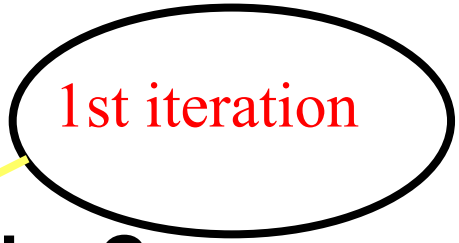
Requirements Overview
软件需求分析

Objectives

- Describe the basic Requirements concepts and how they affect Analysis and Design

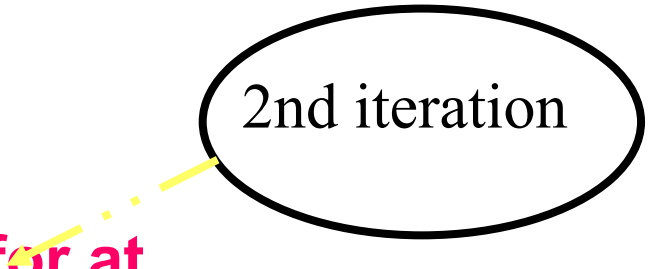
- Demonstrate how to read and interpret artifacts of Requirements that are used starting point for Analysis and Design

Overall artifacts in whole A&D (1)



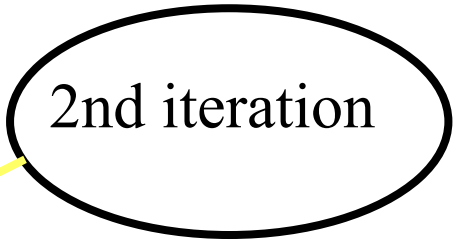
1. **Project Description**
2. **Requirement: UseCase, Glossary, UseCase Specification, Supplement Specification.**
3. **Analysis and Design: Architecture Document, Design Pattern, Key Abstraction, UseCase Realization**

Overall artifacts in whole A&D (2)



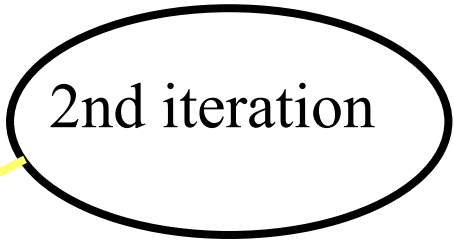
4. **UseCase Analysis: Use-Case Realization Interaction; Diagram for at least one of the usecase flows of events; VOPC class diagram, containing the analysis classes, their stereotypes, responsibilities, attributes, and relationships; Analysis class to analysis mechanism map.**

Overall artifacts in whole A&D (3)



5. Designing Element: Design classes, subsystems, their interfaces and their relationships with other design elements; Mapping from the analysis classes to the design elements; The location of the design elements (e.g. subsystems and their design classes) in the architecture (i.e., the package/layer that contains the design element). For each subsystem, an interface realization class diagram; Table mapping analysis classes to design elements; Table listing design elements and their "owning" package.

Overall artifacts in whole A&D (4)



6. Running Time Architecture: Class diagram showing the Processes, Mapping of classes and subsystems to processes; Process relationships, Design element relationships to support process relationships.
7. Distribution: Deployment diagram depicting, Nodes, Connections and What processes run on what nodes,.

Overall artifacts in whole A&D (5)

3rd iteration

8. UseCase Design: Class diagram (VOPC) that includes the design elements that must collaborate to perform the use case, and their relationships.
9. Subsystem Design: Interface realizations, Interaction diagram for each interface operation; Class diagram containing the subsystem design elements that realize the interface responsibilities and their relationships; Class diagram that shows the subsystem and any dependencies on external package(s) and/or subsystem(s) (subsystem dependencies class diagram).

Overall artifacts in whole A&D (6)

10. Class Design, Produce the following: An updated VOPC, including the relationship refinements (generalization, dependency, association).
11. Data Base Design

需求规约（1）（基于SA，理论上的）

I. 引言	A. 系统参考文献
	B. 整体描述
	C. 软件项目约束
II. 信息描述	A. 信息内容表示
	B. 信息流表示： i数据流 ii控制流
III. 功能描述	A. 功能划分
	B. 功能描述： i处理说明 ii限制/局限 iii 性能需求 iv 设计约束 v 支撑图 C. 控制描述 i控制规约 ii 设计约束
IV. 行为描述	A. 系统状态
	B. 事件和响应
V. 检验标准	A. 性能范围
	B. 测试种类
	C. 期望的软件响应
	D. 特殊的考虑
VI. 参考书目	
VII. 附录	

需求规约（II）

1. 引言：陈述软件目标，在基于计算机的系统语境内进行描述。
2. 信息描述：给出软件必须解决问题的详细描述，记录信息内容和关系、流和结构。
3. 功能描述：描述解决问题所需的每个功能。其中包括，为每个功能说明一个处理过程；叙述设计约束；叙述性能特征；用一个或多个图形来形象地表示软件的整体结构和软件功能与其他系统元素间的相互影响。

需求规约（ III ）

4. 行为描述：描述作为外部事件和内部产生的控制特征的软件操作。
5. 检验标准：描述检验系统成功的标志。即对系统进行什么样的测试，得到什么样的结果，就表示系统已经成功实现了。它是“确认测试”的基础。
6. 参考书目：包含了对所有和该软件相关的文档的引用，其中包括其他的软件工程文档、技术参考文献、厂商文献以及标准。
7. 附录：包含了规约的补充信息，表格数据、算法的详细描述、图表以及其他材料。

基于面向对象的软件需求分析

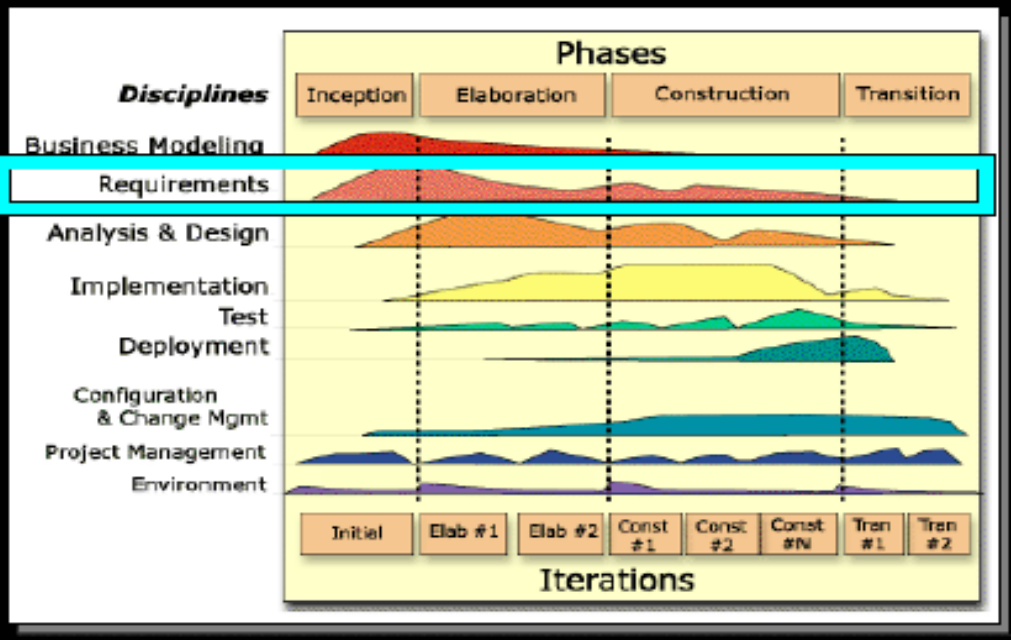
主要内容

- RUP 中的需求流程
- 问题陈述
- 用例模型
- 术语表
- 补充规约
- 检查点
- 案例实践

Requirements in Context

The purpose of Requirements is to:

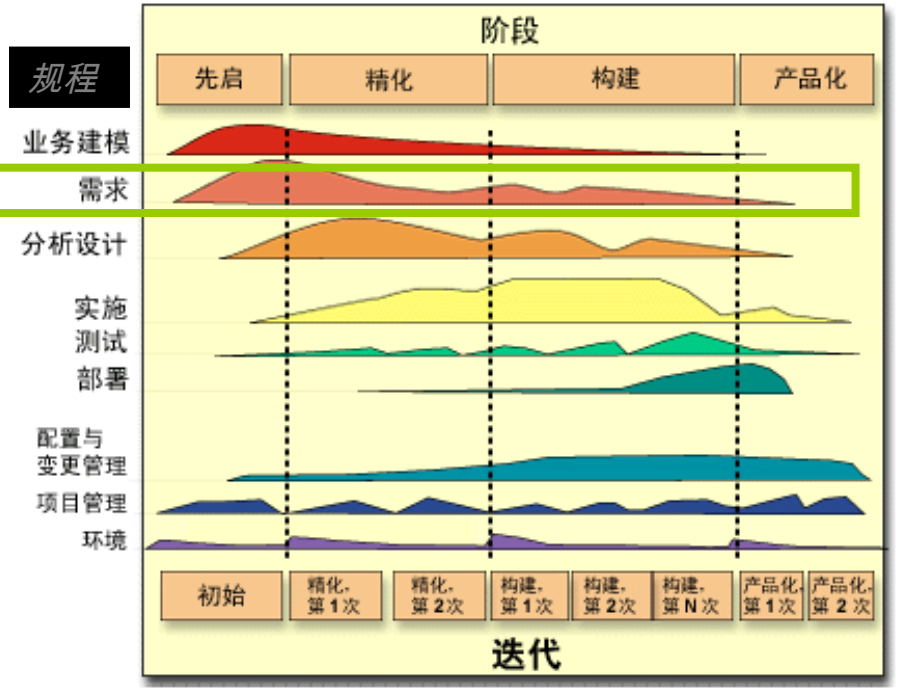
- Establish and maintain agreement with the customers and other stakeholders on what the system should do.
- Give system developers a better understanding of the requirements of the system.
- Delimit the system.
- Provide a basis for planning the technical contents of the iterations.
- Provide a basis for estimating cost and time to develop the system.
- Define a user interface of the system.



RUP 规程中的需求

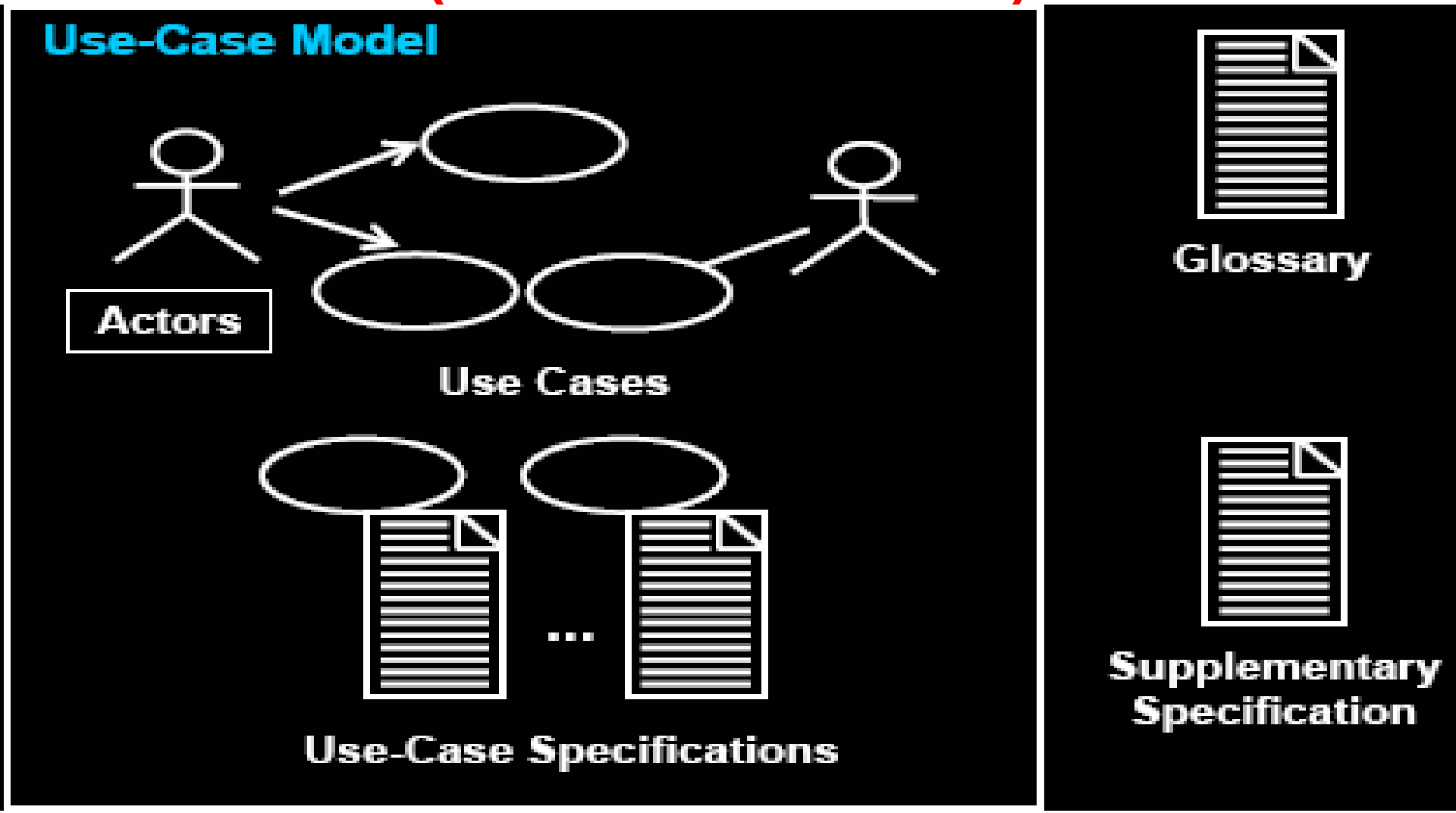
需求的目的

- 与客户和其他涉众在系统工作内容方面达成并保持一致
- 让开发人员对系统的需求有更好的理解
- 划分系统的边界
- 为迭代的技术内容提供基础
- 为估算开发系统所需成本和时间提供基础
- 定义系统的用户界面

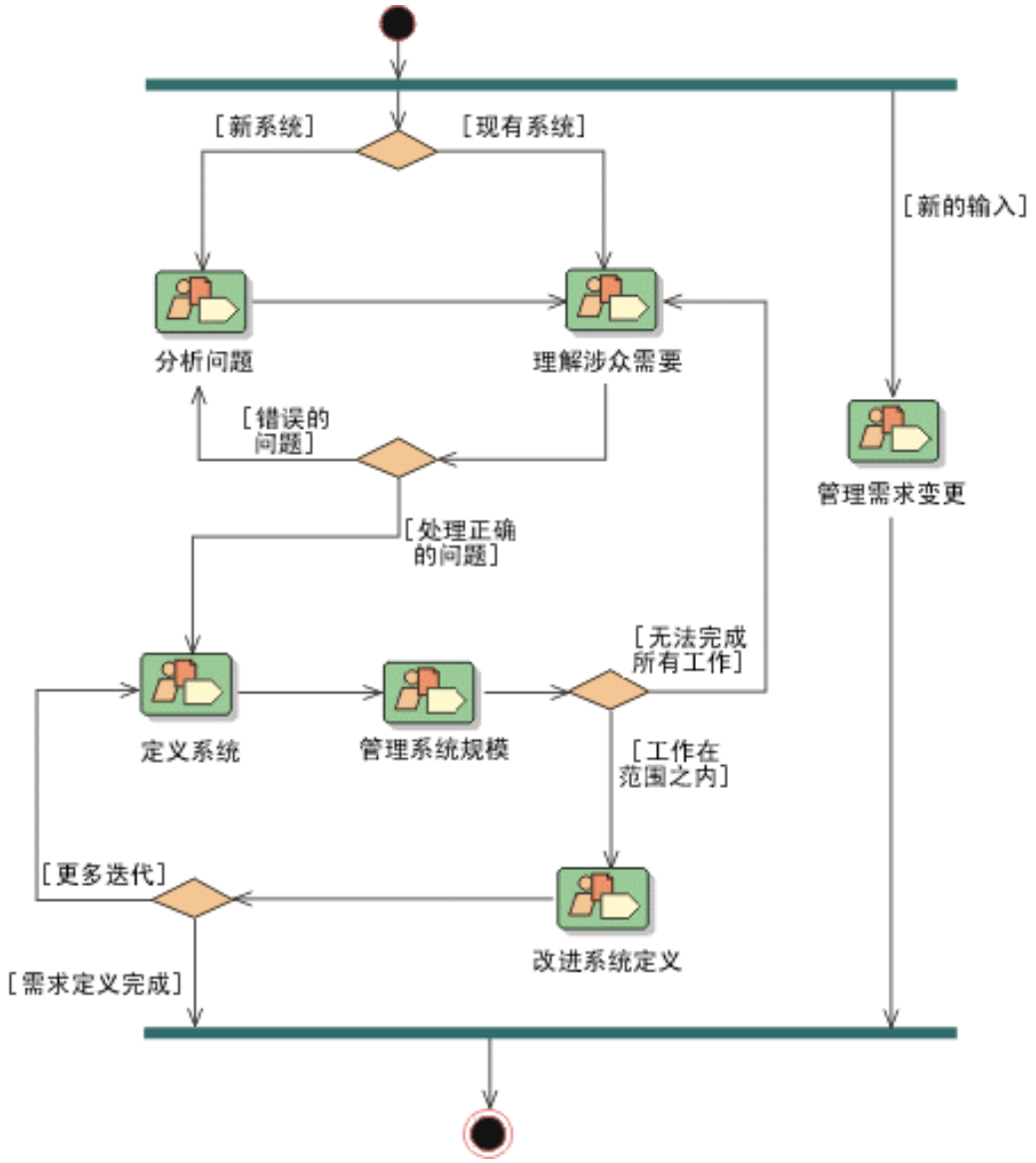


Relevant Requirements Artifacts

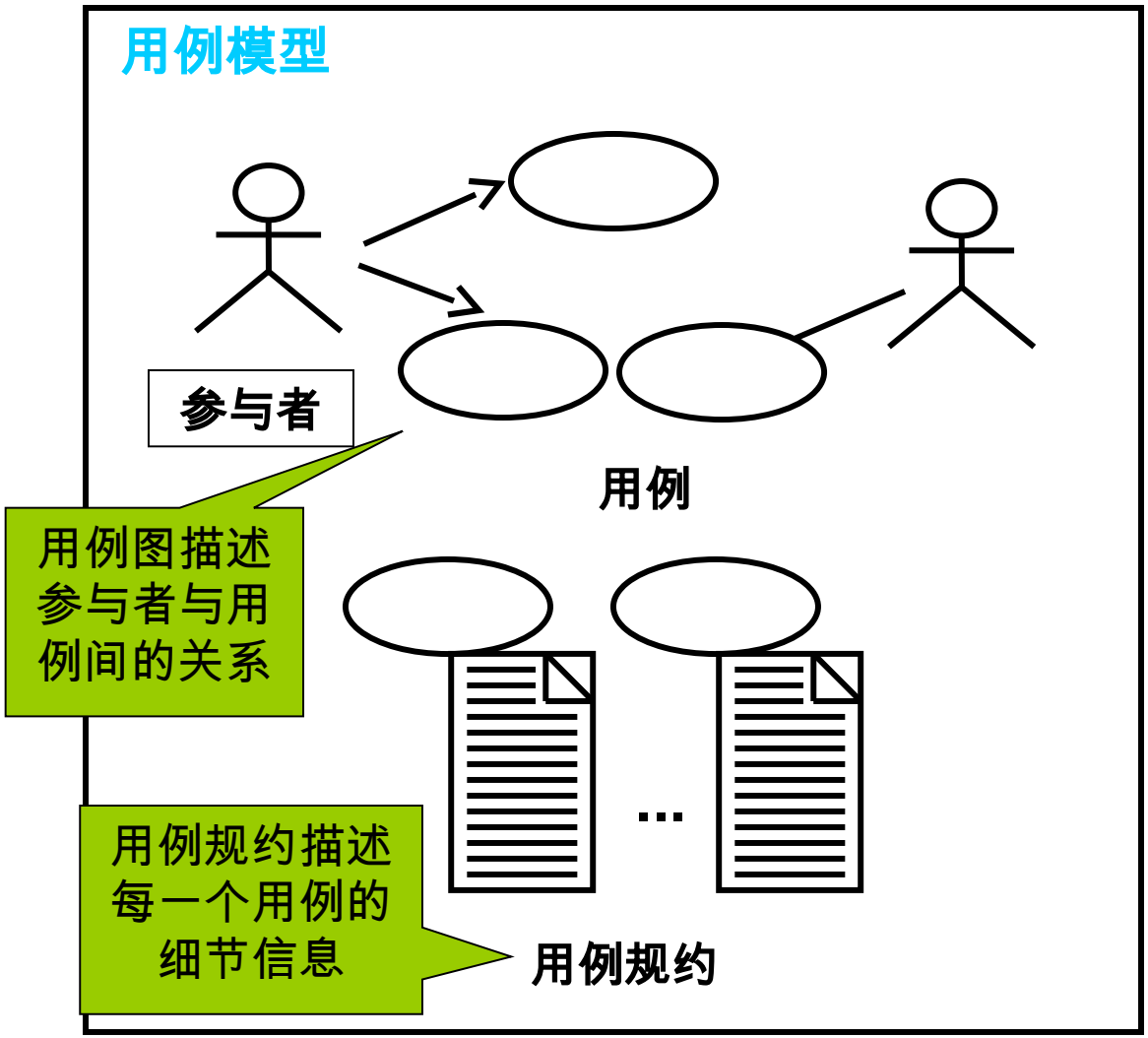
需求分析的所有制品
（没有包括问题陈述）

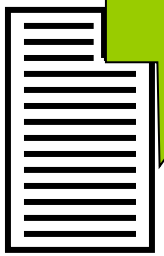


需求工作流


[新系统]
[现有系统]
[新的输入]
分析问题
理解涉众需要
[错误的问题]
管理需求变更
[处理正确的问题]
[无法完成所有工作]
定义系统
管理系统规模
[工作在范围之内]
[更多迭代]
改进系统定义
[需求定义完成]

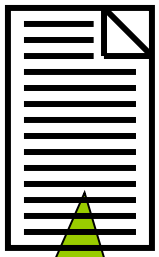
相关需求制品





记录一些系统需求相关的术语

术语表



补充规约

记录一些全局性的功能需求、非功能性需求和设计约束等

Case Study: Course Registration Problem Statement

课程注册需求文档

Review the problem statement provided in the Course Registration Requirements Document.

案例学习：课程注册系统

- 浏览课程注册系统的问题陈述文档

课程注册需求文档

第六章 软件需求

主要内容

RUP 中的需求流程

用例模型

术语表

补充规约

检查点

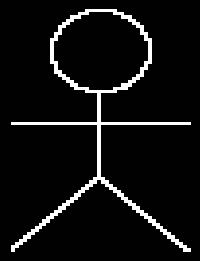
案例实践

What Is System Behavior?

- **System behavior is how a system acts and reacts.**
  - **It is the outwardly visible and testable activity of a system.**
- **System behavior is captured in use cases.**
  - **Use cases describe the system, its environment, and the relationship between the system and its environment.**

Major Concepts in Use-Case Modeling

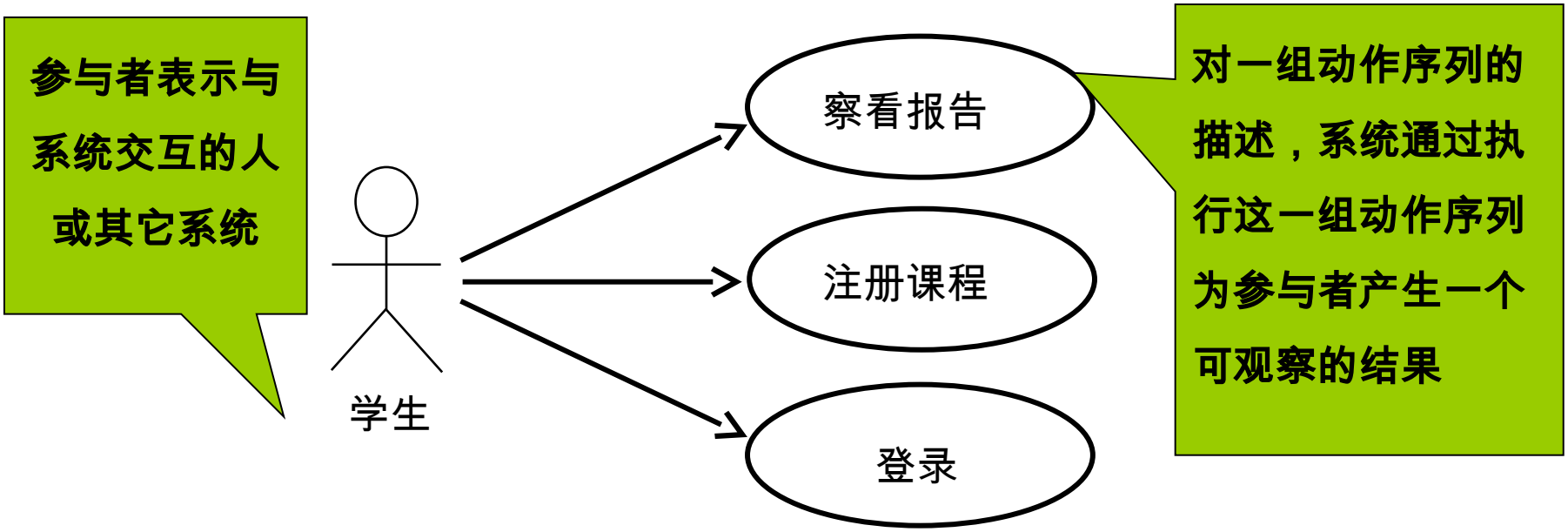
- An actor represents anything that interacts with the system.



- A use case is a sequence of actions a system performs that yields an observable result of value to a particular actor.

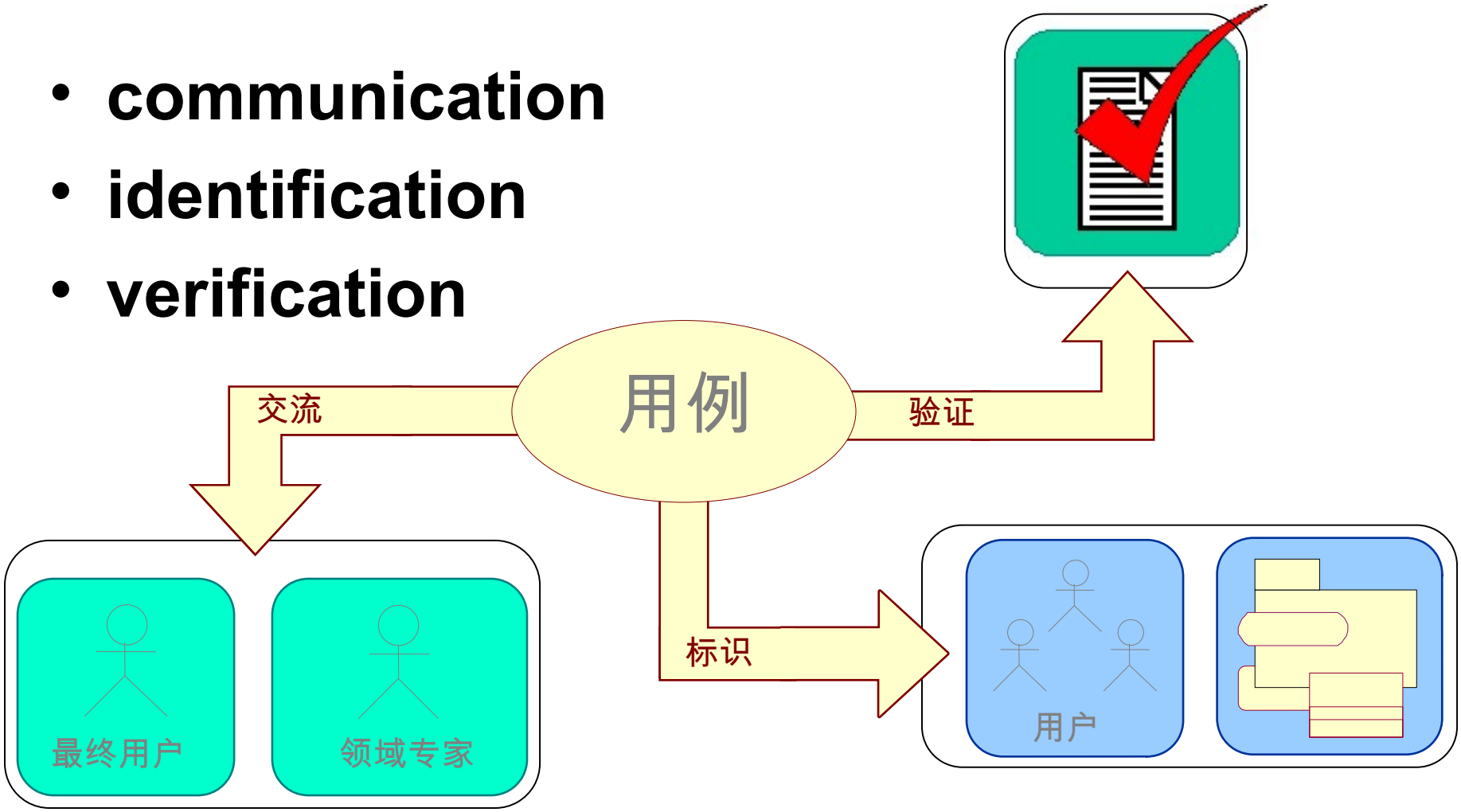
What Is a Use-Case Model?

- **A model that describes a system's functional requirements in terms of use cases**
- **A model of the system's intended functionality (use cases) and its environment (actors)**



What Are the Benefits of a Use-Case Model?

- **communication**
- **identification**
- **verification**



Construct usecase model

- **Process of describing system requirements and function by used is called usecase modeling**
- **Step-by-step process**
  - **Ascertain roles**
  - **Ascertain use cases**
  - **Glossary**
  - **Checkup usecase model**

Ascertain the roles

- **Finding out the roles by questionnaire**
  - **Who use the main function of the system?**
  - **Who or which system receive?**
  - **Who provide the data?**
  - **Which system are related to?**
  - **Who manage or maintain the system?**

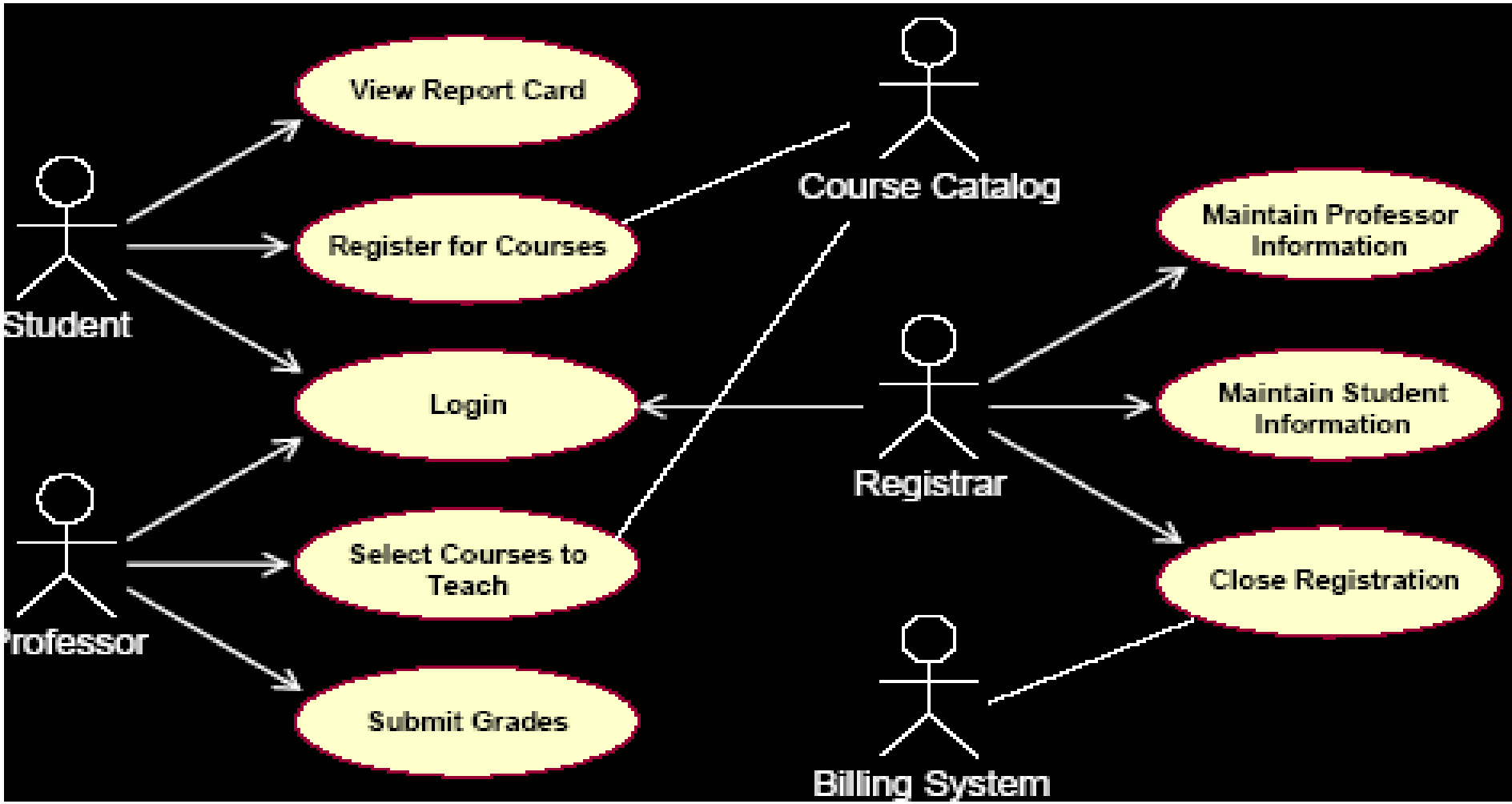
Case study: roles in usecase

- **student——register course**
- **professor——select course to teach**
- **manager——maintain student and professor information**
- **Billing system——obtain some valuable information**
- **Course register system——maintain the course information**

Ascertain usecase

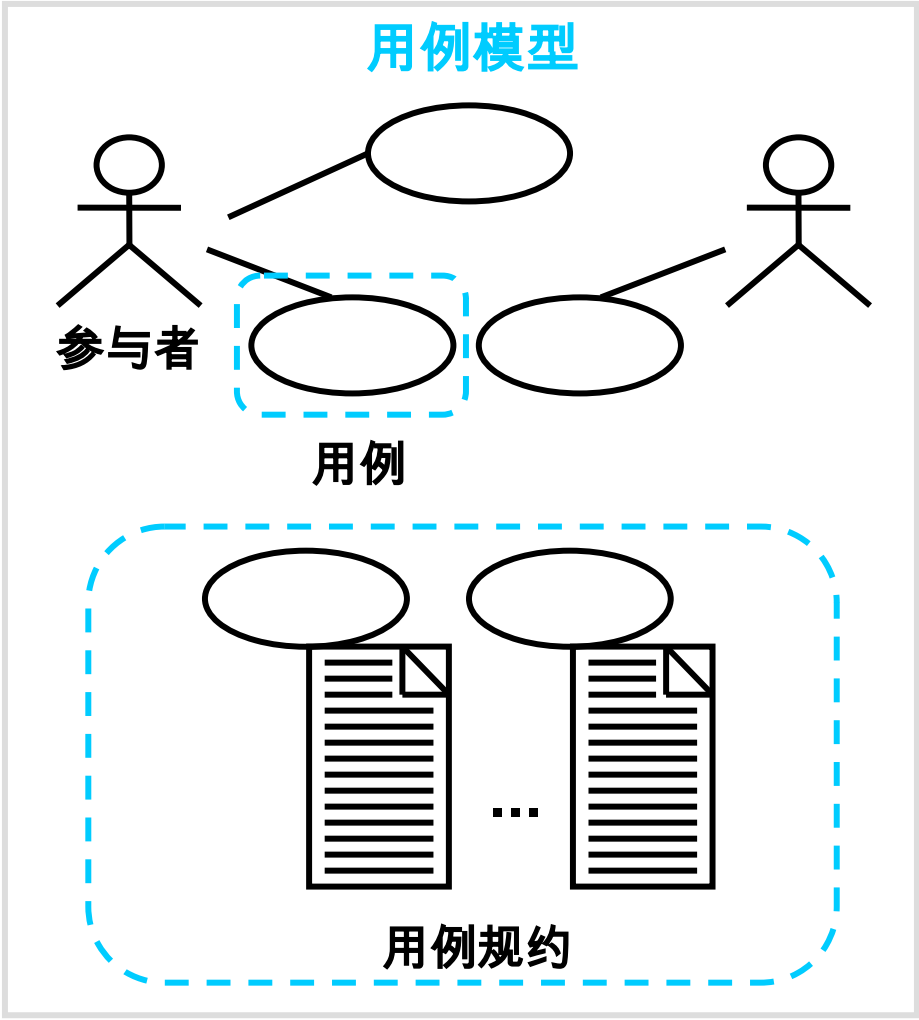
- **Finding out the usecase by questionnaire**
  - **Why the roles will use the system?**
  - **Will the roles will set up, modify, delete, brows, archive some data, and how to do those things ?**
  - **Do the roles inform of the system about outside information ?**
  - **Does the system give notice about the system to the roles?**

How Would You Read This Diagram?



Use-Case Specifications

- Name
- Brief description
- Flow of Events
- Relationships
- Activity diagrams
- Use-Case diagrams
- Special requirements
- Pre-conditions
- Post-conditions
- Other diagrams



Use-Case Flow of Events

- Use-Case Flow

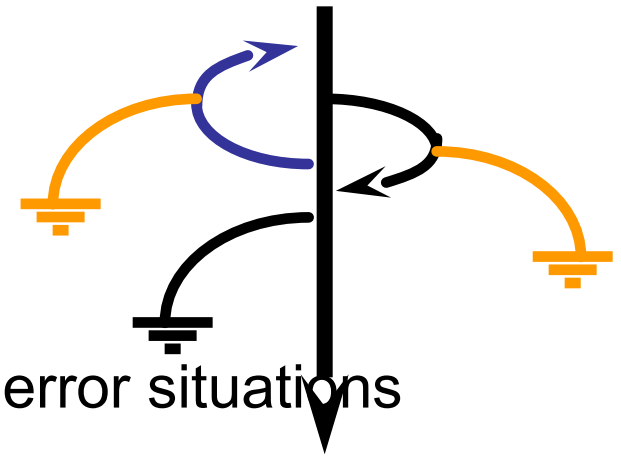
➢ *Has one normal, basic flow*

➢ Several *alternative flows*

– Regular variants

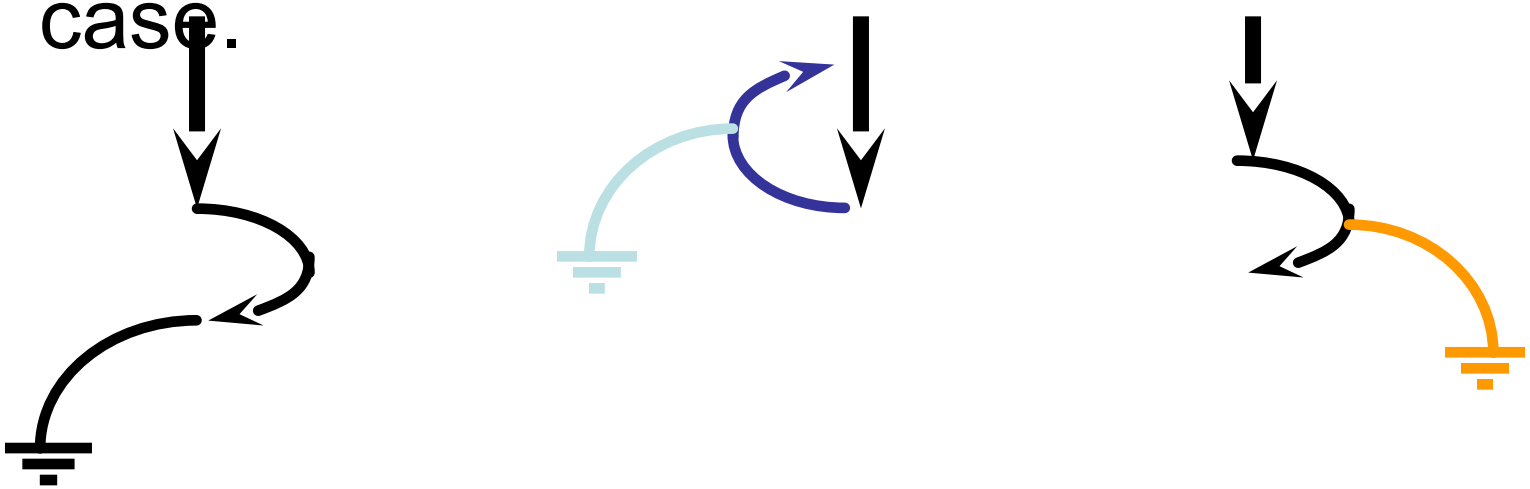
– Odd cases

– Exceptional flows for handling error situations



What Is a Scenario?

- A scenario is an instance of a use case.



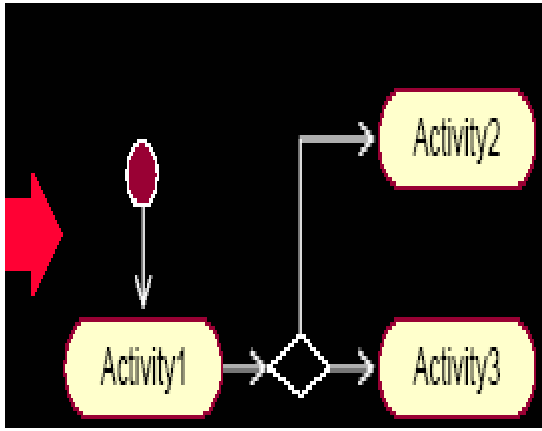
What Is an Activity Diagram?

- An activity diagram in the Use-Case Model can be used to capture the activities in a use case.
- It is essentially a flow chart, showing flow of control from activity to activity.

Flow of Events

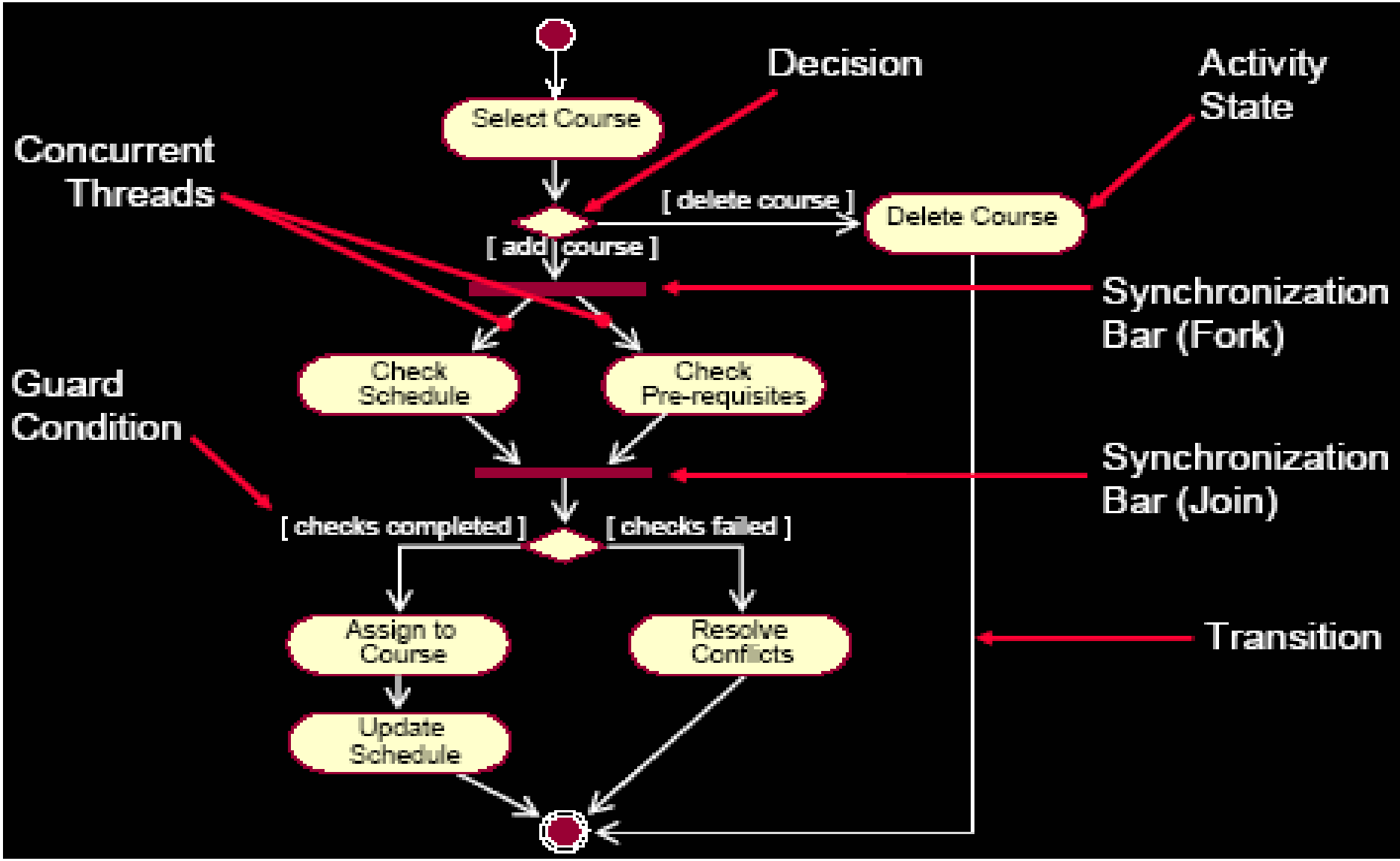
This use case starts when the Registrar requests that the system close registration.

1. The system checks to see if registration is in progress. If it is, then a message is displayed to the Registrar and the use case terminates. The Close Registration processing cannot be performed if registration is in progress.



2. For each course offering, the system checks if a professor has signed up to teach the course offering and at least three students have registered. If so, the system commits the course offering for each schedule that contains it.

Example: Activity Diagram



登录系统的用例规约

简要说明：

学生在进行课程注册前必须先登录该系统；教授也需要先登录才能进行选择课程等操作；登记员也必须登录后才能进行有关信息的维护

事件流：

略

特殊需求：

无

前置条件：

学生 / 教授 / 登记员有正确的用户名和密码

后置条件：

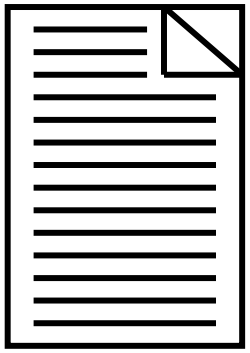
成功登录后，学生 / 教授 / 登记员可分别进行相应权限内的操作；如果登录失败则不能进行任何操作

第六章 软件需求

主要内容

RUP 中的需求流程
用例模型
术语表
补充规约
检查点
案例实践

Glossary



术语表

1. Introduction

This document is used to define terminology specific to the problem domain, explaining terms, which may be unfamiliar to the reader of the use-case descriptions or other project documents. Often, this document can be used as an informal *data dictionary*, capturing data definitions so that use-case descriptions and other project documents can focus on what the system must do with the information.

2. Definitions

The glossary contains the working definitions for the key concepts in the Course Registration System.

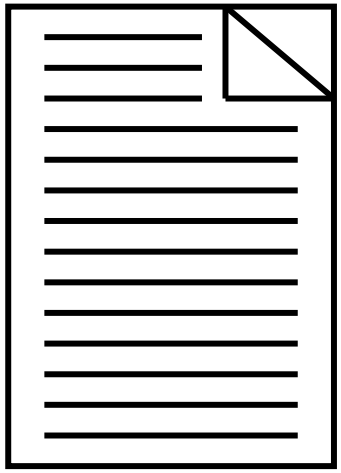
2.1 Course: A class offered by the university.

2.2 Course Offering: A specific delivery of the course for a specific semester – you could run the same course in parallel sessions in the semester. Includes the days of the week and times it is offered.

2.3 Course Catalog: The unabridged catalog of all courses offered by the university.

Case Study: Glossary

- Review the Glossary provided in the Course Registration Requirements Document



Glossary

第六章 软件需求

主要内容

RUP 中的需求流程
用例模型
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检查点
案例实践

Supplementary Specification

- Functionality
- Usability
- Reliability
- Performance
- Supportability
- Design constraints

描述全局性的功能需求

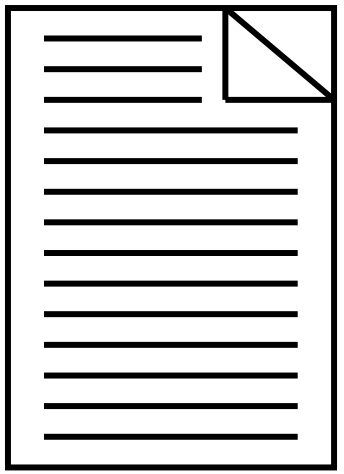
记录所有可用性相关的需求，如系统的使

包括可用性，故障频率和严

包括响应时间

包括编码标准、命名约定、类库、如何来对系统进行维护操作和相应的维

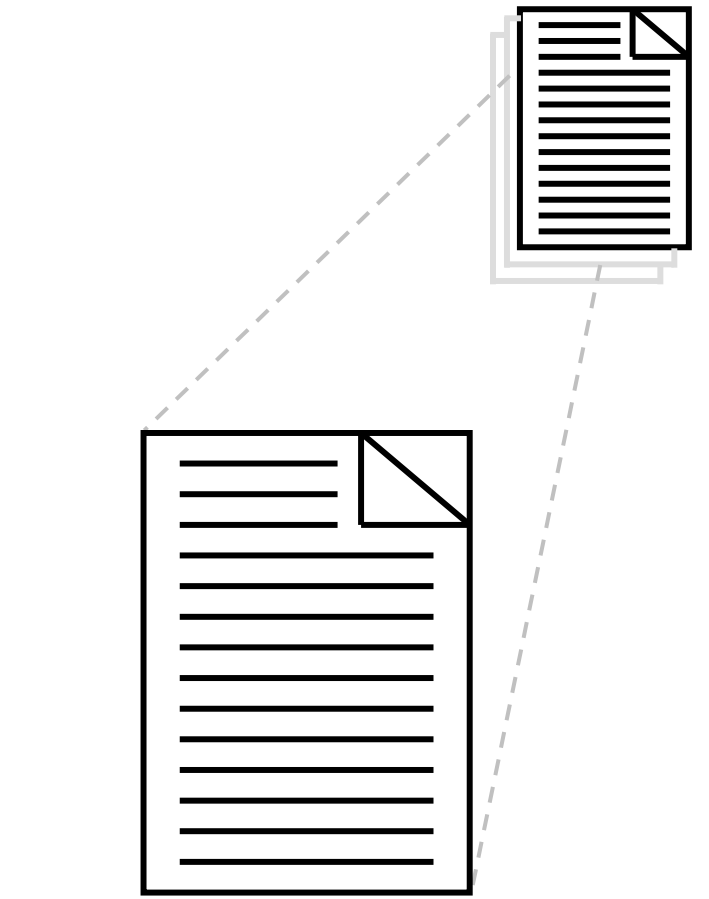
代表已经批准并必须遵循的设计决定，其中包括软件开发流程、开发工具、系统构架、编程语言、第三方构件类库、运行平台和数据库系统等



补充规约

Example: Supplementary Specification

- Review the Supplementary Specification provided in the Course Registration Requirements Document.



Supplementary Specification

第六章 软件需求

主要内容

RUP 中的需求流程
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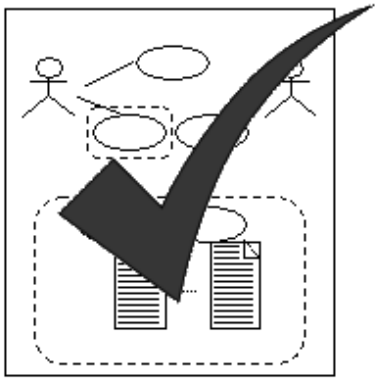
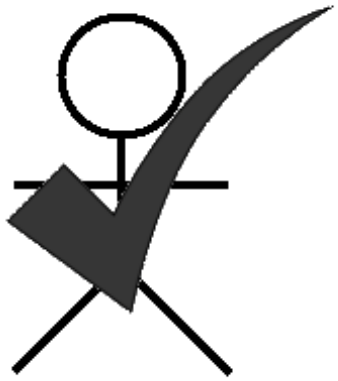
Checkpoints: Requirements: Use-Case Model



- **Is the Use-Case Model understandable?**
- **By studying the Use-Case Model, can you form a clear idea of the system's functions and how they are related?**
- **Have all functional requirements been met?**
- **Does the Use-Case Model contain any superfluous behavior?**
- **Is the division of the model into usecase packages appropriate?**

Checkpoints: Requirements: Actors

- **Have all the actors been identified?**
- **Is each actor involved with at least one use case?**
- **Is each actor really a role? Should any be merged or split?**
- **Do two actors play the same role in relation to a use case?**
- **Do the actors have intuitive and descriptive names? Can both users and customers understand the names?**



Checkpoints: Requirements: Use-Cases

- **Is each use case involved with at least one actor?**
- **Is each use case independent of the others?**
- **Do any use cases have very similar behaviors or flows of events?**
- **Do the use cases have unique, intuitive, and explanatory names so that they cannot be mixed up at a later stage?**
- **Do customers and users alike understand the names and descriptions of the use cases?**

Checkpoints: Requirements: Use-Case Specifications

- **Is it clear who wants to perform a use case?**
- **Is the purpose of the use case also clear?**
- **Does the brief description give a true picture of the use case?**
- **Is it clear how and when the use case's flow of events starts and ends?**
- **Does the communication sequence between actor and use case conform to the user's expectations?**
- **Are the actor interactions and exchanged information clear?**
- **Are any use cases overly complex?**

Checkpoints: Requirements: Glossary

- **Does each term have a clear and concise definition?**
- **Is each glossary term included somewhere in the use-case descriptions?**
- **Are terms used consistently in the brief descriptions of actors and use cases?**

第六章 软件需求

主要内容

RUP 中的需求流程
用例模型
术语表
补充规约
检查点
案例实践

Review: Requirements Overview

- **What are the main artifacts of Requirements?**
- **What are the Requirements artifacts used for?**
- **What is a Use-Case Model?**
- **What is an actor?**
- **What is a use case? List examples of use case properties.**
- **What is the difference between a use case and a scenario?**
- **What is a Supplementary Specification and what does it include?**
- **What is a Glossary**

Exercise: Requirements Overview

- **Given Problem Statement**
- **Produce following artifacts:**
  - **Use-Case Model, especially the use-case flows of events**
  - **Key abstractions/classes**
  - **The Supplementary Specification**

作业

1. 软件需求分析需完成哪些任务？
2. 软件需求分析的一般性过程是什么？
3. 基于面向对象的软件需求分析的步骤及其制品是什么？
4. USE CASE Diag. 包含哪些图形符号？分别代表什么？
5. Activity Ddiag. 包含哪些图形符号？分别代表什么？
6. Problem Statement（问题陈述）应怎样撰写（阐述）？
7. Use case Specification（用例规约）应怎样撰写？
8. Glossary（术语表）应该怎样撰写（阐述）？
9. Supplementary （补充规约）应该怎样撰写（阐述）？

实验作业

- 以组为单位，针对你们组的项目，完成如下制品
  - 问题陈述
  - 用例模型（包括用例图和用例规约），至少写5个用例规约，写事件流时用文字和活动图
  - 补充规约
  - 术语表

Lab 作业

- Considering your project, finishing following artifacts
  - Problem Statemement
  - Usecase model containing at least 5 case specification
  - Glossary and supplementary