Use Case Analysis

When looking at the system as a whole, Use Case Analysis identifies all the major uses of the system. It is a functional description of the entire system.

- Use Cases are the main tasks performed by the users of the system.
- Use Cases describe the behavioral aspects of the system.
- Use Cases are used to identify how the system will be used.
- Use Cases are a convenient way to document the functions that the system must support.
- Use Cases are used to identify the components (classes) of the system.

Use Case examples

Clerk prints a sales receipt for a video rental.

Person spell checks a typed document.

Receptionist schedules an appointment.

Advisor registers student for classes.

Two important concepts in these analyses are:

- A person is involved. (In UML, the person involved is called an **actor**)
- The actor uses the system.

Formal Definitions

Actor

A role that a user can play.

Examples: instructor, advisor, student.

Actors do not have to be human. An actor such as a sensor may cause a system reaction.

An actor is always outside of the system boundary, an external entity.

Use Cases

Actions on a system initiated by an actor. These are the main tasks performed by each actor. Use cases represent complete functionality of a task.

Example: Register for course.

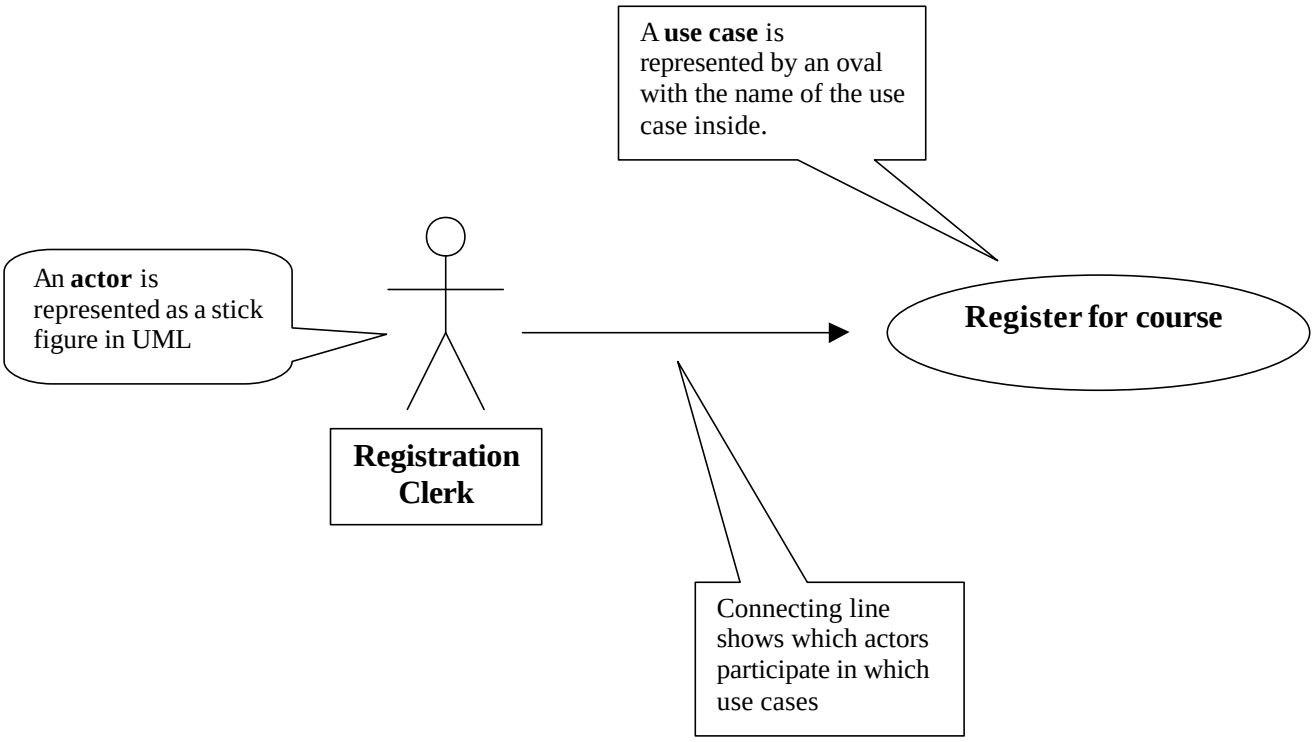
User

Someone who uses the system. The same user can play multiple roles. Example Prof. John Doe plays the role of an instructor and the role of an advisor. A user is an instance of an actor.

Views

Two or more actors interacting with a use case. Example Register for Course involves both the Student registering for the course and the Bursar's office sending out a bill for it. Each actor views this task from a different perspective.

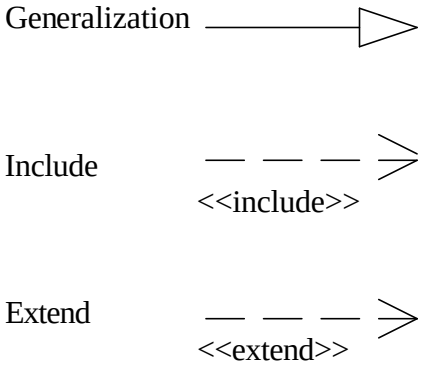
UML symbols



A use case is only a high-level description of an activity that will be performed on a system. It may require a sequence of individual steps to carry out the use case.

There could be different sequences of individual steps for the same use case. These are called **scenarios**. For example, use case register for classes may have two scenarios, one for registering through an advisor and one for online registration.

UML use case relationship symbols



Relationships Use cases may be related to other use cases.

- A use case that is a variation on normal behavior of another use case describes a ***generalization*** relationship. These generalization use case relationships can be used to describe actions when an alternative behavior must be carried out for some reason.

Example: A use case Prerequisites Not Met describes a use case that is an alternative action for use case Register for Course.

- A use case may ***include*** another use case. A use case that is included is generally a common behavior that many use cases may need. One use case will use the services of another use case.

Example: Review Transcript Data use case is used by the Register for Course use case to be sure the student has met the course's prerequisites. Review Transcript Data use case is also used by Graduate Student use case to be sure that all program requirements have been met for graduation.

- A use case may ***extend*** a use case by adding new actions to it.

Example: Use case Register for Distance Course may extend use case Register for Course. Additional actions must be performed when a student registers for a distance course.

Documentation

Describe each use case, actor and relationship. Describe how the use case interacts with the actor as opposed to how it will perform its task.

Example: Register for Course can be described as Student completes a registration by entering the course number, section, term and year. The student's advisor indicates approval. A course registration printout of the classes this student is registered for prints. A bill for the course prints in the Bursar's office.

Use Case Diagram

A diagram used to capture the functional requirements of a system by identifying actors and use cases.

Development of a Use Case Diagram

1. Identify all of the actors who will use the system.
2. Interview these actors to identify the functions that they need to perform. (use cases)
3. Identify scenarios (sequence of steps to accomplish a use case).
4. Identify common steps within the different scenarios. Separate them into different use cases so that they can easily be included in other scenarios.
5. Identify relationships between use cases.

Use Case Diagram Example for College Registration System

A student may register for classes during a specified registration period. To register, a student must see their advisor. The advisor must approve each course that the student has selected. The advisor will use the registration system to determine if the student has met the course prerequisites, is in good academic standings and is eligible to register. If the advisor approves the courses, the advisor enters the student's college id into the course registration system. The course registration number for each course is entered. The course description, course number and section for those courses will automatically display. The system will check for schedule conflicts before saving the registrations. A bill for the courses will print in the Bursar's office. The student should proceed to pick it up.

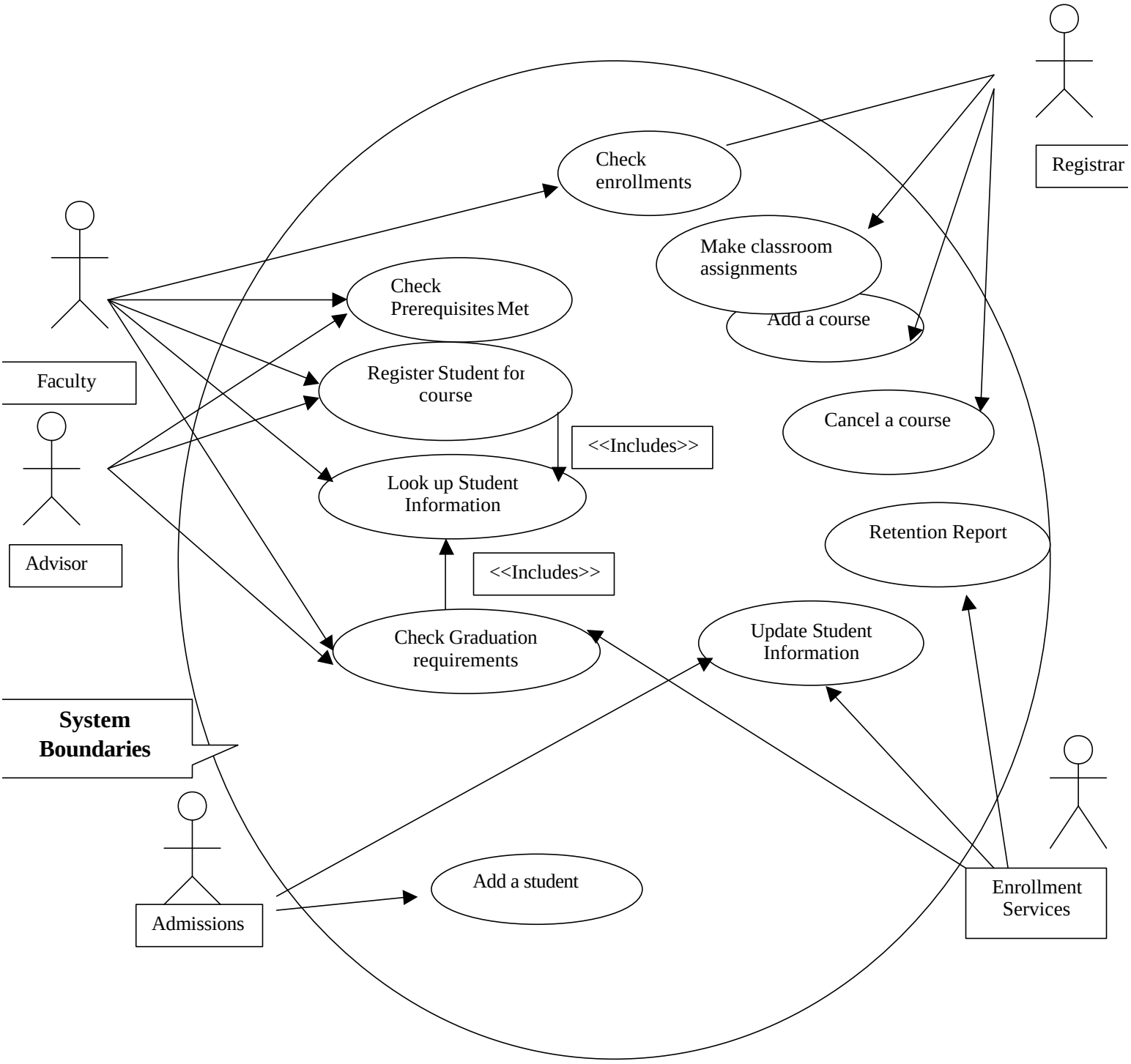
Faculty can use the registration system to check enrollments in their classes, get a class list, check a student's transcript, look up a student's phone number and other such student information.

The registrar can use the registration system to enter new classes for an upcoming semester, cancel a class, and check conflicts in classroom/faculty assignments.

Admissions use the registration system to add new students.

Enrollment services use the registration system to report on retention, update student information, and check fulfillment of graduation requirements for those students planning to graduate.

College Registration System Use Case Diagram



Process high priority use cases first.

High priority use cases:

- Use cases that are the primary element of the business functionality.
- Use cases that contain high risk factors (time critical, technology intensive, new technology)
- Use cases that promise high level of progress for least amount of effort.
- Use cases that promise lower operating costs or increased revenue.

Why use Use Case modeling diagrams:

- They offer a disciplined way to develop a system and deal with its complexity.
- They are great test cases for the system.
- They provide quantifiable progress.
- They provide a strong base for formulation of other models.

Use Case Diagram to Class Diagram

Develop a class diagram from the nouns that are used in the use cases. Develop the class diagram from the highest priority use cases first.

Exercises

1. Contrast the following terms:

   a. actor; use case
   b. extends relationship; includes relationship

2. Capture the functionality for a system that accepts a tuition payment from students as a use case.

3. Extend the use case diagram in exercise #2 to capture the situation where employees of the college are not billed for tuition. Their spouses do not get a full tuition waiver, but pay for only 25 percent of the total tuition.

4. Draw a use-case diagram for a college that would like to keep track of each graduate. In order to maintain strong ties to its alumni, the college holds various events. The college needs to keep track of which graduates have attended which events. The college keeps in contact with graduates by mail, email, telephone and fax to announce each event and keep graduate information up to date. The college would like to be able to produce a report showing the latest information about a graduate and the events the graduate attended.

5. An auto rental company wants to develop an automated system that would handle car reservations, customer billing, and car auctions. Usually a customer reserves a car, picks it up, and then returns it after a certain period of time. At the time of pick up, the customer has the option to buy or waive collision insurance on the car. When the ca is returned, the customer receives a bill and pays the specified amount. In addition to renting out cars, every six months or so, the auto rental company auctions the cars that have accumulated over 20,000 miles. Draw a use-case diagram for capturing the requirements of the system to be developed. Include an abstract use case for capturing the common behavior among any two use cases. Extend the diagram to capture corporate billing, where corporate customers are not billed directly; rather the corporations they work for are billed and payments are make sometime later.

References

Fowler, M. 1997. UML Distilled: Applying the standard Object Modeling Language. Reading, MA: Addison-Wesley.

Hoffer, George, Valacich 1998. Modern Systems Analysis & Design Addison-Wesley