Please start Visual Paradigm.
Next class: Read Murach chapter 9. Exercises due after class
Dynamic UML models

- While static models (use cases, class diagram, component diagram) are done for the system as a whole, dynamic models are done only for key components
- **State diagram**
  - Specifies behavior of a single object
  - Diagram has states and transitions only
- **Sequence diagram**
  - Shows details of one scenario and messages that flow between objects/organizations in that scenario over time
  - Heavily used in standards
- **Activity diagram**
  - Shows flow of logic, data, messages
  - Diagram has activities, decisions, forks, joins (parallel)
  - Replaces flow charts
- **Communication diagram**
  - Shows flow of messages as a graph
  - Used as variant of sequence diagram
- Others, as needed
An object (account in this example) can be in only one state at any time.
State diagram exercise

• Model the state transitions of a student’s registration in this class:
  – Preregistered
  – Registered
  – Listener
  – Dropped
  – Complete, incomplete (not resolved), etc.

• Remember that an entity can only be in one state at any time. It cannot be in two or more states.
State diagram solution
Activity diagram

• Shows flow of messages, logic, actions
• This is at a much higher level of abstraction than flow charts
  – Flow charts show logic for single method (if statements, loops, etc.)
  – Activity diagrams show flow among objects
Activity diagram example

- **Initial Node**
- **Activity Node**
- **Fork (parallel)**
- **Decision (either-or)**
- **Merge (either-or)**
- **Join (parallel)**
- **Final Node**
Activity diagram exercise

• Draw an activity diagram for getting an apartment. Example activities are:
  – Find roommates
  – Find apartment
  – Sign apartment lease
  – Get electric service
  – Get phone or cable TV service
  – Get gas or oil heat account set up
  – Obtain furniture
  – Move in

• (Use this as a simple model of setting up a warehouse…)

• Use activities, decision nodes, fork/join nodes
Activity diagram solution
Sequence diagram (optional)

- Objects or entities are diagrammed at the top
- Each object’s life is represented by a vertical line from creation to destruction
- Messages or events are diagrammed from the sending object to the receiving object, in the order in which they occur
- Responses may or may not be diagrammed, depending on complexity/obviousness
- These are sometimes called ‘swim lane’ diagrams
  - Swim lanes can be used in activity diagrams as well
Sequence diagram example
UML Summary

• Use UML while writing scenarios and narratives as an initial requirements document
  – Diagram use cases, then refine them into scenarios
  – Focus on completeness of use cases
• Use UML component diagrams to list all system elements
  – Focus on completeness, and use to set system boundaries
• Prepare the initial data model (next lecture)
  – Add operations/methods to the entities, after understanding the data, to create a class diagram
• Use UML state diagrams, sequence diagrams and activity diagrams to specify objects and processes
  – Prepare these selectively for complex or interesting objects
• UML is becoming a ‘universal’ language: staff coming to a project know it, which sharply reduces learning curve
  – Developers and analysts can both understand it readily
  – Consultants/analysts use UML even for analysis-only projects (as well as writing requirements and modeling data)
  – Business process execution language (BPEL) in Web lectures is UML extension to directly create systems