Software Design: Modeling with UML

System Analysis and Design

Class 03

Mustafa Hasan



A partial abstract representation of a real-world system

An inexpensive way to analyze, communicate, test, and document our understanding of the system

Types of Models

Computational

Computer simulations representing time-varying behavior of a system

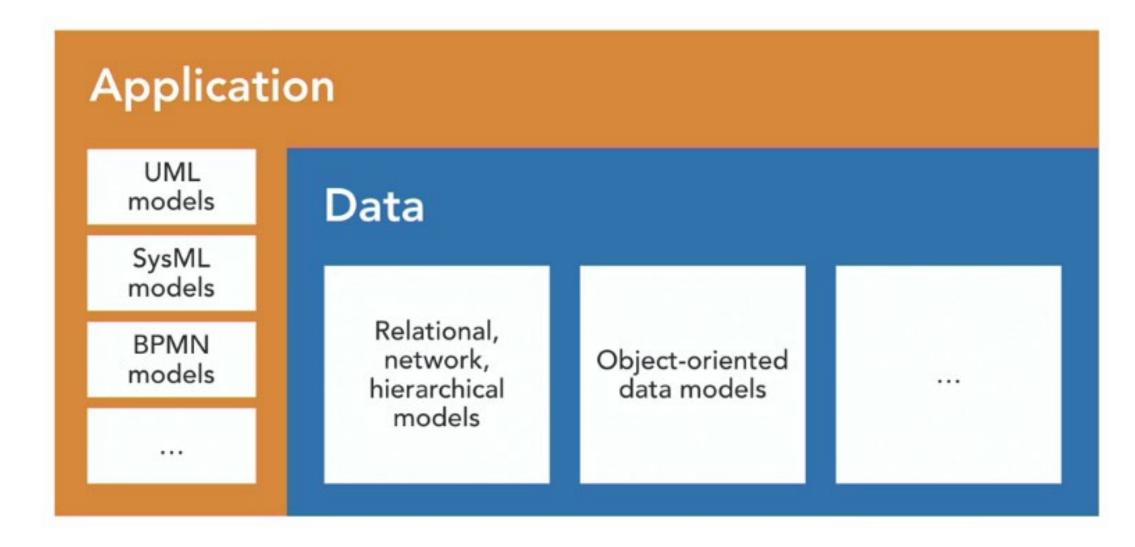
Analytical

• Mathematical models of relationships among variables in a system

Nonanalytical/descriptive

• Describe components and their relationships in a system

Models of Software



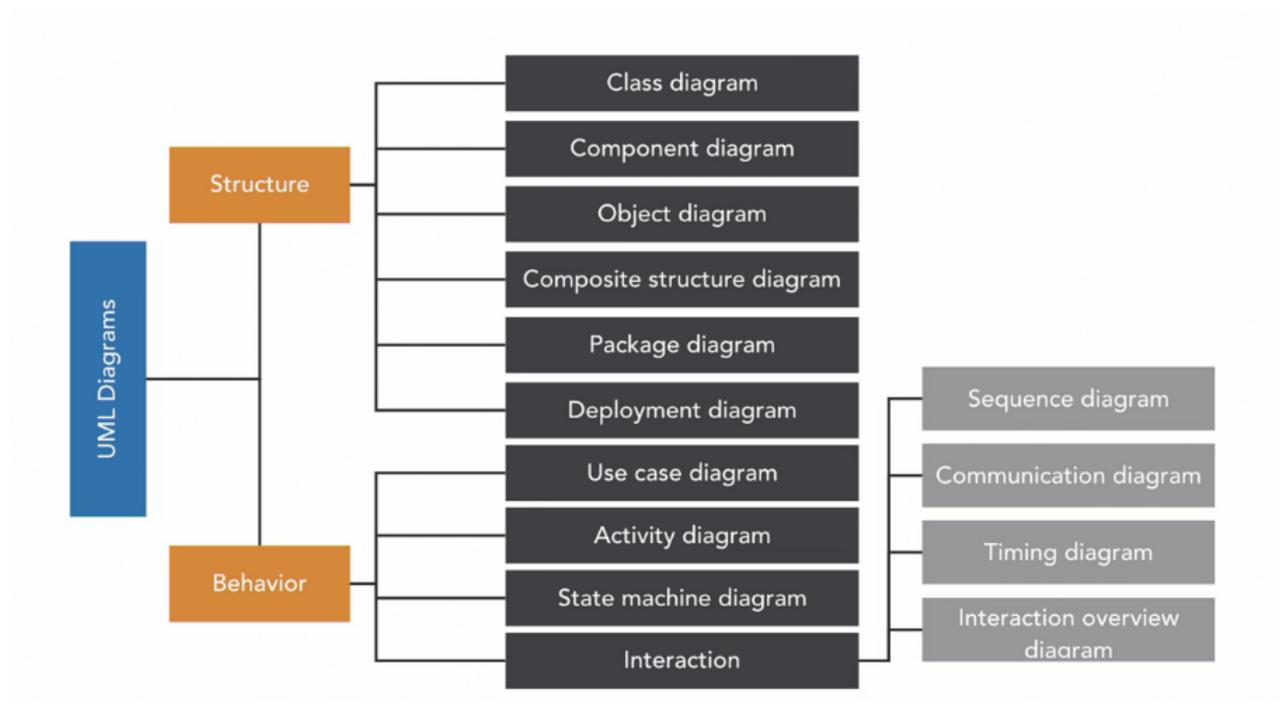


Unified Modeling Language

A family of graphical notations to describe and design software systems, especially those using an object-oriented approach

Based on standards controlled by Object Management Group (OMG)

Releases: UML 1 (1997), UML 2 (2005), UML 2.5 (2015)



1

Structure

Represents static view of the system and its components

2

Behavior

Represents dynamic view of the system and its components 3

Interaction

Represents interaction

- Among components of the system
- Between system and external actors

Important Considerations

- Model selectively: you need not (and should not) draw all the models to develop a system
- Model collaboratively: use models to think, share, learn, and understand together with your team
- Model smartly: start rough and refine it as needed, making it as a long-term asset for the team

Q CASE Tools

- Computer-aided software engineering tools help in various tasks throughout the software development life cycle
- Some key functions of CASE tools: modeling, code generation, reverse engineering, analyzing code complexity, and other metrics

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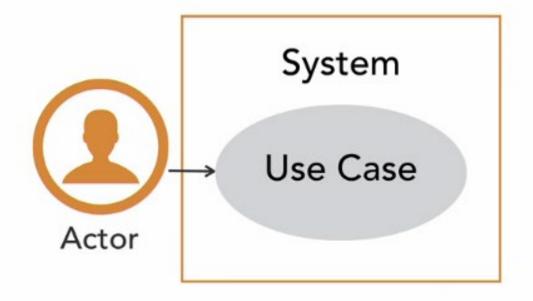
https://en.wikipedia.org/wiki/ List_of_Unified_Modeling_ Language_tools



Use Case Diagram

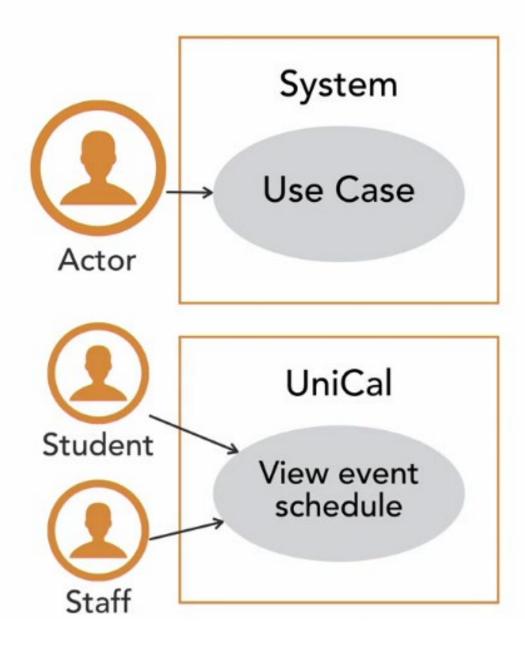
Capture high-level functionality of a system using notations for actors, use cases, and relationships among them

Often drawn by business analysts to depict the summary all use cases in a system



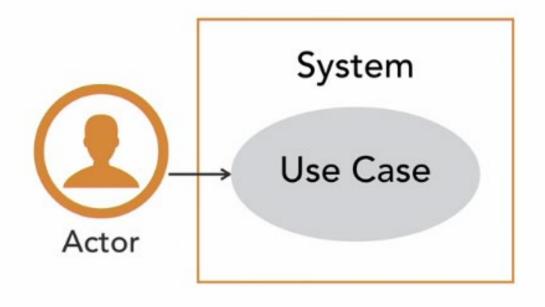
Key Elements

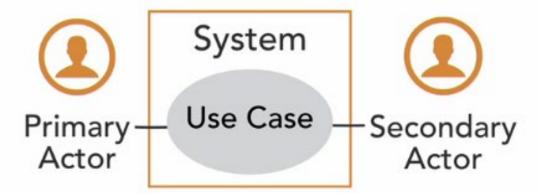
- Use cases
- Systems
- Actors
- Associations



Use Case

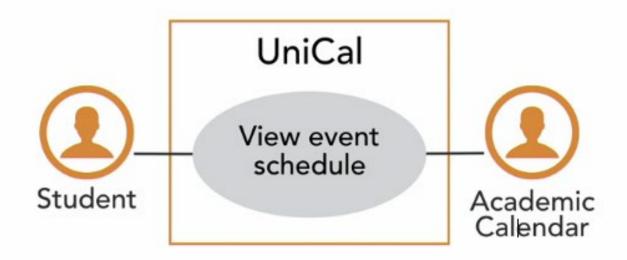
- The use case notation is a bubble that carries use case title
- Associated with actors and possibly other user cases

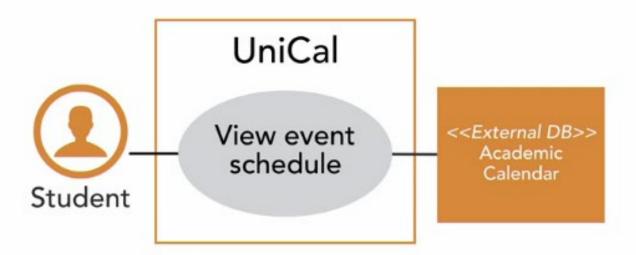




Actor

- A user's role with respect to the system
- May be a human or another system
- Primary actor: whose goal is fulfilled by the use case
- Secondary actor: who is involved in the use case

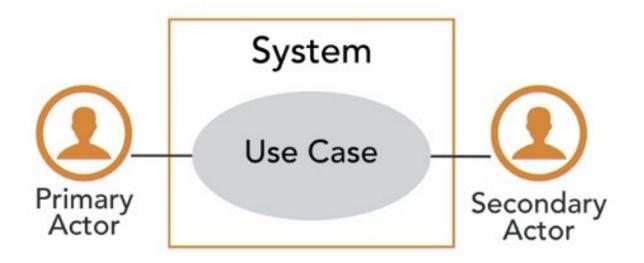




Secondary Actor

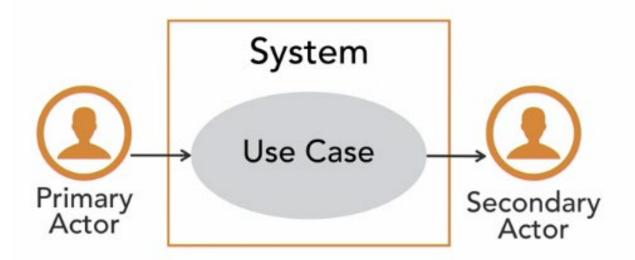
Often an external system
Possible notations

- A nonhuman notation such as a rectangle
- Stereotyped with << >>



Association

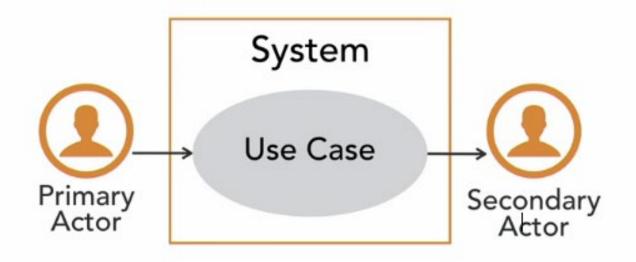
- Between actor and use case
- Between use cases
- Between actors

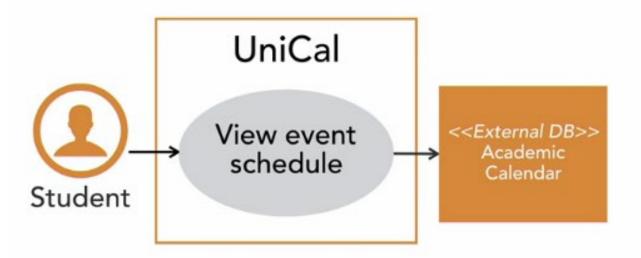


Between Actor and Use Case

Convention

- Primary actor on the left
- Secondary actor on the right of the system





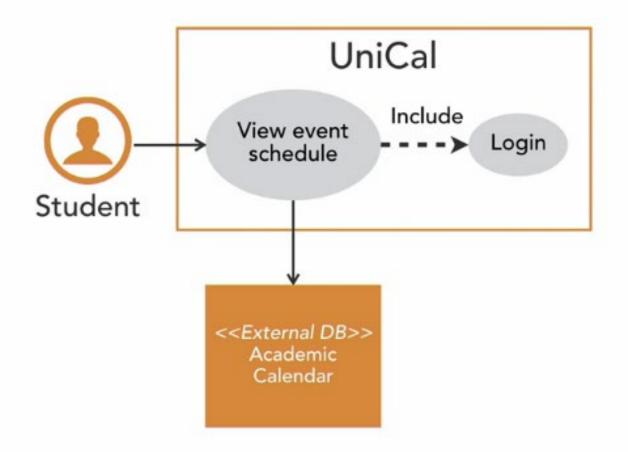
Between Actor and Use Case

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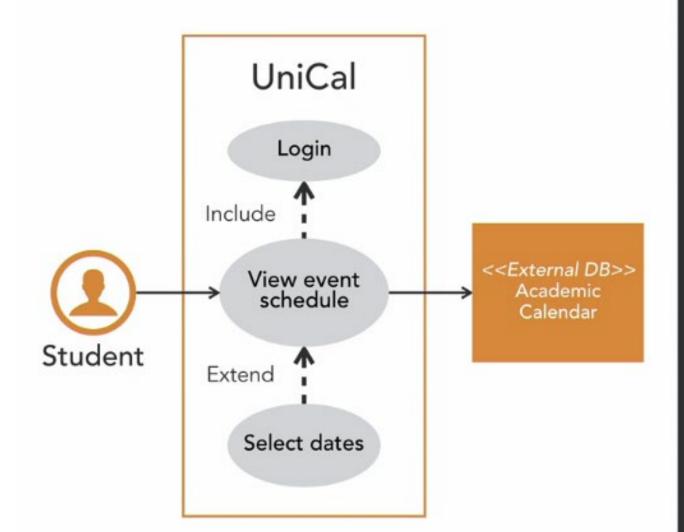
Arrowheads

- From primary to use case
- From use case to secondary



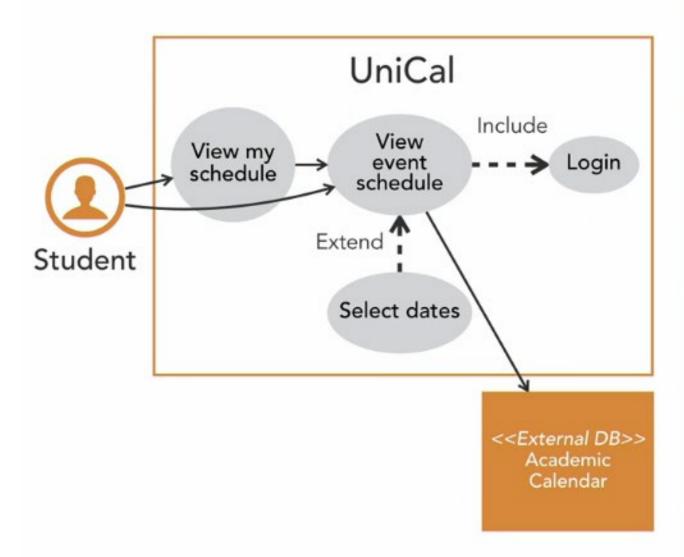
Between Use Cases: Include

 For reusable parts of behavior across two or more use cases



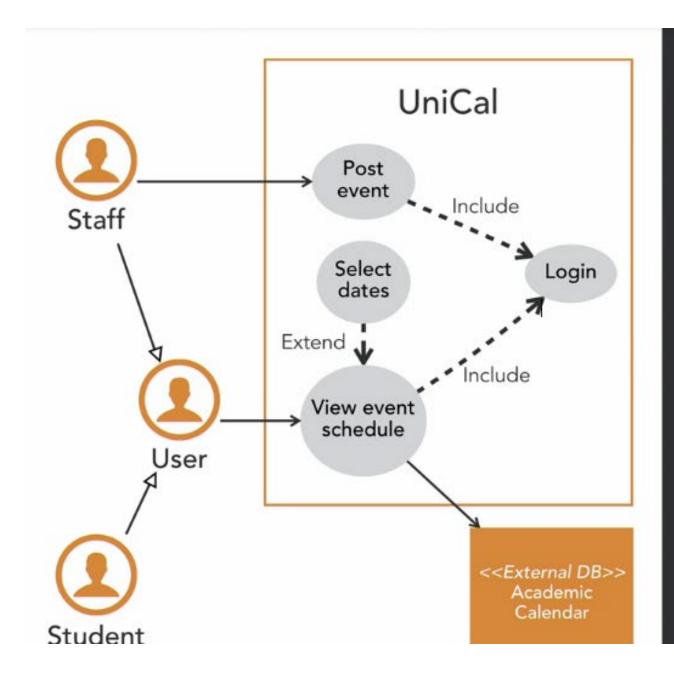
Between Use Cases: Extend

- Optional behavior added to use case
- Helps keep the base use case unchanged while adding more specifics or conditional changes



Between Use Cases: Generalization

 One use case is a special case of another more general use case



Between Actors: Generalization

 Depict generalization – specialization or inheritance relationship between actors