1.264 Lecture 7

Unified Modeling Language (UML) II

Please start Visual Paradigm.
Next class: Read Murach chapter 9. Exercises due <u>after</u> 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**

State diagram example
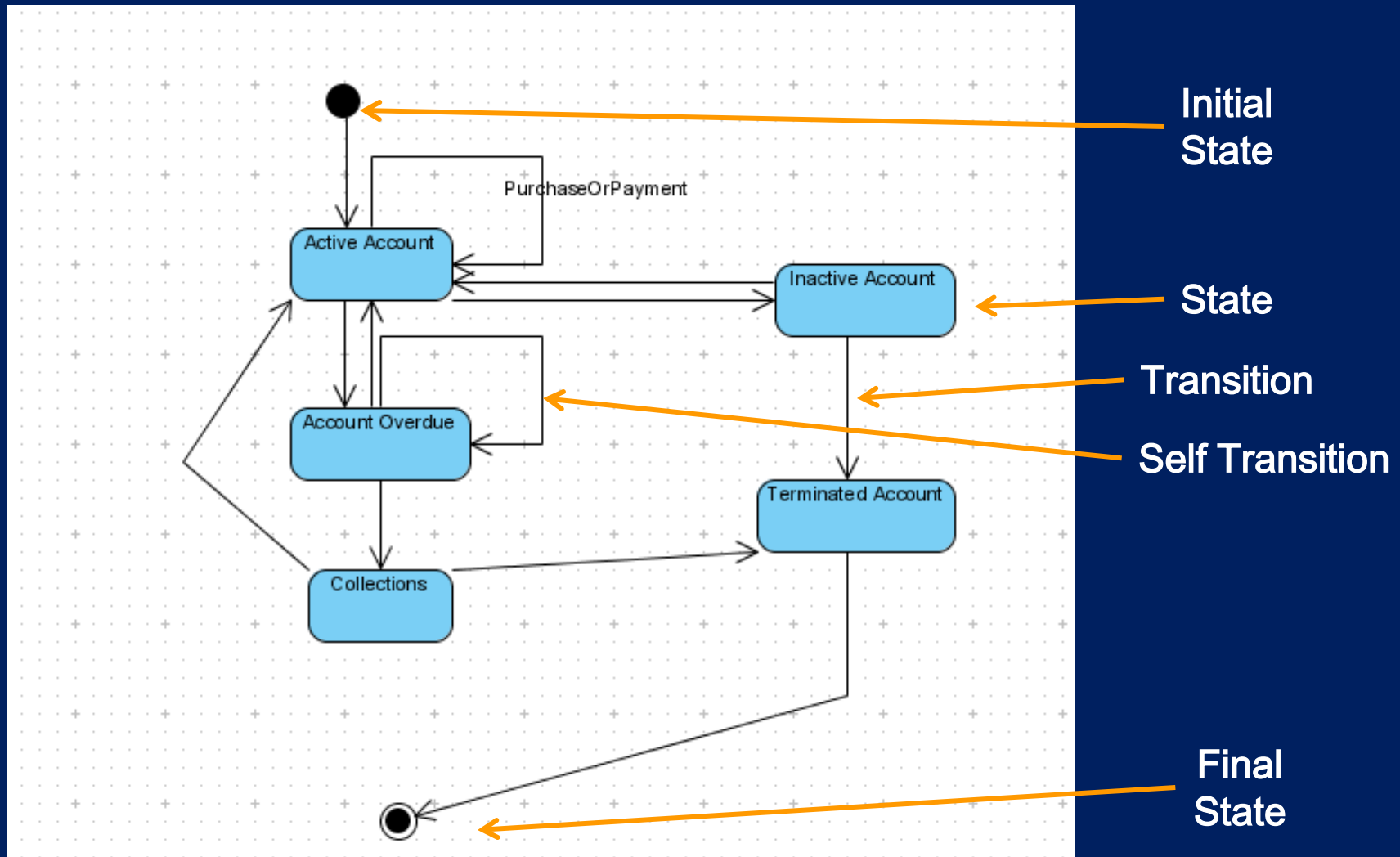
An object (account in this example) can be in only one state at any time

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
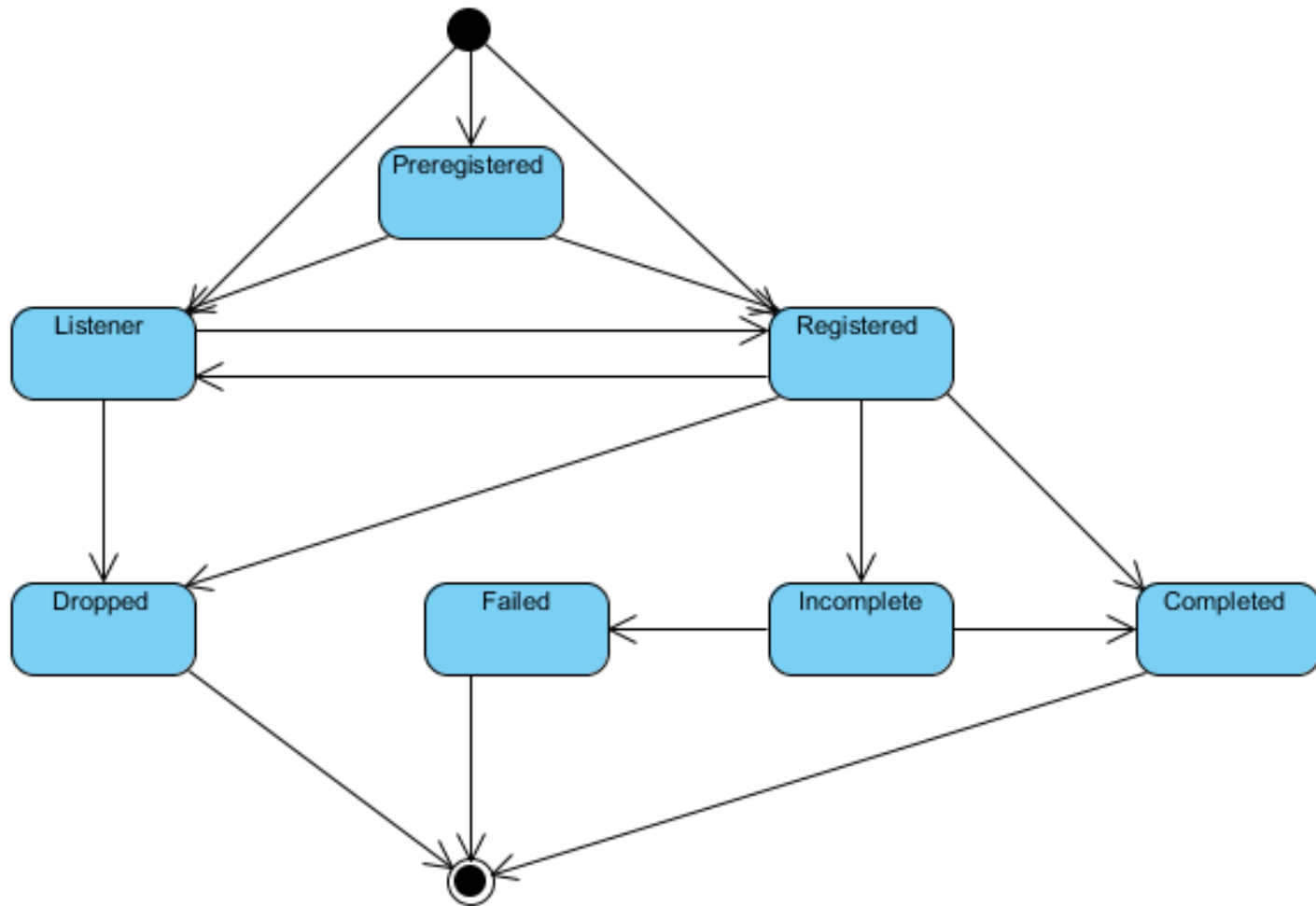
Activity diagram

- **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
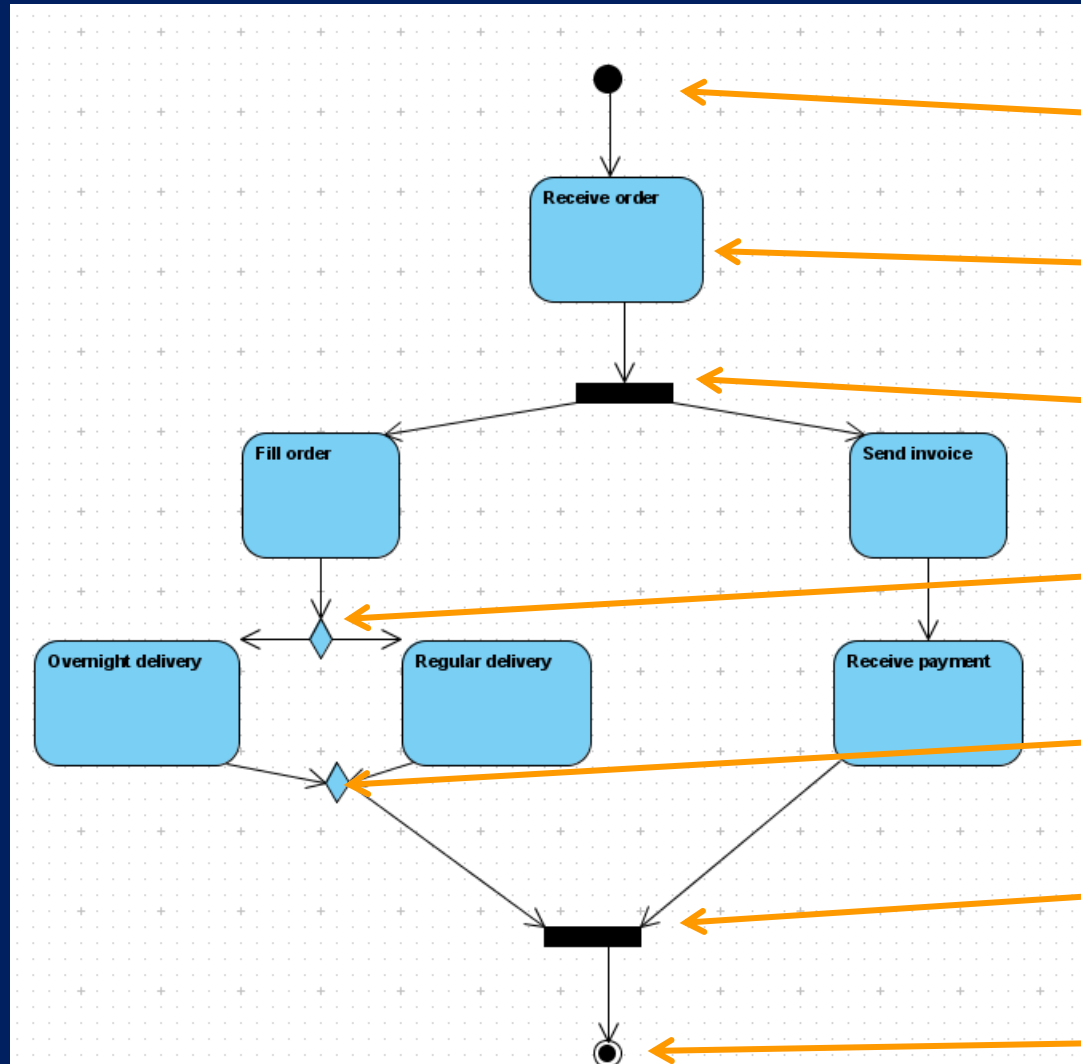
Initial Node

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
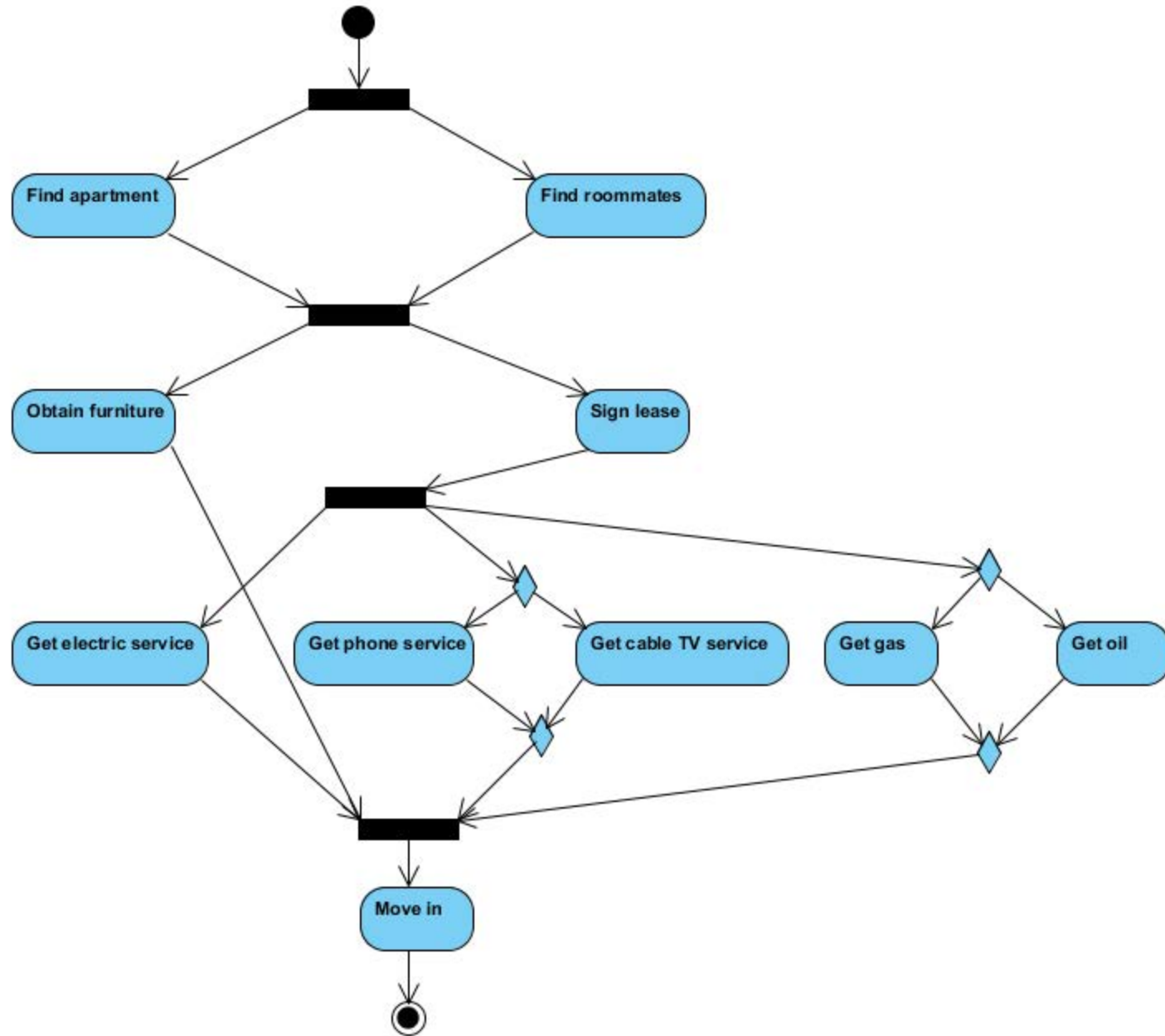
Sequence diagram (optional)

- **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
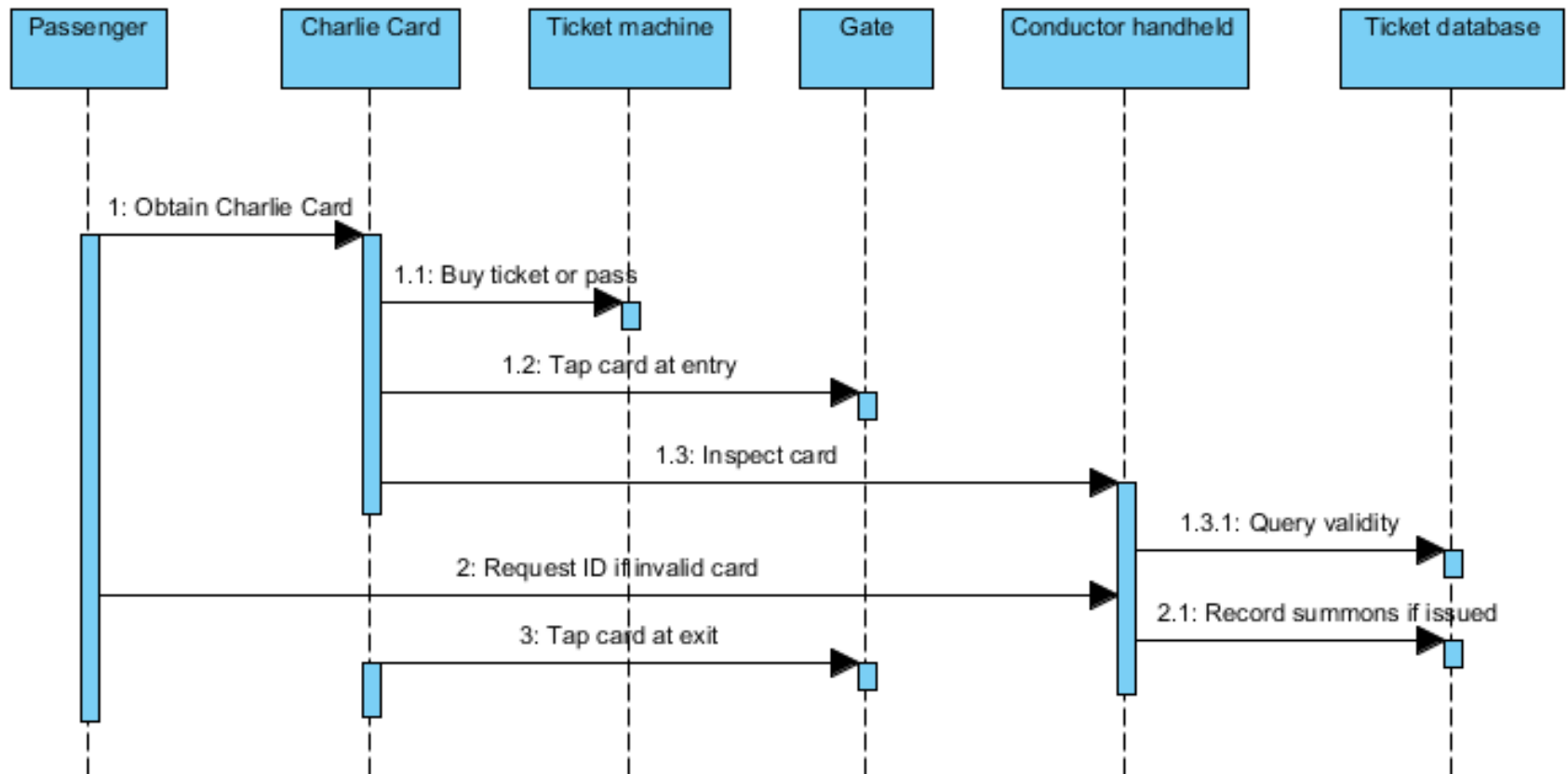
UML Summary

- **Use UML while writing scenarios and narratives as an initial requirements document**
  - **Diagram <u>use cases</u>, then refine them into scenarios**
  - **Focus on completeness of use cases**
- **Use UML <u>component diagrams</u> 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 <u>class diagram</u>**
- **Use UML <u>state diagrams, sequence diagrams</u> and <u>activity diagrams</u> 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**

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