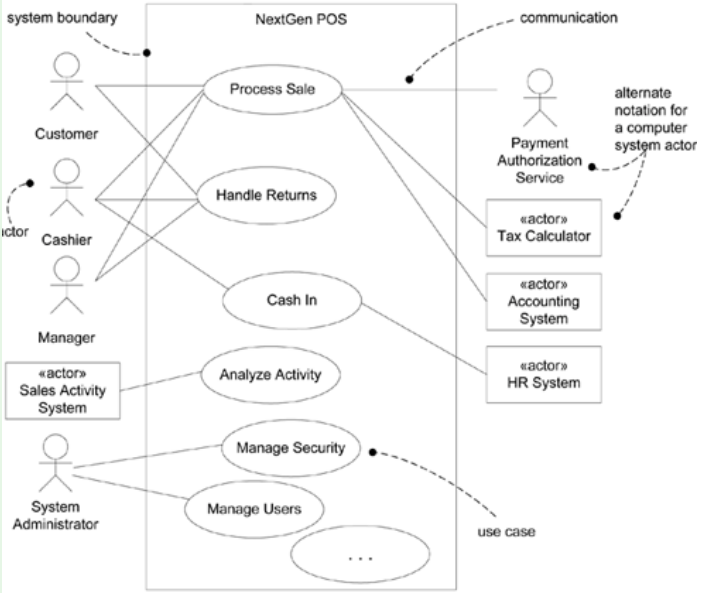
为不同服务的应用程序（税金、库存等）提供接口；

一定的容错性，不能瘫痪；

支持日益增多的客户终端和接口。

Use Case Diagrams

Figure 6.3. Partial use case context diagram



CASE STUDY 2: Monopoly game

Use case: play monopoly game

Scope: Monopoly application

Level: user goal

Primary Actor: Observer

Stakeholders and Interests:

- Observer: Wants to easily observe the output of the game simulation.

Main Success Scenario:

1. Observer requests new game initialization, enters number of players.
2. Observer starts play.
3. System displays game trace for next player move (see domain rules, and "game trace" in glossary for trace details).

Repeat step 3 until a winner or Observer cancels.

Extensions:

*a. At any time, System fails:

(To support recovery, System logs after each completed move)

1. Observer restarts System.
2. System detects prior failure, reconstructs state, and prompts to continue.
3. Observer chooses to continue (from last completed player turn).

Special Requirements:

- Provide both graphical and text trace modes.

3. 从用例到功能

【用例名称】

买单

【场景】

Who：顾客、收银员

Where：商店的收银台

When：营业时间

【用例描述】

1. 顾客携带选择好的商品到收银台；
   （这一步没有异常）
2. 收银员逐一扫描商品条形码，系统根据条形码查询商品信息；
   2.1 扫描仪坏了，必须支持**手工输入条形码**；
   2.2 商品的条形码无法扫描，必须支持**手工输入条形码**；
   2.3 条形码能够扫描，但查询不到信息，需要收银员和顾客沟通，放弃购买此产品
3. 扫描完毕，收银员告诉顾客商品总额；

（这一步没有异常）

4. 顾客将钱交给收银员；

4.1 顾客的钱不够，顾客和收银员沟通，**删除某商品**；

4.2 顾客的钱不够，顾客和收银员沟通，**删除某类商品中的一个或几个**（例如买了 5 包烟，去掉两包）

4.3 顾客觉得某个商品价格太高，要求**删除某商品**；

4-A：**顾客使用信用卡支付**

4-A.1 信用卡支付流程（请读者自行思考完善，可以写在这里，如果太多，也可以另外写一个子用例）

4-B：**顾客使用购物卡支付**

4-B.1 购物卡支付流程

4-C：**顾客使用会员卡积分支付**

4-C.1 会员卡积分支付流程

5. 收银员清点钱数，输入收到的款额，系统**给出找零的数目**；

（这一步没有异常）

6. 收银员将找零的钱还给顾客，并**打印小票**；

7. 买单完成，顾客**携带**商品和小票**离开**；

【用例价值】

顾客买完单以后，就可以携带商品离开，而超市也将得到收入；

【约束和限制】

5. POS 机必须符合国标 XXX；

6. 键盘使用中文，因为收银员都是中国人；

7. 一次买单数额不能超过 99999RMB；

8. POS 机要非常稳定，至少一天内不要出现故障；

功能编号	功能描述	备注
001	扫描商品条形码	NA
002	手工输入条形码	在用例的几个步骤中有体现
003	删除某商品	在用例的几个步骤中有体现
004	删除某类商品中的一个或几个	NA
005	顾客使用信用卡支付	这三个功能点比较大，如有需要，可以继续拆分。
006	顾客使用购物卡支付	
007	顾客使用会员卡积分支付	
008	计算找零的数目	用例中是“给出”，对应系统功能是我们改为“计算”，因为这更加符合计算机的描述术语。
009	打印小票	NA

- Exercise:
  - Detail description for use case: “get money from ATM”
- Next class: ch8~10,ch15
  - Key topic located in ch9: Domain Model
  - Ch10,Ch15: System sequence diagram.
    - You should already understand(!?)
      - Really?
      - Please review / preparation
- End