The main concepts for object approaches and UML

Part 2 :
The dynamical models

CIRAD

The dynamical models

- To understand and describe the behaviours of the objects and their interactions

- Three types of representations
  - State chart diagrams (*internal dynamics)*
  - Activity diagrams (*intra and inter object dynamics)*
  - Interaction diagrams *(interaction dynamics)*
    - *Sequence diagrams*
    - *Collaboration diagrams*

Content

- State chart diagrams
- Activity diagrams
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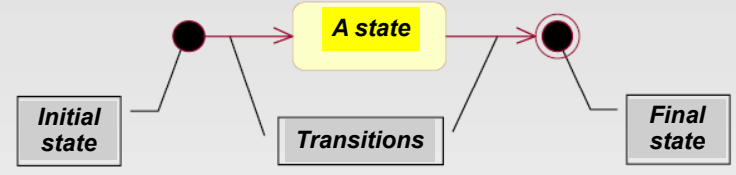
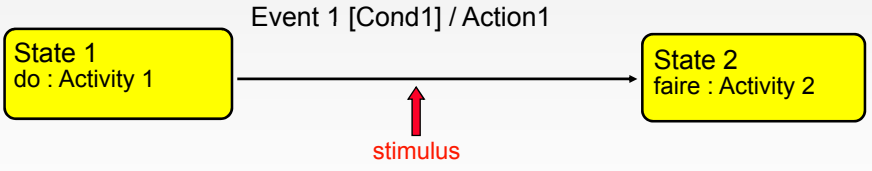
State chart diagrams

- Objective :
  - To describe the life cycle of an object
- Elements :
  - State of an object
    - Values of its attributes and links
    - An object change its state over time
  - Transition
    - Events (action of an object onto another)
    - Guard (conditions)
    - Actions

State chart diagrams

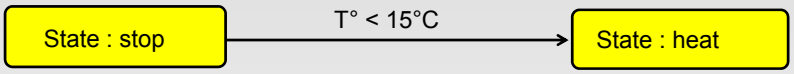


- A transition is due to an event

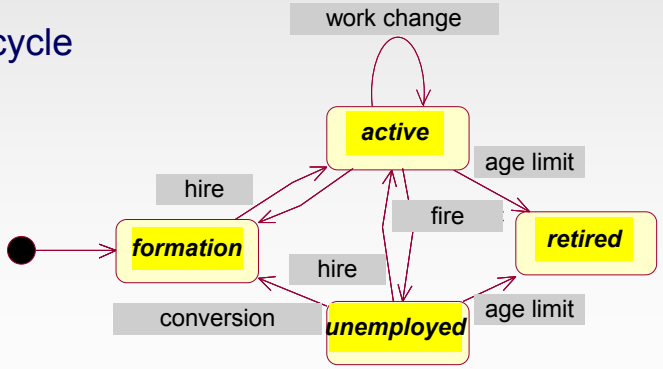


Examples

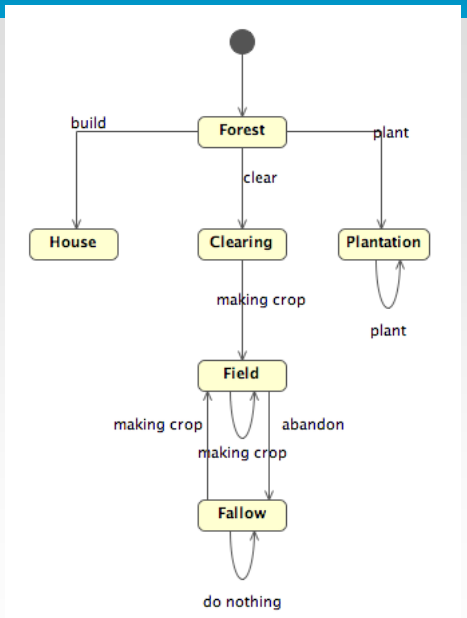
- Heater



- Life cycle

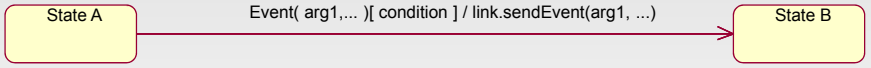


Example: plot

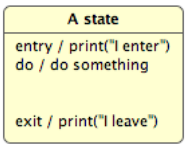


The actions

- For the transitions

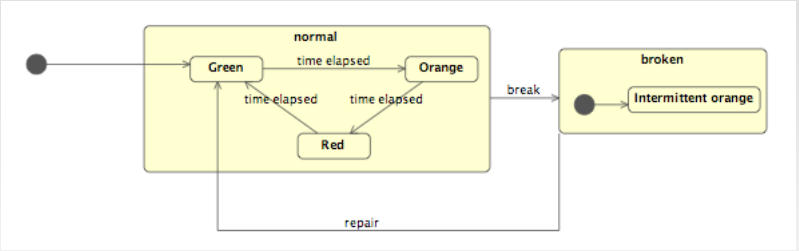


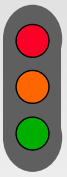
- For the states



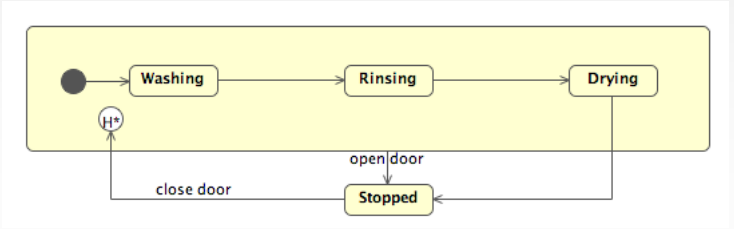
Super states

- États d'un feu tricolore



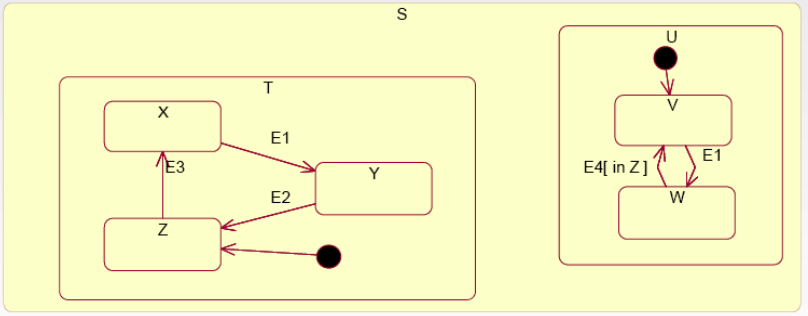


- Etats d'une machine à laver



Parallelism

- T and U in parallel
- Event E1 dispatched to T and U



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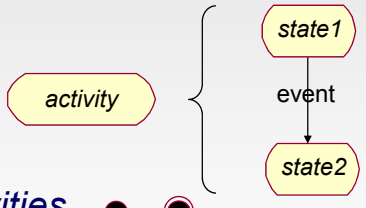
Activity diagrams

- Objective:
  - To describe the activities and their ordering
- Can be used for
  - the internal behaviour of an object
  - the concrete functioning of a behaviour
  - the control ordering between activities spread among a set of objects

Activity diagrams the elements

- Activities 

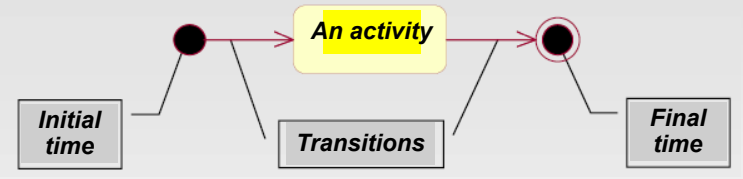
- Order between activities
  - En fait ces diagrammes peuvent être vus comme une forme simplifiée des diagrammes d'états - transitions



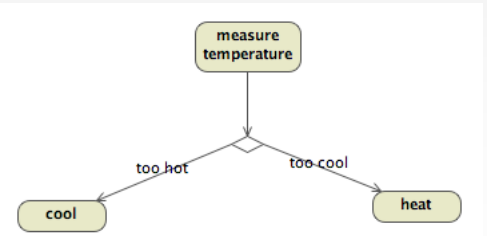
- *Initial and final pseudo activities* 
- Decision and synchronisation points
- Object flows (petri nets, etc.)

Notations

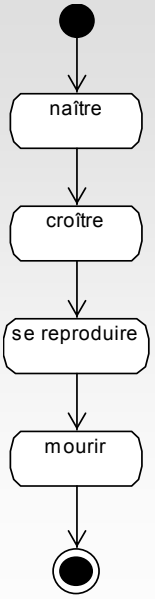
- An activity is an action



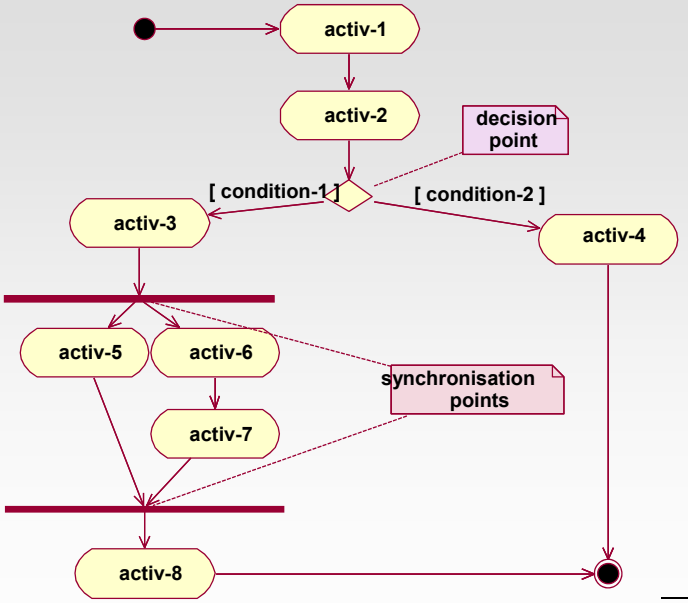
- A link is a sequencing of activities



Activity diagram: life cycle



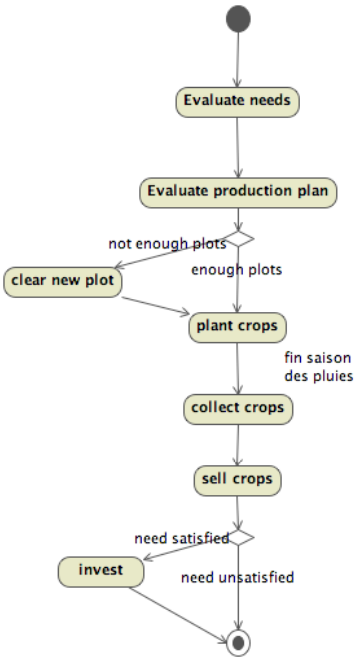
Other notations



The swimlanes

QuickTime™ et un
décompresseur TIFF (LZW)
sont requis pour visionner cette image.

Example: farmer activities



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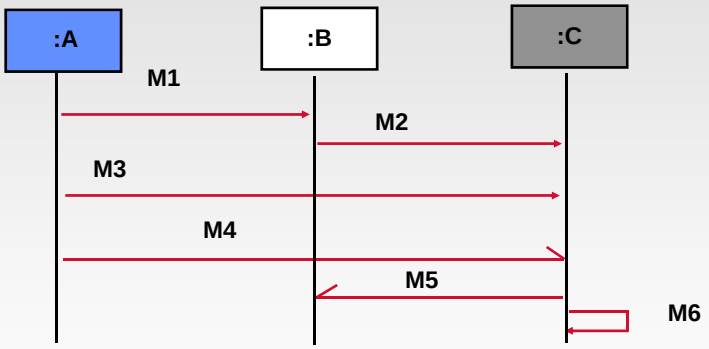
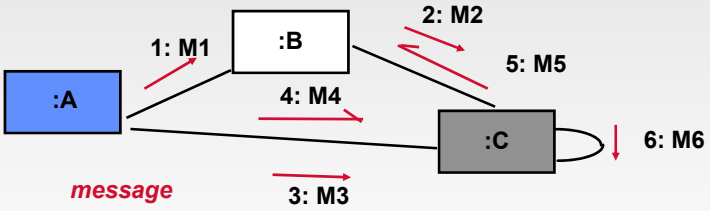
Sequence diagrams

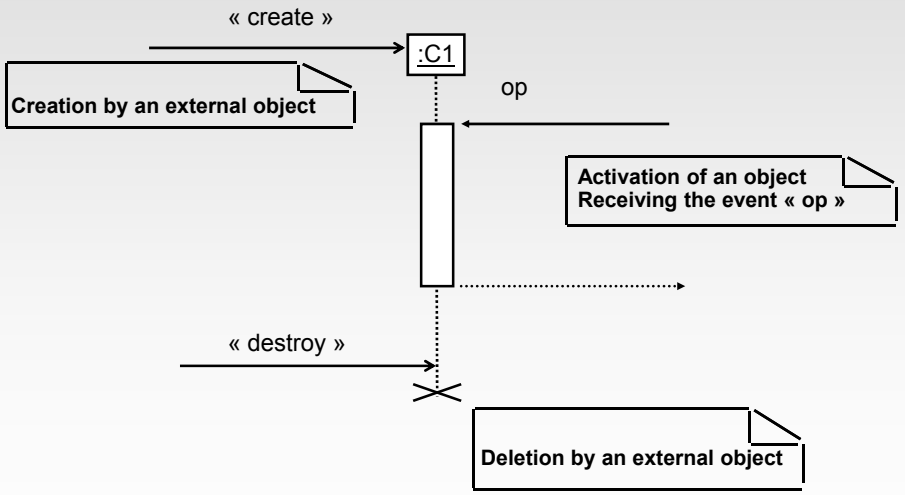


Collaboration diagrams



Sequence diagrams

The life line



Sequence diagrams

- Interaction types
  - synchronous:
  - asynchronous:
  - reflexive:
  - constructive: :Ca
  - destructive:
  - alternative: [X]mess. / [non X]mess.
  - loops: *[X]mess.

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UML: Conclusion

- A tool for dialog :
  - A language to represent models
  - Graphical and simple
  - Formal and nomalized (OMG)
- An open tool
  - Independent of the implementation
  - It is a language, not a process
  - Adaptable (stereotypes)

UML books (1)

- Booch **Grady,** Rumbaugh **James, and** Jacobson **Ivar,** The Unified Modeling Language User Guide, 0-201-57168-4, *Addison Wesley,* Fall 1998,
- Jacobson **Ivar,** Booch **Grady and** Rumbaugh **James,** The Unified Software Development Process, 0-201-57169-2, *Addison Wesley,* Fall 1998,
- Rumbaugh **James,** Jacobson **Ivar, and** Booch **Grady,** The Unified Modeling Language Reference Manual, 0-201-30998-X, *Addison Wesley,* Fall 1998

UML books (2)

- Conallen **Jim, Concevoir des applications Web avec UML, *Eyrolles* , 2000.**
- Douglass **Bruce Powell, Doing Hard Time : Developping Real-Time Systems with UML, *Addison Wesley,* 1999.**
- Eriksson , **UML Toolkit, *Wiley,* 1997**
- Fowler **Martin, UML Distilled, Applying the Standard Object Modeling Language *Addison Wesley,* 1997**
- Kettany **N et al**, **De Merise à UML,*Eyrolles* , 1998**
- Larman **Craig**, **Applying UML and Patterns,*Prentice Hall,* 1998**
- Lee **R**, Tepfenhart **W, UML et C++, *Simon et Schuste* , 1998**
- Lopez **N**, **Intégrer UML dans vos projets, *Eyrolles,* 1997**
- Muller **Pierre-Alain**, **Modélisation objet avec UML, *Eyrolles*, 1997**
- Roques **Pascal**, Vallée **Franck**, **UML en action, *Eyrolles*, 2000.**
- Roques **Pascal**, **UML par la pratique, *Eyrolles*, 2001.**
- Schmuller **Joseph**, **Teach Yourself UML in 24 Hours, *Sams Publishing*, 1999**
- Texel **Williams**, **Uses cases combined with Booch/OMT/UML, *Prentice Hall,* 1998**