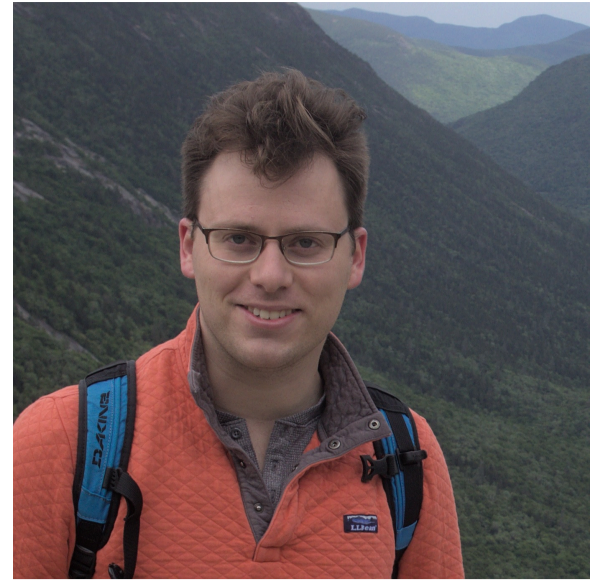


Replanning in Advance for Instant Delay Recovery in Multi-Agent Applications Rerouting Trains in a Railway Hub



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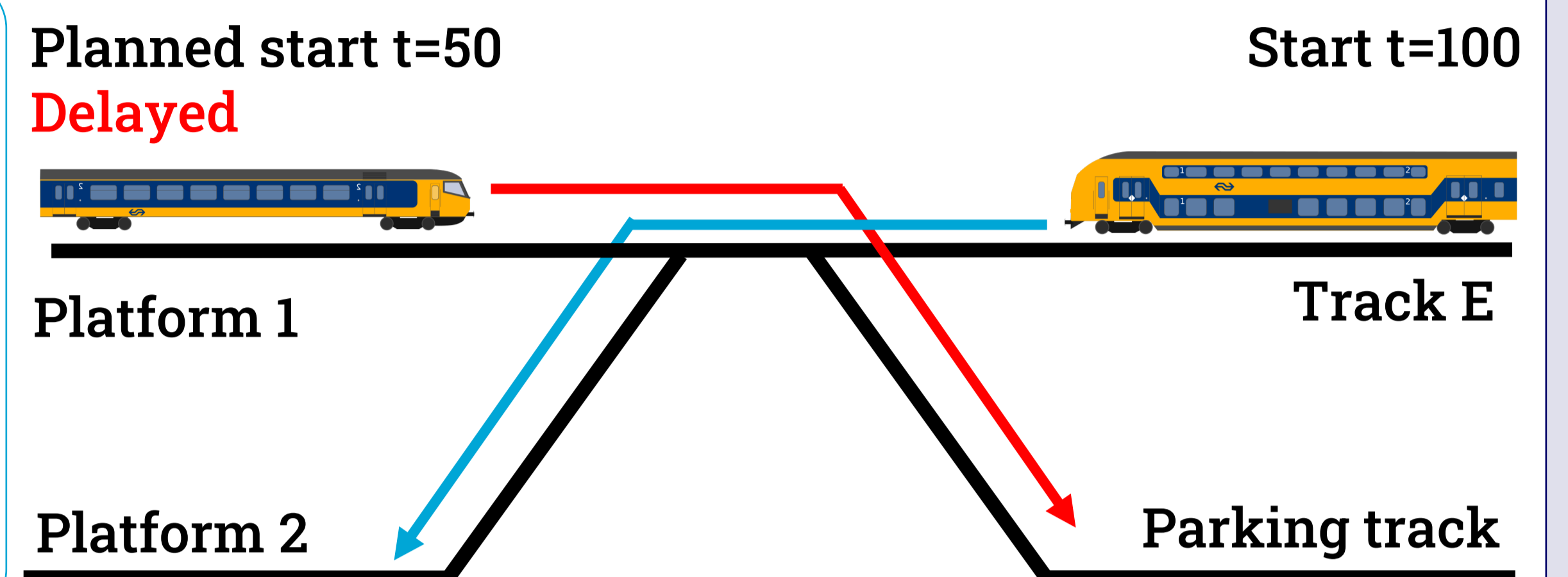
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PROBLEM

- **Multi-agent delay replanning**
 - Single delayed agent, treat others as obstacles
 - Don't affect other agents
- **Example: railway hub delay replanning**



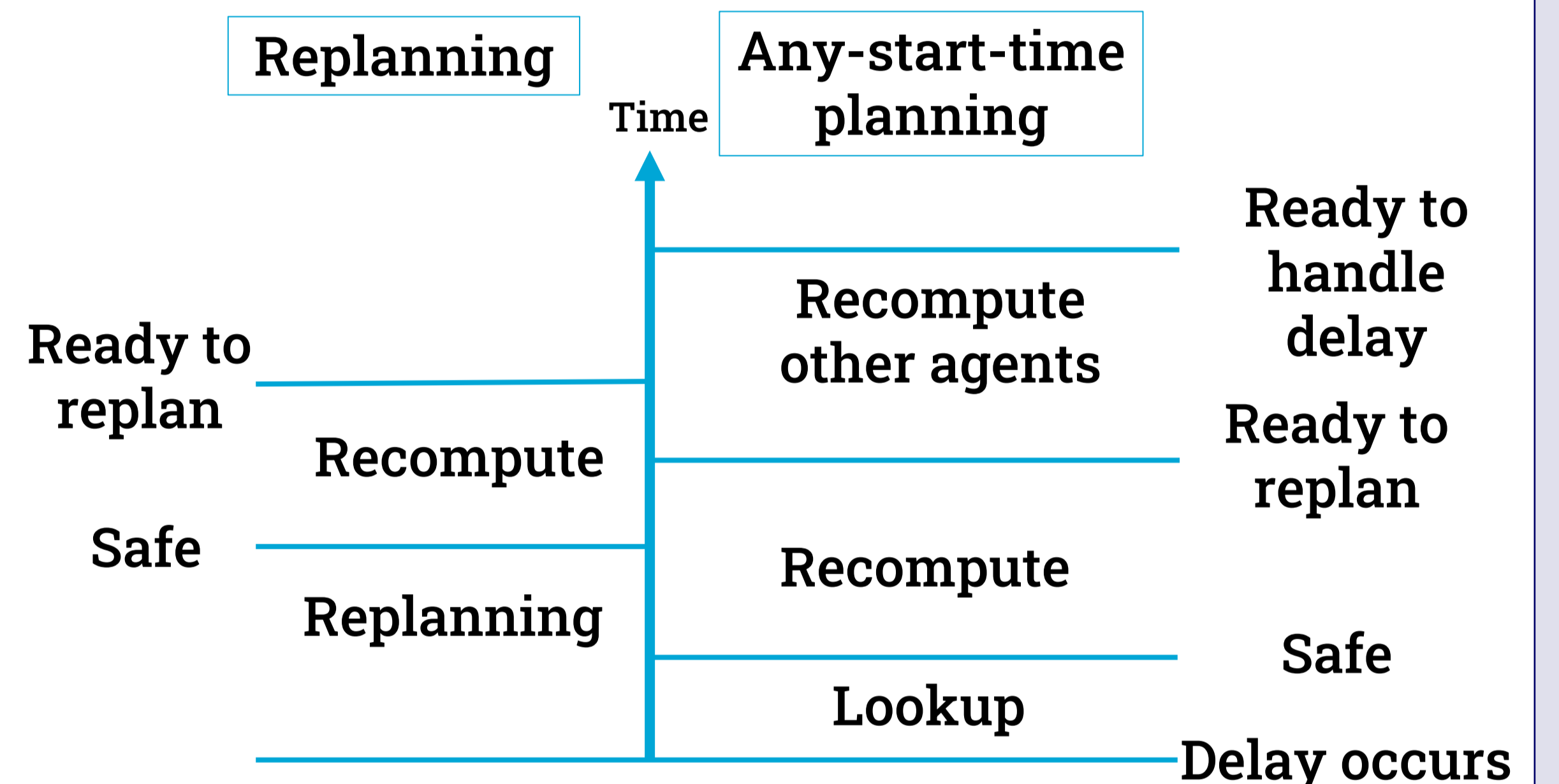
SOLUTION

Precomputation:

1. Generate search graph with other agents as obstacles
2. Compute any-start-time plan

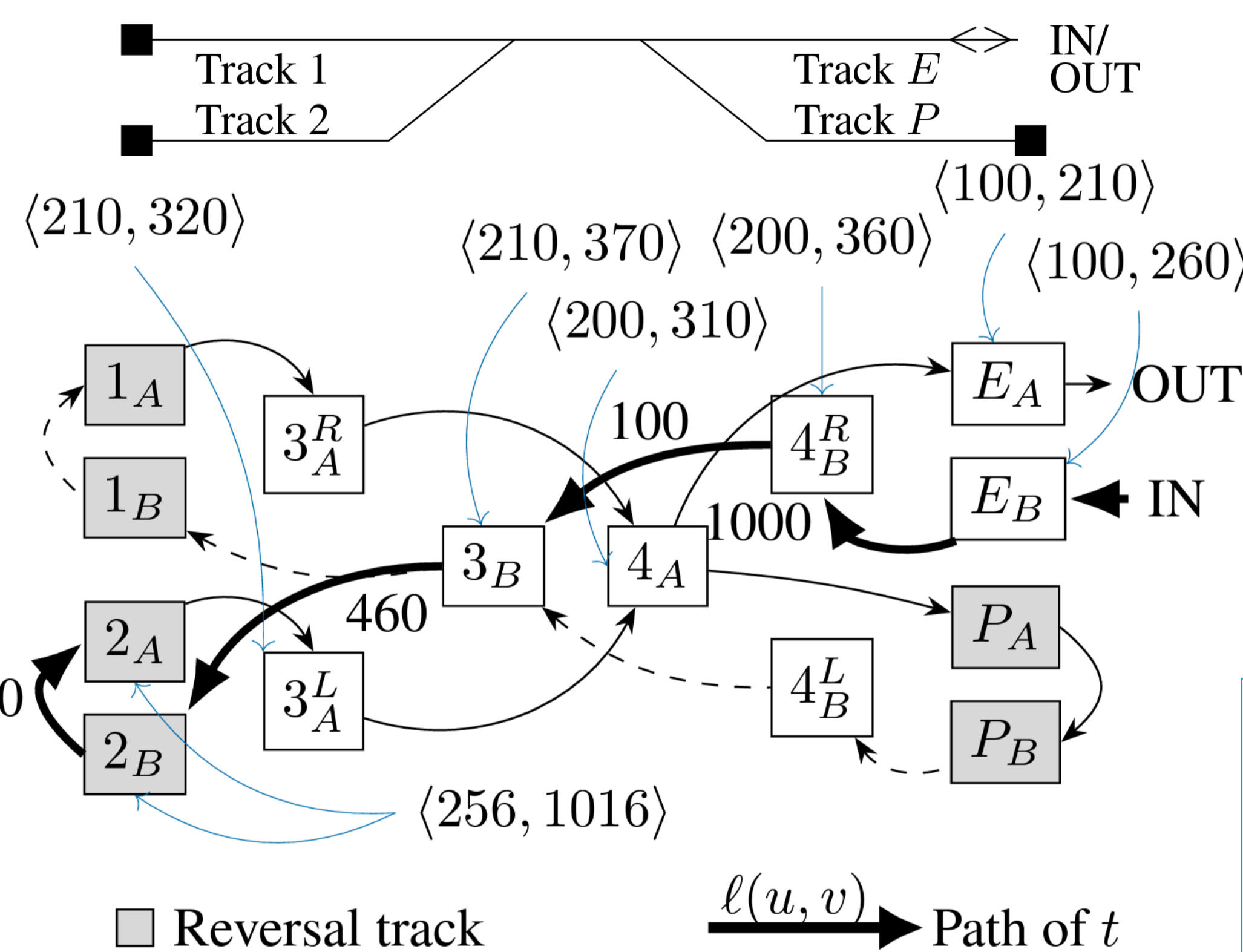
On-delay:

1. Query any-start-time plan of delayed agent



GENERATE GRAPH

- **Graph creation**
- **Unsafe intervals**
 - Time to get to next node
 - Add headways
 - Special case on reversal tracks
 - Take care of associated nodes
- **Safe intervals**
 - Put onto the edges



Param	Value
Arrival t	100s
Length t	600m
Speed t	10 m/s
Walking speed	1 m/s
Headway f	100s
Headway c	50s

Parameters train t moving from E to 2 starting at 100s

This shows train application, let's talk how to adapt it to your domain!

RESULTS

- **Plan lookup: nanoseconds**
 - Recovered state
- **Precomputation: less than a second**
 - Ready to handle new delay
- **Other applications:**
 - Ad-hoc demand
 - Container terminal handling

