

Use Case Diagram

Requirements Analysis and Specification

Requirements Analysis and Specification

- **Activities for Analysis and Requirements Capture**
 - Study of the application domain
 - Identification of boundaries and interactions among the application and the external world
 - Identification/Comprehension of requirements
- **Activities for Requirements Specification**
 - Requirements specification (based on WHAT and not HOW)
 - Validation/Verification of requirements specification
- **Note: the boundary between analysis and specification is often confused**

Analysis: Methodologies

- **No scientific methods**
- **Guidelines, general principles and empirical techniques**
- **Too many**
 - Subjective factors,
 - Human-related factors, and
 - Communication issues

Analysis: Guidelines

- **Analysis should identify**
 - A representation of relevant information
 - A model of software behaviour
- **Analysis should consider how the system**
 - Will be structured (from the user perspective)
 - Will provide functionality
- **For complex systems, they must be partitioned hierarchically**
 - Analysis is then carried out separately on different parts

Specification: levels of formality

Informal specification

- Based on natural language (ambiguous)

Formal specification

- Based on mathematical language

Semi-formal specification

- Made of both informal and formal parts

Specification: types

- Specification of data (static view)
- Specification of behaviour (dynamic view)

Specification: styles (behaviour)

Operational

- It specifies the procedures
- Example: List B is obtained from list A by moving the smallest element in A in the first position of B, the new smallest element in A in the second position of B, and so forth until list A is empty.

Descriptive

- It specifies the properties
- Example: list B is the ordered permutation of list A

Use Case Diagram

- Semi-formal notation
- Specifies the interactions between the system and the external world
- Useful to
 - Oblige the analyst to state well-defined boundaries between system and external world
 - Organize system functions into elements (use cases) on which attention is focused
 - Supply a first basis for the specification of system structure from the user perspective

Elements of a Use Case Diagram

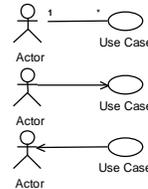


- Someone (user) or something (external system, hardware) that
 - Exchanges information with the system
 - Supplies input to the system, or receives output from the system

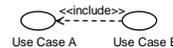


- A functional unit (functionality) part of the system

Relations among Use Cases



Association. Models:
 - Which actors participate in a use case
 - Where execution starts
 Adornments (e.g. multiplicity, direction) allowed

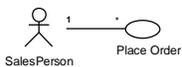


Include. Models that functionality A is used in the context of functionality B (one is a phase of the other)

Relations among Use Cases



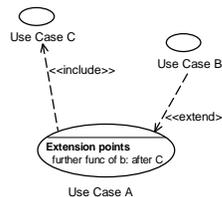
Generalization. Defines functionality B as a specialization of functionality A (e.g. a special case)



Generalization. A generalization from an actor B to an actor A indicates that an instance of B can communicate with the same kinds of use-case instances as an instance of A



Relations among Use Cases



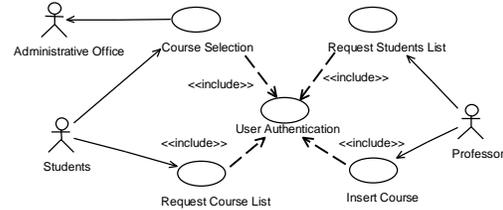
Extension. An extend relationship from use case B to use case A indicates that an instance of use case A may be augmented by the behavior specified by B

- The behavior is inserted at the location defined by the extension point in A

Online Courses

- At the beginning of the semester, the students office has to supply the students with the list of available courses through a system of online registration.
- Each student must select 4 available courses, and state two possible alternatives.
- Each course must have from 3 to 20 students: courses with less than 3 students are cancelled, and those with more than 20 are split.
- In the previous period, the professors access the system online to insert their courses in the list, while in the period after students' selection they access to check current state of enrolled students to their courses.
- After the selection period, the system creates def. lists, by solving all anomalies (courses with less than 3 or more than 20 selections) and it sends them to administrative office to state enrolment charges due by each student.
- The students access the system for the list of their courses
- All user interactions are authenticated

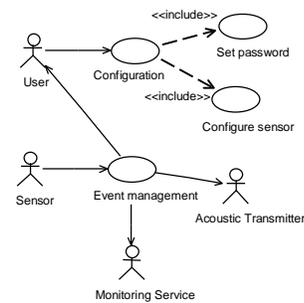
UCD for Online Courses



Domestic Security System

- Once installed, the system monitors all connected sensors (of movement, entrance, smoke), and interacts with the user through a keyboard and a display inside a dedicated control panel.
- During installation, the control panel is used to configure the system. Each sensor is assigned with a unique numeric code and the phone number of the monitoring service to call in case of events related with a sensor. It also defines a password for activate/deactivate the system.
- In case of an event related with some sensors, the system displays a message and produces an acoustic alarm. After a period (defined during user configuration) the system calls the phone number associated with the sensor. Should the number be busy, the system repeats the call every 20 seconds.

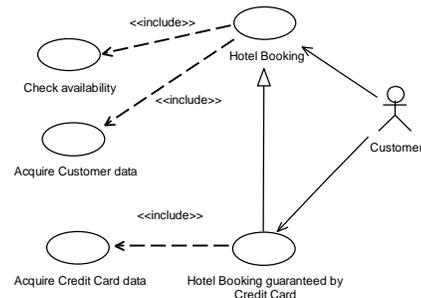
UCD for Domestic Security System

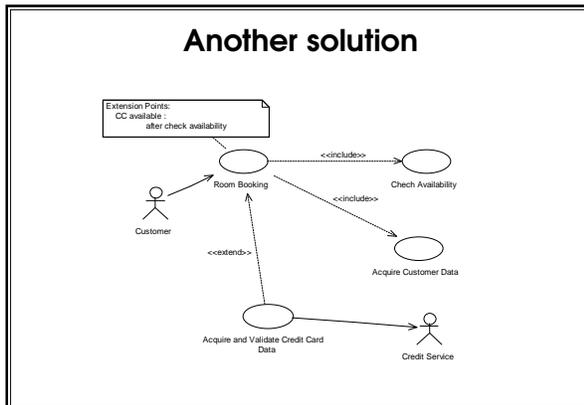


Room booking

- Un sistema di prenotazione di un hotel deve permettere ad un cliente di riservare una stanza
- Il sistema deve ricevere le preferenze dell'utente (camera singola, fumatore, ...) e i suoi dati personali
- Per effettuare la prenotazione, il sistema deve verificare la disponibilita' di camere confacenti le preferenze dell'utente
- Estendere il sistema affinche' integri una funzionalita' di garanzia di pagamento con Carta di Credito

Further example of relations Include/Generalize





Electronic Elections System

Define the UCD so an electronic elections system as follows:

- Electors are like referendum (yes, no, null).
- Each elector as a personal code identifier (PID).
- Each elector can vote only once and his/her vote is secret (cannot be stored in the system).
- Before voting, the elector must state his/her generalities and PID. The system allows only registered electors to vote (supplied data must coincide).
- System manager can
 - Monitor elections (access percentages of electors, know who did vote)
 - After elections terminate, access to results