

# A travelling story with timed automata

Patricia Bouyer-Decitre

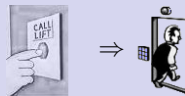
LSV, CNRS & ENS Cachan, France

# Model-checking

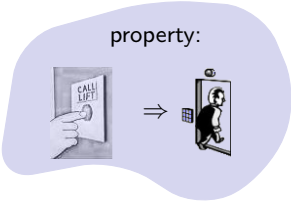
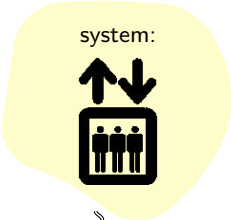
system:



property:

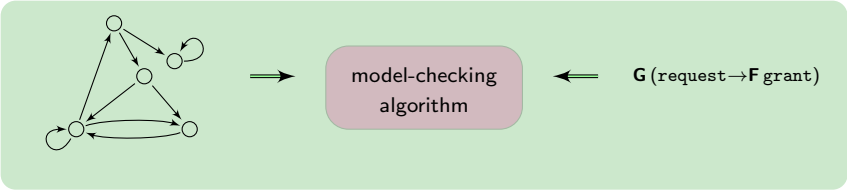
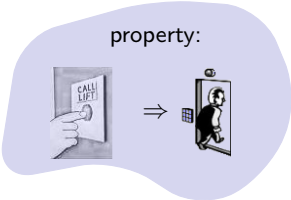
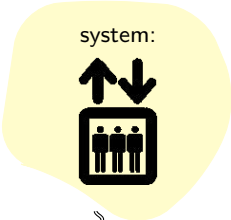


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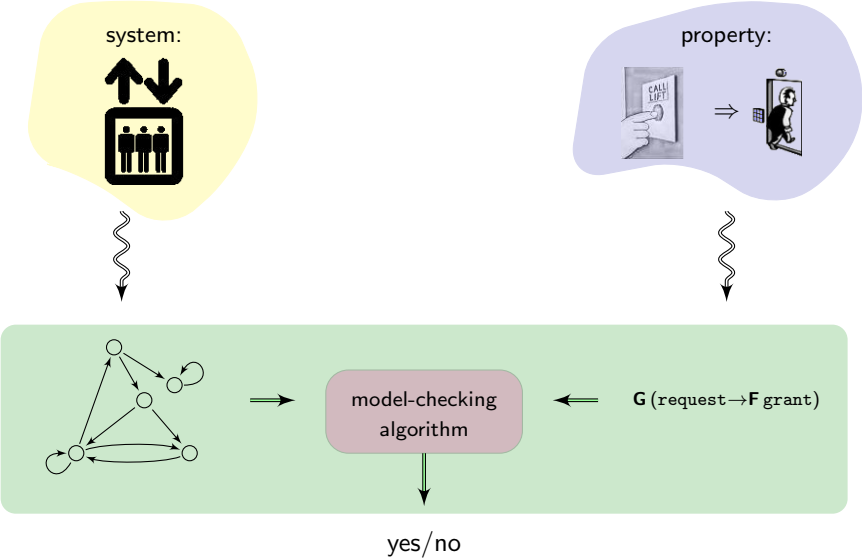


$G (\text{request} \rightarrow F \text{ grant})$

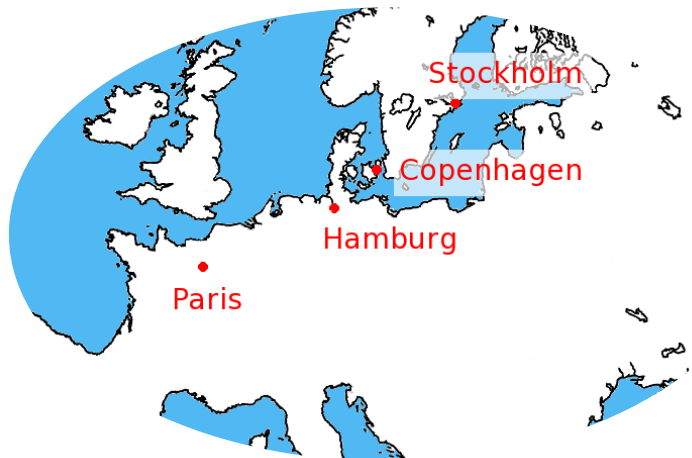
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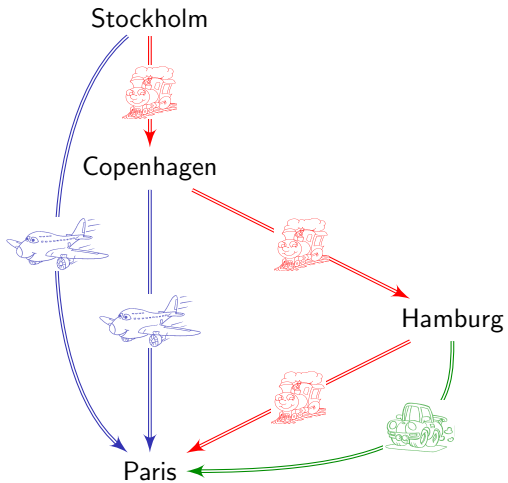
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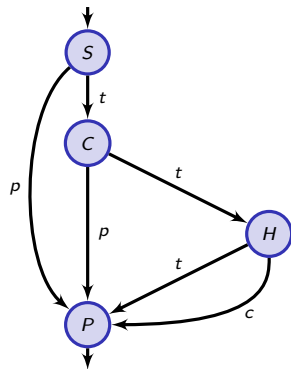
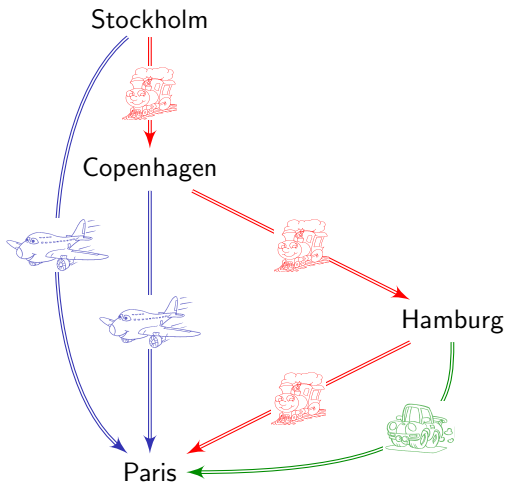
## April 2010: Back from Stockholm (HSCC)



# A first (and rough) modelization



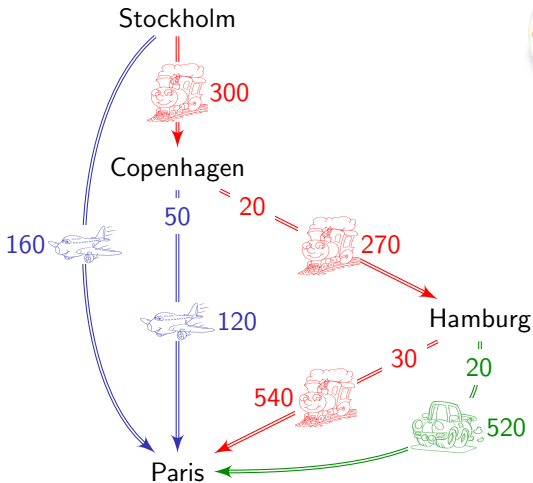
# A first (and rough) modelization





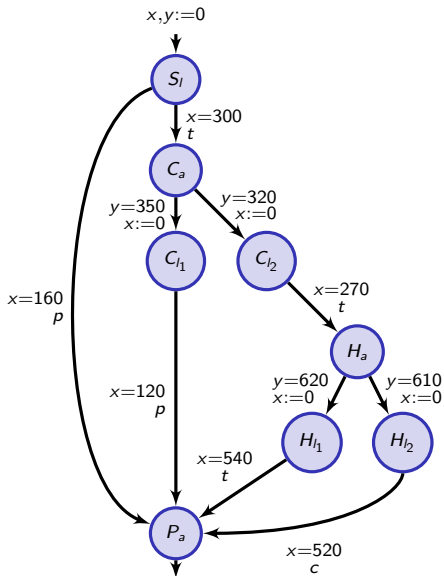
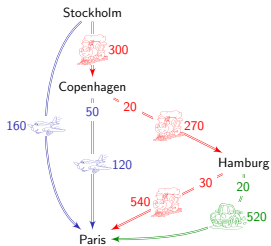
# How much time does that take?

## The “nominal” approach



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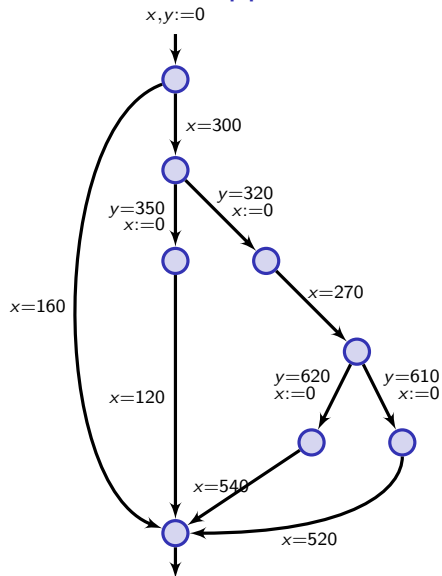
## The “nominal” approach



Timed automata

How much time does that take?

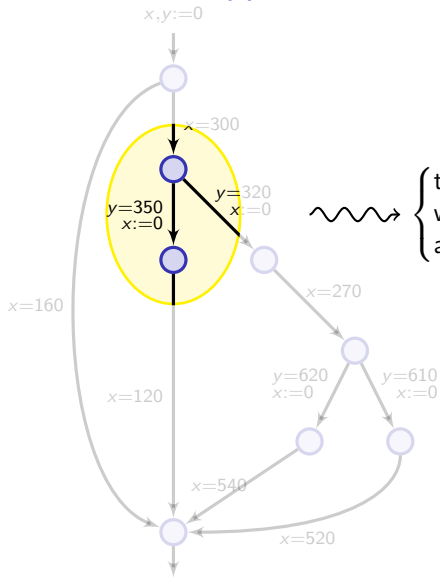
The “nominal” approach



Timed automata

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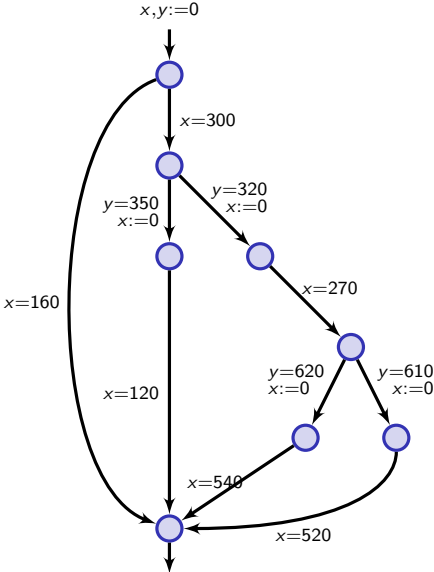
## The “nominal” approach



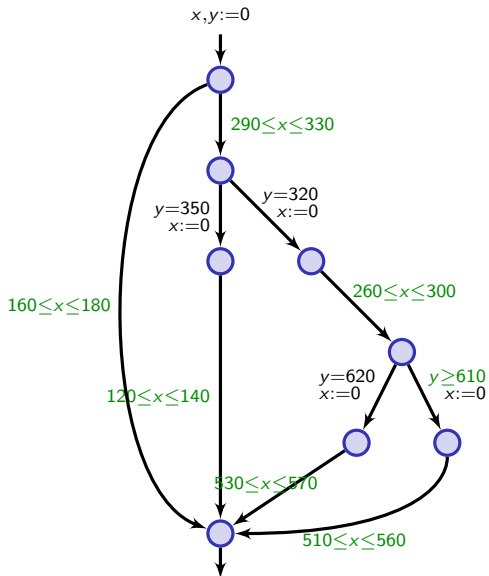
this transition can be taken  
when  $y = 350$   
and should reset clock  $x$

Timed automata

# Maybe too idyllic?

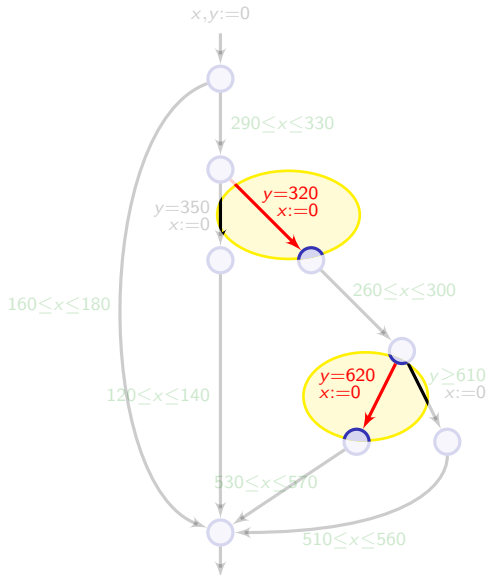


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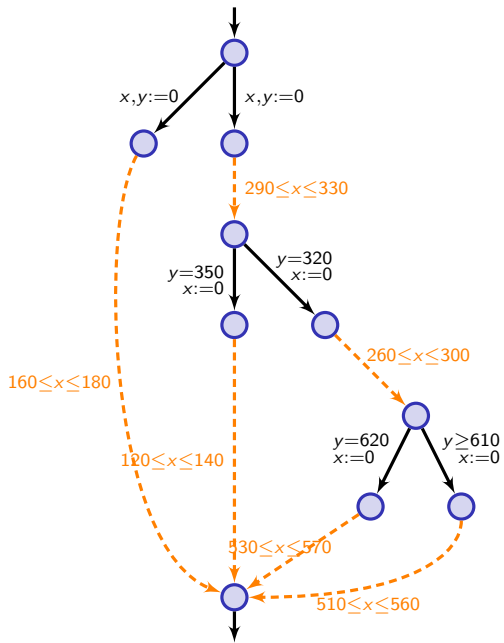
Timed automata

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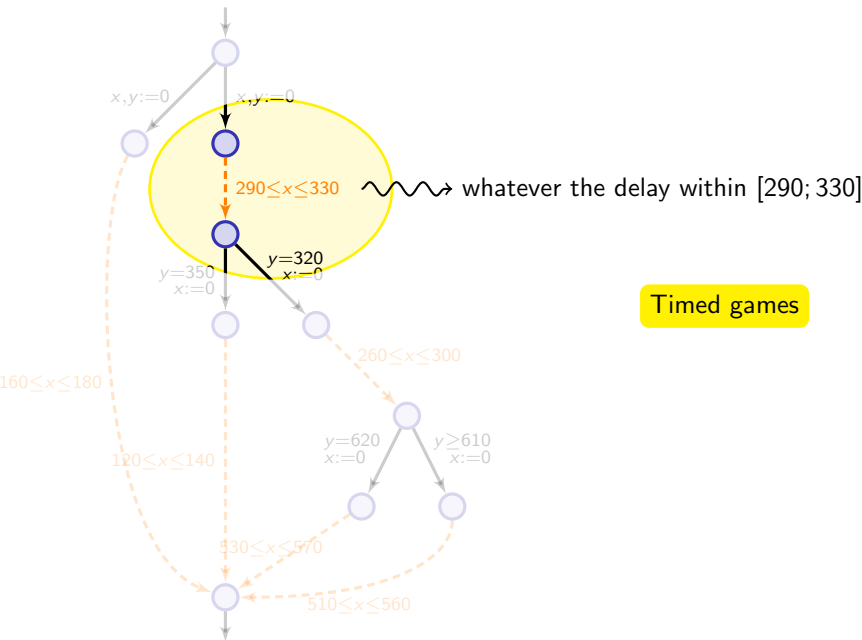
Some correspondences might be short or disabled!

# Toward more faithful models?

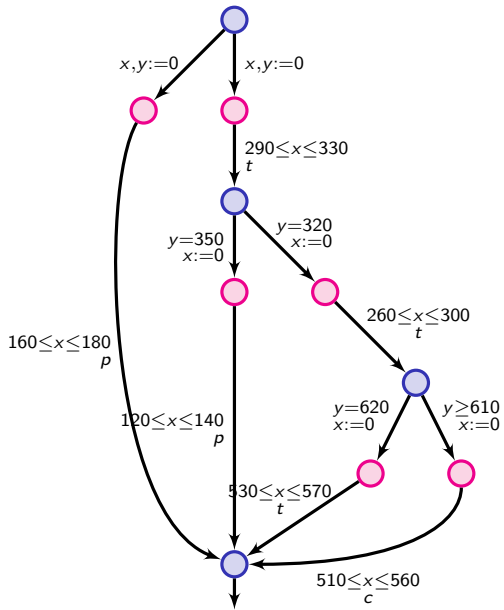




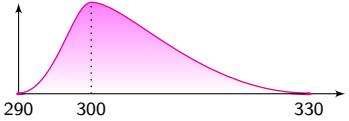
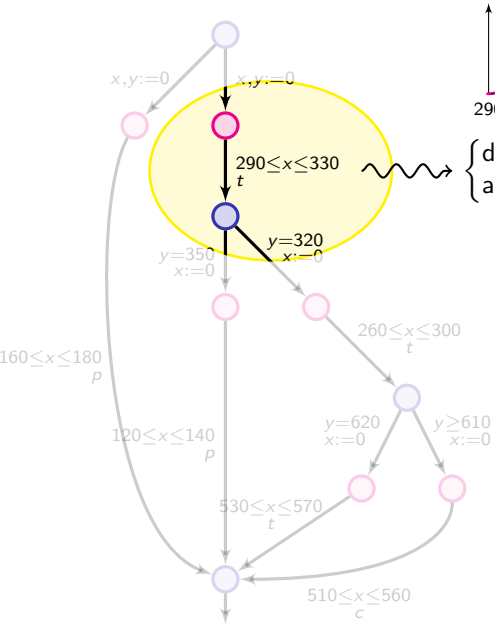
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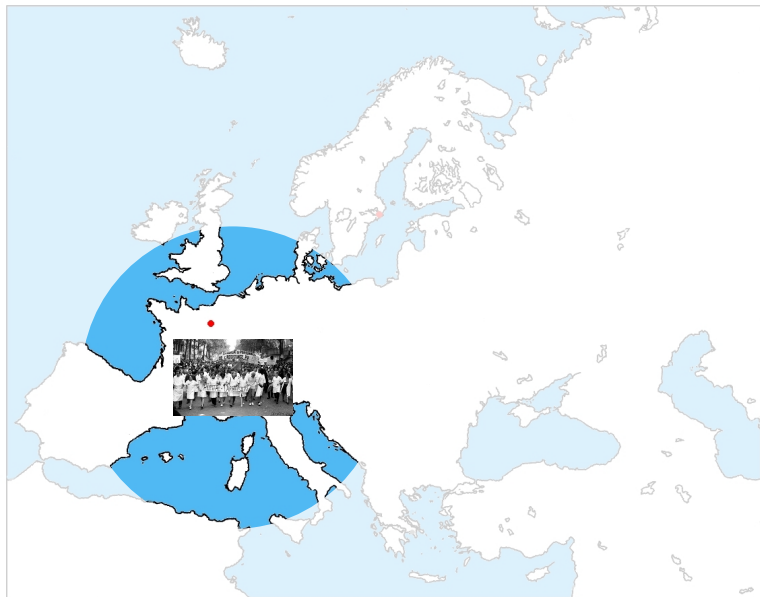
{ delay is chosen according to a probability distribution

Timed-automaton-based stochastic (decision) process

## What if unexpected events?



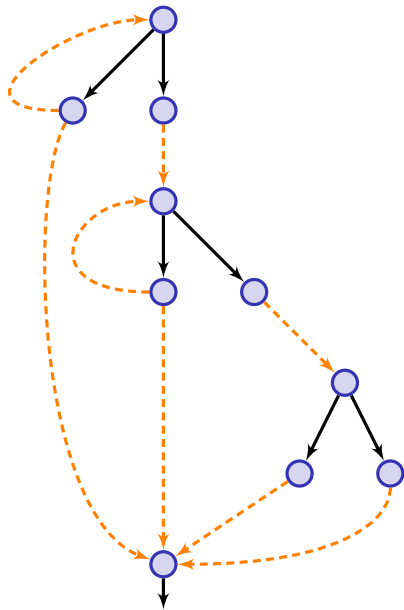
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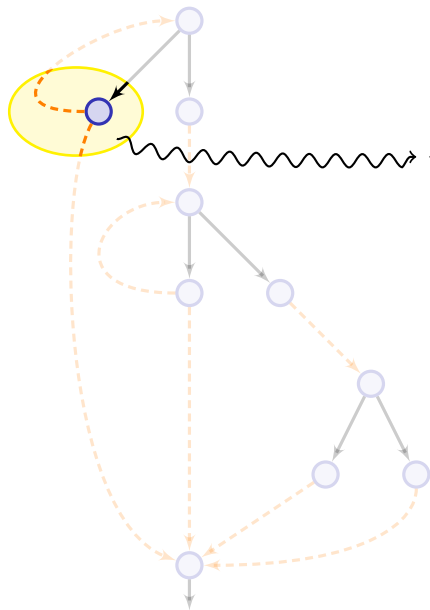


# What if unexpected events?



Timed games

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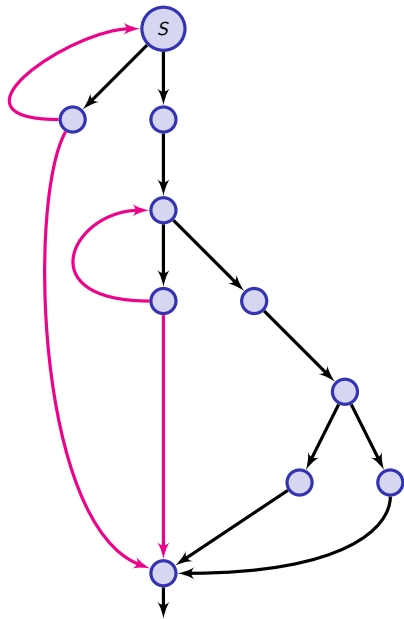


{ we should be able to reach Paris  
whatever happens at the airport

Timed games

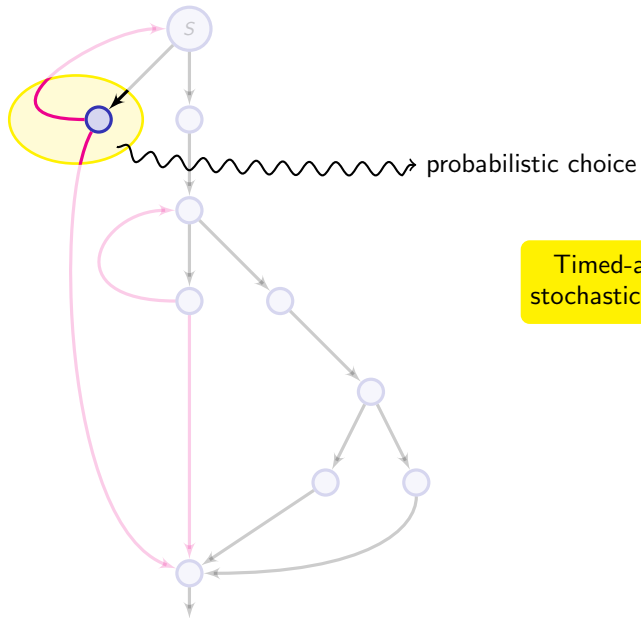


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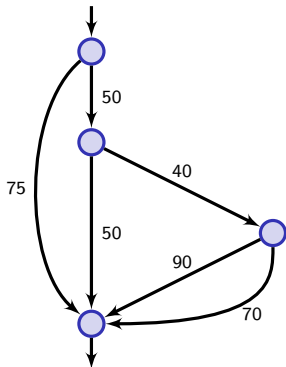
Timed-automaton-based  
stochastic (decision) process

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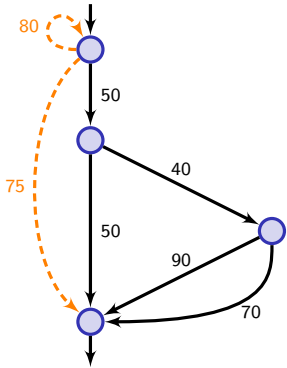
Timed-automaton-based  
stochastic (decision) process

# Other quantitative information might be relevant



Weighted automata

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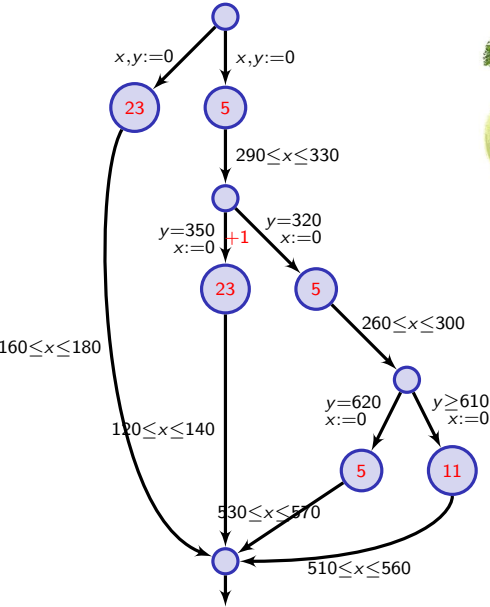


Weighted games

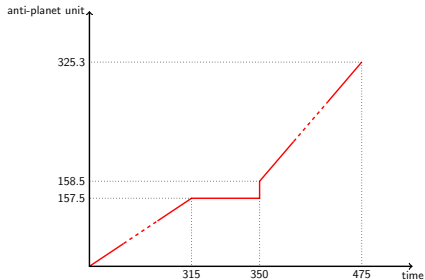
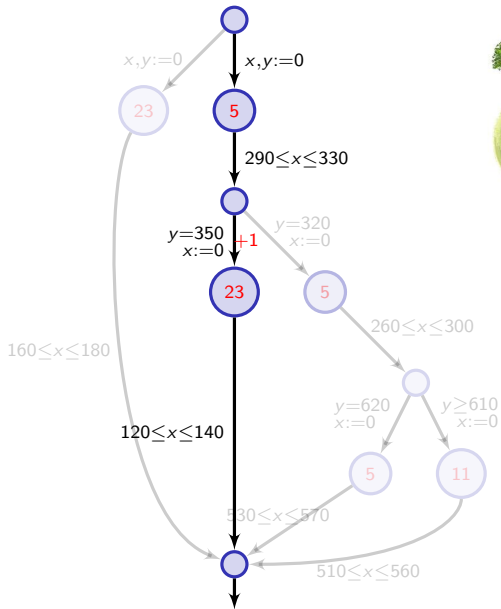
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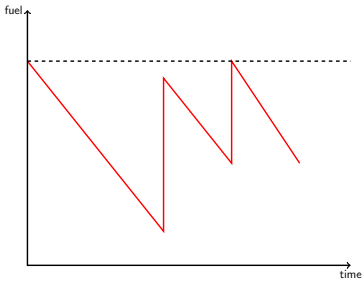
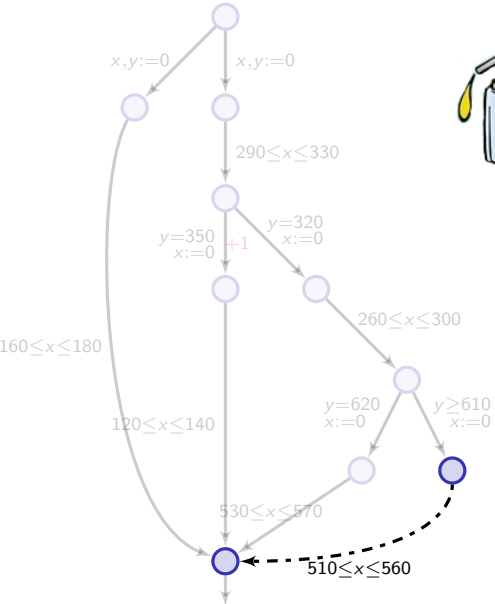
Weighted timed automata



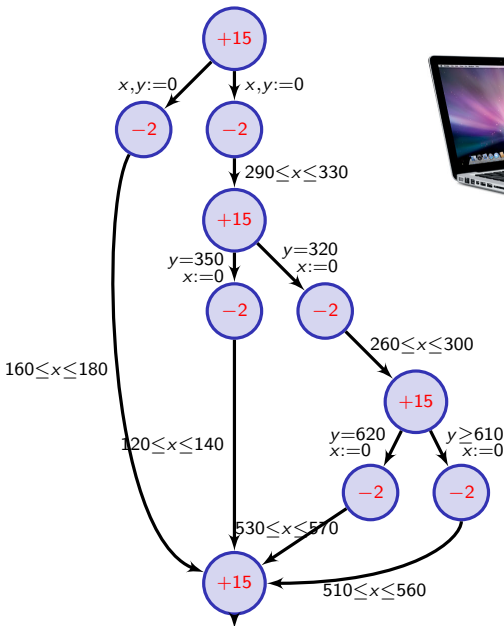
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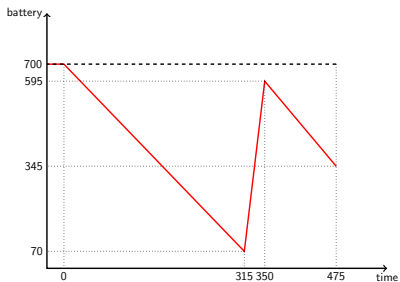
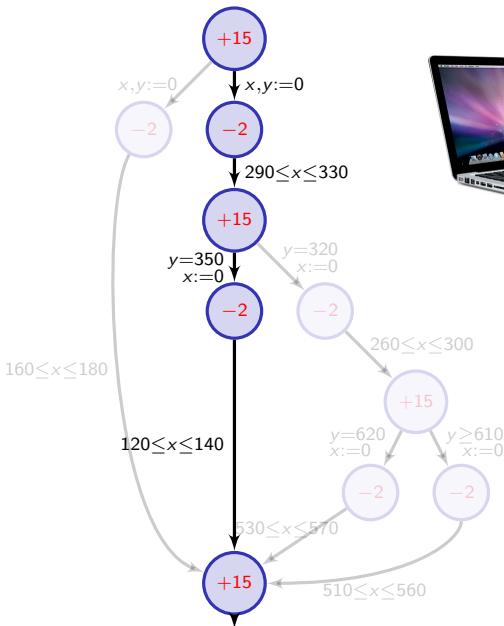
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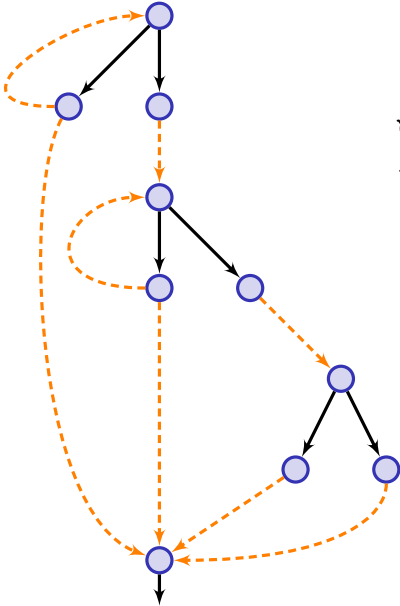
Weighted timed automata



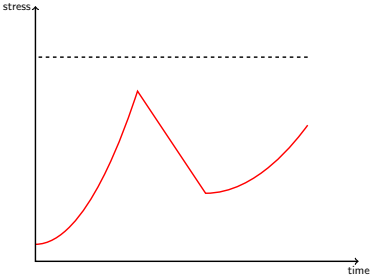
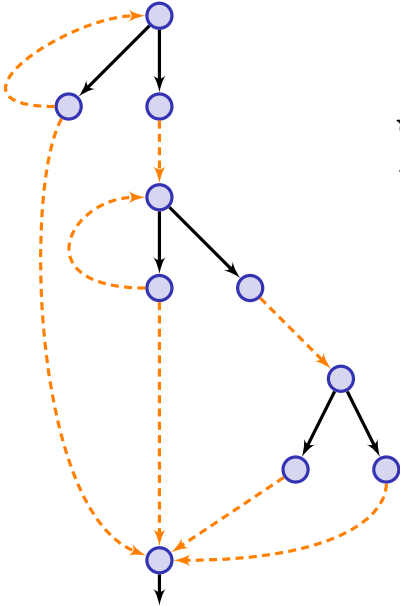
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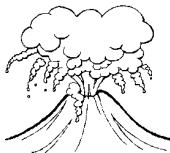


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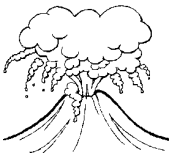
# What do we do with those models?

- We compute:
  - optimal time
  - optimal cost
  - expected time
  - ...
- We synthesize:
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  - optimal schedules
  - constrained schedules
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  - ...



... and we have fun!



# Finally...

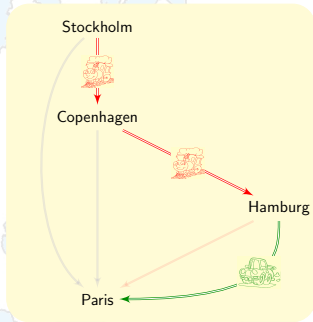
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