

October 1-4, 2002

3rd AMORE seminar
Testing the stability of the railnetwork



Presentation outline

- Capacity management
- Dutch situation
- Timetables
- Simulation model
- Case studies
- Conclusion/future

Capacity manager

- Capacity planning
- Capacity allocation
- Innovation
- (Safety)

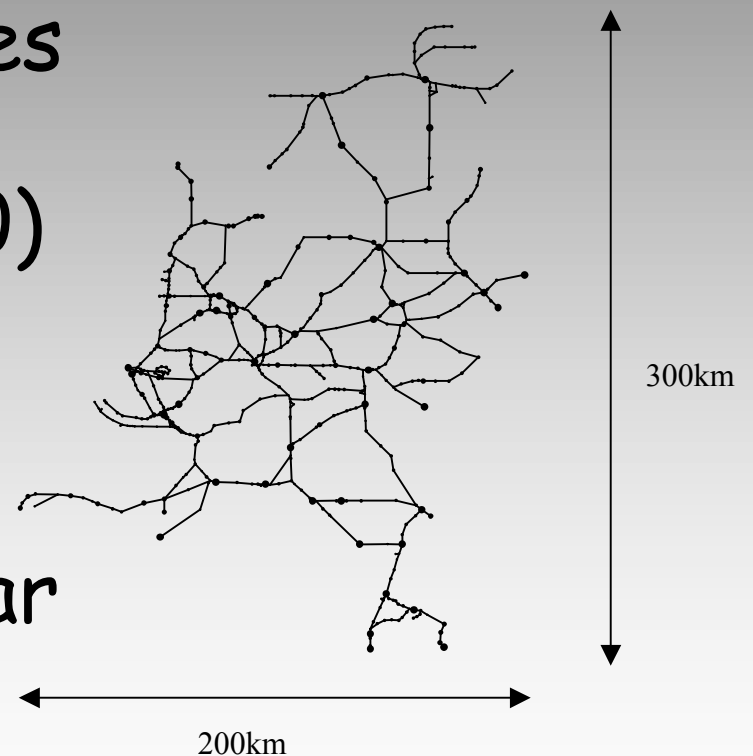
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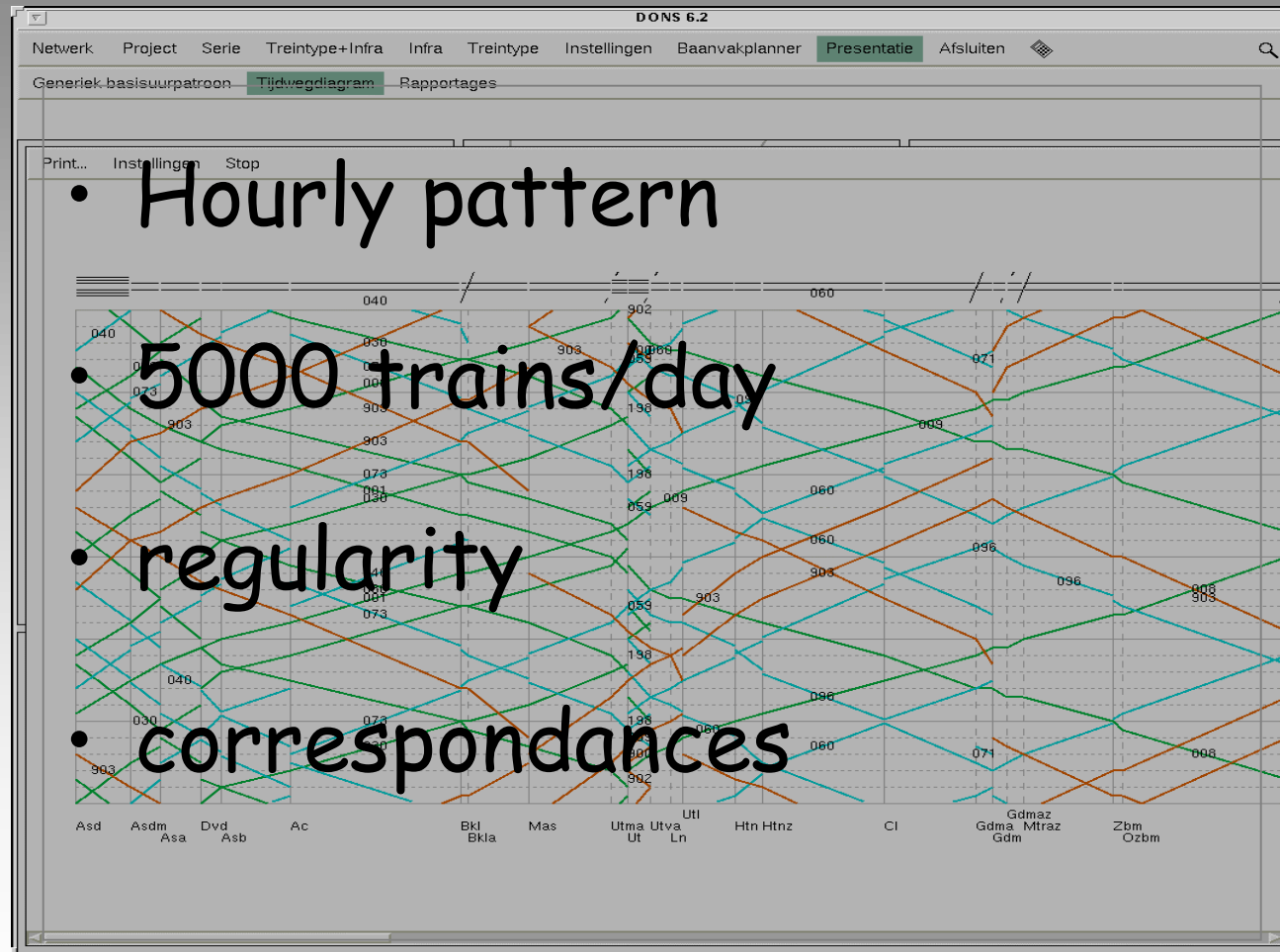


Dutch situation

- 2800 km track, 70 nodes
- 350 stations (up to 600)
- 1 mln passengers/day
- 15 bln passengerkm/year



Timetable



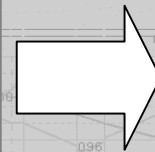
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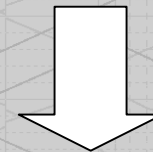


Timetable construction

Transport demand
Infrastructure network
Design standards



Timetable
generator
(DONS)



Timetable(s)



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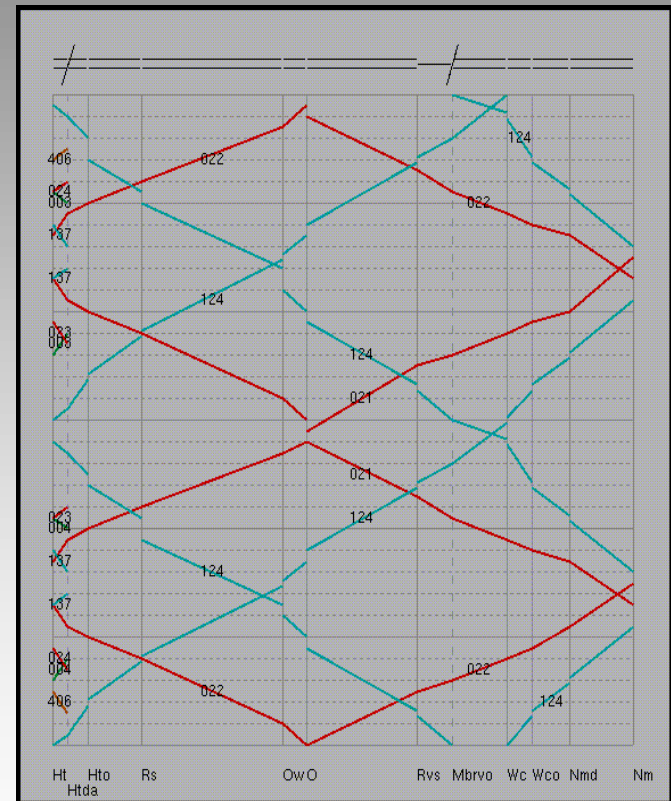
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Timetable quality

- Number of passengers
- Punctuality
- Delay propagation
- Delay reduction
- Stability



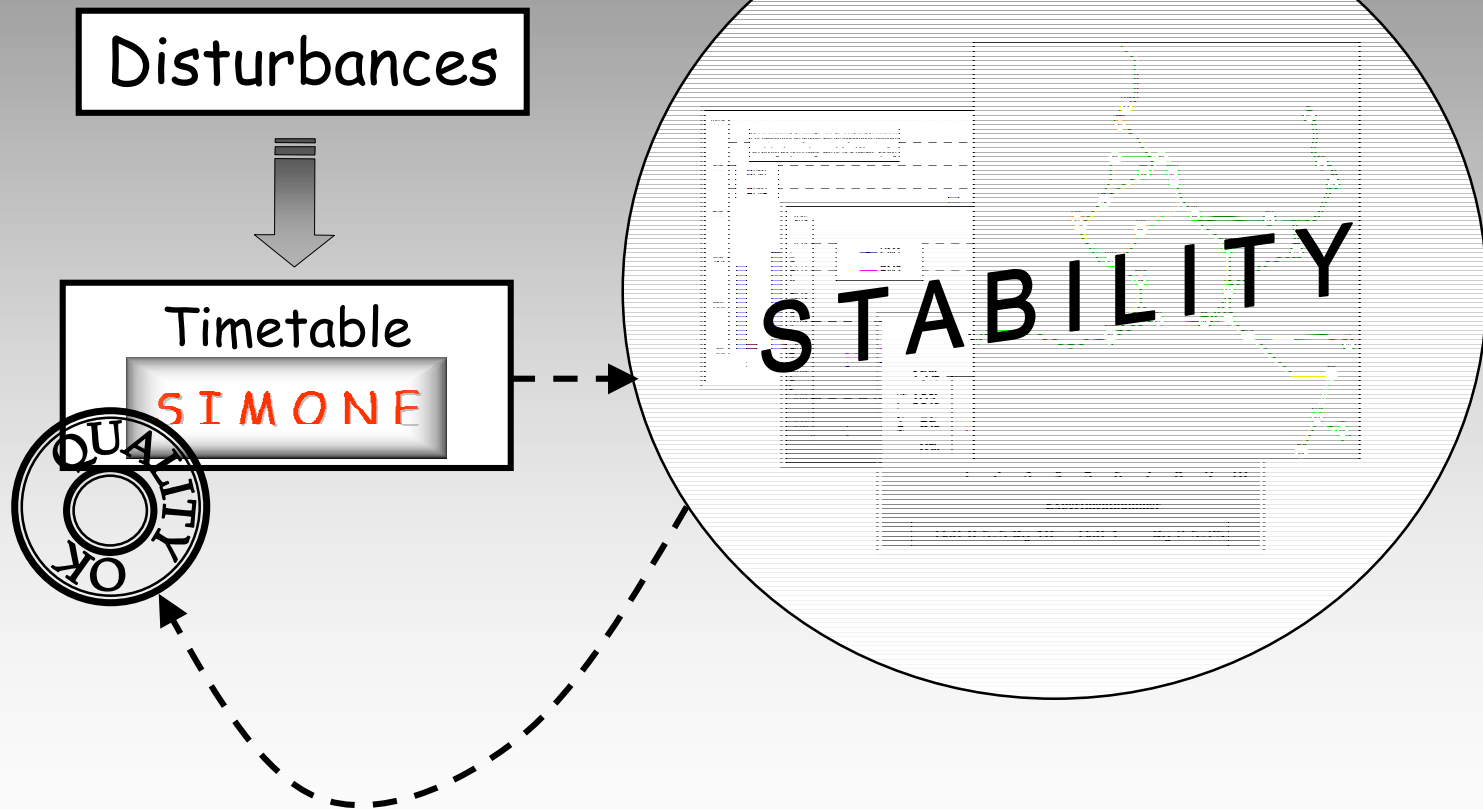
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Stability test



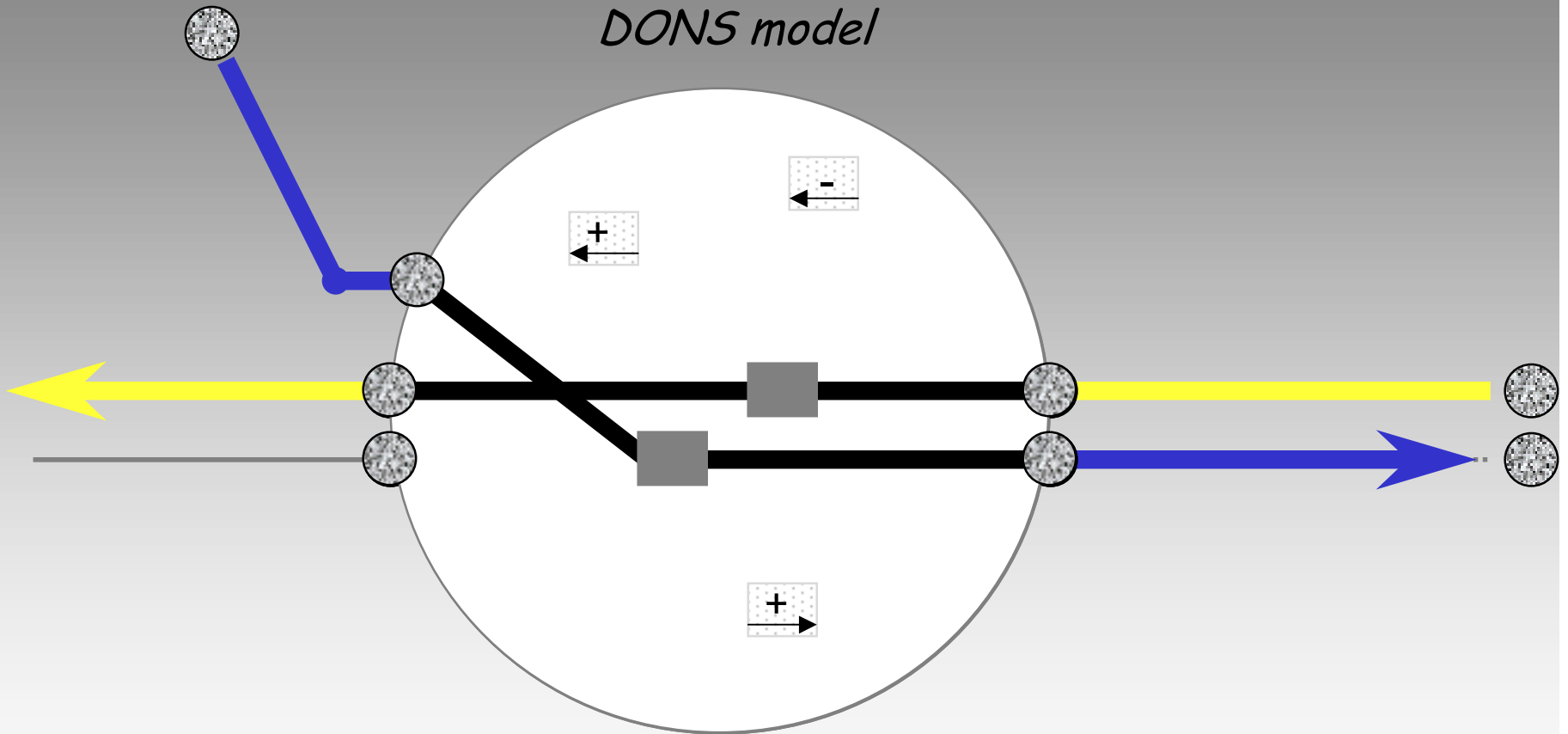
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Infrastructure

DONS model



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Timetable

- Planned processes

- Runningtimes
- Dwelltimes
- Headwaytimes
- Dependencies
- Recovery times

- Track allocation

Process

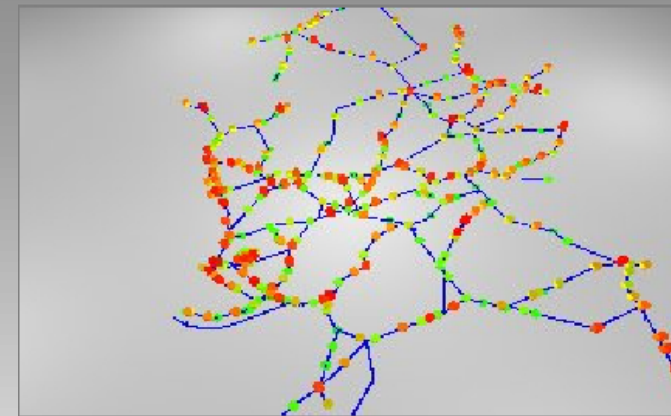
Planned time

minimum

buffer

Disturbances

- Noise
- One location
- Continuous/
temporarily
- Combinations
- Maintain plan

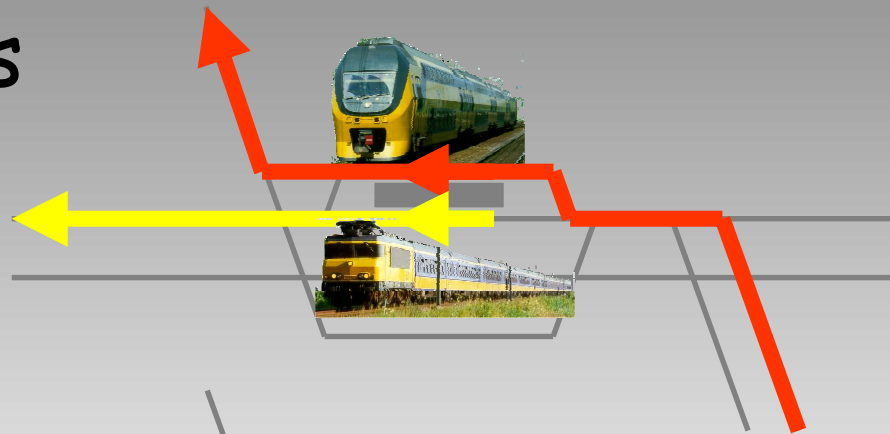


low  high
Delay

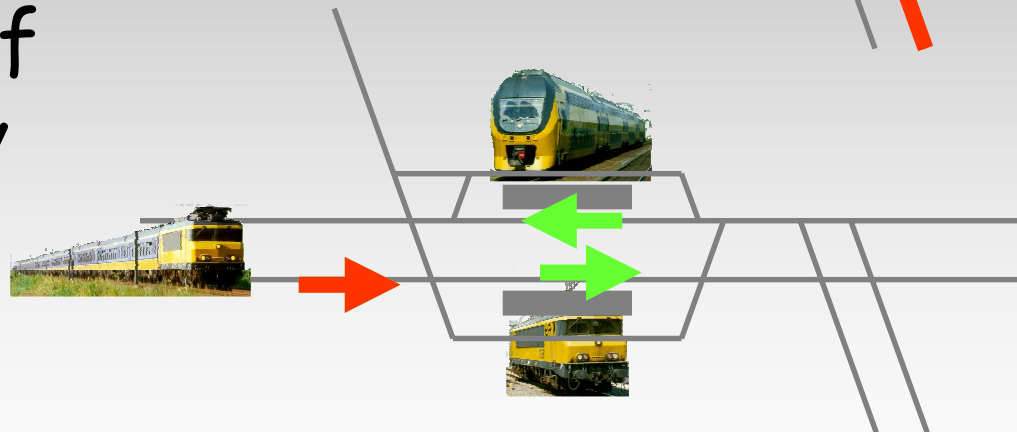


Delay propagation

- Correspondances

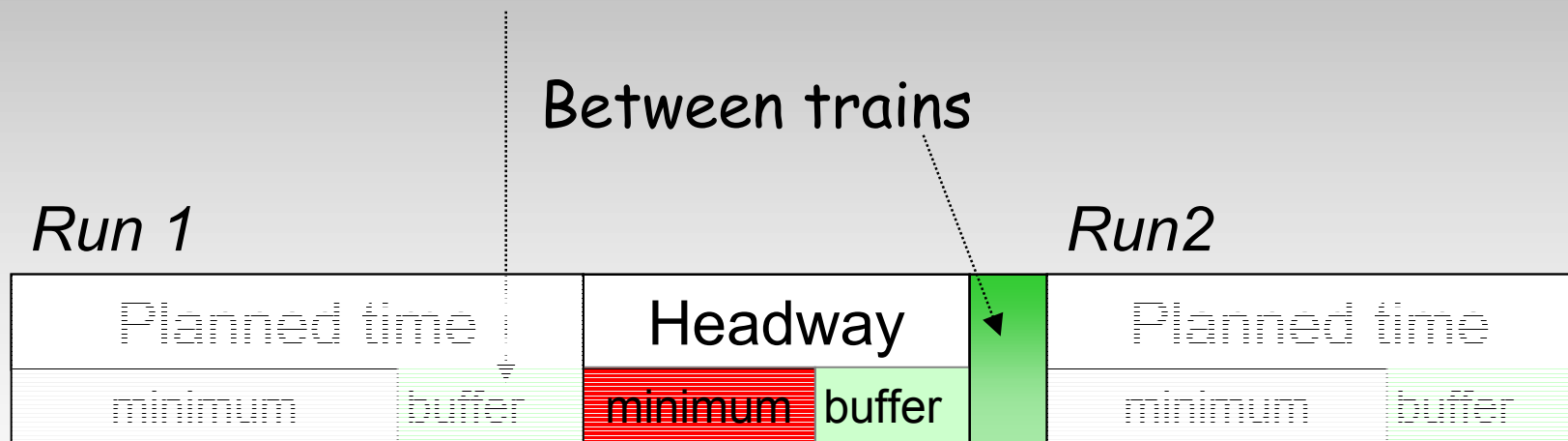


- Shared use of infracapacity

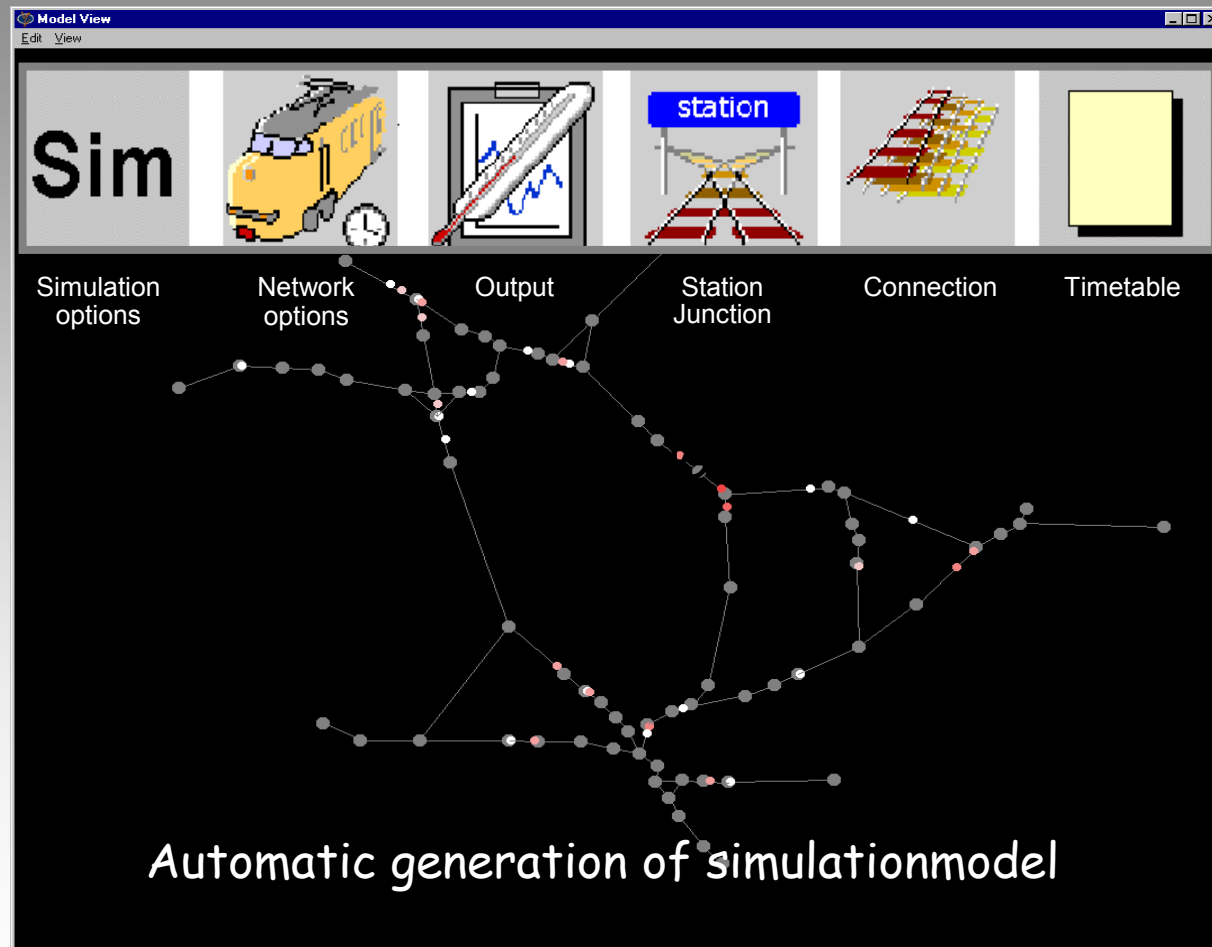


Handling delays

- Breaking correspondances
- Use of slack (running and dwell times)



Simulation model



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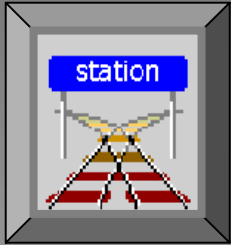
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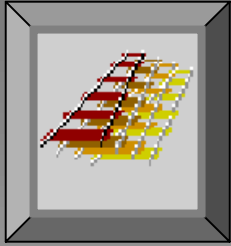
Network options

- Adjustments
 - headwaytimes
 - dwelltimes
 - use of recoverytime
 - ..
- Trainlines
- Sets



Station/junction

- Grey box
- Enter-/exitpoints
- Conflictdefinition
- Capacity
- Priority rules
- Local details



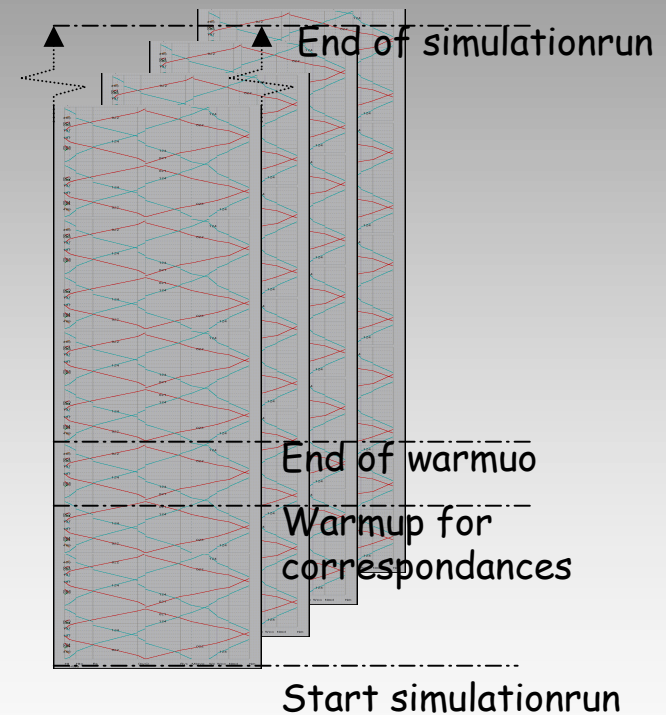
Track

- Connection A to B
- Number of tracks
- Capacity
- Local details



Simulation options

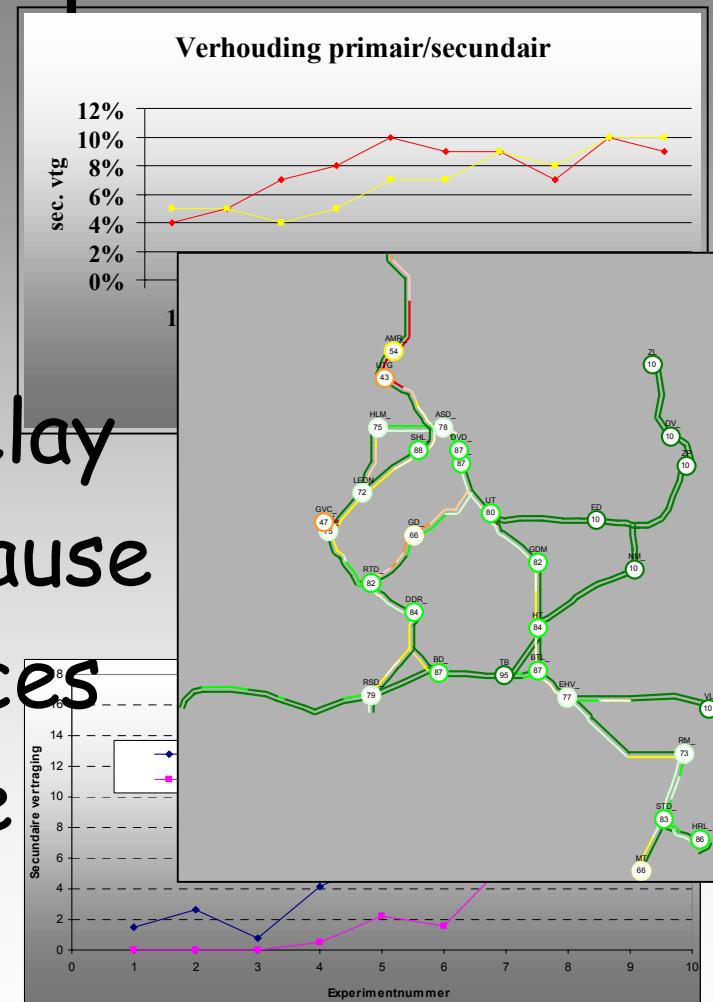
- Runlength
- Warmup period
- Number of runs



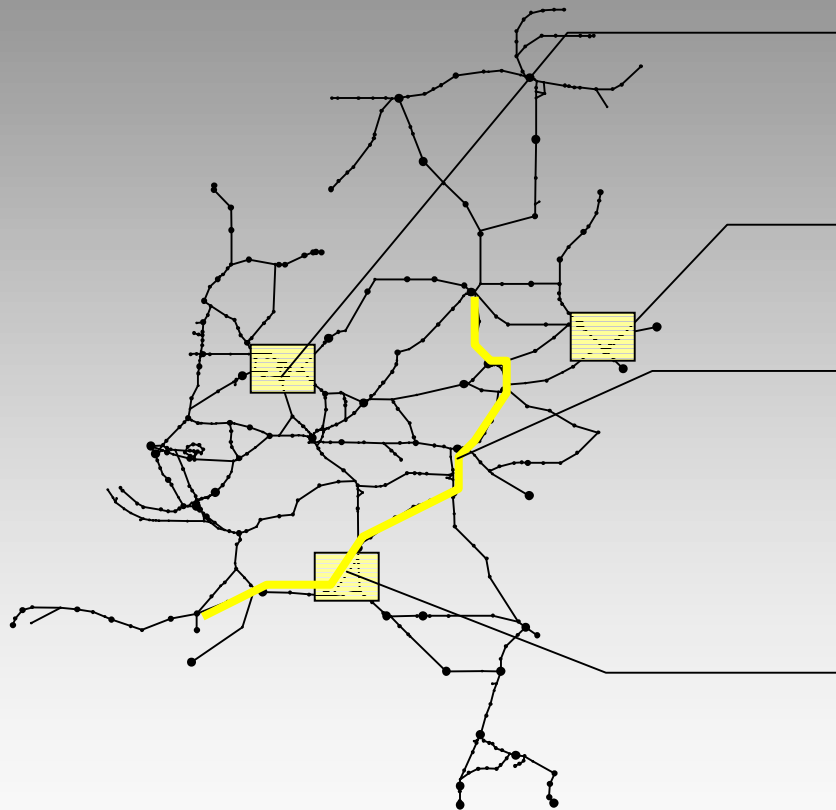


Output examples

- Average delays
- Use of recovery time
- Primary/secondary delay
- Secondary delay by cause
- Broken correspondances
- Network performance



Case studies



Correspondances
Weesp

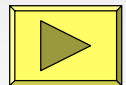


Conflict Hengelo



Breaking
trainlines
IJssellijn

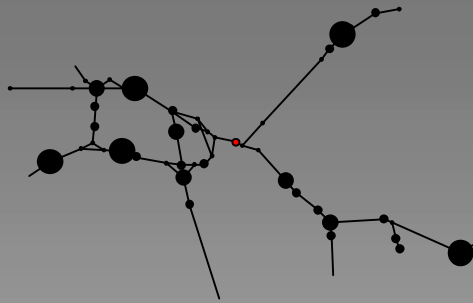
Extra freight
trains



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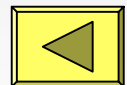
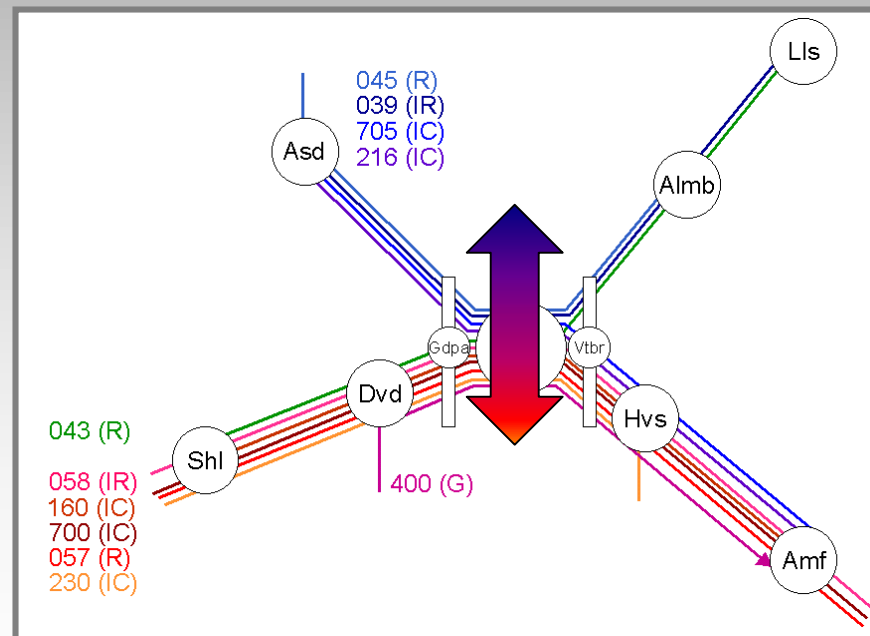
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Case Weesp

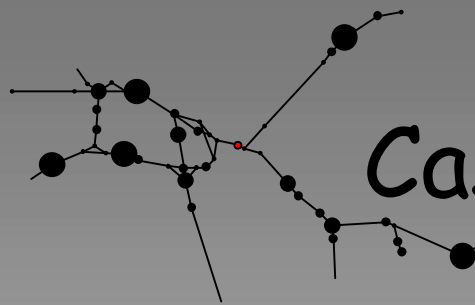
- Sensitivity network performance
- Waiting for correspondances 0 or 3_{min}.



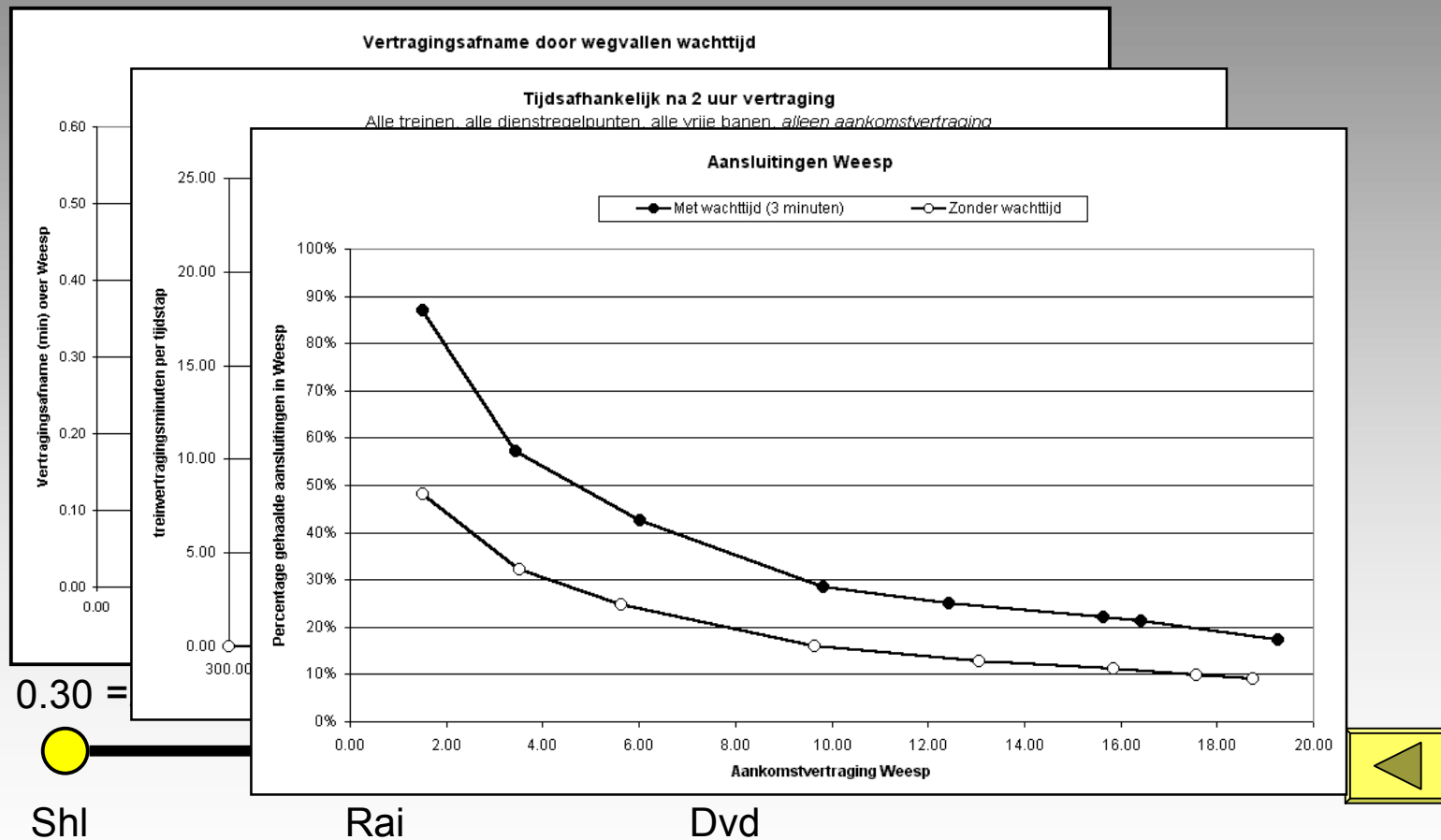
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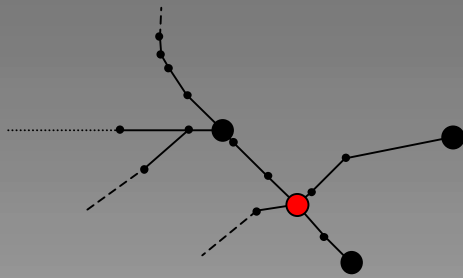
Case Weesp Results



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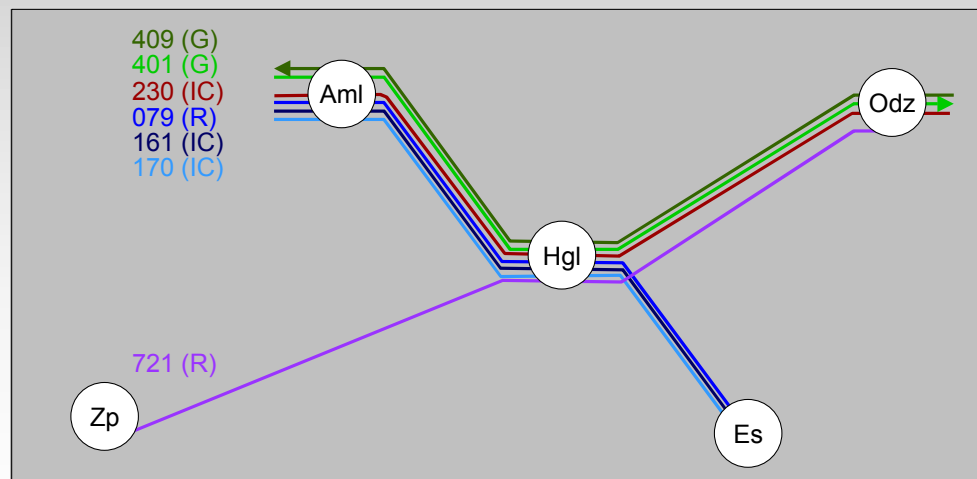
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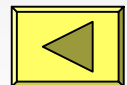
Case Hengelo

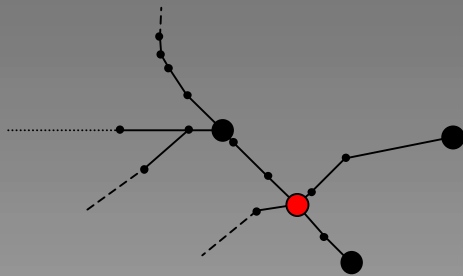
- Simultaneous station exit
- Correspondance
- Tight turnaround (Odz)



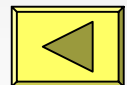
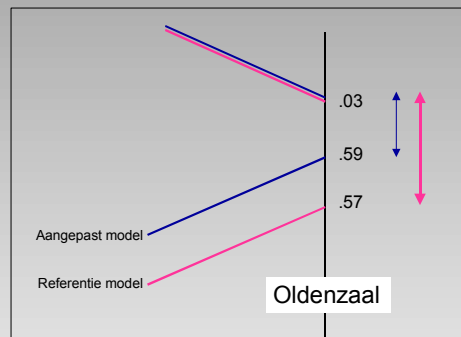
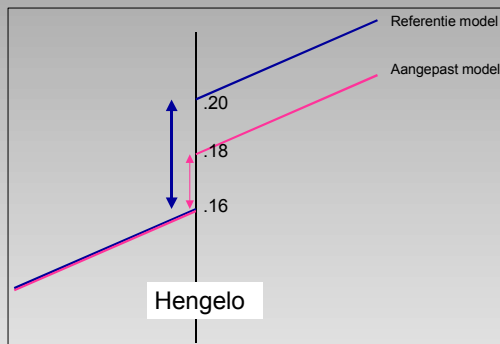
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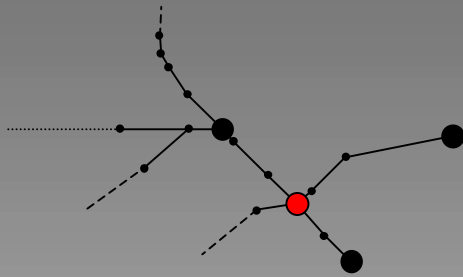
Case Hengelo



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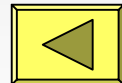
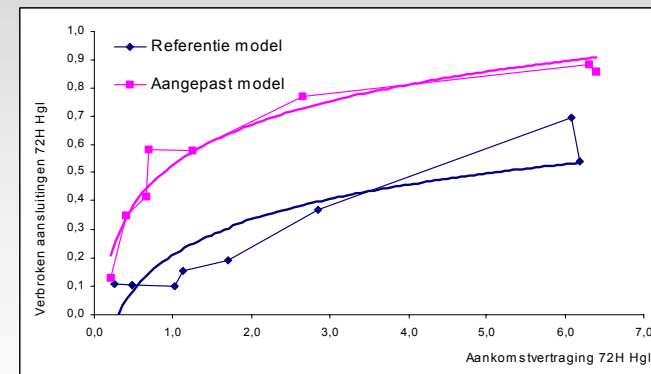
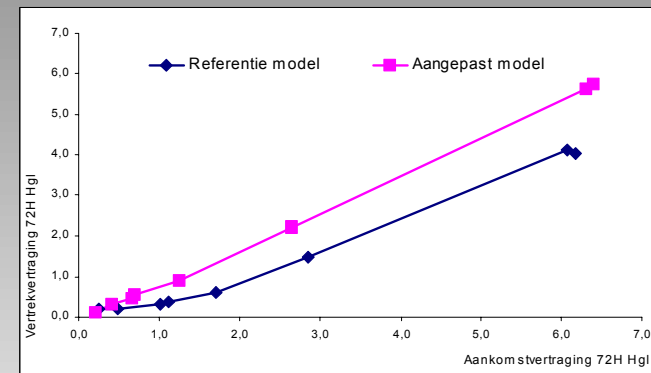
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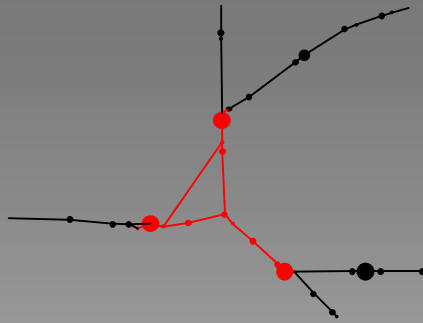




Case Hengelo

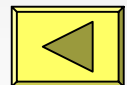
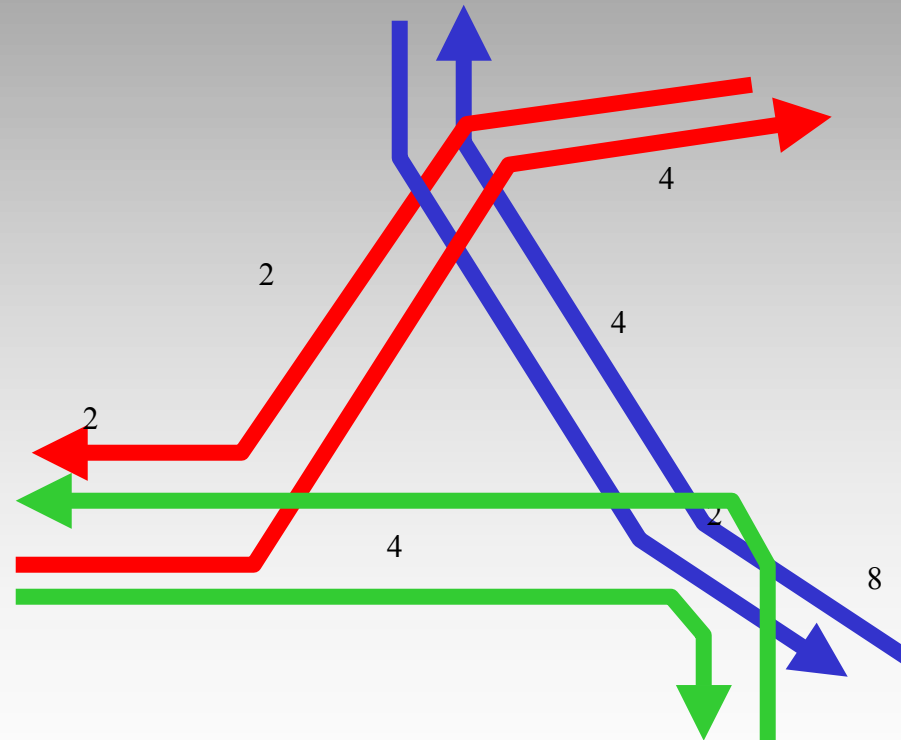
- Trainline 72 delay shift from Odz to Hgl
- Correspondances more often broken
- Local effects





Case Triangle

- Introducing 6 freight trains

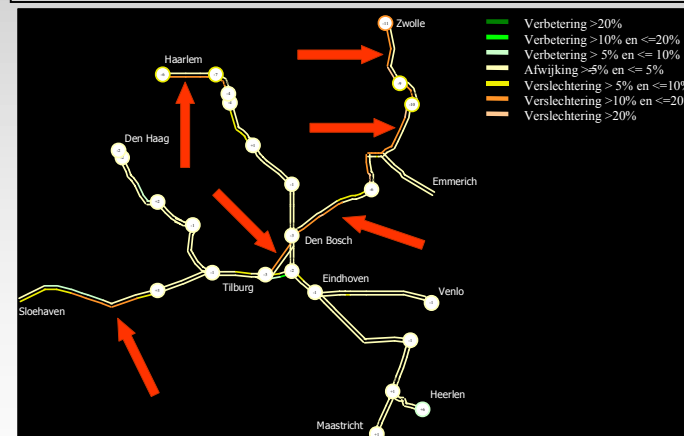
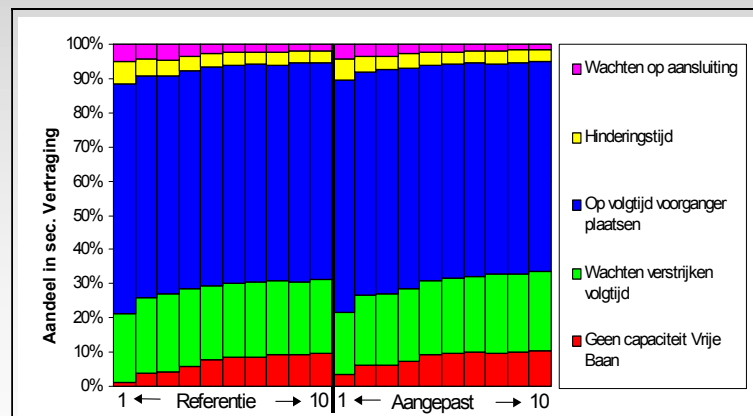
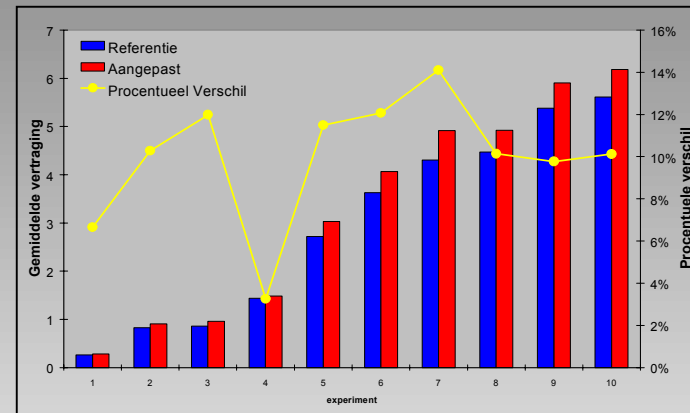
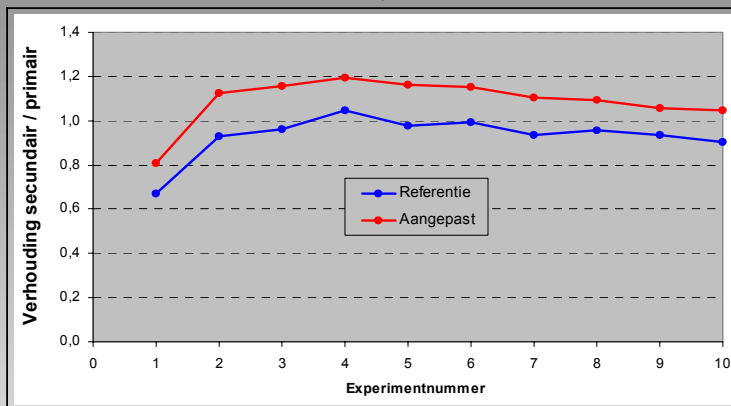


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Case Triangle



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Conclusion/future developments

- Transparent and objective
 - Improvement knowledge
 - Tracing bottlenecks
-
- Adopted by Capacity Allocation
 - Integration in annual timetable audit