

Simulation for Logistics

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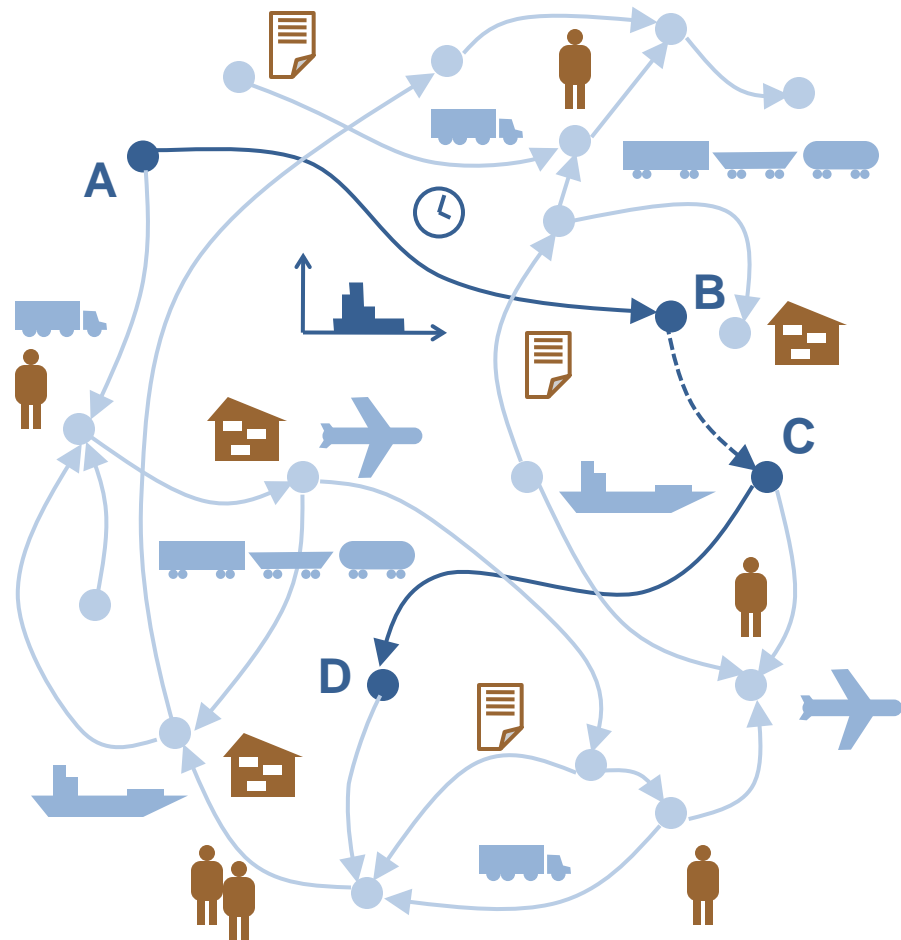
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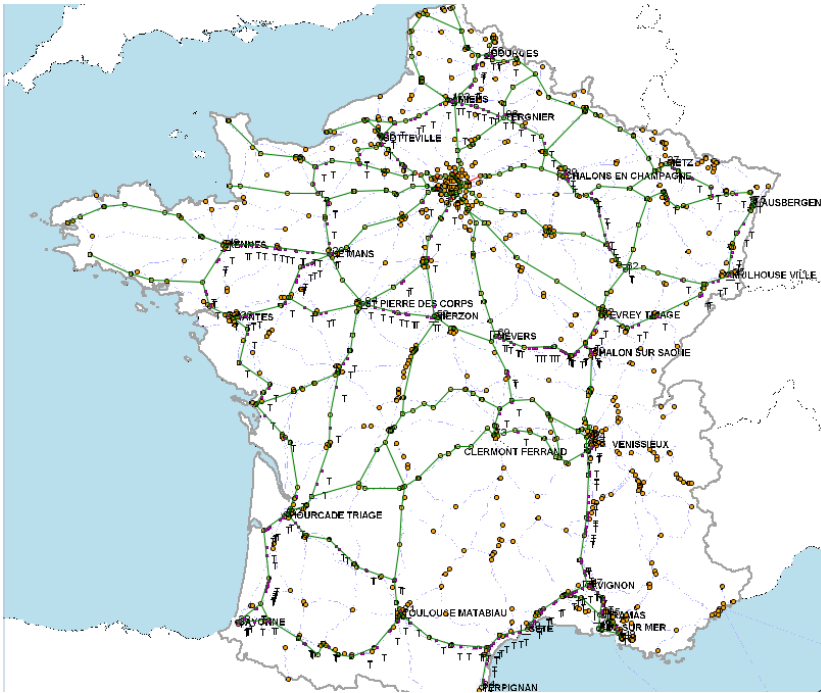
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Logistics: transportation, storage,...

- Space
- Time
- Uncertainty
 - Delivery time
 - Failures
 - Causal dependences
- Large number of parameters
 - When, where
 - Auto/Rail/Sea
 - Own/Rented
- Interaction with other processes
 - Sales/forecast
 - Business-process
 - Production



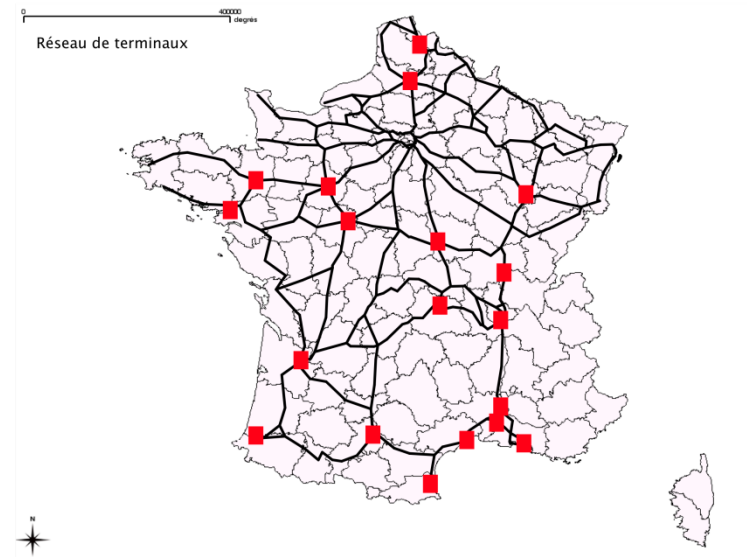
Resofret: Problem definition



- Checking competitiveness of “auto – rail – auto” transportation scheme against “auto” only

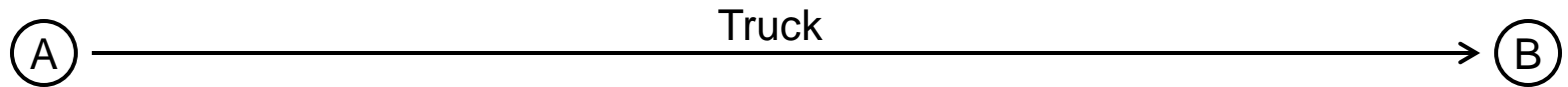
Resofret: Challenges

- Identifying structure of transportation network
 - Number of required terminals
 - Utilization of terminals
 - Parameters of shipments
 - Capacity of segments
- Trains management
 - Restricted by available time slots
 - Trains size

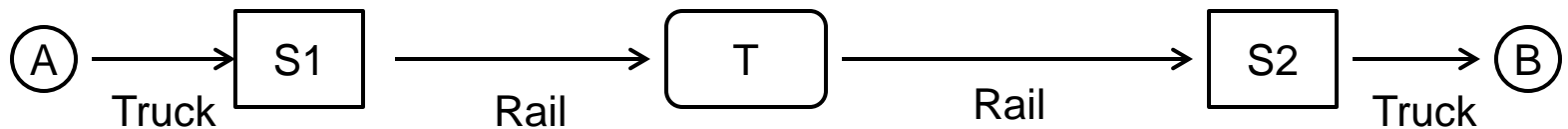


Resofret: Approach

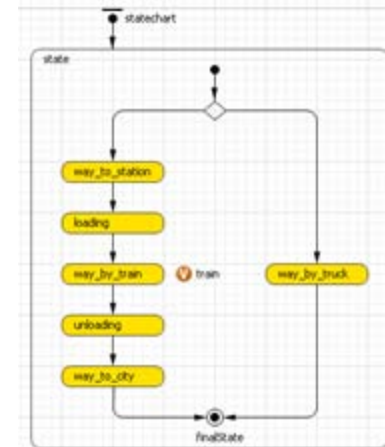
- All requests are split in two:
 - Request goes over auto network



- Request goes over a combined chain



- Stations, terminals, rail segments are agents
- Implicit simulation of expeditors



Resofret: Results

Module and train assembling policies

Add truck to module according to:

Sort modules while adding to a train by:

Minimum completeness level for train to be sent:

Maximum truck waiting time on a station (hrs):

Avg auto delivery velocities

On short distance: On long distance:

Auto delivery costs

Per km: Per hour:

Per day:

Train properties

modules in a train: # cars in a module:

Rail costs

Locomotive cost per module per km:

Wagon cost per km:

Energy cost per module per km:

Infrastructure cost per module per km:

Trailer cost per day:

Base kWh cost:

Staff cost per module per km:

General properties

Global demand multiplier:

Global slot (trains/hour) multiplier:

Global train speed (km/hour) multiplier:

Simulation duration (days):

Warm-up duration (days):

Running mode:

Animation settings

show map

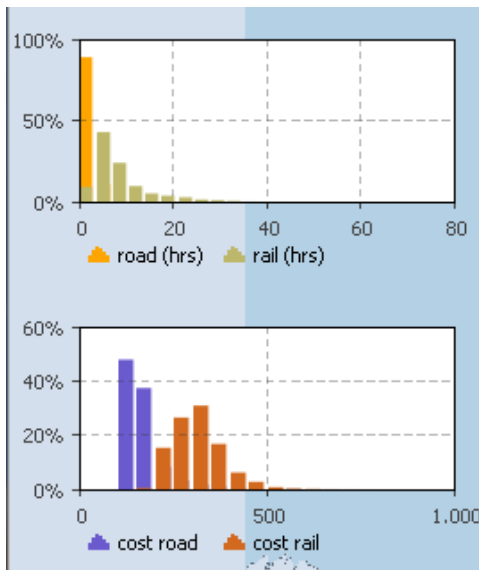
show waiting trucks

show segments trains

show segments utilization

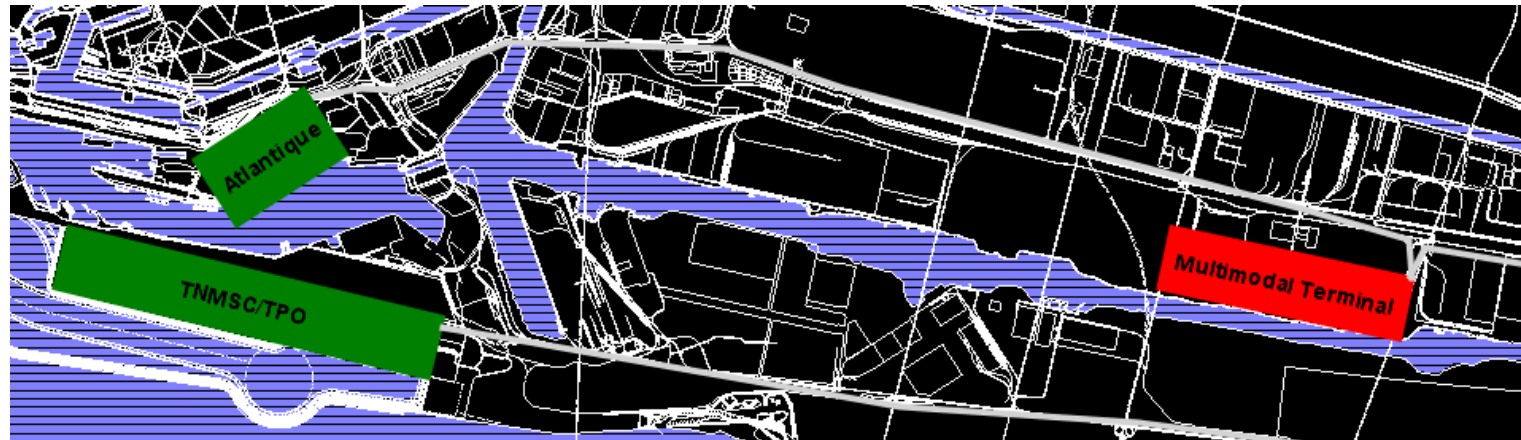
show waiting trains

- Flexible simulation based tool for complex analysis of transportation network
 - Costs adjustment
 - Changes to network structure
 - Different train assembling policies



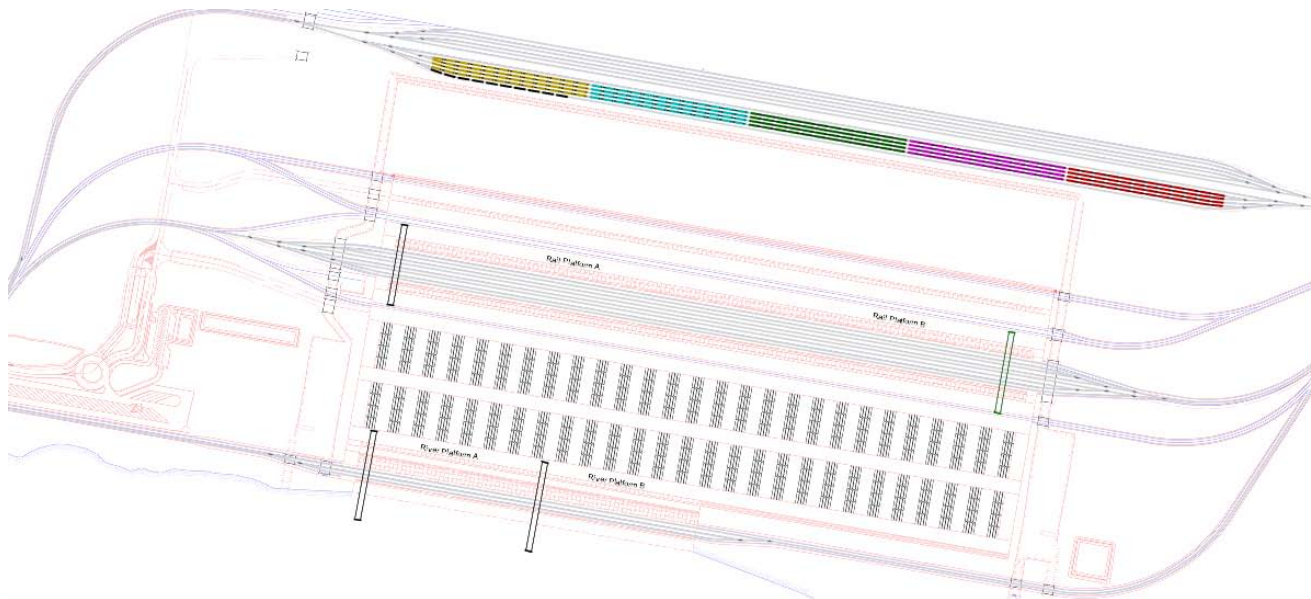
Port du Havre: Construction of new terminal

- New multimodal terminal supporting containers transfer between rail trains/river barges and sea transport
- Containers are transferred by shuttles, consisting of several rail cars



Port du Havre: Two scenarios

- Base scenario:
 - Passive cars driven by locomotives
- Advanced scenario:
 - Autonomous cars able to move without locomotives



Port du Havre: Goals of simulation

- Compare scenarios by:
 - Costs
 - QOS
- Identify internal network structure supporting desired throughput of the system

Questions