Escuela Técnica Superior de Ingeniería Informática
Departamento de Lenguajes y Sistemas Informáticos

Behavior Modeling
State Diagrams

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Behavior Modeling: State Diagrams

- Learning objectives
  - Understand the basics of behavior modeling using UML **state diagrams** (statecharts).
  - Be able to **develop** state diagrams from a requirements specification.

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Behavior Modeling: State Diagrams

- Models of a software system
  - **Static model** (conceptual model)
    - Describes the structure and constraints of the information representing the system **state** .
  - **Behavior model**
    - Describes how the system **interacts** with actors and how its state evolves as a result of the interactions.

Model = { Static model = { Structure + Constraints } + Behavior model = { External interactions + Internal evolution }

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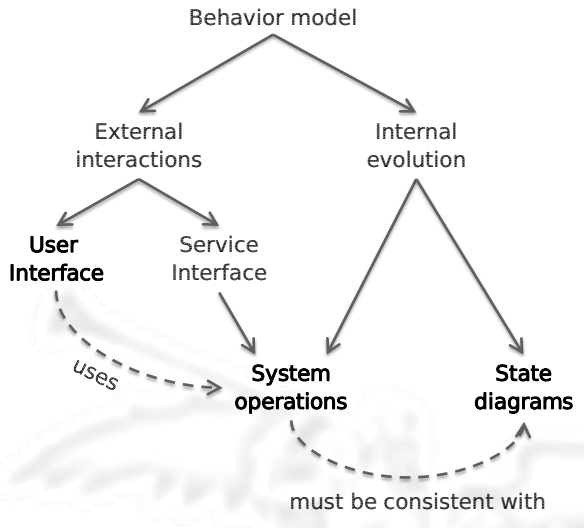
Behavior Modeling: State Diagrams

- Behavior model of a software system



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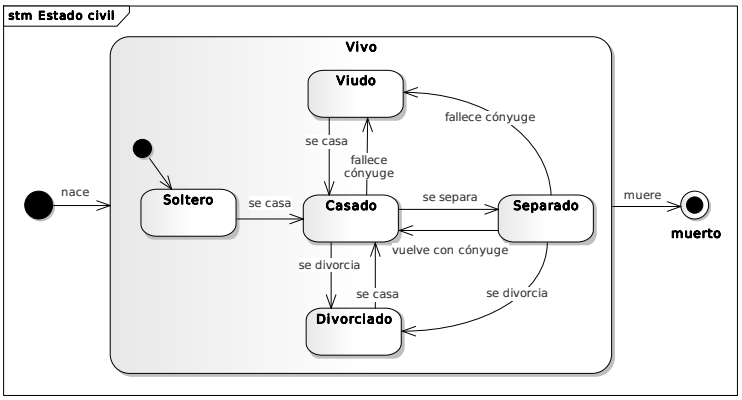
1. Behavior model of a system
2. UML state diagrams
3. State diagrams and OCL
4. Alternative representations

Behavior Modeling: State Diagrams

- State diagrams in UML (*statecharts*)
  - If the objects of a class have a number of clearly identified **states**, a state diagram can be associated to that class.



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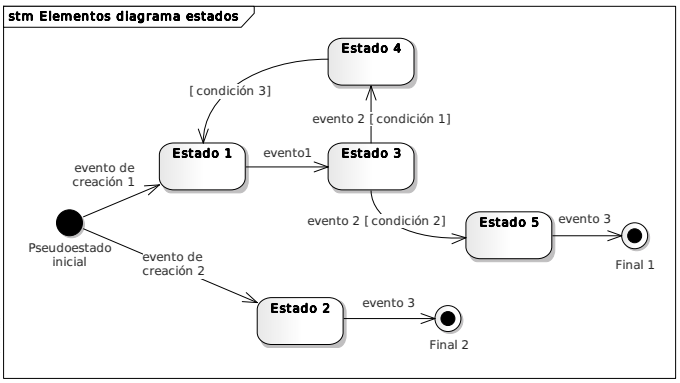
Behavior Modeling: State Diagrams

- Elements of state diagrams
  - **States**: represent **relevant** situations of the objects of a class in the problem domain.
  - They are usually named as **past participles**.



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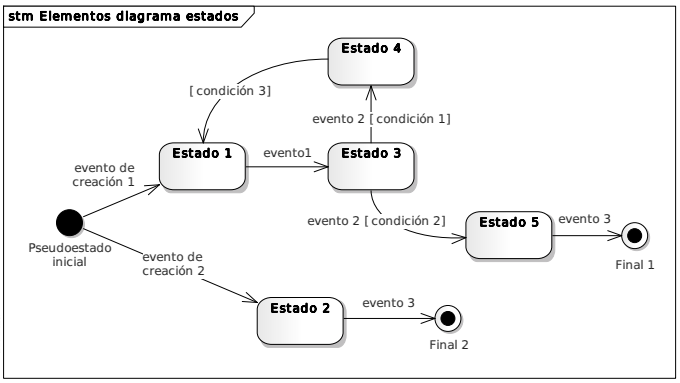
Behavior Modeling: State Diagrams

- Elements of state diagrams
  - **Transitions**: indicate from which state to which state an object can pass when some **event** is triggered and/or some **condition** (guard) is met.



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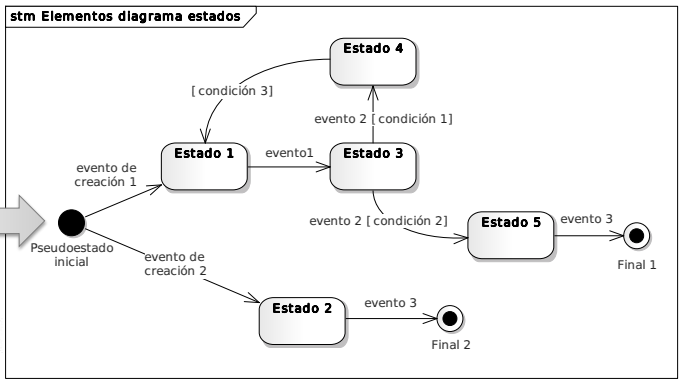
Behavior Modeling: State Diagrams

- Special states: **initial pseudostate**
  - It is the only state in which object **creation events** are accepted. There can only be **one** in a diagram.
  - Not an actual state (the object does not exist yet).



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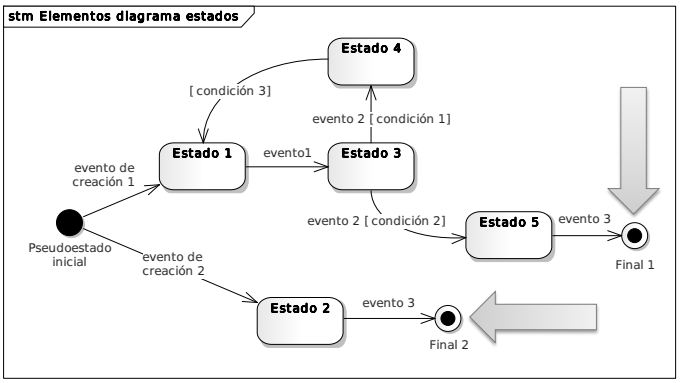
Behavior Modeling: State Diagrams

- Special states: **final states**
  - They do not have output transitions, i.e. they are states in which the object **cannot evolve anymore**.
  - There can be **several** of them in a state diagram.



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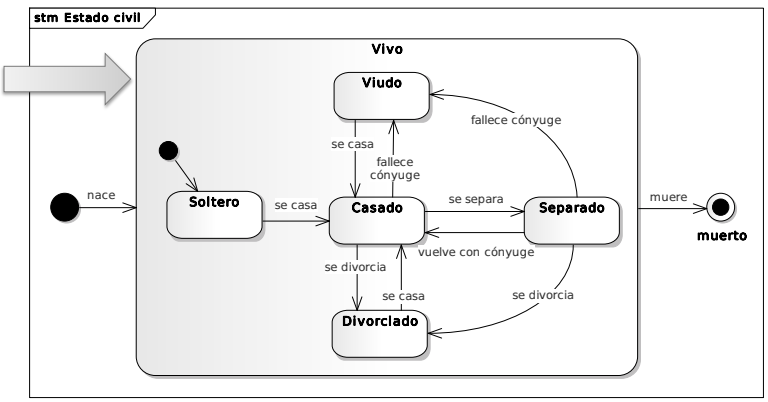
Behavior Modeling: State Diagrams

- Special states: **composite states**
  - They are states containing other internal state diagram.
  - They can be represented collapsed or expanded.



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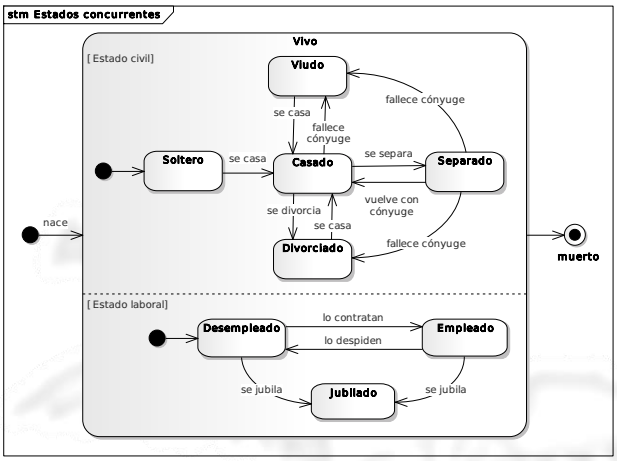
Behavior Modeling: State Diagrams

- Special states: **concurrent states**
  - They are used when an object can be in **several states at the same time**.



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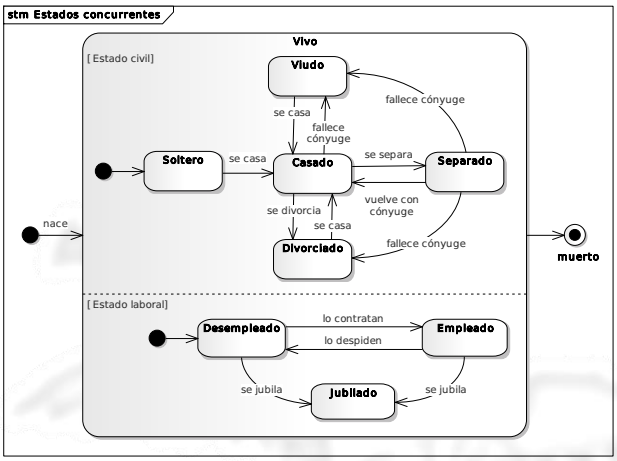
Behavior Modeling: State Diagrams

- Special states: **concurrent states**
  - They are equivalent to a single state diagram with all possible state combinations.



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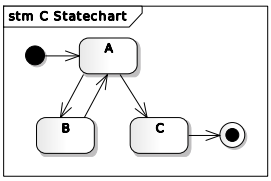
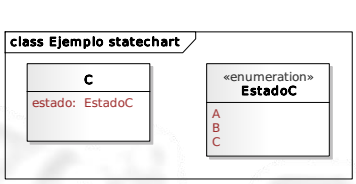
Behavior Modeling: State Diagrams

- Alternative representation: enumerations
  - The object state can also be represented by an **enumerated attribute**.





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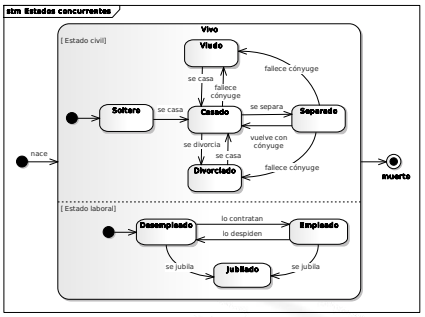
Behavior Modeling: State Diagrams

- Alternative representation: enumerations
  - Each **concurrent region** and each **composite state** need its own attribute and enumerated type.



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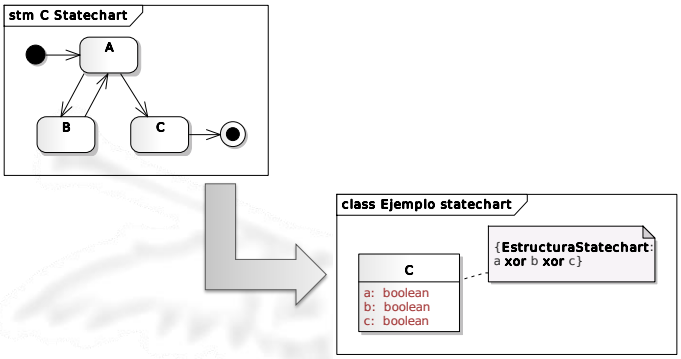
Behavior Modeling: State Diagrams

- Alternative representation: Booleans
  - Each state can be represented by a **Boolean attribute**.
  - The statechart structure is represented by **invariants**.



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- Comments, suggestions, ...

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