

# An Agent Based Travel Assistant for the Dutch Railway Company

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# Outline

- Problem definition
- Distributed agent based communication system
- Design of the Personal Intelligent Travel Assistant
- Experiments
- Conclusion



# Artistic impression of seamless multimodal transport , using Personal Intelligent Transport Assistant



PITA provides info about Start and Arrival times of trains, busses, planes etc.

Pita is able to plan a multimodal route

# Bulletin Board of time tables of trains

## Arrivals for Utrecht Centraal station

This are trains that have already arrived (up to 30 minutes ago) or will arrive in the next 60 minutes  
See also [live departures for Utrecht Centraal](#).

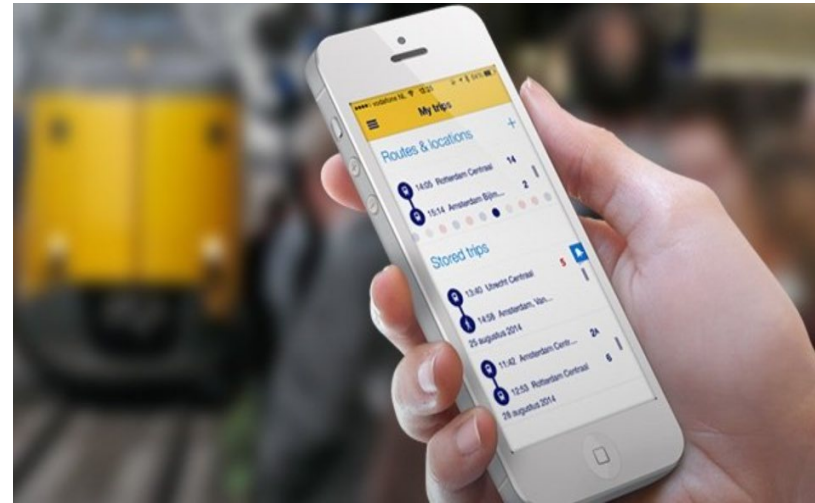
● live

**14:59 +47** ICE International from **Frankfurt (M) Hbf**  
126 via Frankfurt Flugh., Köln Hbf, Düsseldorf Hbf, Duisburg Hbf  
⚠ Delayed due to excessive delay abroad

**15:12** Intercity from **Enkhuizen**  
3953 via Hoorn, Sloterdijk, Amsterdam C., Amstel

**15:12** Intercity from **Rotterdam Centraal**  
653 via Alexander, Gouda

# Digital info of time tables displayed on a smart phone app of Dutch Railway



[Travel information](#) [Products](#) [Customer Service](#) [More about NS](#)

[Mijn NS](#)

Zoetermeer Oost  X ↔  Kerkrade Centrum X

Departure  Arrival  Today  15:13  Now  Travel options

Choose with which transport you travel.

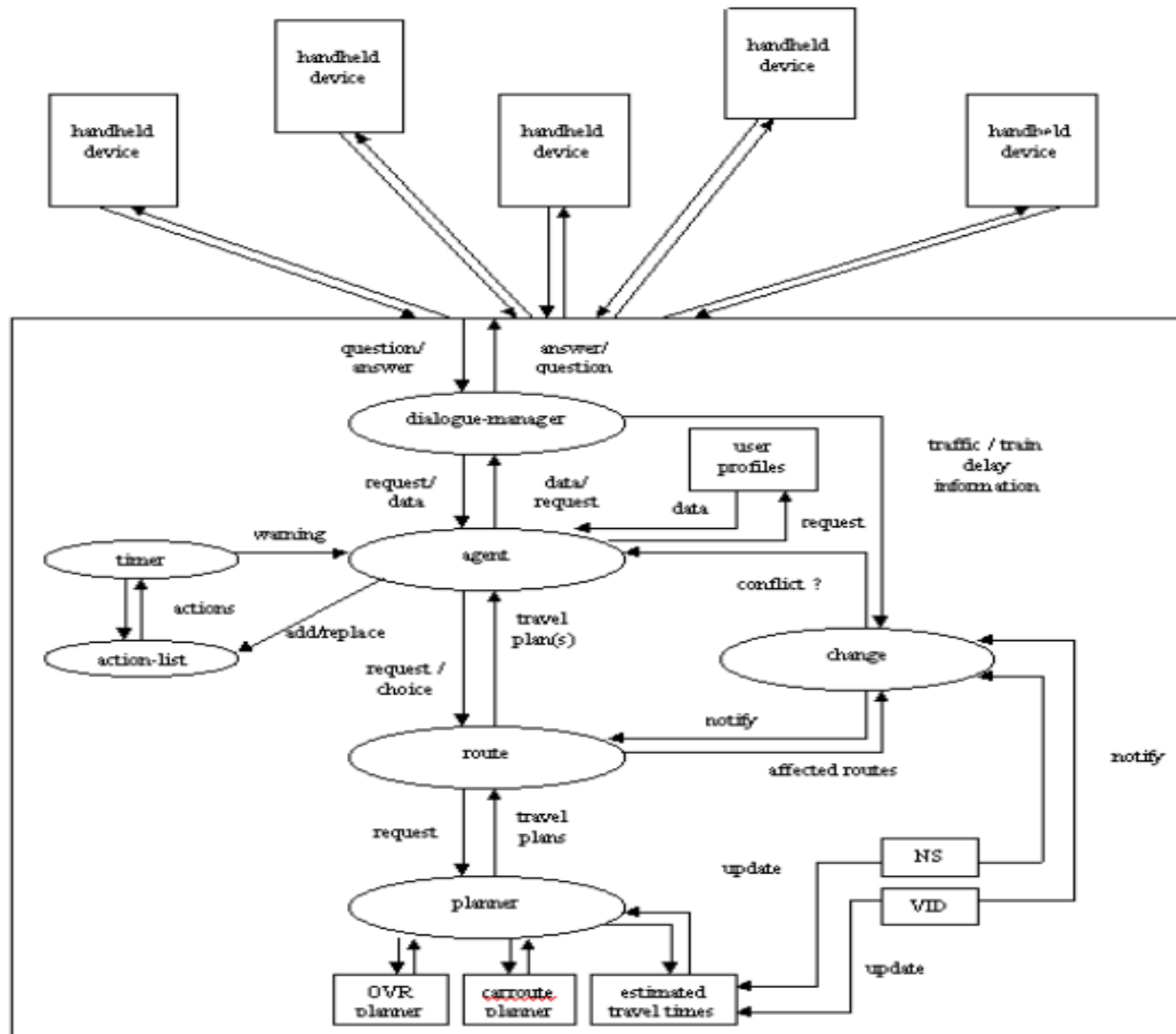


# How to combine PITA systems for different railway providers

- NS (Netherlands Dutch Railway provider) is the main exploiter of the Dutch Railway network
- New companies exploiting different parts of the network
- How to provide scheduling and info such that traveller can seamless switch from one company to the other
- Test systems in a simulation environment

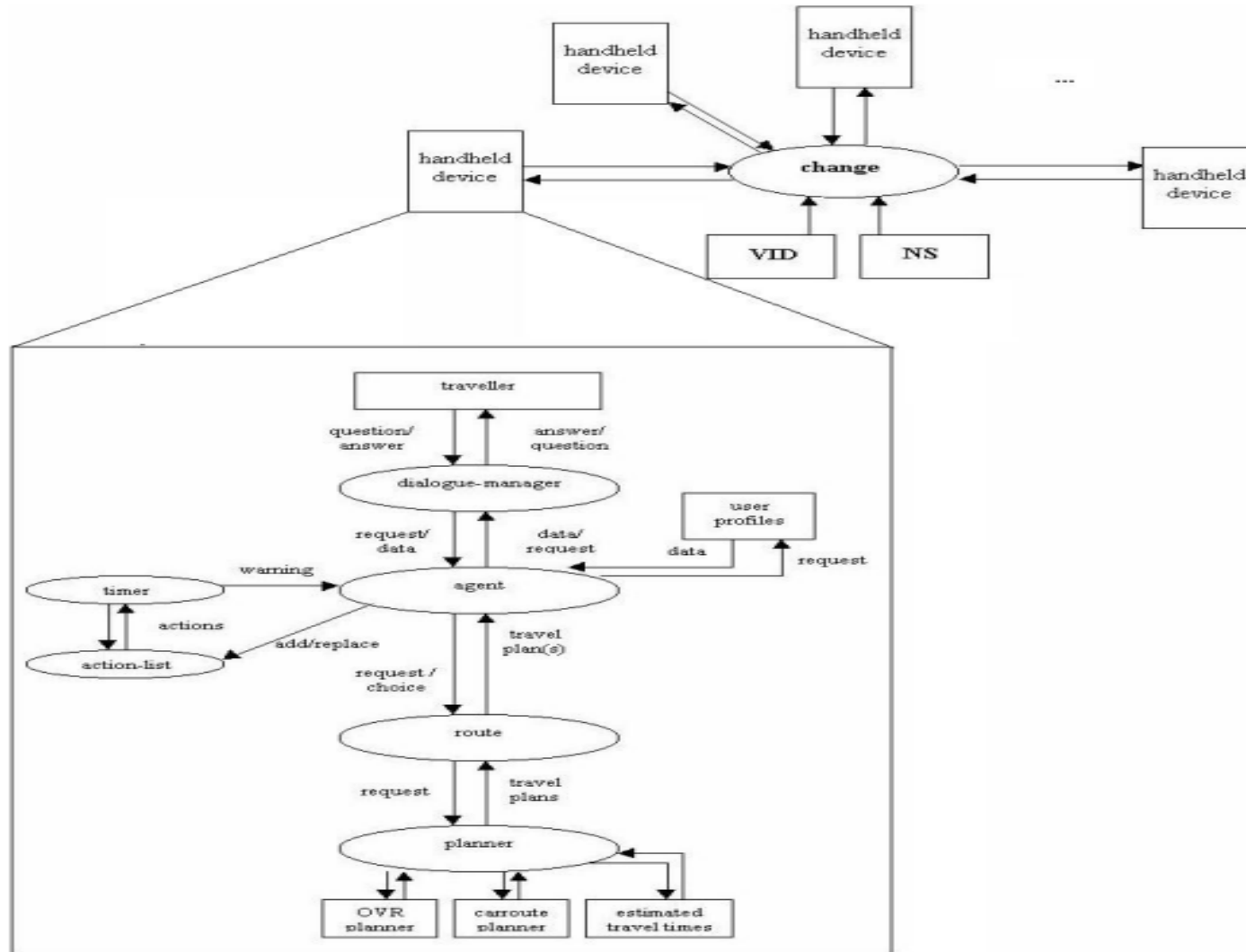


# Architecture of centralized PITA system



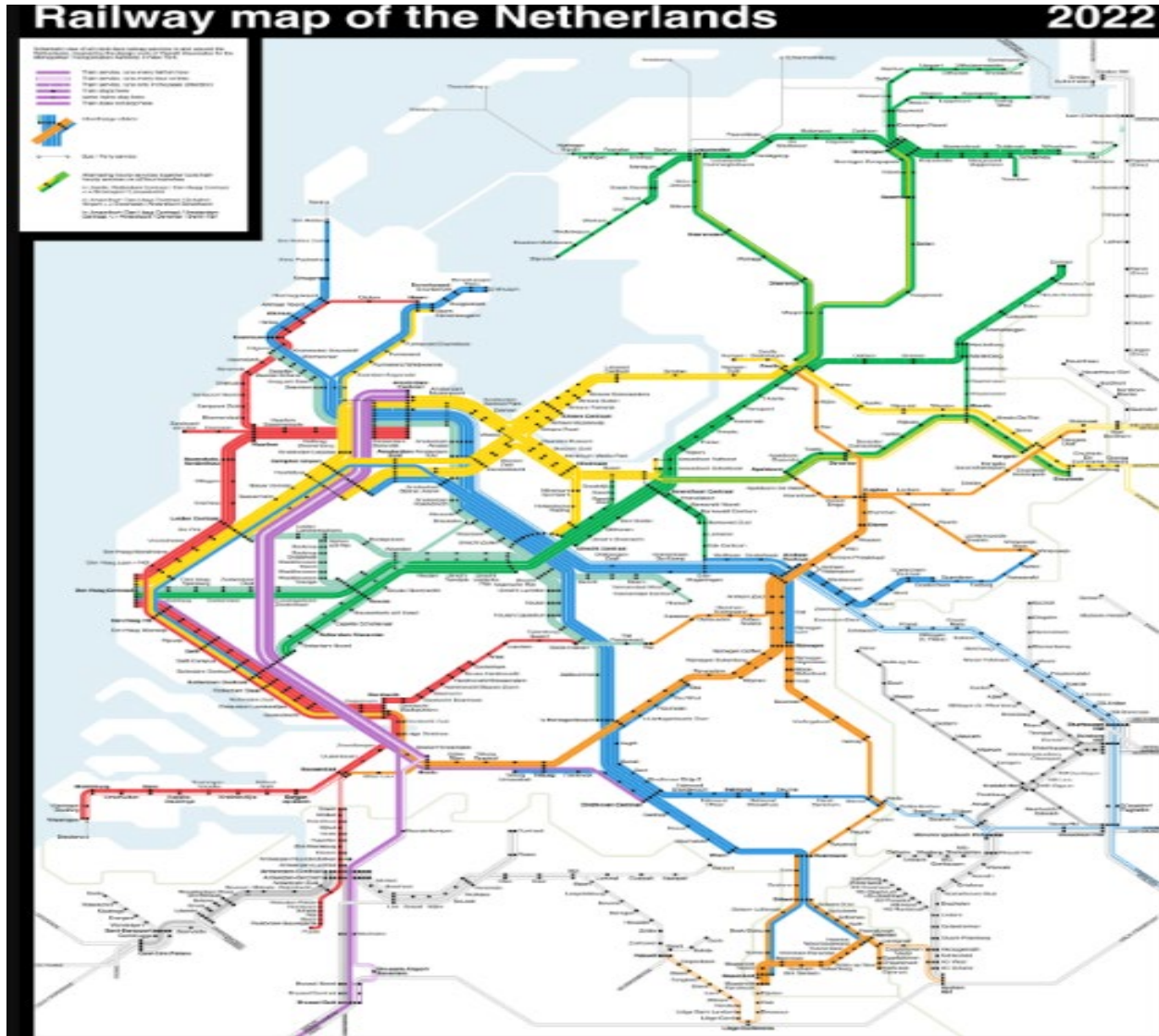


# Architecture of a de-centralized PITA





# Railway map of the Netherlands



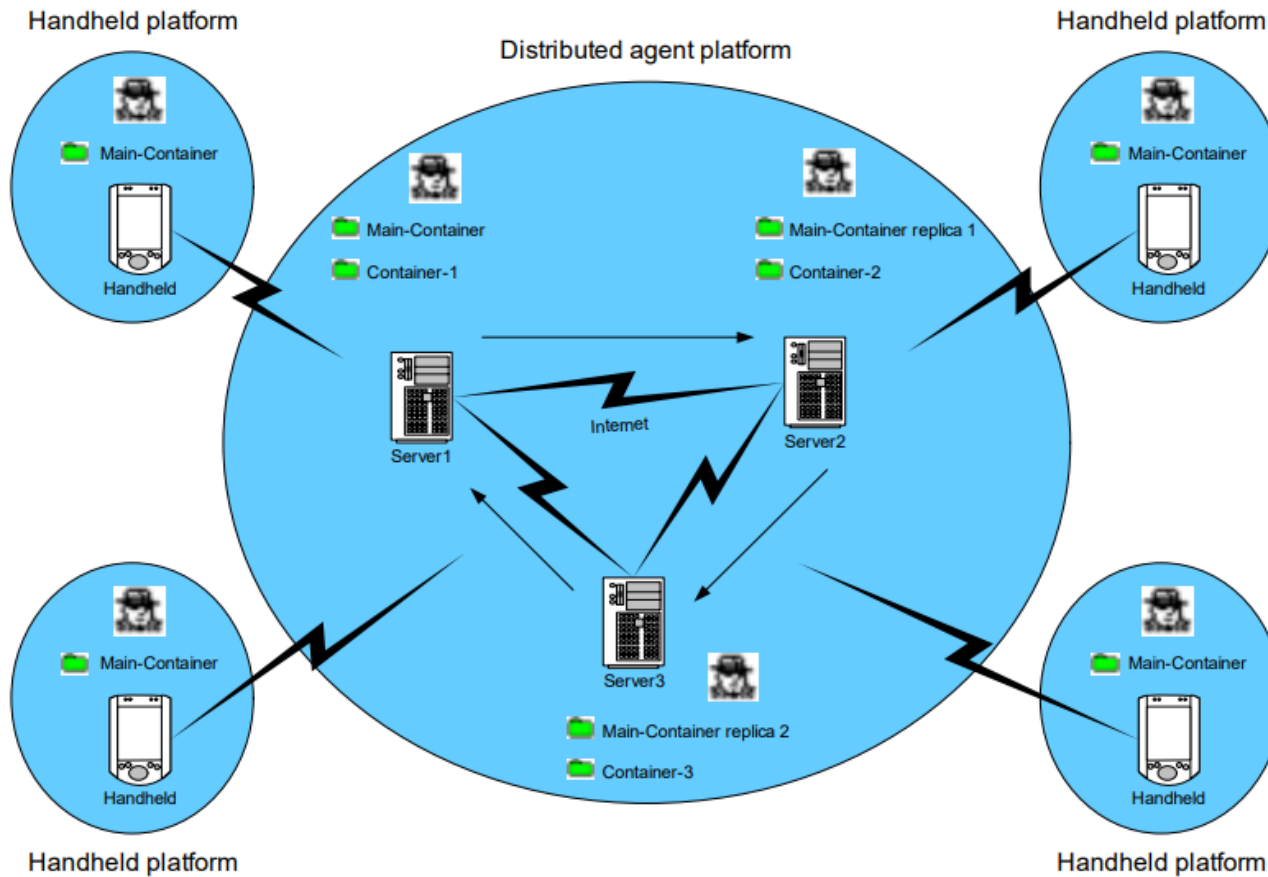
# Combination of different railway providers

- Backbone of the railwaysystem still exploited by NS.
- At some railway stations traveller have to switch to a network exploited by different company
- How to design a common time table system for different companies?

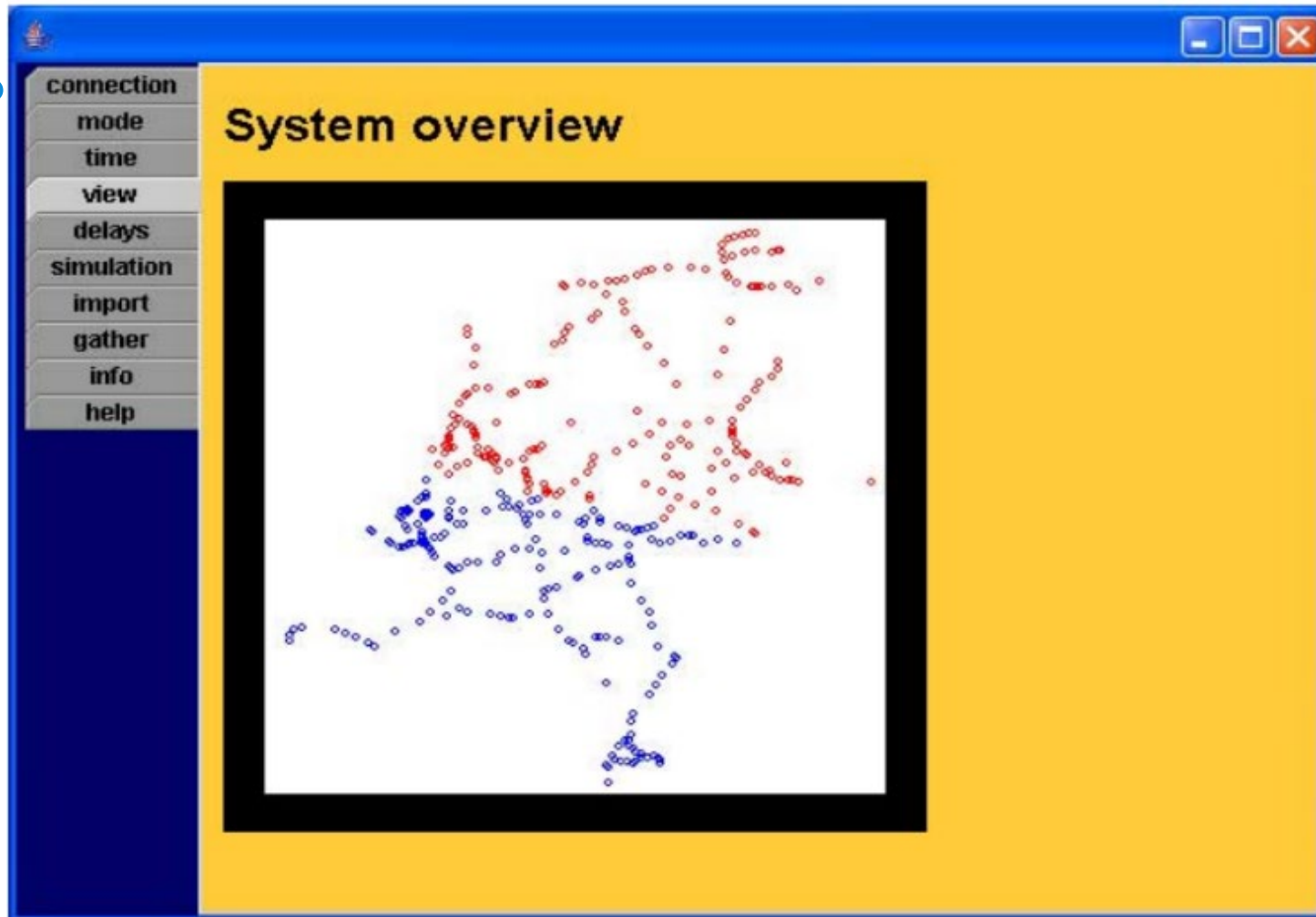
# Simulation of a train system, to test different time table systems

- DUNET algorithm designed by Tulp and co.
- Given the railway tracks, requested frequencies of trains, priority of trains, time tables are generated
- Alternative planning train schedules by Schrijver and Olsder using max-plus algebras

# Distributed agent Platform



# Region division between multiple Train Providers





# Display of a routeplan of sharing different providers



The screenshot shows a software window with a blue title bar and a yellow background. The window has a menu bar with the following items: Start parameters, Advise, Plan, Graphics, and Preferences. The main content area is titled "The route plan:" and contains a list of train segments. A blue Ethernet cable is visible in the bottom right corner of the image.

**The route plan:**

- 10:18 Delft platform 1, Stoptrein 5126 to Rijswijk arriving at 10:22 platform 3.
- 10:22 Rijswijk platform 3, Stoptrein 5126 to Den Haag Moerwijk arriving at 10:25 platform 3.
- 10:25 Den Haag Moerwijk platform 3, Stoptrein 5126 to Den Haag HS arriving at 10:29 platform 5.
- 10:29 Den Haag HS platform 5, Stoptrein 5126 to Den Haag Centraal arriving at 10:33 platform 1.
- 10:38 Den Haag Centraal platform 5, Intercity 537 to Voorburg arriving at 10:42 platform 2.
- 10:43 Voorburg platform 2, Intercity 537 to Utrecht Centraal arriving at 11:16 platform 11b.
- 11:22 Utrecht Centraal platform 11a/b, Intercity 537 to Amersfoort arriving at 11:36 platform 1.
- 11:38 Amersfoort platform 1, Intercity 537 to Zwolle arriving at 12:15 platform 3a/b.
- 12:17 Zwolle platform 3a/b, Intercity 537 to Assen arriving at 12:57 platform 3.
- 12:58 Assen platform 3, Intercity 537 to Groningen arriving at 13:15 platform 3b.
- 13:31 Groningen platform 1a, Stoptrein 30539 to Groningen Noord arriving at 13:35 platform 1.

*Questions ??*