



## Project 1: Architecting time-critical systems

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### Question I.1

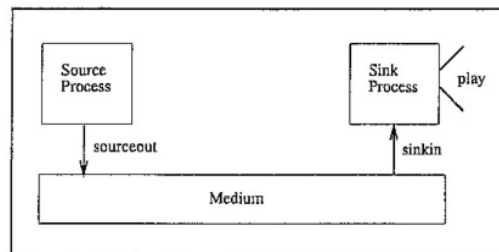
**An elevator.** Consider an autonomous elevator which operates between two floors. The requested behaviour of the elevator is as follows:

- The elevator can stop either at the ground floor or the first floor.
- When the elevator arrives at a certain floor, its door automatically opens. It takes at least 2 seconds from its arrival before the door opens but the door must definitely open within 5 seconds.
- Whenever the elevator's door is open, passengers can enter. They enter one by one and we (optimistically) assume that the elevator has a sufficient capacity to accommodate any number of passengers waiting outside.
- The door can close only 4 seconds after the last passenger entered. After the door closes, the elevator waits at least 2 seconds and then travels up or down to the other floor.

Suggest a timed automaton model of the elevator. Use the actions up and down to model the movement of the elevator, open and close to describe the door operation and the action enter which means that a passenger is entering the elevator.

### Question I.2

**QoS of a media stream.** Consider the following requirements for a media stream channel and model a possible representation in .



- Source emits a message every 50ms (ie, 20 messages per second)
- Channel may lose messages (no more than 20%)
- A message is considered lost if it does not arrive within 90 ms
- Sink end receives messages and takes 5ms to process each one
- An error should be generated if less than 15 messages per second arrive at the sink end

### Development I.1

**Demos.** Select an *architectural style* among the following *Client & Server*, *Publish & Subscribe*, *Peer2Peer*, *Event-bus*, *Table-driven* and create an architectural scenario around the chosen style with *time critical* requirements. Develop a model in . Discuss its design and try out a few variants.