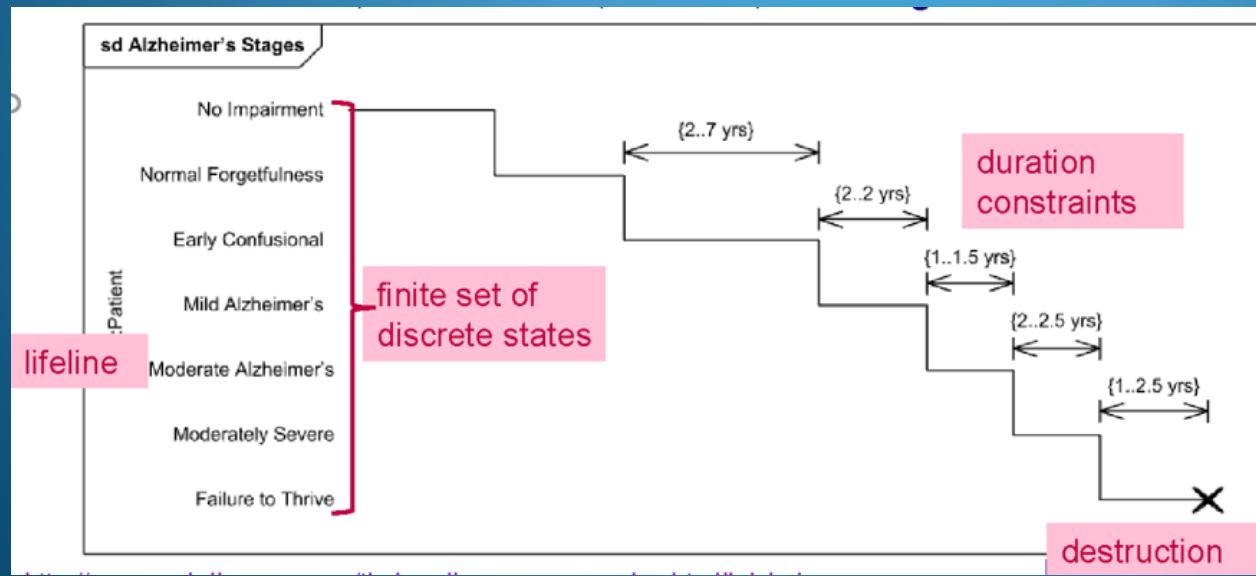


Interaction diagrams

Timing Diagram



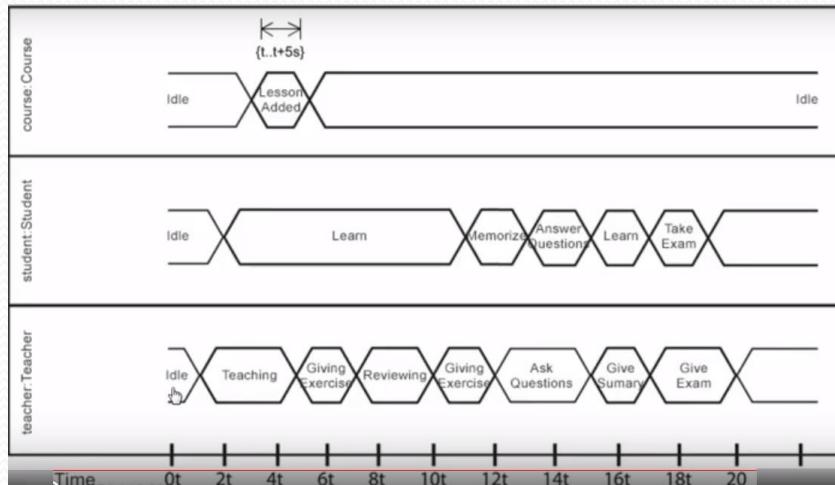
Timing Diagram

- Timing Diagram list different actions that are going to happen for the piece of project that we're going to draw the diagram for.
- It shows how long it takes each action to be processed and when each of them will be triggered.
- Use Case Description and its step of execution(main flow) and its extension help us in drawing activities (states) of the timing diagram.

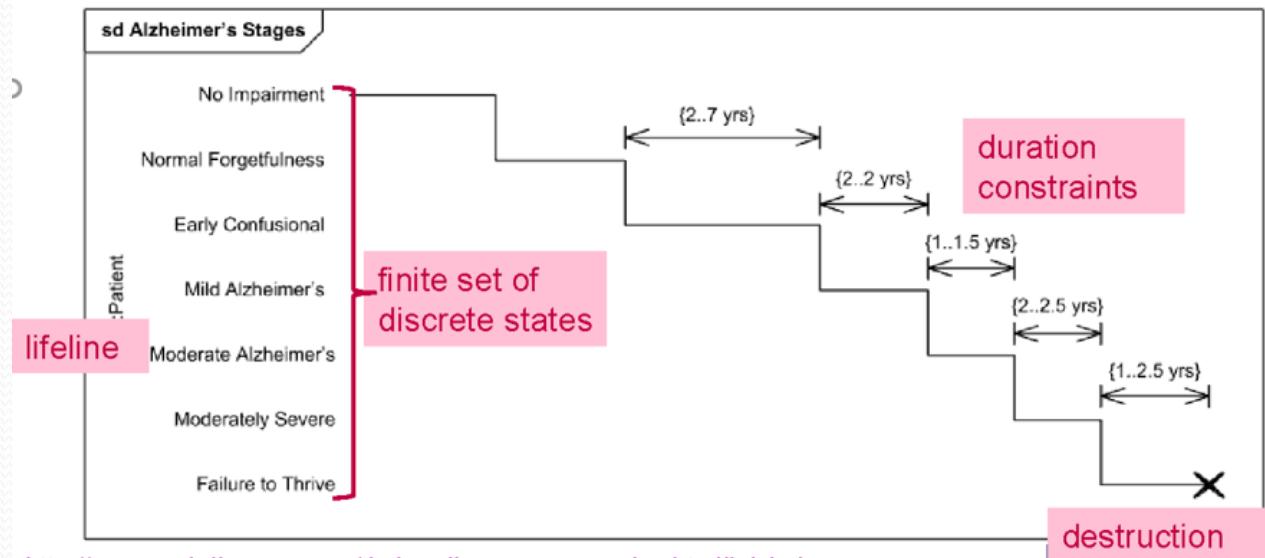
Timing Diagrams

- A timing diagram allows you to show the interaction of objects and changes in state for those objects along a time axis.
- A timing diagram provides a convenient way to show active objects and their state changes during their interactions with other active objects and system resources.
- The X-axis of the timing diagram has the time units, while the Y-axis shows the objects and their states.
- Timing diagrams describe behavior of both individual **classifiers & interactions of classifiers**, focusing attention on time of events causing changes in the modeled conditions of the lifelines.

Alternate Notations



Concise Notation



Robust Notation

Purpose of Timing Diagram

- Define the timing between different states in the system.
- Describe when events occur, how long it takes for participants to react and how long it take for each individual interaction to get complete.

Participants of timing Diagram

- Participants (it's an object)
- States (actions)

Steps of Timing Diagram

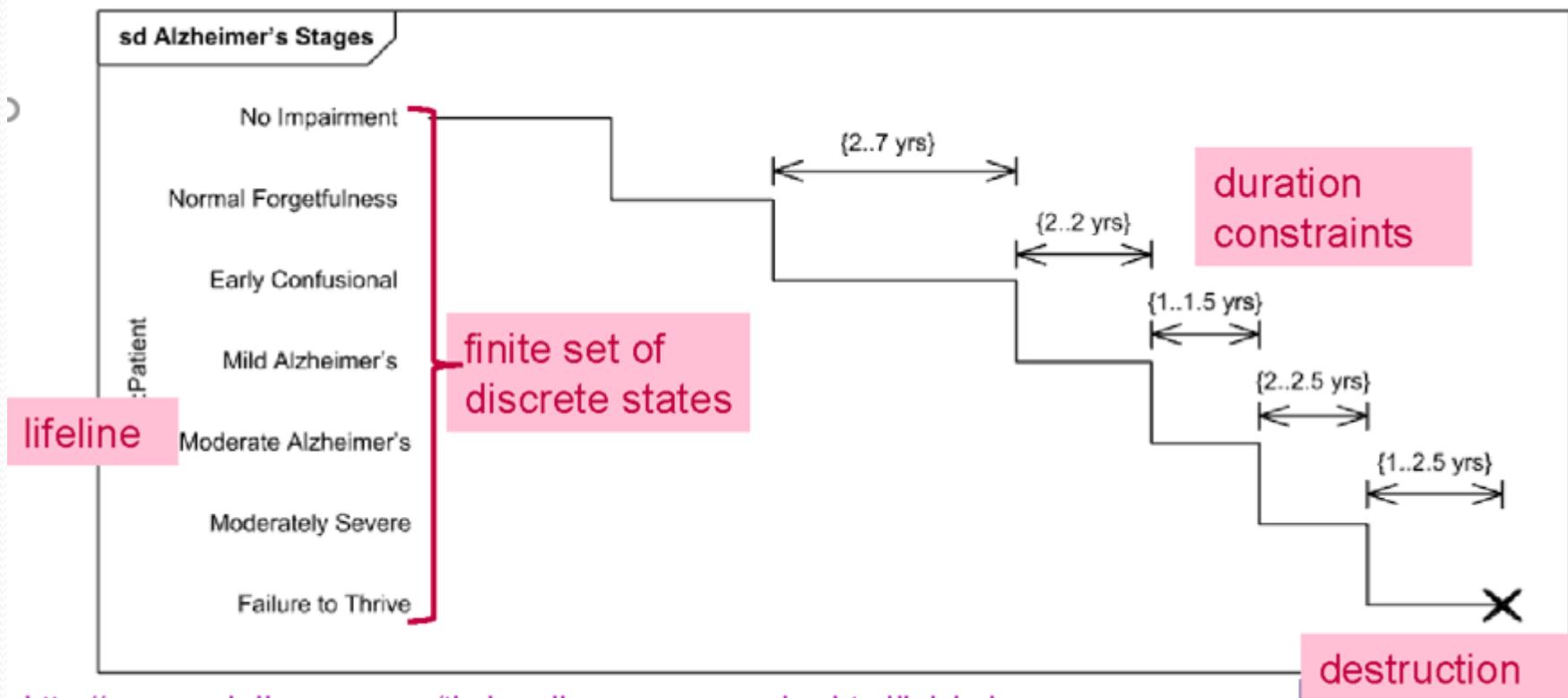
- Find states.
- Find the participants that these states belong to.
- Match the states to participants.

Drawing Timing Diagram

- We draw a table which contains participants in each row.
- Now we start the lifetime of the first action of the first participants that starts a system. As soon as we reach an event or a message we draw it and connect to next participants lifetime line and again continue.
- Then we move on and show how long it takes state of a participant to change to another state for all of the participants

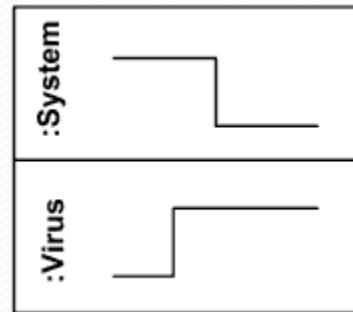
Timing Diagrams

- Timing Diagrams are Interaction diagram for reasoning about time.
- **Basic elements:** lifelines, states, duration/time constraints, destruction, events, messages



Lifeline

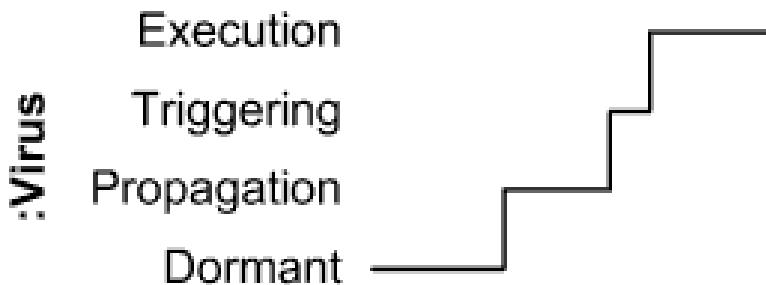
- Lifeline is a **named element** which represents an **individual participant** in the interaction. While **parts** and structural features may have multiplicity greater than 1, lifelines represent **only one** interacting entity.
- Lifeline on the timing diagrams is represented by the **name** of classifier or the instance it represents. It could be placed inside diagram frame or a "swimlane".



Lifelines representing instances of System and Virus

State or Condition Timeline

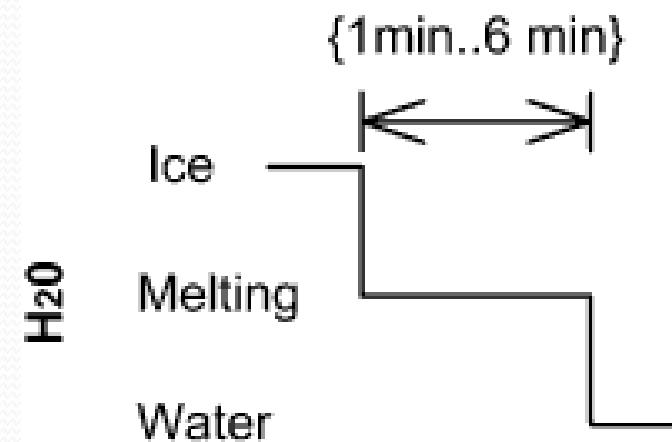
- Timing diagram could show **states** of the participating **classifier** or attribute, or some testable **conditions**, such as a discrete or enumerable value of an attribute.



- Timeline shows Virus changing its state between Dormant, Propagation, Triggering and Execution state*

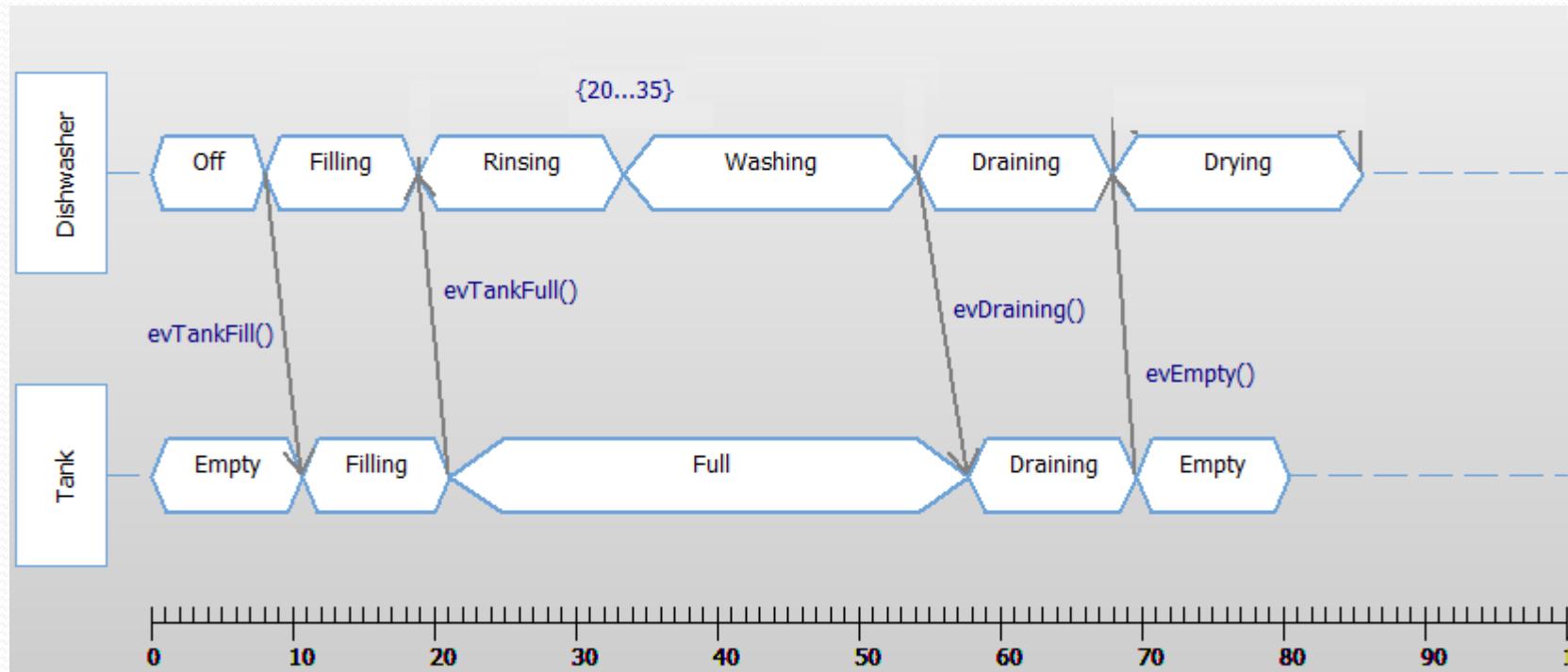
Duration Constraint

- Duration constraint is an interval constraint that refers to a duration interval. The duration interval is duration used to determine whether the constraint is satisfied.
- Duration constraints represent the minimum and maximum duration for which a defined part of the timing diagram can occur.
- Represents a duration interval, or the period of time a state or value must be in effect for.
- E.g., *Ice should melt into water in 1 to 6 minutes*



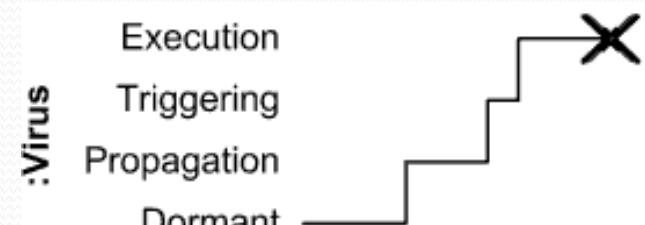
Time Constraint

- **Time constraint** is an **interval constraint** that refers to a **time interval**. The time interval is time expression used to determine whether the constraint is satisfied.
- Shows a range of time on an instance line. All elements that are located within the constraint must adhere to variables specified in the constraint. In the example, the time constraint for the states Rinsing and washing is at least 20 minutes, but no more than 35 minutes.
- Indicates when an event should occur.



Destruction Occurrence

- **Destruction occurrence** is a **message occurrence** which represents the destruction of the instance described by the **lifeline**.
- It may result in the subsequent destruction of other objects that this object owns by **composition**.
- No other occurrence may appear after the destruction event on a given lifeline.
- **Notation**
- The destruction event is depicted by a cross in the form of an X at the end of a timeline.



Points to Consider

- If an object doesn't have any major interaction, then there's no reason to draw that object in a Timing Diagram.
- Events and message will be shown in the same way as it is shown on Sequence Diagram. They will be shown to trigger the state changes from one participants to another.

Coffee pot

- Let's take a simple scenario based on the pump and hotplate for a coffee pot. Let's imagine a rule that says that at least 10 seconds must pass between the pump coming on and the hotplate coming on. The water reservoir becomes empty after 6 minutes and the pump switches off, and the hotplate cannot stay on for more than 15 minutes.

