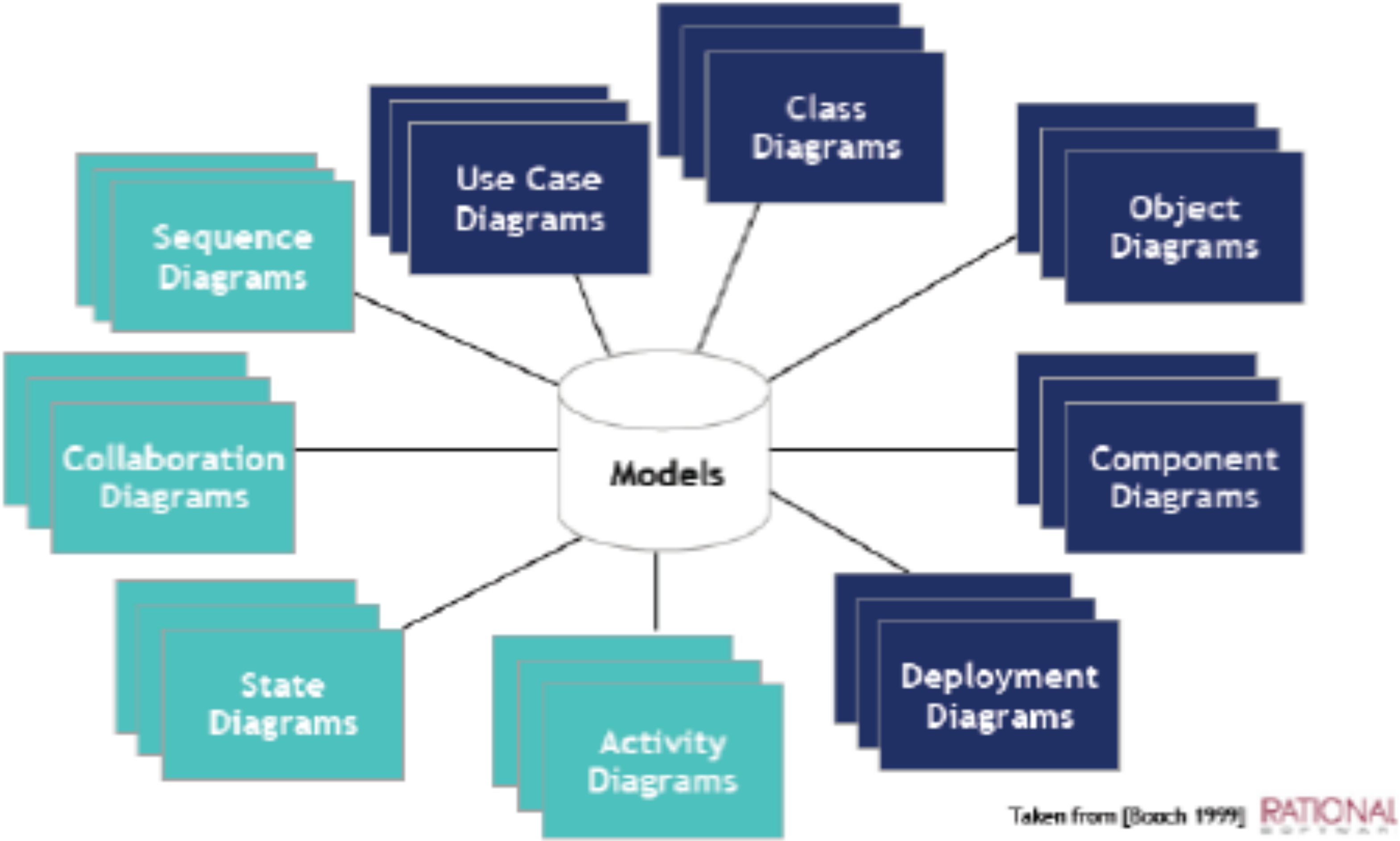
UML Diagrams



Taken from [Booch 1999]

Models

The language of the designer

(real-world) Representations of the system to-be-built or as built

A complete description of a system from a particular perspective

Tools for communication with various stakeholders

Allow reasoning about some characteristics of a system

Often captures both structural and behavioural (e.g., interaction) aspects of the system

UML Diagrams

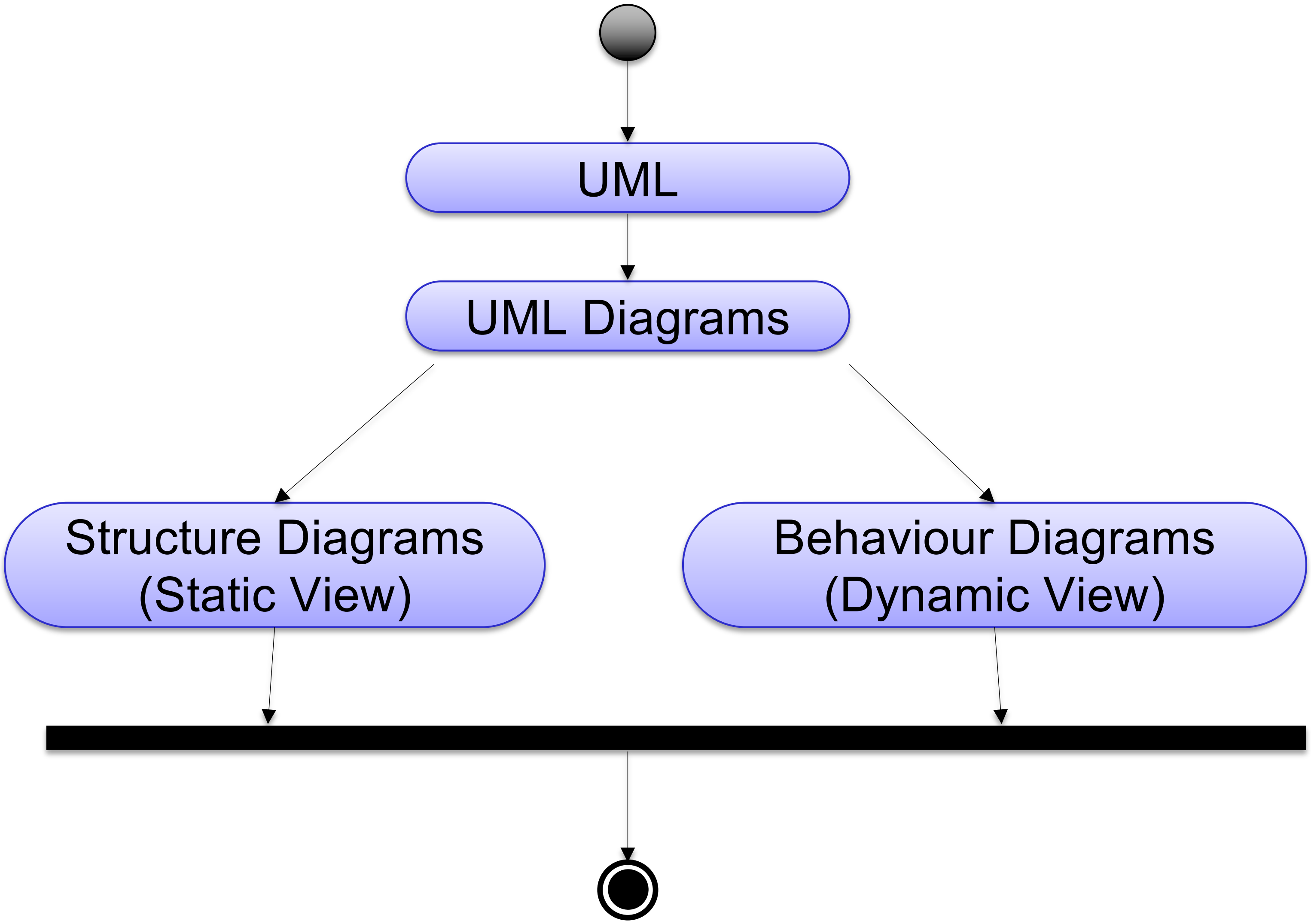
Diagram: a view into the model

In UML, there are more than fourteen modelling diagrams, but nine are considered standard diagrams:

Structure diagrams [Static view]: use-case, class, object, component, deployment

Behaviour/Interaction diagrams [Dynamic view]: activity, sequence, communication/collaboration, state

Model of UML Diagrams!


UML
UML Diagrams
Structure Diagrams (Static View)
Behaviour Diagrams (Dynamic View)

Summary of UML Diagrams (1): Structure

Use Case Diagram

Shows use cases, actors, and their interrelationships

Class Diagram

Shows a collection of static model elements such as classes and types, their contents, and their relationships

Component Diagram

Depicts the components that compose an application, system, or enterprise. The components, their interrelationships, interactions, and their public interfaces are depicted

Deployment Diagram

Shows the execution architecture of systems. This includes nodes, either hardware or software execution environments, as well as the middleware connecting them

Object Diagram

Depicts objects and their relationships at a point in time, typically a special case of either a class diagram or a communication diagram

Summary of UML Diagrams (2): Dynamic

Activity Diagram

Depicts high-level business processes, including data flow, or to model the logic of complex logic within a system

Sequence Diagram

Models the sequential logic, in effect the time ordering of messages between classes (or classifiers)

Communication/Collaboration Diagram

Shows instances of classes, their interrelationships, and the message flow between them. Communication diagrams typically focus on the structural organization of objects that send and receive messages. Formerly called a Collaboration Diagram

State (Machine) Diagrams – Behavioral and Protocol

Describes the states an object or interaction may be in, as well as the transitions between states. Formerly referred to as a state chart diagram, or a state-transition diagram. A behavioral state machine examines the behavior of a class; a protocol state machine illustrates the dependencies among the different interfaces of a class

UML Diagrams vs Software life Cycle/Process models

Analysis:

Requirement Engineering:

Elicitation/discovery: User+system requirements->scenarios, interviews etc.

Requirement Analysis (of a Business/System)): [use case] + [Activity]

Specification: [Use case description]

Design:

System Analysis

Design options: [Component]

System/object Design/Modelling

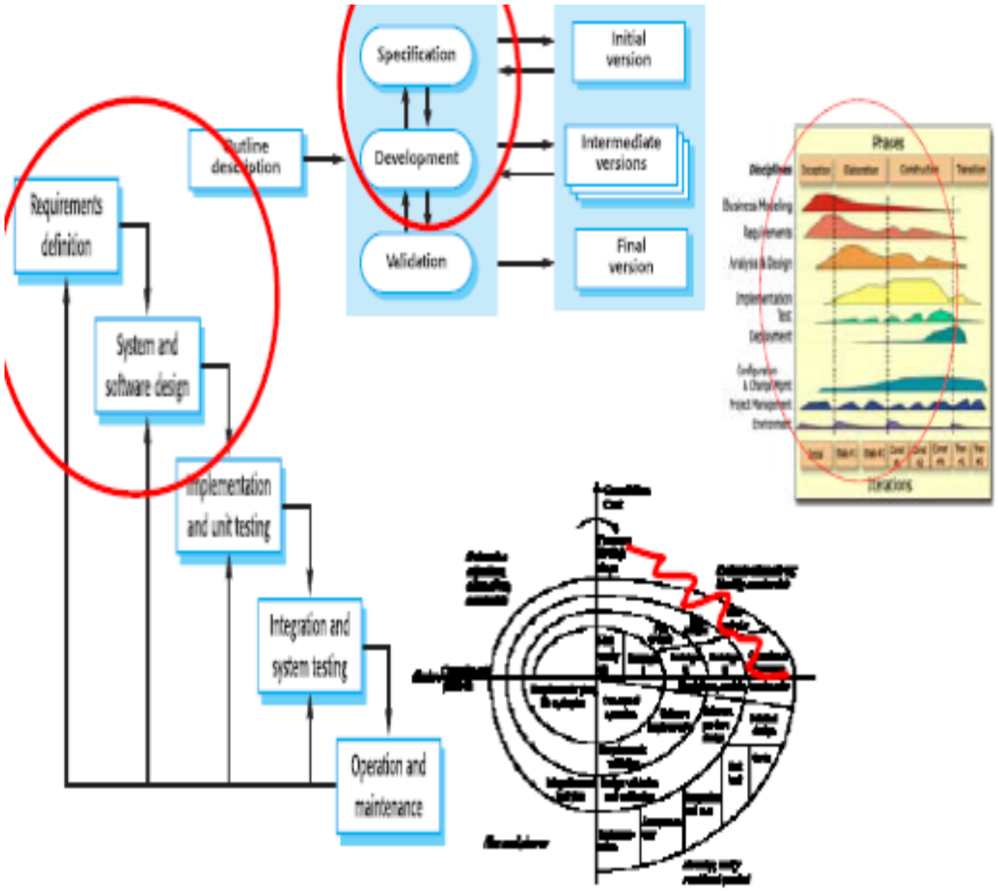
System Entities: [Class]+[object]

Interactions: [Sequence/communication] + [State]

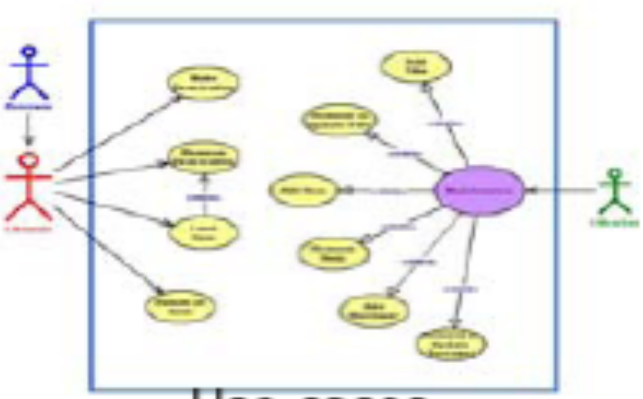
System Design

Architecture/component view: [Component]

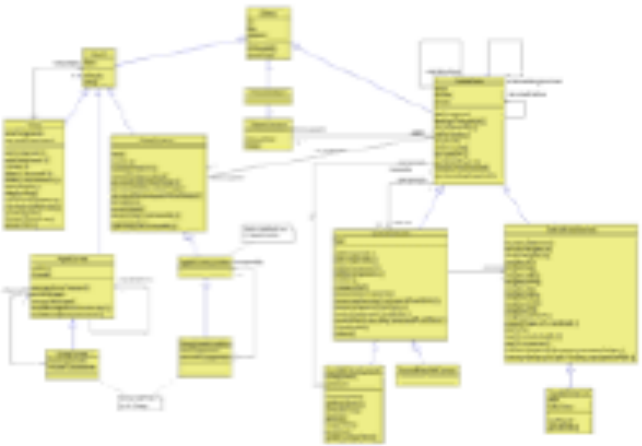
Execution view: [Deployment]



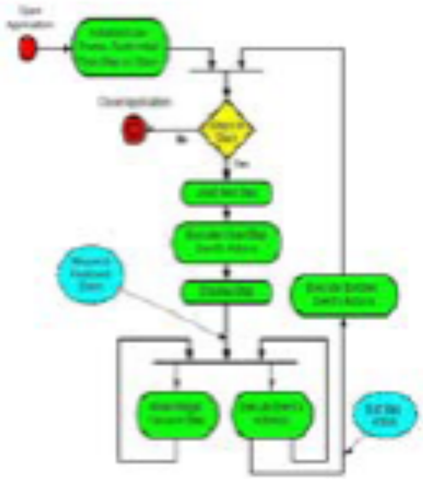
Examples of UML Diagrams



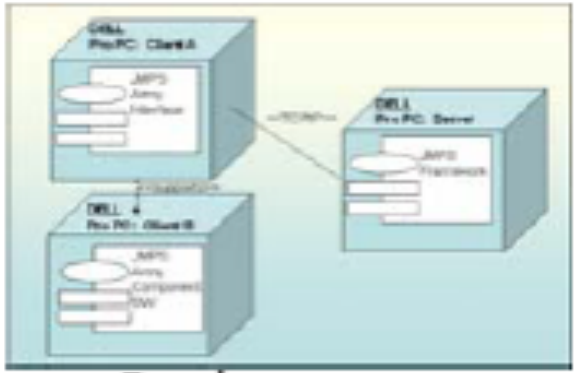
Use cases



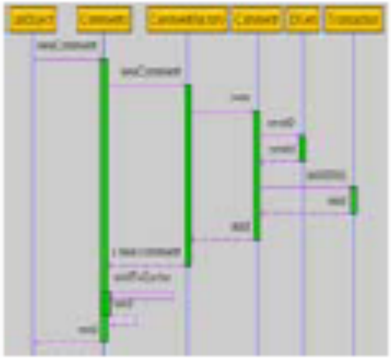
Class diagram



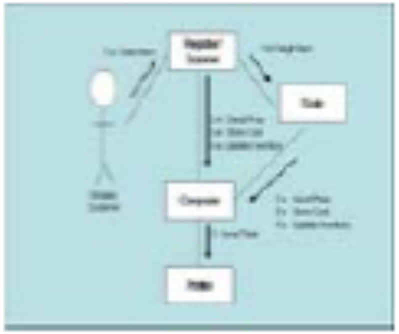
activity



Deployment

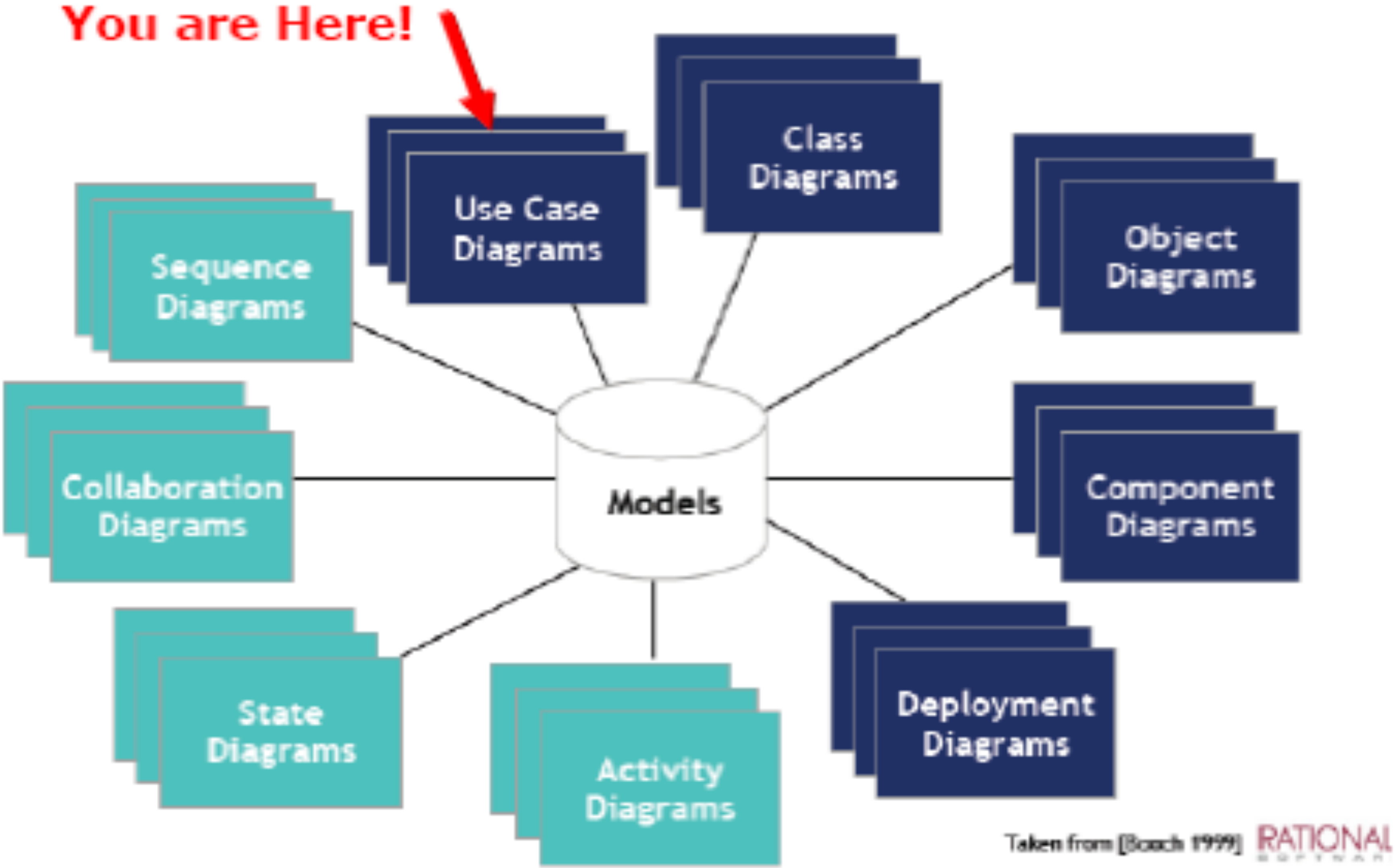


Sequence



Collaboration

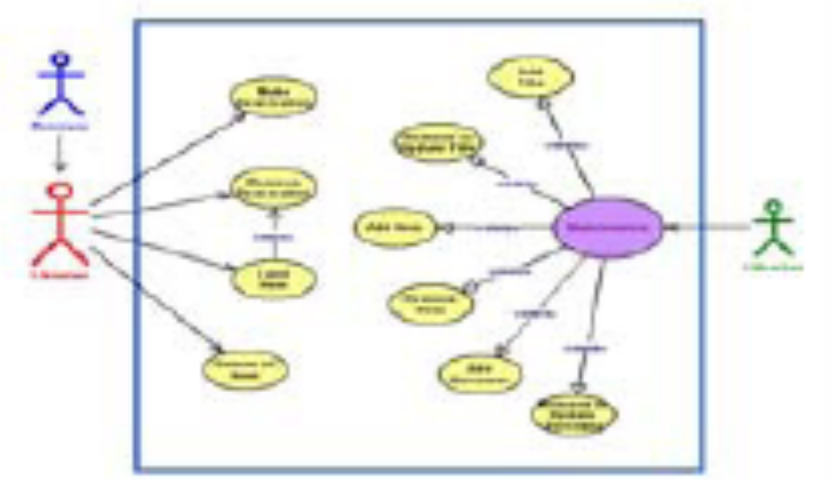
UML Diagrams



Taken from [Booch 1999]

Use Cases

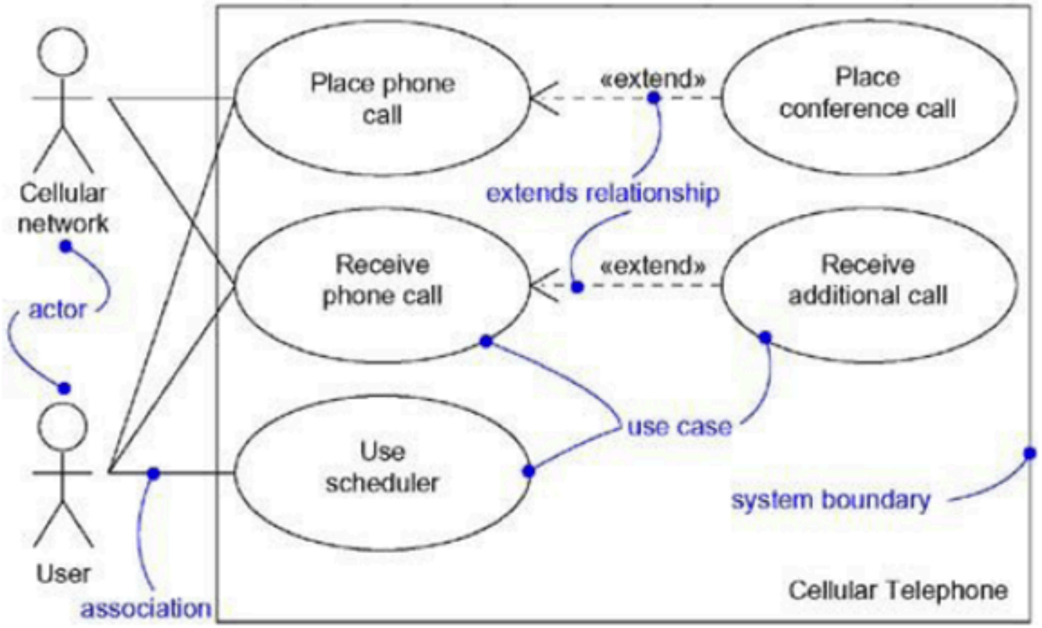
What is use case modelling?
What are actors?
How to find actors?
What are use cases?
How to find use cases?
How to construct a use case
Detailing a use case…



What is use case modelling?

Basis for a user-oriented approach to system development

- Identify the **users** of the system (**actors**)
- Identify the **tasks** they must undertake with the system (**use cases**)
- Relate users & tasks (**relationship or association**)… help identify system boundary
- Capture system functionality as seen by *users*



Booch 1999

Use cases?

Represent that an Actor has a **case** of (or for) **using** the system. The tasks that must provided by the system to the user (Actor) to undertake.

Use cases:

- Built in early stages of development
- Developed by analysts & domain experts during requirements analysis

Use cases aid to:

- Specify the context of a system
- Plan iterations of development
- Validate a system's architecture
- Drive implementation & generate test cases

How to identify Actors?

Observe direct users of the system- could be users or systems

- What roles do they play?
- Who provides information to the system?
- Who receives information from the system?

Actors could be:

- Principal
- Secondary (External hardware, other systems, …)

Describe each actor clearly and precisely (semantics)

- Short name: always a **Noun**
- Description: describe what is their role and how they interact with the system

Example:

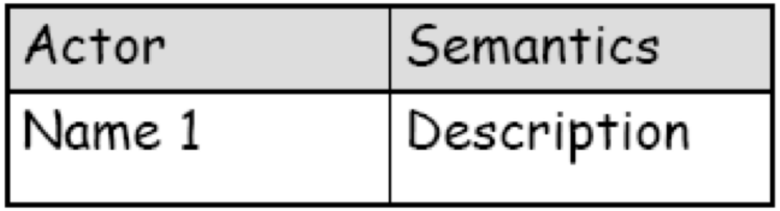
BookBorrower: This actor represents some one (or a user) that makes use of the library for borrowing books [Principal actor]

SystemTimer: This actor represents a system-event that triggers regularly (automatically) checking expired loans [Secondary Actor]

Exercise!

Assume you have a requirements document for a library system: identify all actors that interact with the system

For each actor, write down the name and provide a brief textual description (i.e., describing the semantics of the actor)



Actor	Semantics
Name 1	Description

Exercise: Potential Actors!

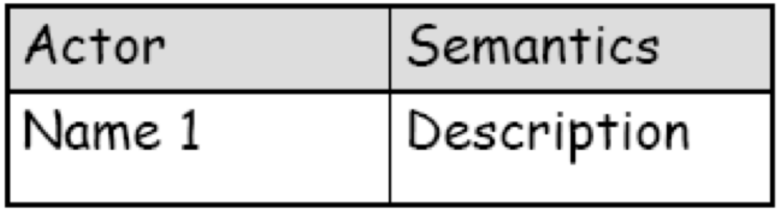
Actor	Semantics/Description
BookBorrower	This actor represents someone who is a member of the library, registered on the system, that can borrow books only
JournalBorrower	This actor represents someone who is a member of the library, registered on the system, that can borrow books and journals
BookBrowser	This actor represents someone who can search for books or journals (but may not be a member of the library and cannot borrow books or journals)
BookClassifier	This actor represents someone who classifies/catalogs new books and registers them in the systems
BookReturnRegistrar	This actor represents someone who receives returned books and registers them in the system
BookLendRegistrar	This actor represents someone who lends (or renews borrowing) books and registers them in the system.
BookShelver	This actor represents someone who shelves books and register book shelving status in the system

Librarian

Exercise!

Assume you have a requirements documents for a Patient Medical System (PMS): identify KEY actors that interact with the system

For each actor, write down the name and provide a brief textual description (i.e., describing the semantics of the actor)



Actor	Semantics
Name 1	Description

Exercise: Potential Actors!

Actor	Semantics/Description
Doctor	This actor represents someone who is a member of the PMS, registered on the system, that can view and edit patient records only
Nurse	This actor represents someone who is a member of the PMS, registered on the system, that can view and edit patient records
Receptions	This actor represents someone who is a member of the PMS, registered on the system, that can view, Edit and create patient records
Patient	This actor represents someone who their information is registered on the system, but can not view, edit their records
IT Staff	This actor represents someone who can maintain patient records
Lab Staff …	This actor represents someone who can edit patient records to enter lab tests only