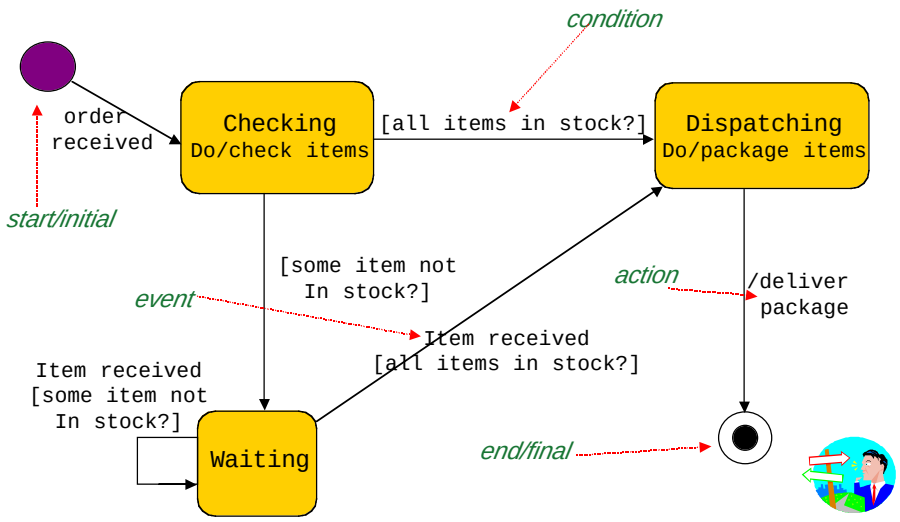
# IV. State Diagrams

**State Diagrams**
**Events and States**
**Superstates**

# State Diagrams (Statecharts)

- *State diagrams model processes (business processes, machine processes, or anything in-between.)*
- *States*
- *Transitions*
- *Events, conditions and actions (all optional)*
  `Event[Condition]/Action`
- *Initial and final states*

# State Diagram for Purchase Order





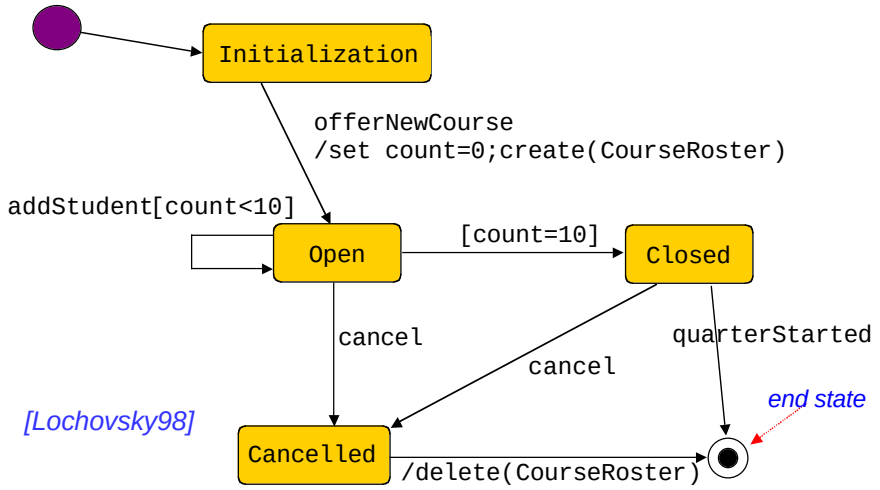



# Events

- An ***event*** is a happening that the system needs to know about.
- In UML, there are four types of events:
  - ✓ ***Change events*** occur when a condition becomes true, e.g., `when(balance < 0);`
  - ✓ ***Signal events*** designate the receipt of an explicit (real-time) signal from outside;
  - ✓ ***Call events*** indicate the receipt of a call for execution from outside;
  - ✓ ***Time events*** mark the passage of a designated period of time from the moment a state was entered/exited,

    e.g., `after(10 seconds)`

# Course Lifetimes




[Lochovsky98]

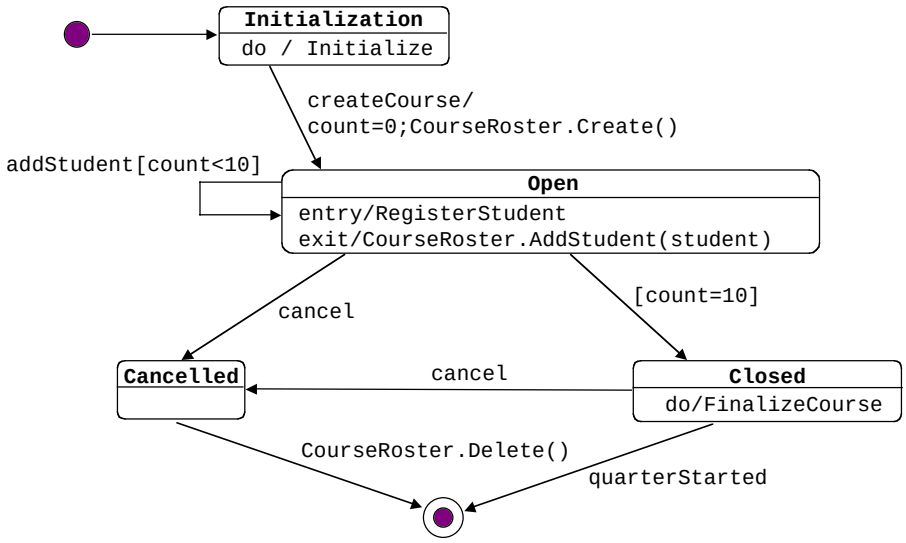




# States

- *A state represents a time period during which*
  - ✓ *A predicate is true, e.g.,* `budget - expenses >0`*,*
  - ✓ *An action is being performed, or*
  - ✓ *Someone waits for an event to happen.*
- *A state can be "on" or "off".*
- *States can have associated activities. Special activity constructs include:*
  - ✓ *do/stateDiagramName(parameterList) -- "calls" another state diagram;*
  - ✓ *entry/action -- carry out the action when entering the activity;*
  - ✓ *exit/action -- carry out the action when exiting;*

# Course Lifetimes, Again



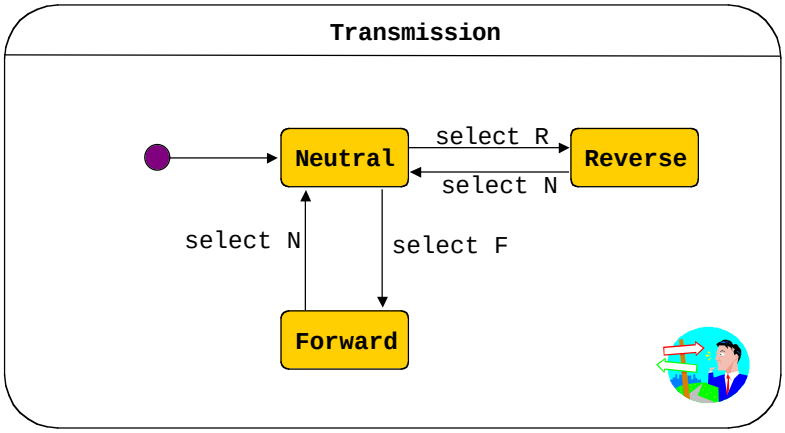





# Superstates

- *A superstate consists of two or more substates.*
- *There are AND and OR superstates.*
- *When an **AND superstate** is "on", all its states are also "on".*
- *When an **OR superstate** is "on", one of its states is "on".*

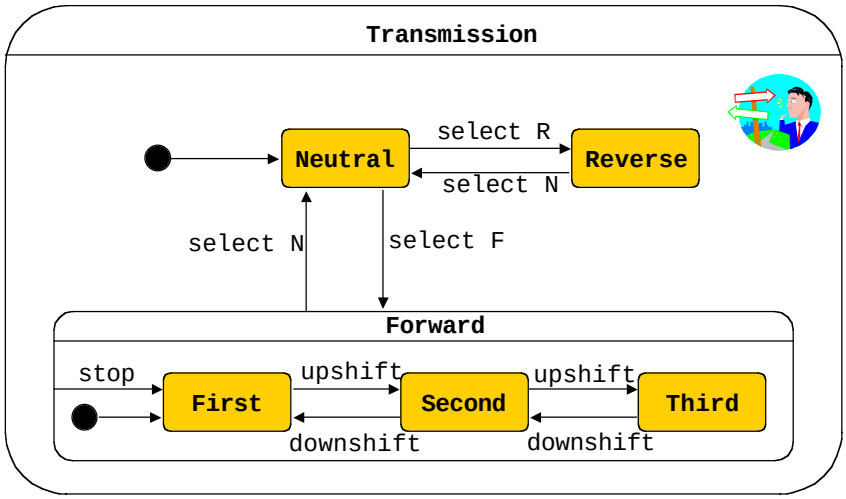
# An OR Superstate



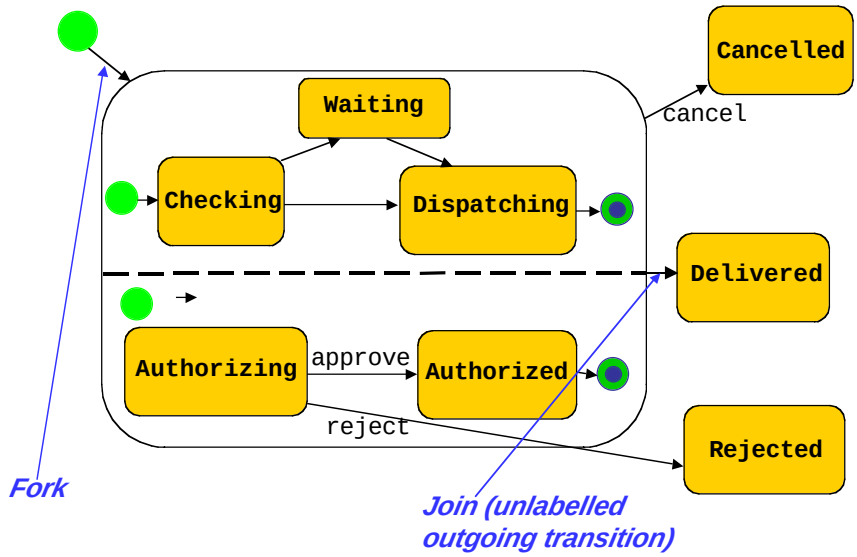





# ...More on Transmission



# An AND Superstate








# Additional Readings

- *[Booch99] Booch, G. et al., The Unified Modeling Language User Guide*, Chapters 19, 20, 21, 24. Addison-Wesley.
- *[Fowler00] Fowler, M., UML Distilled: A Brief Guide to the Standard Object Modelling Language*, Chapters 8, 9. Addison-Wesley.