UML - Use Case Diagrams and Interviews

School of Computer Science | Software Requirements and Design
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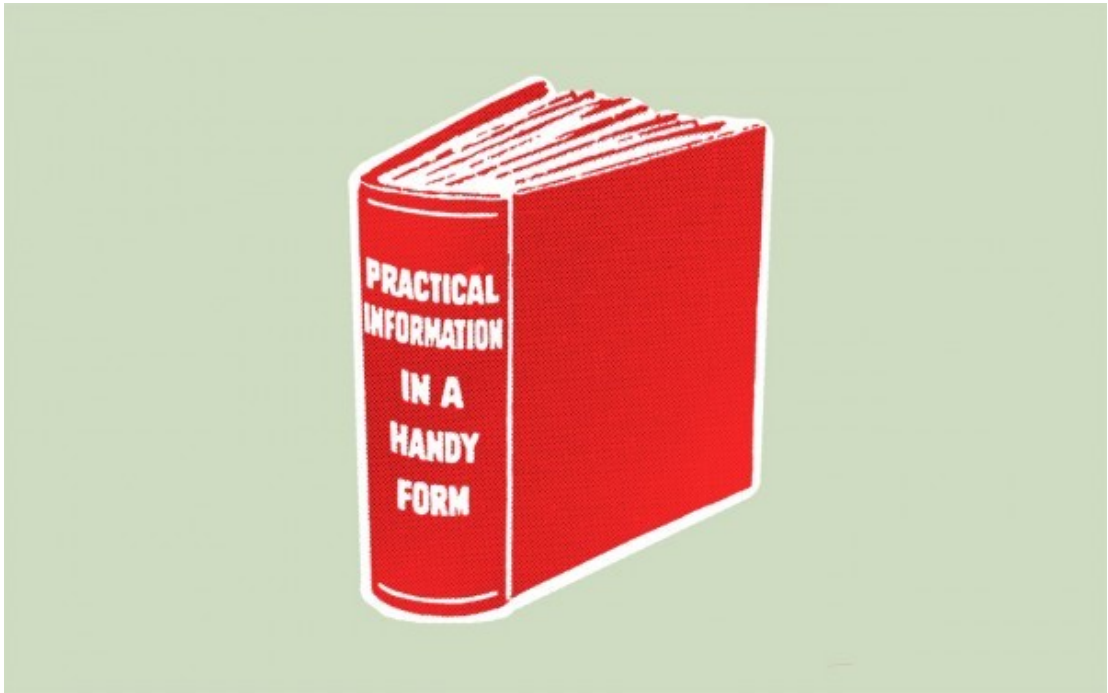
January, 18, 2016

Practical Information



Last lecture

- Describing User Groups

Notendahópur	Bakgrunnur	Notkun kerfisins	Umhverfi	Helstu markmið
Námsmenn hérlendis **Mikilvægi:** Mikilvægasti hópurinn ásamt námsmönnum erlendis	***Aldur:*** yfir tvítugt ***Kyn:*** bæði kynin ***Menntun:*** framhaldsskólapróf ***Hæfni vanhæfni:*** ekkert sérstakt ***Tölvufærni:*** mjög góð yfirleitt	***Notkun:*** Kerfið mest notað á haustin. Líka notað þess á milli nema út af sérstökum fyrirspurnum. ***Þjálfun:*** Engin þjálfun á kerfinu eða reynsla frá vinnu. ***Viðhorf:*** Notendur eru almennt jákvæðir fyrir kerfinu þar sem það veitir þeim þjónustu sem þeir þurfa á að halda. ***Fjöldi notenda:*** ca. 4.000	***Tæknilegt umhverfi:*** Mjög mismunandi hvernig umhverfið er þar sem notendur koma úr ólíum áttum, nettenging og ytri aðstæður mismunandi. ***Raumverulegt umhverfi:*** Ættu að vera oftast í skólaumhverfi eða heima, en gætu verið hvar sem er. ***Annað umhverfi:*** ekkert sérstakt	<Sækja um lán eða styrki og nálgast upplýsingar
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- Describing what users should be able to do:
  - Use cases, user-stories, scenarios

This lecture

- What is UML
- A quick introduction to UML – diagrams
- Uses cases and Use case diagrams
- Interviews

- Reading
  - Cp 3 – pg. 72 - 78

Unified Modelling Language

What is UML?

- Unified Modeling Language
- NOT a programming language, but a language used to specify the design of individual parts of a system
- Mostly graphical
- Parts of UML can be used for more than software projects
  - UML diagrams can be described using a class diagram
- Take a look at www.uml.org to read the spec, articles and more

What parts of UML will we learn?

- UML specifies a lot of diagrams, but we will only look at a few of them:
  - class diagram (ísl. klasarit)
  - object diagrams (ísl. tilvikarit)
  - sequence diagram (ísl. runurit)
  - state diagram (ísl. stöðurit)
  - use case diagram (ísl. notkunarlíkan)
- Other diagrams (which we won't cover):
  - activity diagrams
  - package diagrams
  - implementation diagrams
  - etc.

Various UML diagrams

- The following diagrams have different purposes, e.g. describe different things

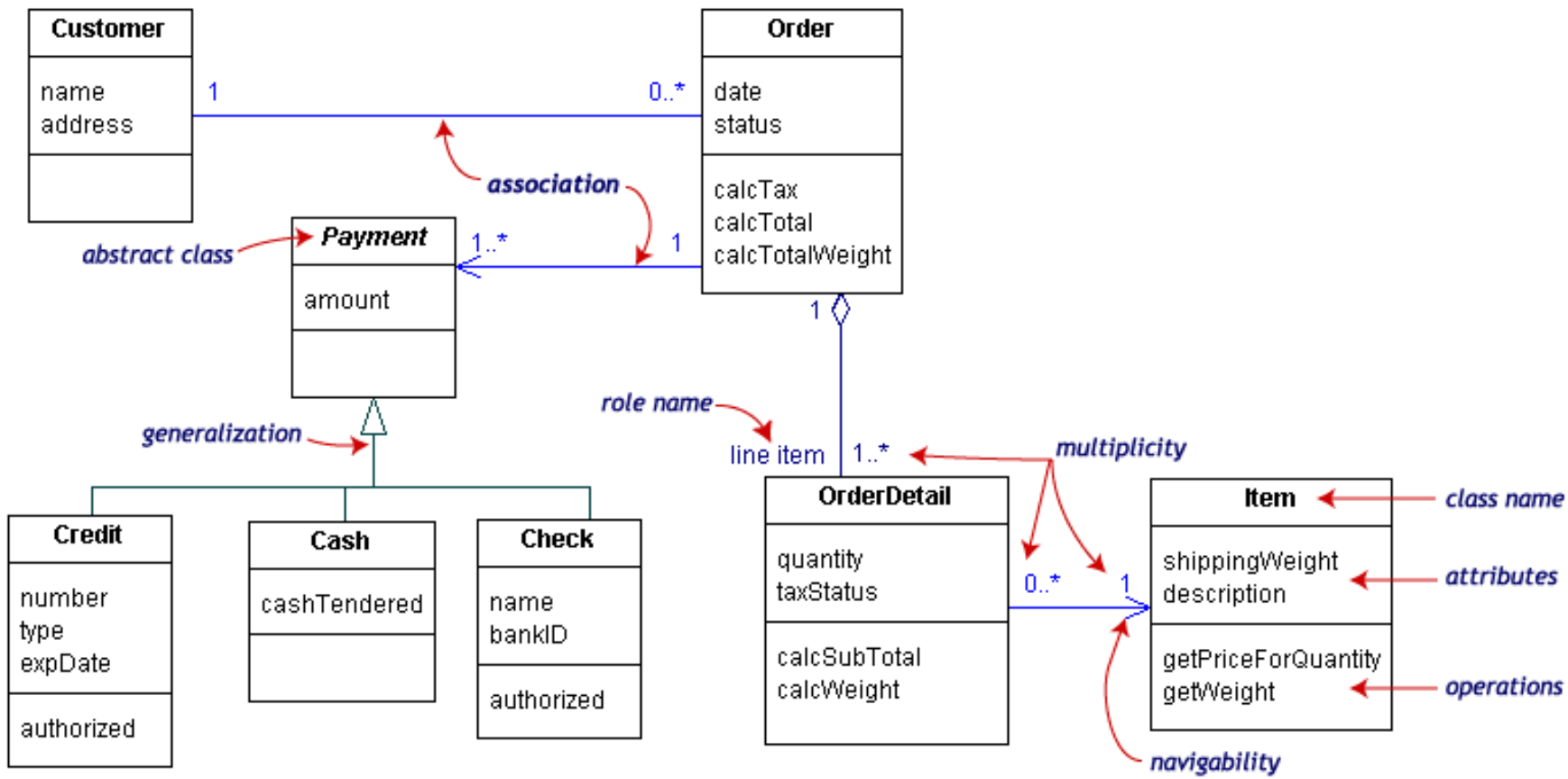
- Used mostly for the requirement analysis phase:
  - use case diagram (ísl. notkunarlíkan)

  - Used more for designing the programming part
    - class diagram (ísl. klasarit)
    - object diagrams (ísl. tilvikarit)
    - sequence diagram (ísl. runurit)

    - state diagram (ísl. stöðurit) - used in both phases

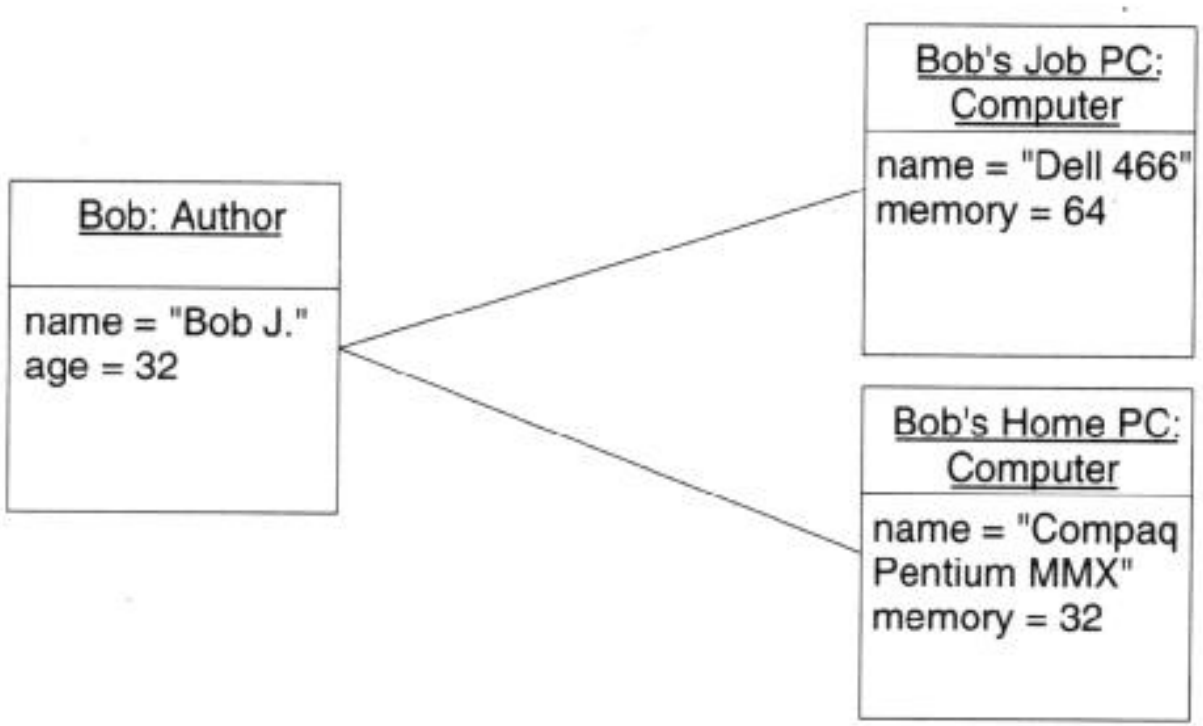
Class diagram example

Class diagrams describe the classes in a project (or a part of a project), their attributes/operations, and their relationship



Object diagram example

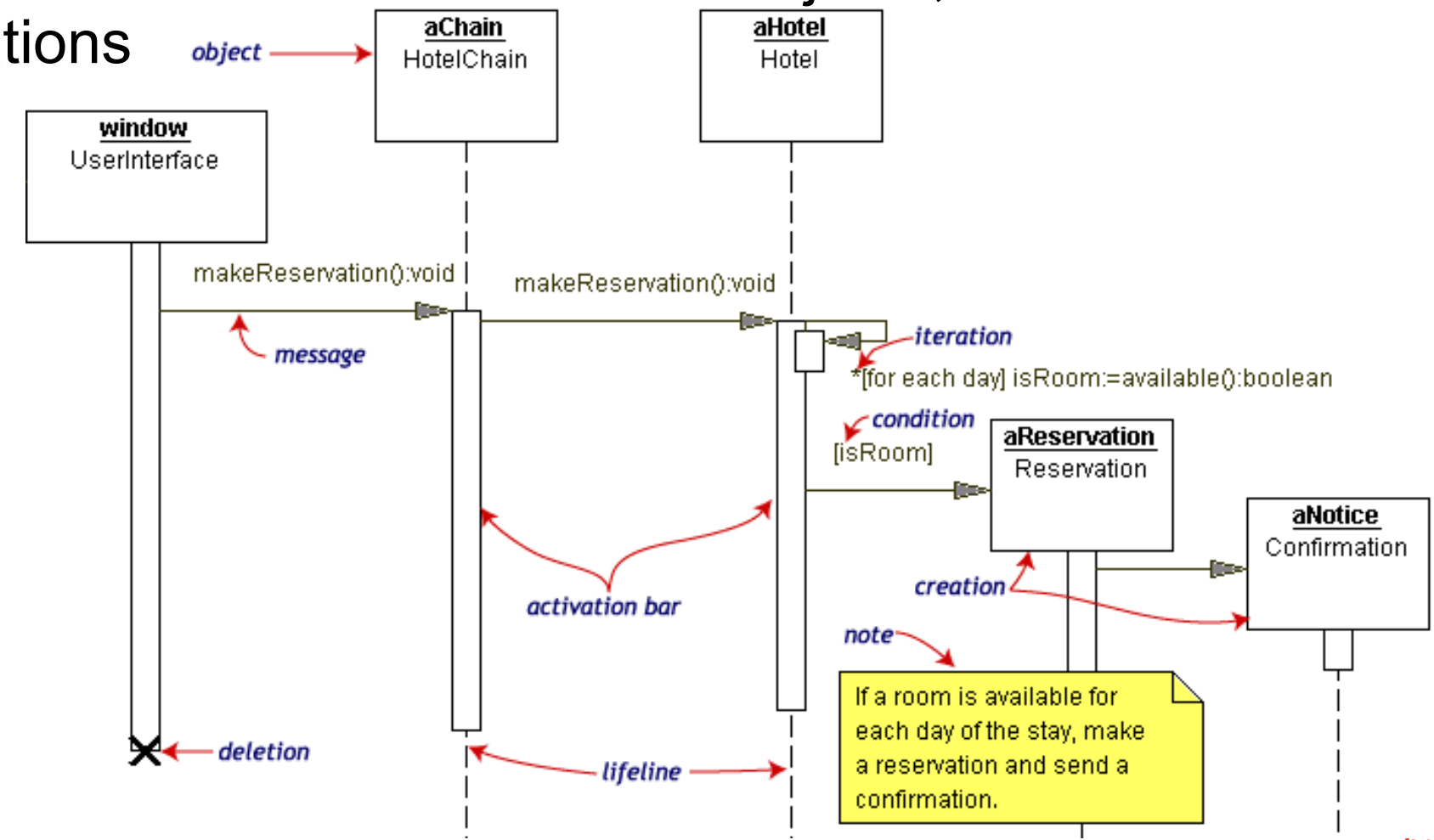
Object diagrams shows what objects are in use at a particular time in a software system



Object Diagram

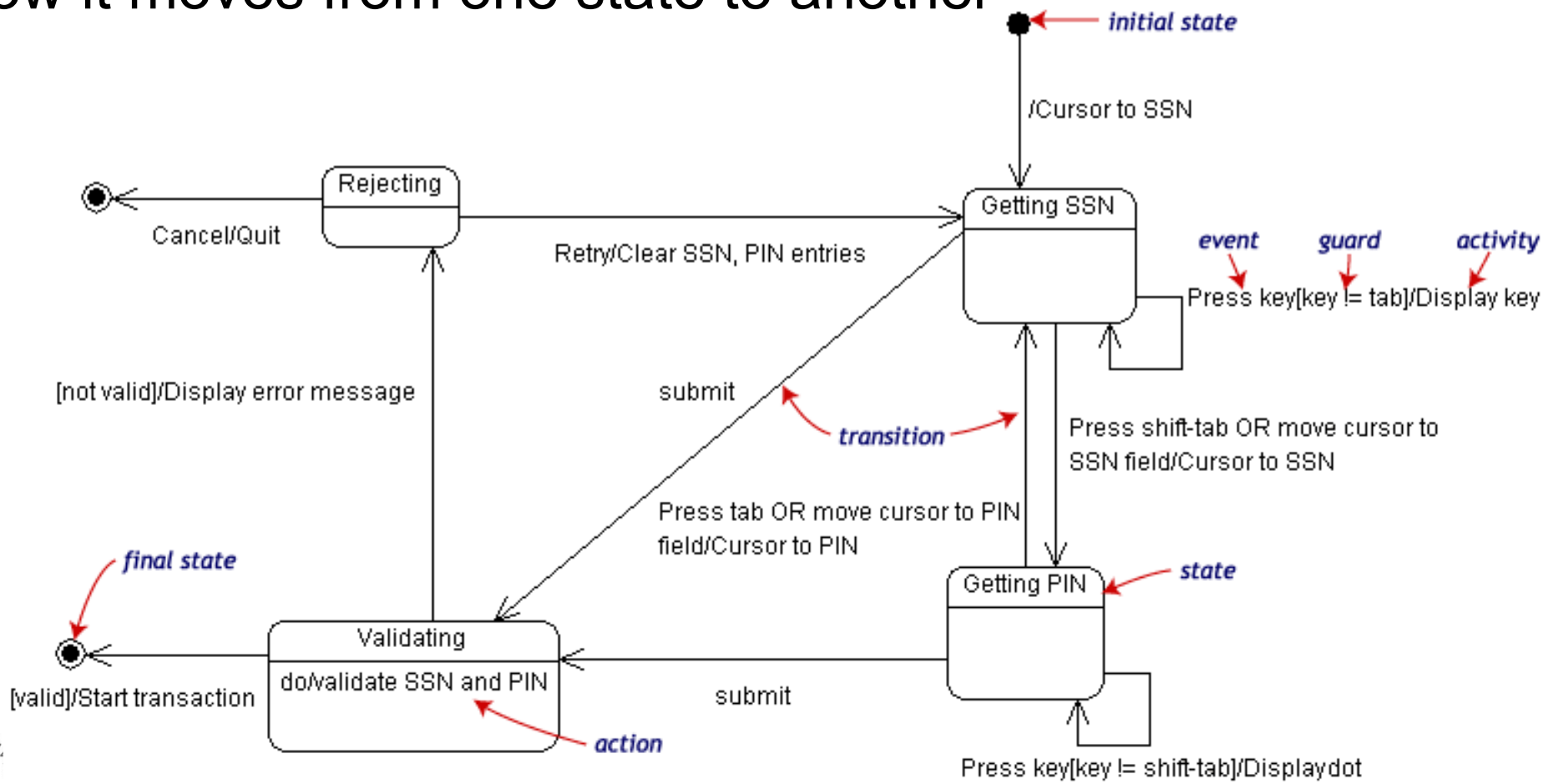
Sequence diagram example

Sequence diagrams show how a single operation is implemented in terms of classes/objects, and their operations



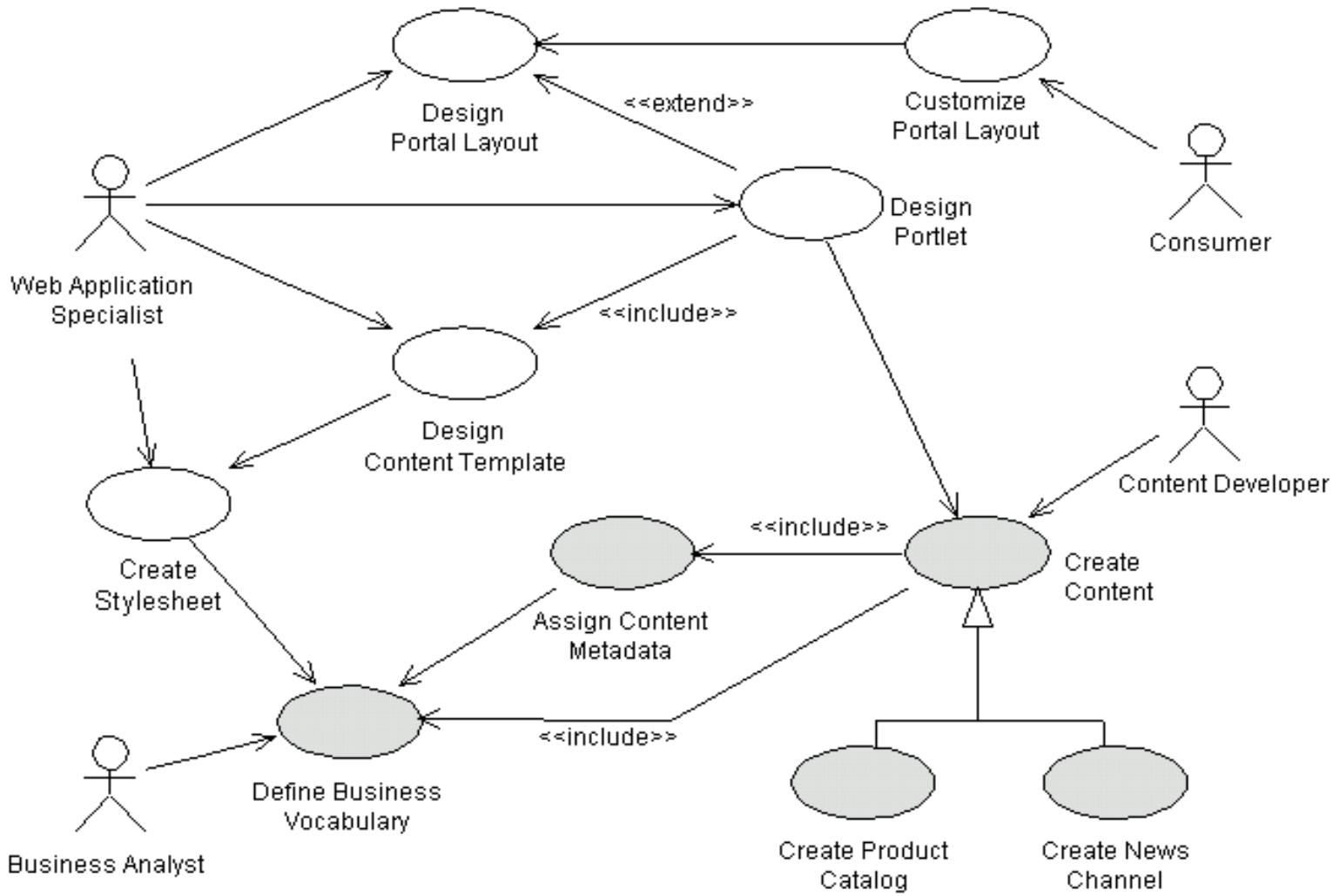
State diagram example

State diagrams show the states a system can be in, and how it moves from one state to another



Use case diagram example

Use case diagrams show what use cases are defined in a system, user groups, and how they are related



Source

Use Cases

What is a use case?

- A more detailed description of a single activity/operation within a system
- A use case is not "drawn" like many UML diagrams, but written
- The format of a use case has not been standardized
  - you will see different forms in different books
- Should be understandable for people with little or no technical background
  - But experience shows that it is not easy for users to understand use cases
- Should describe in detail what happens
  - and what should not happen
- Is often used as a foundation for test descriptions

Purpose of a use case

- Make sure everyone involved has the same understanding about a certain functionality - what exactly is going to happen?
  - much easier to change the flow / implementation at this stage, instead of implementing first, and then discover that the users want a different implementation
- Helps us get a better idea how to implement this functionality

Name:	User borrows a book
Number:	21
Priority:	High
Precondition:	None
Description (base flow):	A user gives the clerk the book he wants to borrow, the clerk scans in the book barcode, or types in the ISBN of the book. The user then shows his library card, the clerk scans that in as well, and the user can then take the book to his home.
Alternative flow:	• This is a new user, and he doesn't have a library card. The clerk will have to register the user (see use case 22: Register new user). • The users library card has expired. Clerk offers user to renew his subscription (see use case 23: Renew user subscription). • The user forgot his library card. The clerk types in his SSN instead of scanning his card (see use case 28: Clerk looks up a user) • The user has borrowed a maximum amount of books, and must return some of them before he can borrow other books.
Postcondition:	This particular book is now in "borrowed" state, and cannot be borrowed by another user until it has been returned.
Source (requirements):	3, 11, 17
Actors	User, Clerk
Author	Jón Jónsson

Contents of a use case

- A use case could potentially contain lots of rows, but only few are really important:
  - **Name** - a short name that identifies this use case
  - **Number** - for easier reference (requirements and use cases are usually cross referenced)
  - **Description** - what happens from the perspective of the user(s) during a particular operation
  - **Actors** - what users take part in this use case
  - **Source** - a list of requirement numbers which refer to this use case. There may not necessarily be a one-to-one mapping between requirements and use cases

Contents of a use case

- Other columns are not mandatory, but will definitely be useful in some use cases (but not all):
  - **Priority** - can often be deduced from the requirements referred to.
  - **Precondition (ísl. forskilyrði)** - what must be true before the use case can continue. Note: there is no need to state the obvious here ("the computer is turned on", "the user is alive"). Preconditions don't always apply.
  - **Postcondition (ísl. eftirskilyrði)** - what must be true after the use case has been completed. Again: don't state the obvious. Not always used.

Contents of a use case

- continued:
  - **Alternative flow (ísl. frávik)** - describes what happens when things don't go perfectly as planned. Try to list as many things as possible without going into extreme alternatives (we don't need to specify what happens if we have a volcanic eruption - unless that is the problem domain of our application!)
  - **Author** - who wrote this requirement. May not be entirely necessary.
- The book mentions a few more:
  - **Other participating actors/stakeholders** - not always important
  - **Trigger** - what caused the use case. Not often used

A few guidelines for writing use cases

- Remember the purpose!
  - Don't write use cases "just because we have to"
- Spend most of your writing what really matters
  - usually the description
- Be as clear as possible
  - don't use vague words such as "information", "data" "and more", "etc." - spec everything as precisely as possible!
- Don't be afraid to skip rows that aren't important for a particular use case
  - reduces clutter, makes it easier for readers to read what really matters

Similar concepts

- There are at least two methods that can be used in a similar way as use cases:
  - User stories - part of the Agile methodology
  - Scenarios
- Both are shorter and less formal
- We saw these last time we met

Differences

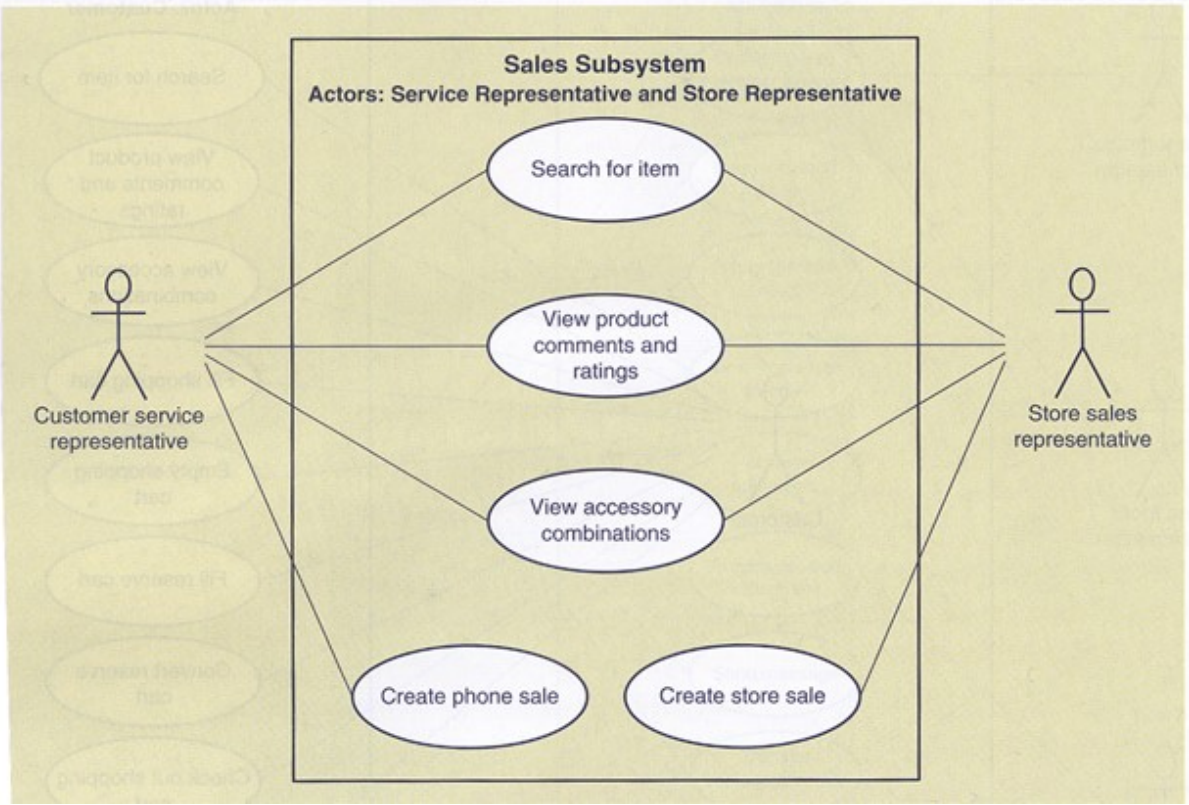
- User stories:
  - Provide a small-scale and easy-to-use presentation of information. Are generally formulated in the everyday language of the user and contain little detail, thus remaining open to interpretation. They should help the reader understand what the software should accomplish.
  - Must be accompanied by Acceptance Testing procedures (acceptance criteria) for clarification of behavior where stories appear ambiguous

- Use Cases :
  - Describe a process and its steps in detail, and may be worded in terms of a formal model. A use case is intended to provide sufficient detail for it to be understood on its own. A use case has been described as “a generalized description of a set of interactions between the system and one or more actors, where an actor is either a user or another system”.
  - May be delivered in a stand-alone document.

Source: http://en.wikipedia.org/wiki/User_story

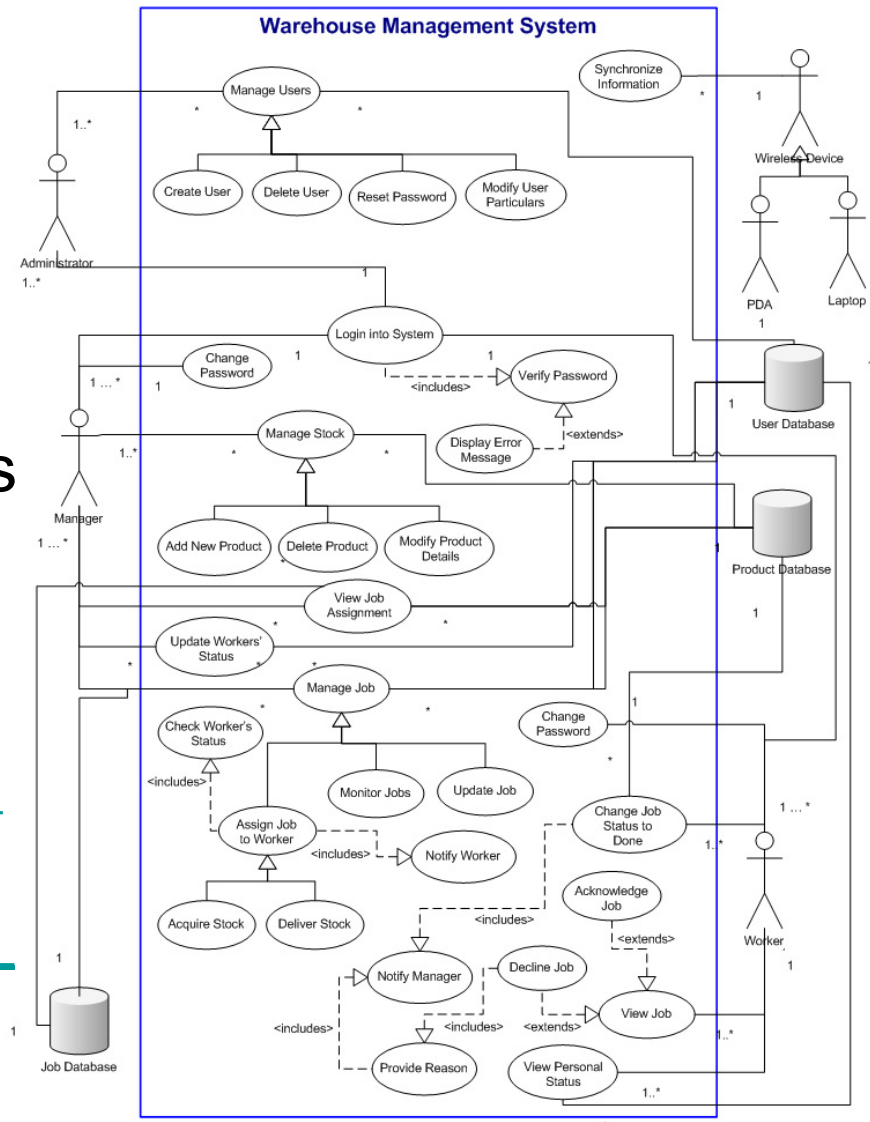
Use Case Diagrams

3-15 *Use cases involving the customer service representative and store sales representative for the Sales subsystem*



Use case diagrams

- Use case diagrams can be useful to get an overview of all use cases and users (actors)
- Use case diagrams should not be too complex! example ->
  - A complex diagram should be broken down into smaller diagrams
- Software available:
  - **staruml**.sourceforge.net/
  - http://www.visual-paradigm.com/solution/freeumltool/
  - http://en.wikipedia.org/wiki/List_of_UML_tools



Source

Actors

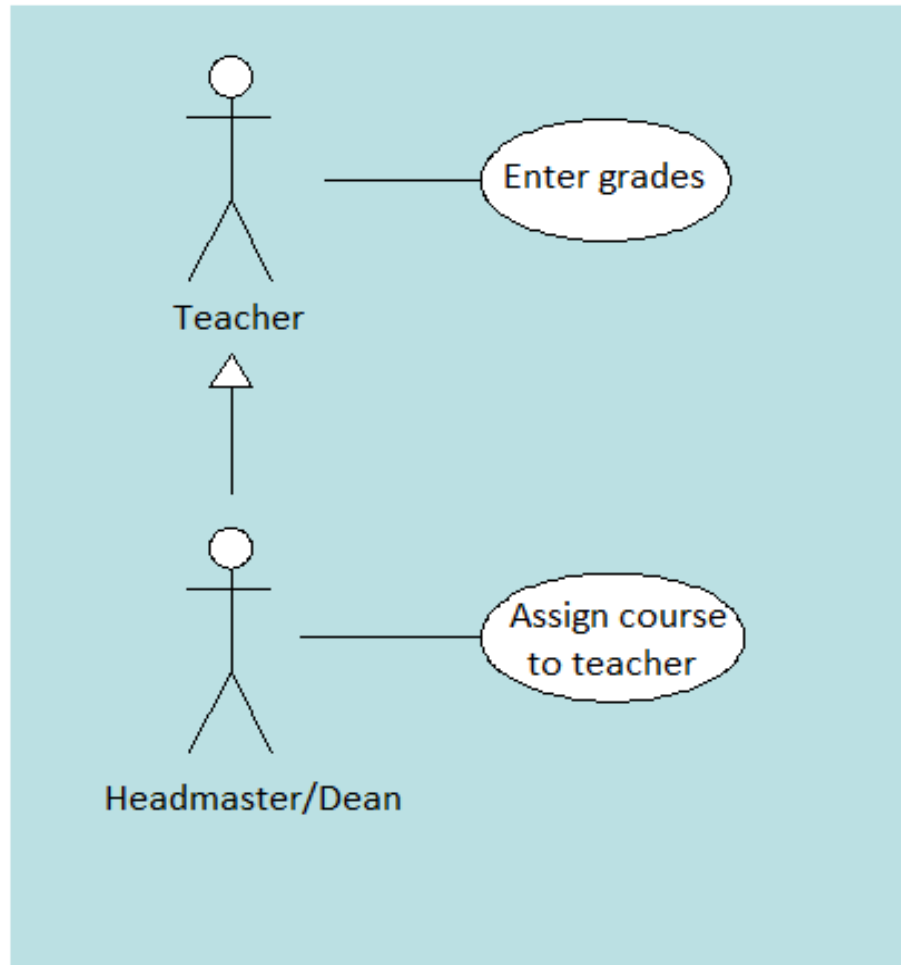
- A user of the system
- Can be both human and another system
- Can be active (initiates operations) or inactive (receives information or otherwise is a part of the system without asking for it)
  - example: account owner might get a SMS notification when someone makes a deposit to his account
- A given user could be a part of many user groups
  - in a school system: the headmaster is maybe also a teacher

Relations (ísl = vensl)

- We can define relations:
  - between actors and use cases
  - between actors
  - between use cases
- Relations can be of various types:
  - uses/takes part in
  - generalization (ísl.: erfðir/alhæfing)
  - <<include>>
  - <<extends>>

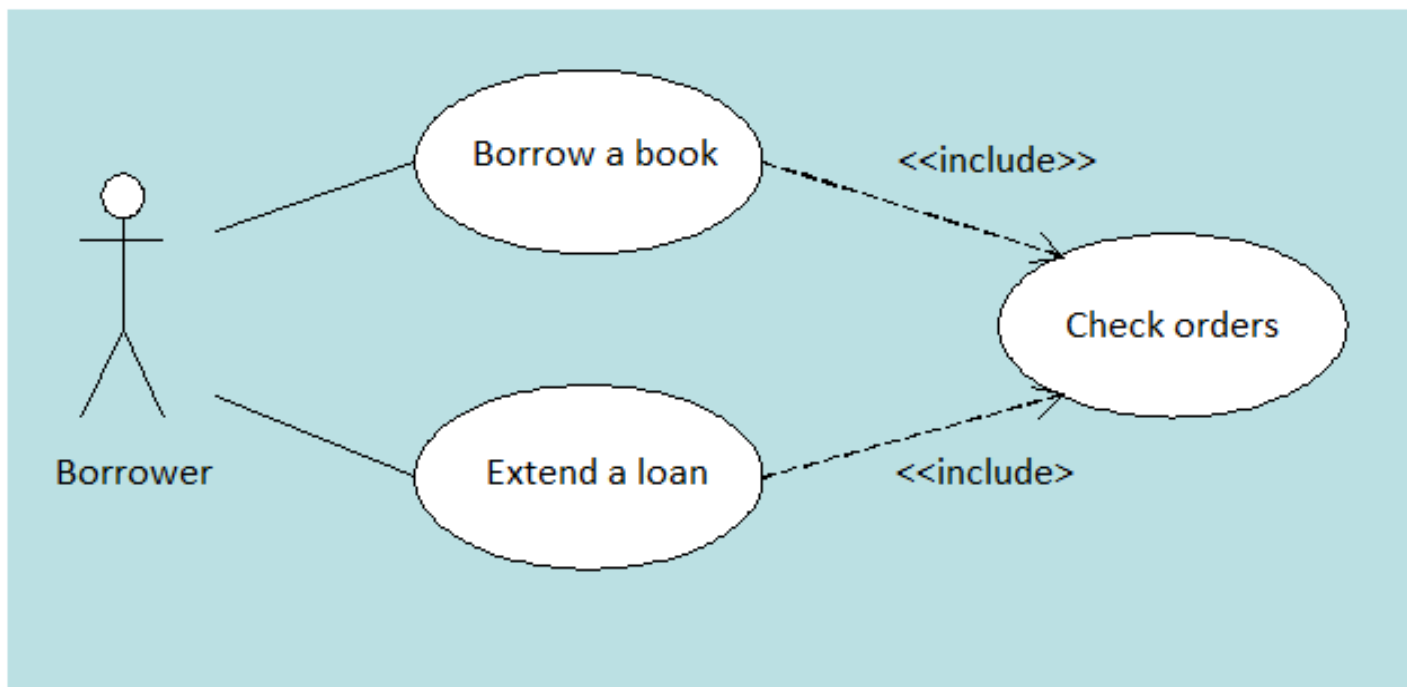
Generalisation

- Describes the relation between actors, or between use cases
- Similar to inheritance in OOP ("is-a")
- Is not used much, tends to complicate the diagrams
- Example: a dean can do everything a teacher can do, but not vice versa



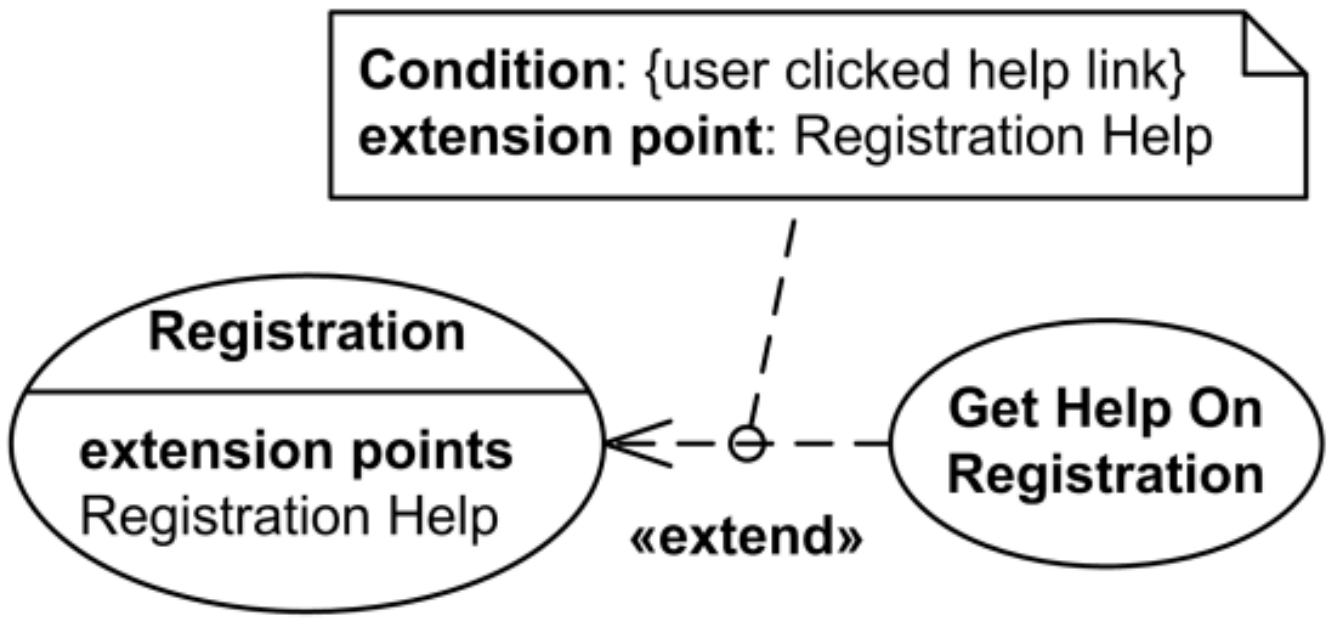
<<include>>

- Used to describe when a use case uses another use case
- Mostly used when a particular behaviour/functionality occurs in more than one use case, is then defined in a single use case, and <<include>>d into the others
- Example:



<<extend>>

- When a use case *may* refer to another use case (such as in an alternative flow), we may describe that with a <<extend>> relation
- Optionally, we may define an "extension point", which describes what caused the extension



Source

A bit more on use case diagrams

- Boundary – what is performed by the system itself
- Many ways to set up the diagrams:
  - Depends on the viewpoint you want to show

FIGURE 3-14
All use cases involving the customer actor for the Sales subsystem

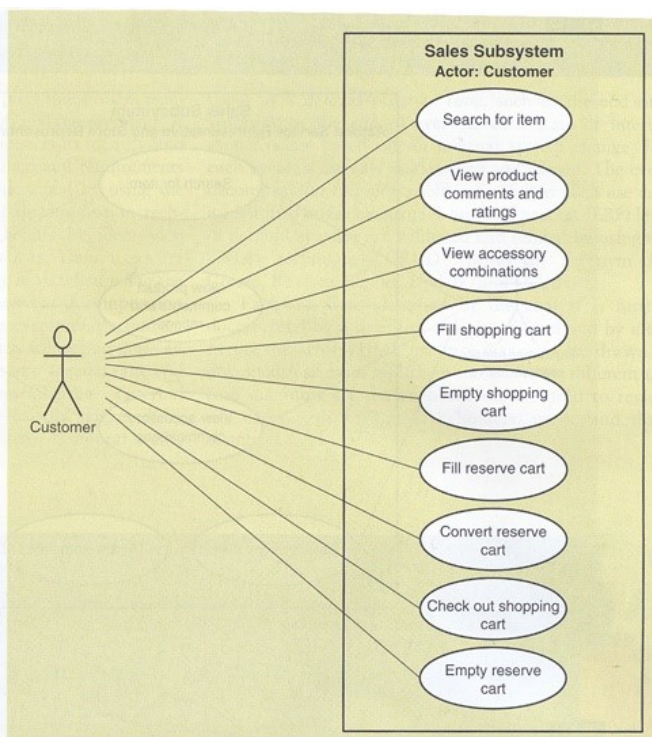
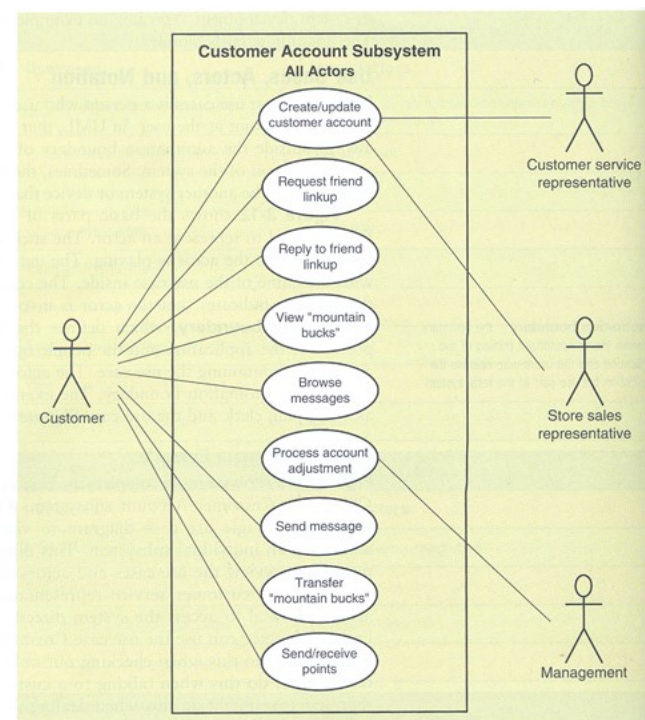
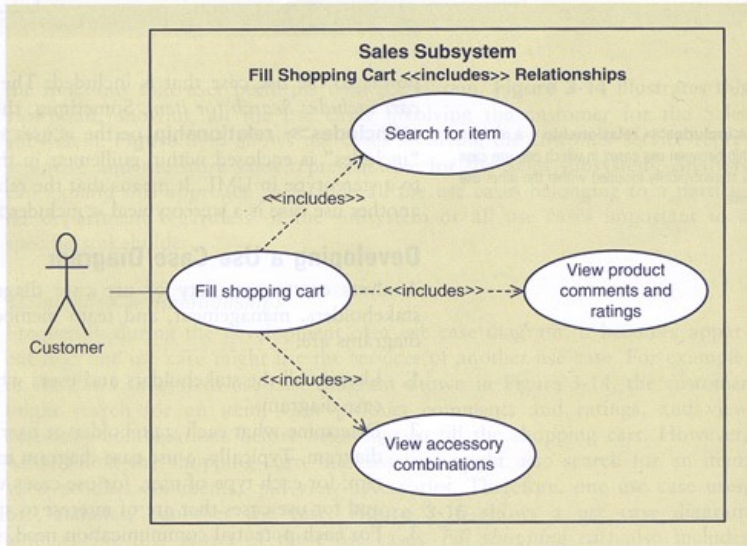


FIGURE 3-13
A use case diagram of the Customer Account subsystem for RMO, showing all actors



More ways

FIGURE 3-16
A use case diagram of the Fill shopping cart *≪includes≫ relationships*



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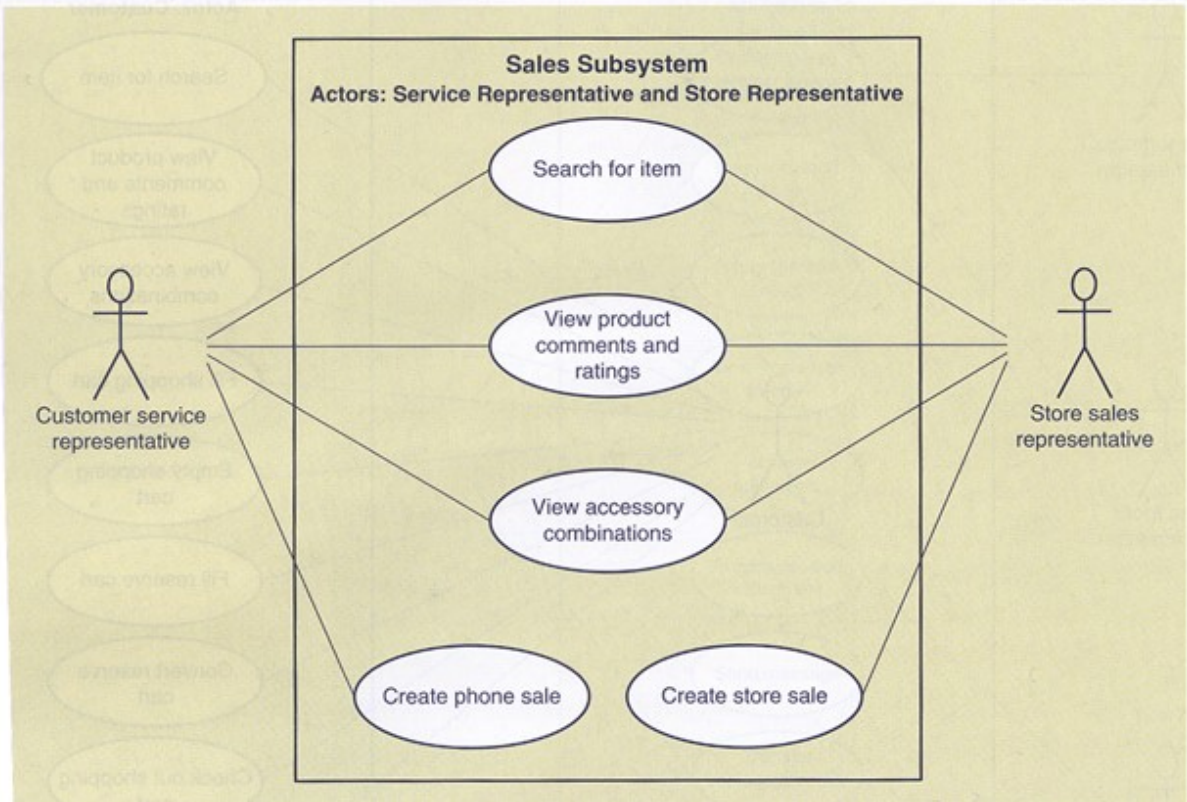

Interviews

Information gathering methods

- The main methods are:
  - Review existing reports, forms, web sites, ….
  - Interviews with users
  - Evaluation of Prototypes
  - Observation
  - Surveys using Questionnaires
  - Conduct JAD sessions
  - Research vendor solutions

Interviewing Users – Viðtöl við notendur

- When you interview, you talk to a person and ask questions
  - It easy and friendly
- Needs good planning
  - Whom do we want to interview?
  - What questions do we want?
  - How long is the interview?
- Two types of interviews
  1. Structured interviews
     - Questions decided in advance
     - No space for discussion
  2. Semi structured interviews
     - Has decided goals
     - The interviewer goes deeper into some issues in the interview

Preparing an interview

- Establish the objective
  - What do you want to accomplish with this interview?
- Determine which participants should be involved
  - Usually two team members
  - One asking questions, another taking notes
  - How many users?
    - If the focus in narrow – a small number of users – ca. 3
    - Generating or evaluating new ideas – larger group
  - Depends on how many user groups are involved

Prepare Questions

- Write list of specific questions
  - Questions should relate to the goal of the interview
  - Open ended questions
    - How do you do this function?
  - Closed-ended questions
    - How many forms a day do you process?
- Make the final interview arrangements
  - Communicate those to all participants
  - Specific time and place
  - Let the participants know the goal of the interview
  - Maybe send them the questions or introduction material

During the interview

- Dress appropriately
  - At least as well as the best-dressed user
- Arrive on time
  - Better to be a bit too early than too late
- Limit the time of the interview
  - I would say max1 hour – in the book max1,5 hours
- Look at exception and error conditions (e.g. alternative flows)
  - Look for opportunities to ask “what if” questions
    - What if it doesn’t arrive?
    - What if the signature is missing?
    - What if the balance is incorrect?

During the interview – cont.

- Probe for details
  - To ensure a complete understanding of all procedures and rules
- Take careful notes
  - Handwritten notes are a good idea
  - Good to tape record too
- Identify and document any unanswered questions
  - Establishes a basis for the next interview session

Follow Up the Interview

- Absorb, understand and document the information
- Construct models of the business processes
- Write descriptions of non functional requirements

- Should be completed as soon as possible
  - Preferably within 48 hours
- Distribute to the interview participants for validation

- Track outstanding issues
- Make a list of new questions that need further elaboration

Flexible interviews

- Are very good for requirements analysis and design
- Good to get users opinion on particular ideas
- More informal that structured interview
- But we need to have some structure for the discussion
  - Either written down or ideas
- There has to be some trust between the people involved
  - Some people find it hard to be negative
  - Try to make a friendly atmosphere
- Flexible interviews are harder for the interviewer
  - Training gives you good support
  - Good to pilot test the interview with one person
  - You should always record the interview (sound or video)

We should interview 3 -4 in each group

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Námsmenn erlendis **Mikilvægi:** Mikilvægasti hópurinn ásamt námsmönnum hérlendis	***Aldur:*** yfir tvítugt ***Kyn:*** bæði kynin ***Menntun:*** framhaldsskólapróf ***Hæfni/vanhæfni:*** ekkert sérstakt ***Tölvufærni:*** mjög góð yfirleitt	***Notkun:*** Kerfið mest notað á haustin. Lítið notað þess á milli nema út af sérstökum fyrirspurnum. ***Þjálfun:*** Engin þjálfun á kerfinu eða reynsla frá vinnu. ***Viðhorf:*** Notendur eru almennt jákvæðir fyrir kerfinu þar sem það veitir þeim þjónustu sem þeir þurfa á að halda. ***Fjöldi notenda:*** ca. 2.000	***Tæknilegt umhverfi:*** Mjög mismunandi hvernig umhverfið er þar sem notendur koma úr öllum áttum, nettenging og ytri gæti verið mjög erfiðar aðstæður sums staðar. Gætu verið með umboðsmann. ***Raunverulegt umhverfi:*** Ættu að vera oftast í skólaumhverfi eða heima, en gætu verið hvar sem er. ***Annað umhverfi:*** ekkert sérstakt	-Sækja um lán eða styrki og nálgast upplýsingar
Námsmenn, sem lokið hafa námi **Mikilvægi:** Næst mikilvægastur á eftir námsmönnum hérlendis og erlendis	***Aldur:*** 20 - 99 ***Kyn:*** bæði kynin ***Menntun:*** háskólapróf ***Hæfni/vanhæfni:*** ekkert sérstakt ***Tölvufærni:*** misjöfn, fer töluvert eftir aldri	***Notkun:*** Kerfið notað tvisvar á ári til að greiða afborganir. ***Þjálfun:*** Engin þjálfun á kerfinu eða reynsla frá vinnu. ***Viðhorf:*** Notendur eru almennt jákvæðir fyrir kerfinu þar sem það veitir þeim þjónustu sem þeir þurfa á að halda. ***Fjöldi notenda:*** ca. 30.000	***Tæknilegt umhverfi:*** Mjög mismunandi hvernig umhverfið er þar sem notendur koma úr öllum áttum, nettenging og ytri aðstæður mismunandi. ***Raunverulegt umhverfi:*** Ættu að vera oftast heima eða í vinnu. ***Annað umhverfi:*** ekkert sérstakt	-Skoða upplýsingar um lán - Greiða afborganir

This should be checked in an interview

- Background
  - Age, gender, education, abilities/disabilities, general computer knowledge
- The use of the system
  - How much is it used (how often and how much each time), the skills of using this system, the attitude, the number of users
- The context of use
  - The real environment, the technical environment
- The main users' tasks
  - What do users want to do
  - How do they do this today
- The importance of the user group
  - Estimated from all these things

In what environment?

- Very good to interview in the environment where the system will be used
- If used in different environments
  - Office environment
  - At home
  - In school
  - Different geographical areas

	Viðskiptavinur	Umsjónarmaður	Leiðsögumaður	
Skrifstofuumhverfi	2	2		4
Heima	2	1	2	5
Úti á landi			2	2
	4	3	4	

- Take 2 – 3 in each environment
  - 2 users in each environment
    - If the environment is homogeneous take different groups

Themes in the interview

- What are the business operations and processes?
  - Questions to users: What do you do?
  - Think about: What are the real tasks?
- How should those operations be performed?
  - Questions to users: How do you do it? What steps do you follow?
- What information is needed to perform those operations?
  - Questions to users: What information do you use? What forms or reports do you use?

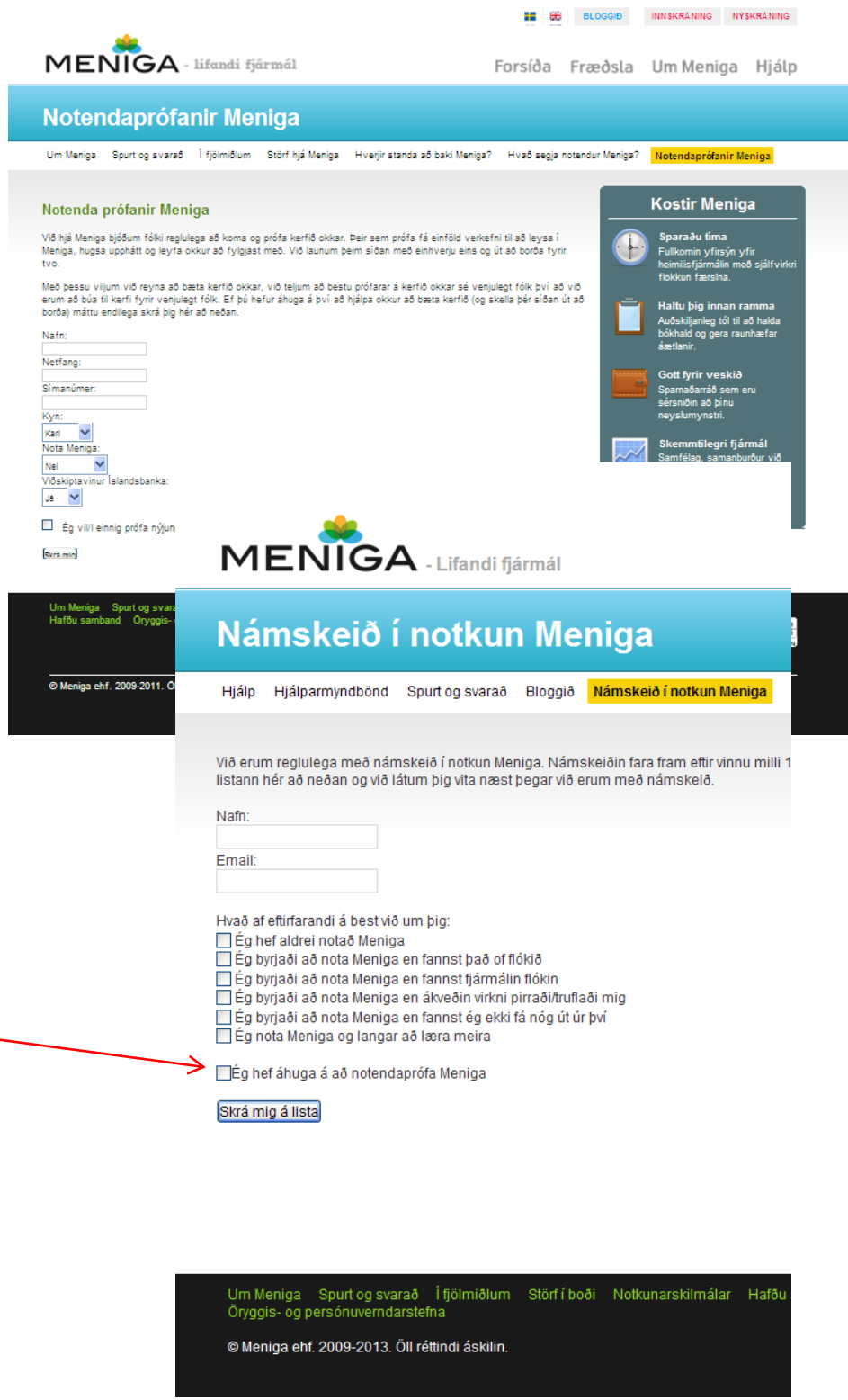
Take into consideration for an interview

- The travelling time
- The attitude of the user
- Trust and security
- The users have to use 2 hours for this

  You 2,5 hours
- Explain how the interview is planned
- Plan for analysis of the data (1:10)
- Plan for that some interviewees will drop out

To find interviewees

- How can we find users?
  - From our customers
  - From our marketing department
  - From our user support
  - Get managers agreement
  - Get connections from users representatives
  - Get a list from the customer
  - Advertise



Next Lecture

- Other information gathering techniques
- Evaluating web sites