

Aalborg Universitet



UPPAAL STRATEGO

David, Alexandre; Jensen, Peter Gjør; Larsen, Kim Guldstrand; Mikučionis, Marius; Taankvist, Jakob Haahr

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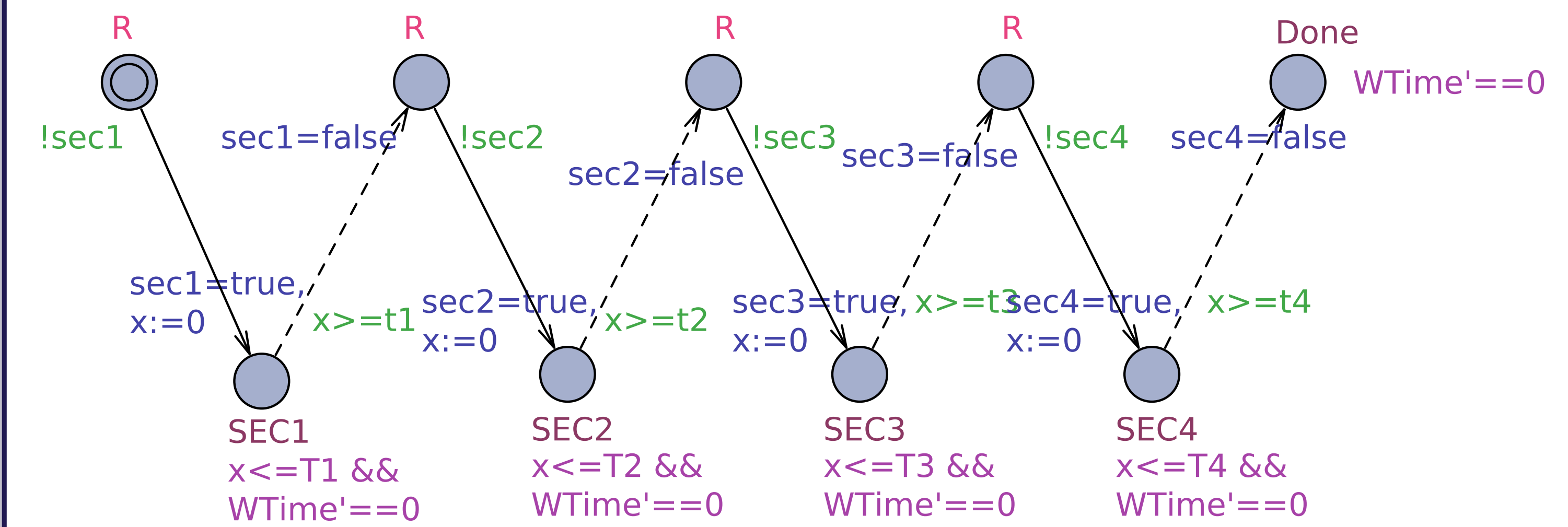
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Problem: Sharing a Newspaper



Model of the Problem



- ▶ Reading a section takes time (uniformly distributed).
- ▶ Decide the order of sections to be read.

Questions and Queries

If the readers chose randomly who will read a section, what is the expected time to completion?

$\Pr[\leq 100] (\langle \rangle \text{ Jakob.Done } \&\& \text{ Kim.Done } \&\& \text{ Marius.Done } \&\& \text{ Peter.Done })$

What is a better strategy for the readers for finishing faster?

strategy Opt = minE[≤ 100]: $\langle \rangle \text{ Jakob.Done } \&\& \text{ Kim.Done } \&\& \text{ Marius.Done } \&\& \text{ Peter.Done}$

What are the expected times to completion with the strategy?

$\Pr[\leq 100] (\langle \rangle \text{ Jakob.Done } \&\& \text{ Kim.Done } \&\& \text{ Marius.Done } \&\& \text{ Peter.Done})$ under Opt

Can the readers ensure Kim can catch a plane in 60 min?

strategy Travel = control: A $\langle \rangle \text{ Kim.Done } \&\& \text{ time } \leq 60$

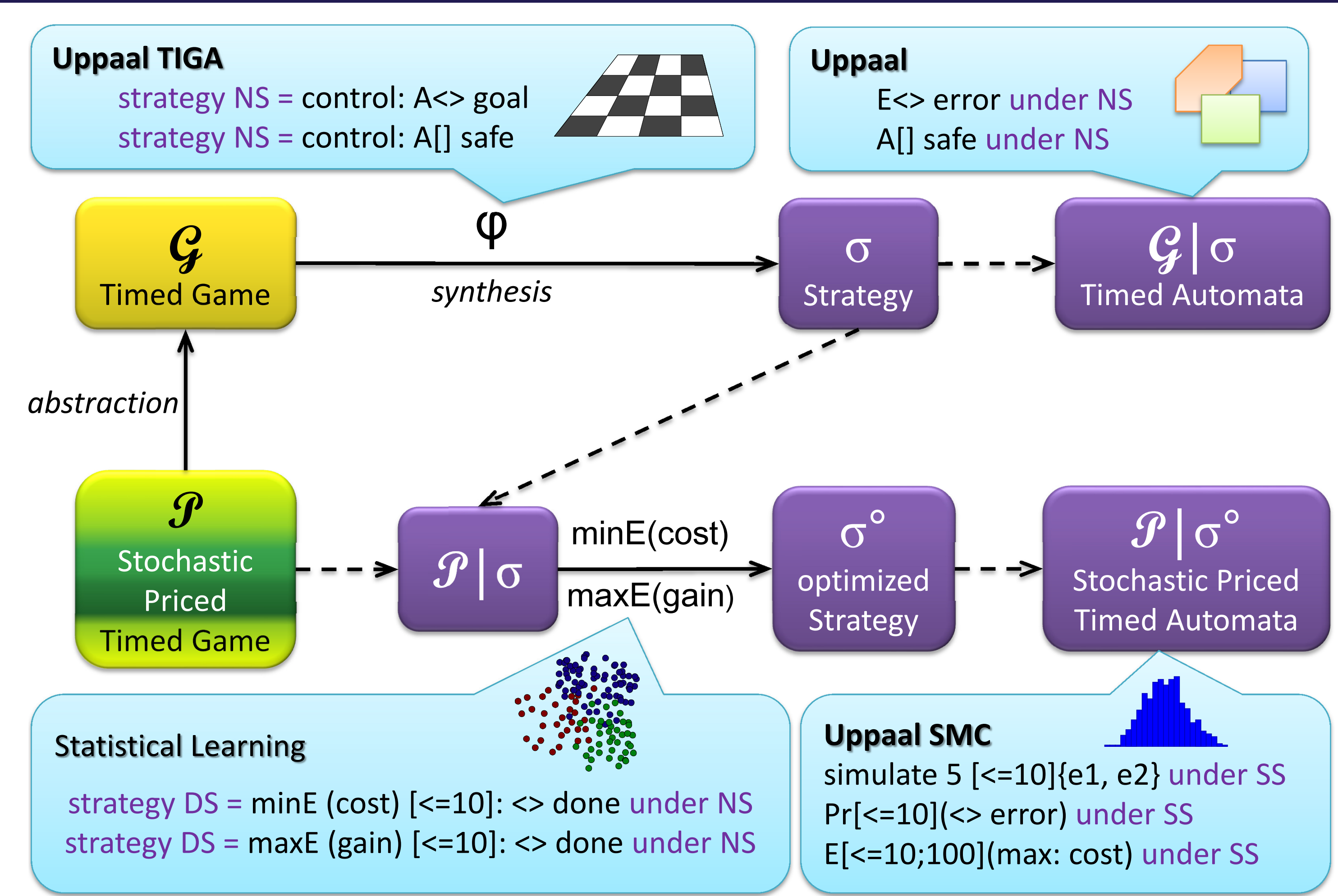
Will Peter ever be able to go with Kim on the plane?

E $\langle \rangle \text{ Peter.Done } \&\& \text{ time } \leq 60$ under Travel

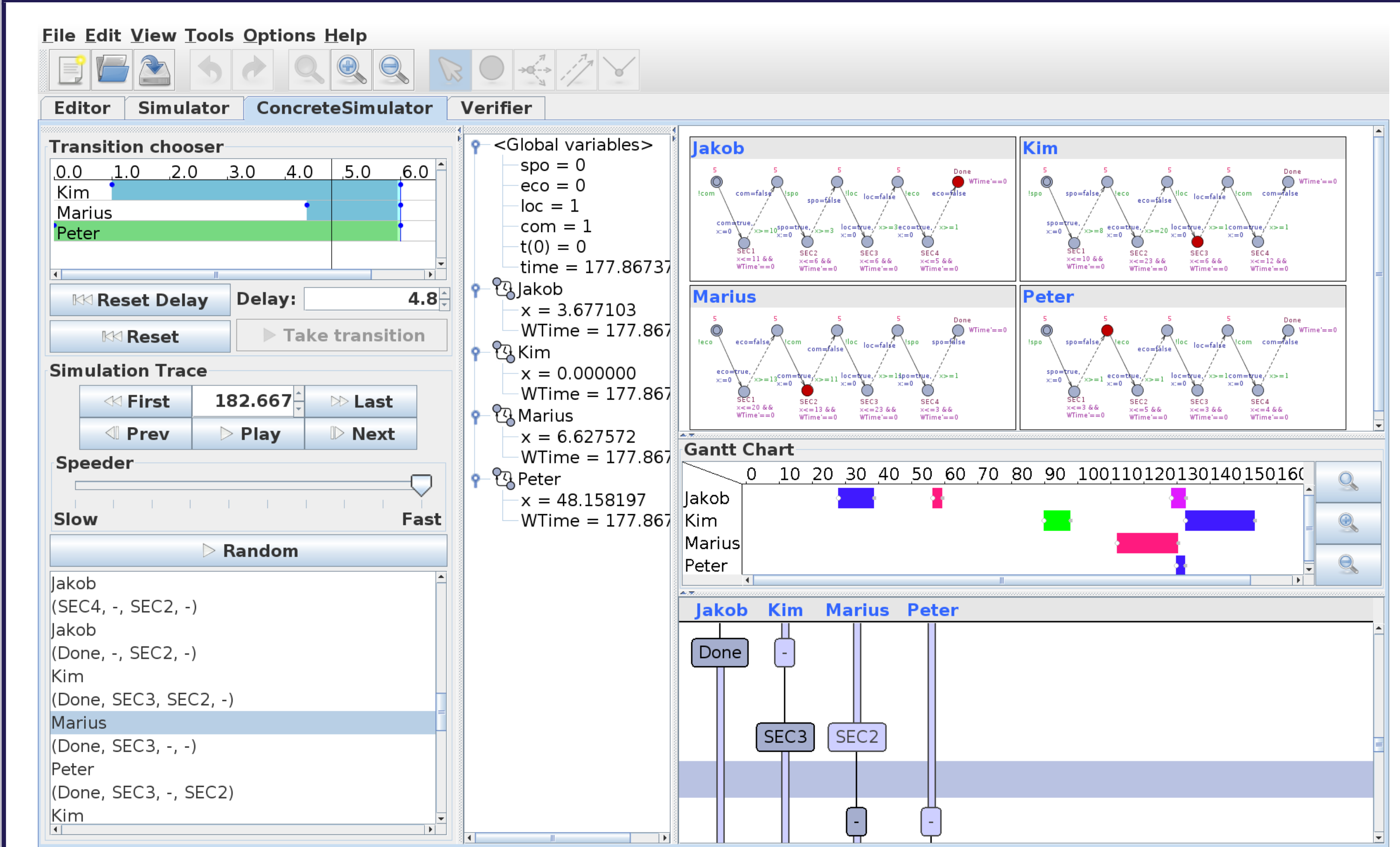
How to minimize the expected Peter's time, while still guaranteeing that Kim can catch the plane?

strategy PeterTravel = minE [≤ 60]: $\langle \rangle \text{ Peter.Done}$ under Travel

Overview of Various Transformations

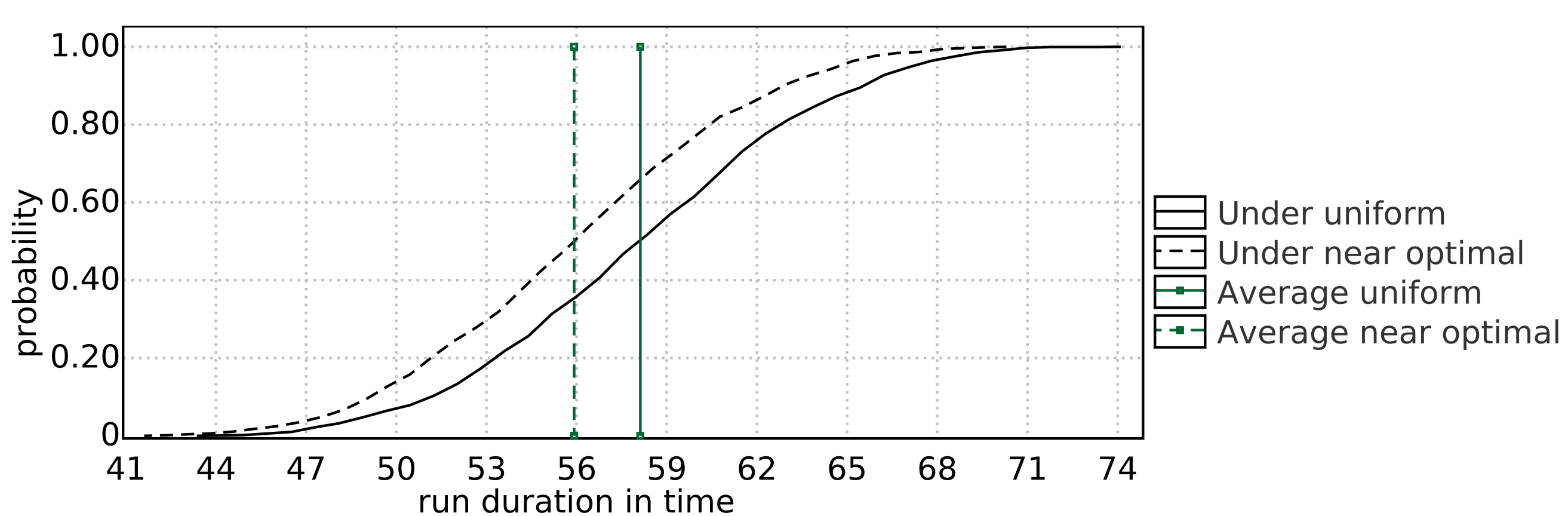


Simulator Interface



Compute and Improve the Strategy

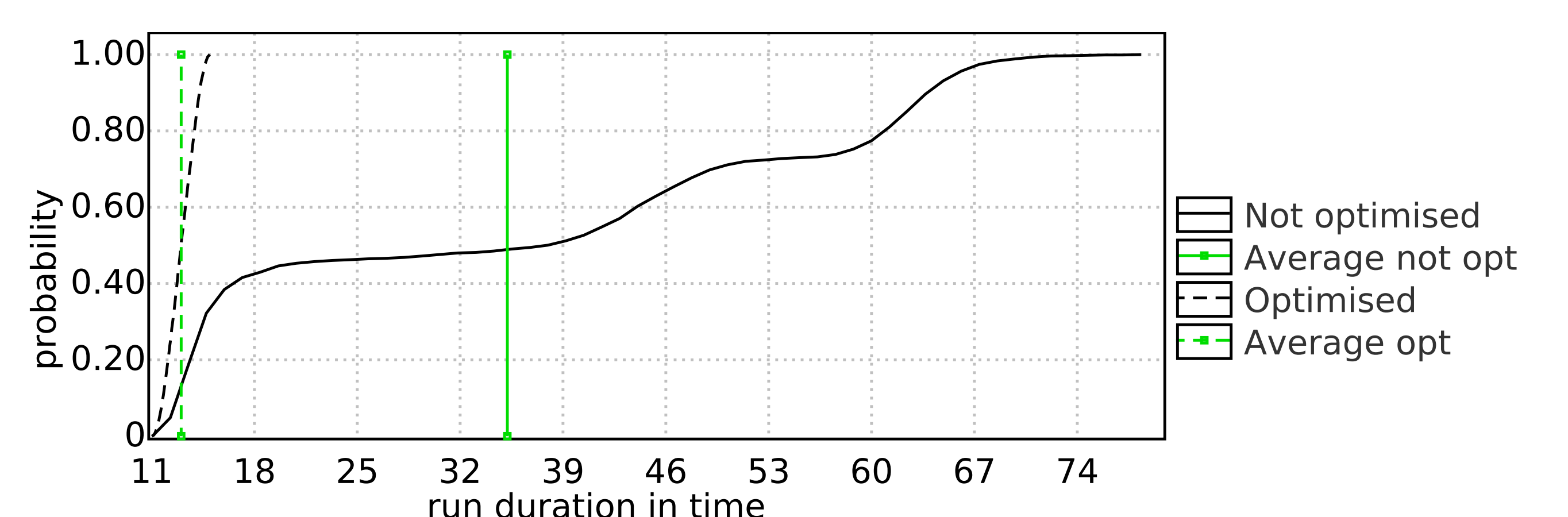
- ▶ Estimate the probability of being done (solid lines).
- ▶ Compute the strategy Opt minimizing the overall time.
- ▶ Estimate the probability of being done under Opt (dashed lines).



By learning the optimal strategy we have improved the time distribution by 3 min in average.

Can Peter finish early under travel?

- ▶ Compute a strategy Travel so that Kim travels in time.
- ▶ Estimate the probability of Peter being done under Travel (solid lines).
- ▶ Compute the strategy PeterTravel minimizing Peter's time under Travel.
- ▶ Estimate the probability of Peter being done under PeterTravel (dashed lines).



By optimizing the synthesized strategy we improved Peter's time while maintaining the goal of Kim's deadline.