Feed forward mechanism in public transport

Data driven optimisation

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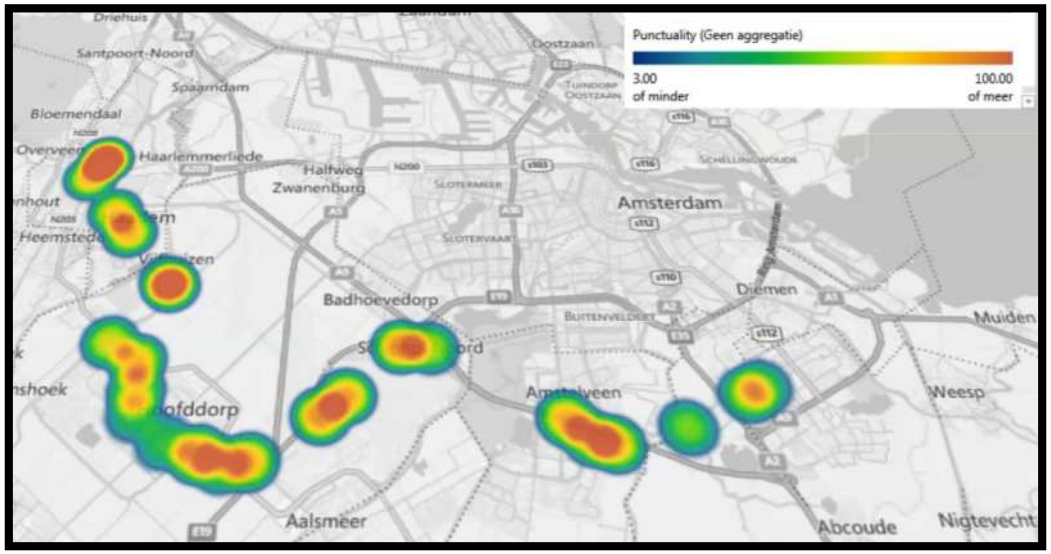


EMTA Meeting
London, TfL
October 2014

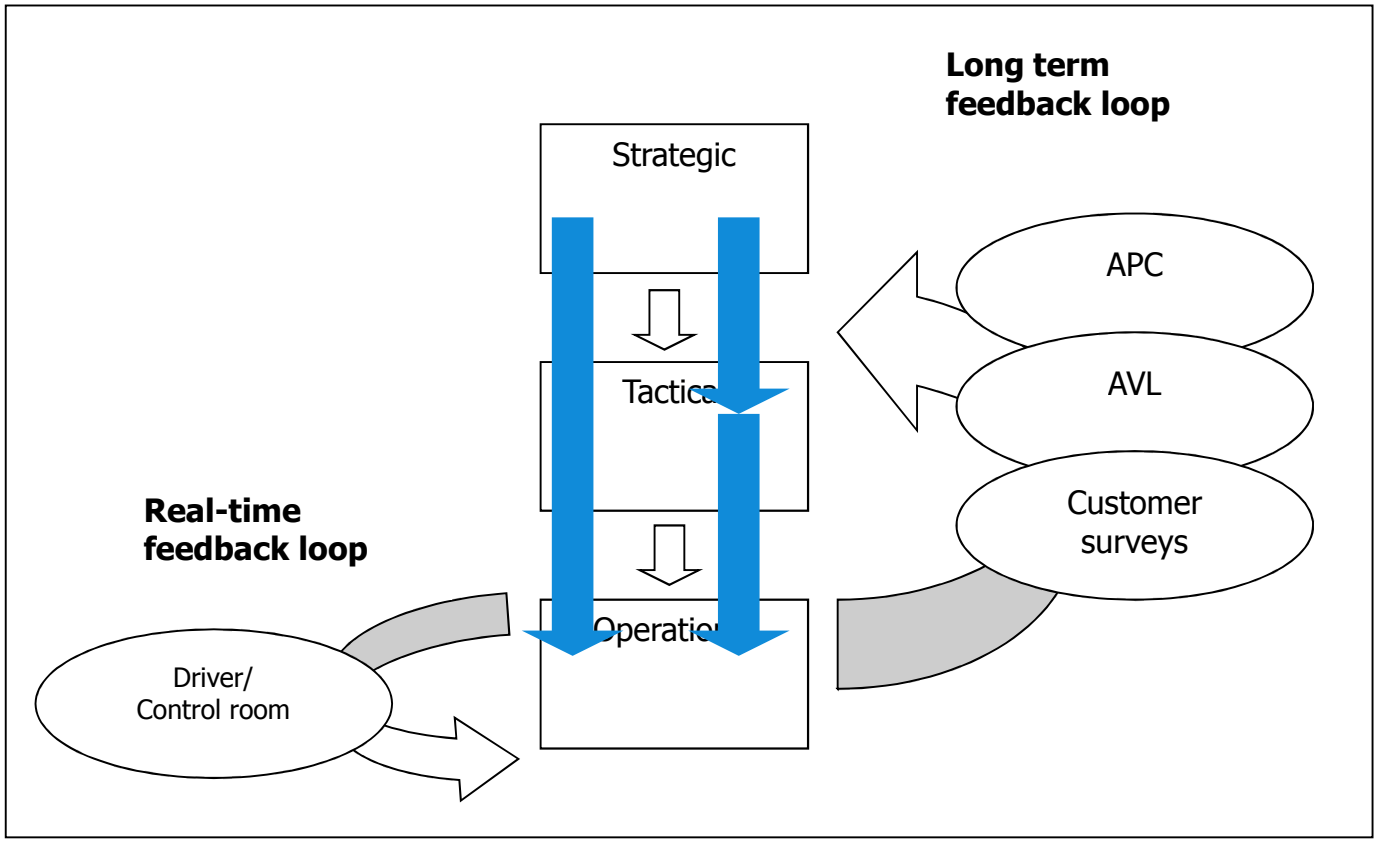
Developments in industry

- Focus on cost efficiency
- Customer focus
- Enhanced quality

Main challenges:
Increasing cost efficiency
Increasing customer experience
Motivating new strategic investments

- Data enable achieving objectives

Operations and feedback



Data sources

GSM data; tracking travellers
- Potential public transport services

Vehicle data (AVL); tracking vehicles
- Evaluating and optimizing performance

Passenger data (APC); tracking passengers
- Evaluating and optimizing ridership and passengers flows

WiFi, Bluetooth, video data
- Tracking pedestrian flows

Combining data sources (APC and AVL)
- Service reliability from a passenger perspective

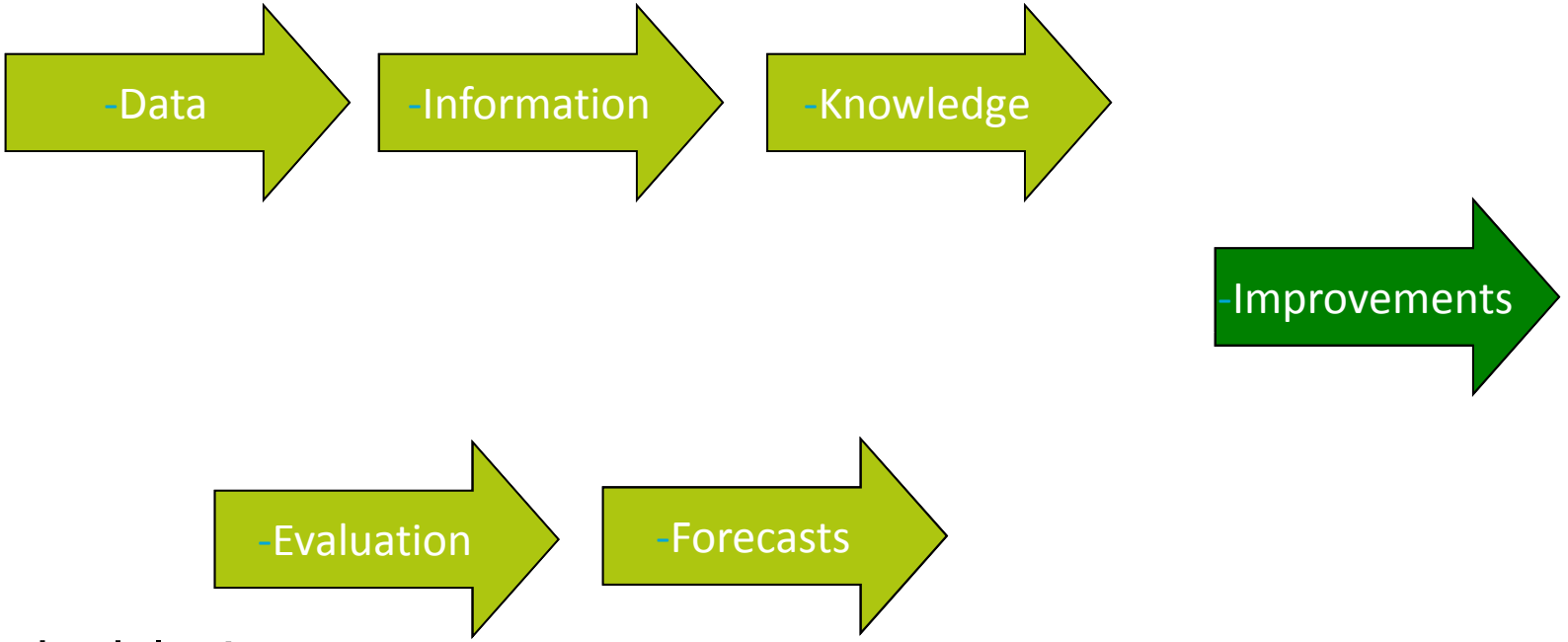
The potential benefits

Optimizing network and timetable design:

The Netherlands:
Potential cost savings: > €50 million

- Utrecht: € 400.000 less yearly operational costs
- The Hague: 5-15% increased ridership
- Amsterdam: ~10% increased cost coverage
- Tram Maastricht:> €4 Million /year social benefits
- Light rail Utrecht: : €200 Million social benefits

The challenge



- New methodologies
- Proven in practice

Applied examples

- Monitoring and predicting passenger numbers: Whatif

- Vehicle performance and service reliability

Quantifying benefits of enhanced service reliability in public transport
Van Oort, N. (2012)., Proceedings of the 12th International Conference on Advanced Systems for Public Transport (CASPT12),

Santiago, Chile.

- **Optimizing planning and real time control**
Van Oort, N. and R. van Nes (2009), Control of public transport operations to improve reliability: theory and practice, Transportation research record, No. 2112, pp. 70-76.

- **Optimizing synchronization multimodal transfers**
Lee, A. N. van Oort, R. van Nes (2014), Service reliability in a network context: impacts of synchronizing schedules in long headway services, TRB

- **Improved scheduling**
Van Oort, N. et al. (2012). The impact of scheduling on service reliability: trip time determination and

holding points in long-headway services. Public Transport, 4(1), 39-56.

Smartcard data (1/2)

The Netherlands
- OV Chipkaart
- Nationwide (since 2012)
- All modes: train, metro, tram, bus
- Tap in and tap out
- Bus and tram: devices are in the vehicle

Issues
- Privacy
- Data accessibility via operators

Data
- 19 million smartcards
- 42 million transactions every week
- Now starting to use the data

Smartcard data (2/2)

- Several applications of smartcard data (Pelletier et. al (2011). Transportation Research Part C)

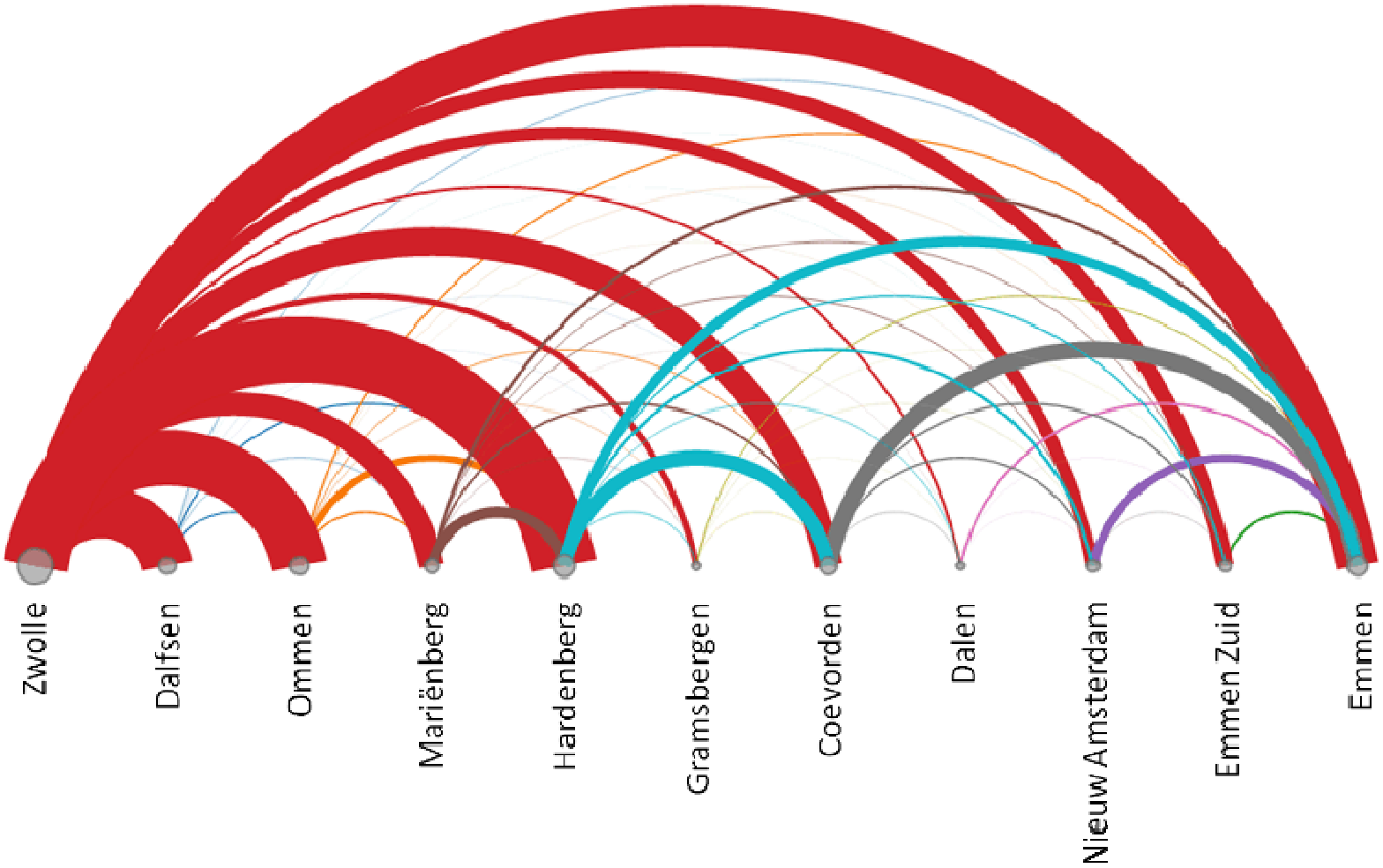
Our research focus:

Connecting to transport model
- Evaluating history
- Predicting the future

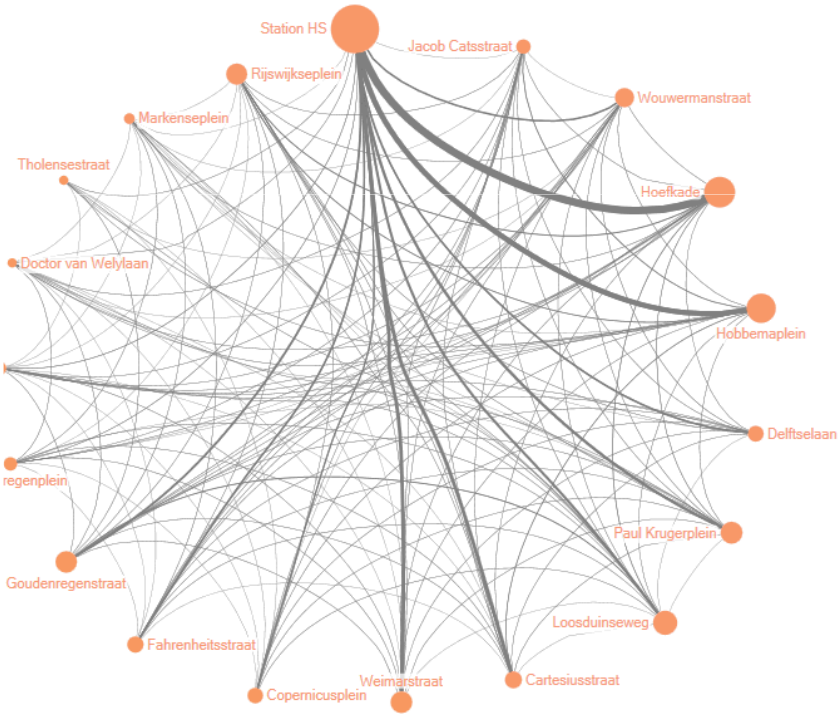
OmniTRANS
Transport Planning Software

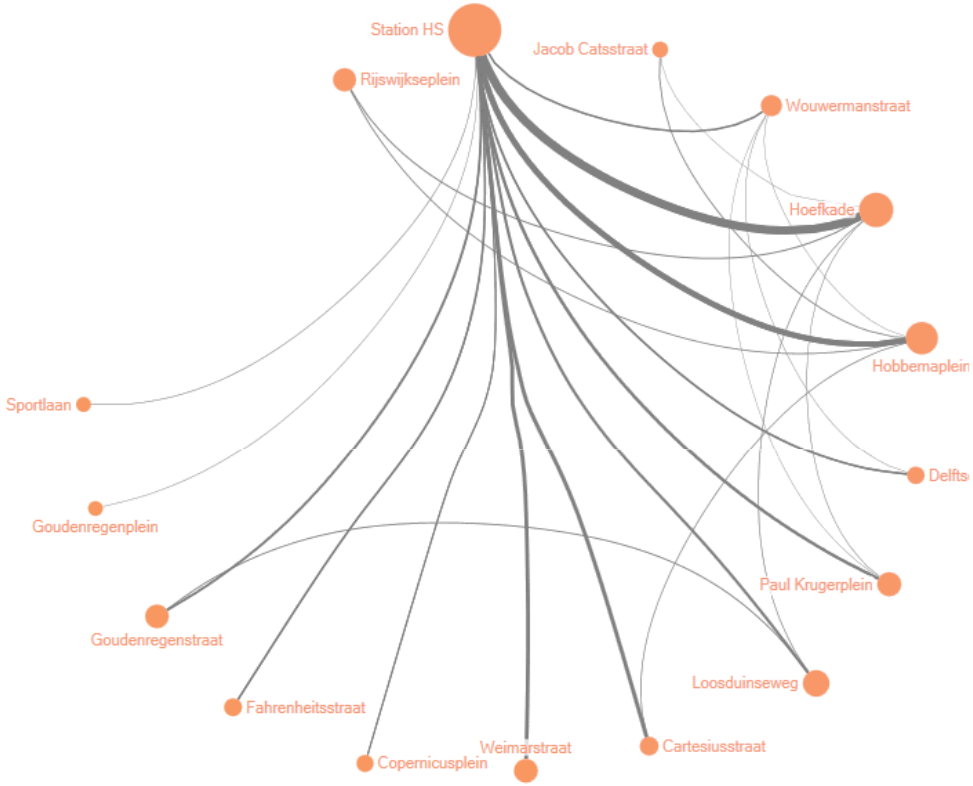
- Whatif scenario's
  - Stops: removing or adding
  - Faster and higher frequencies
  - Route changes
- Quick insights into
  - Expected cost coverage
  - Expected occupancy

Origin Destination Matrix



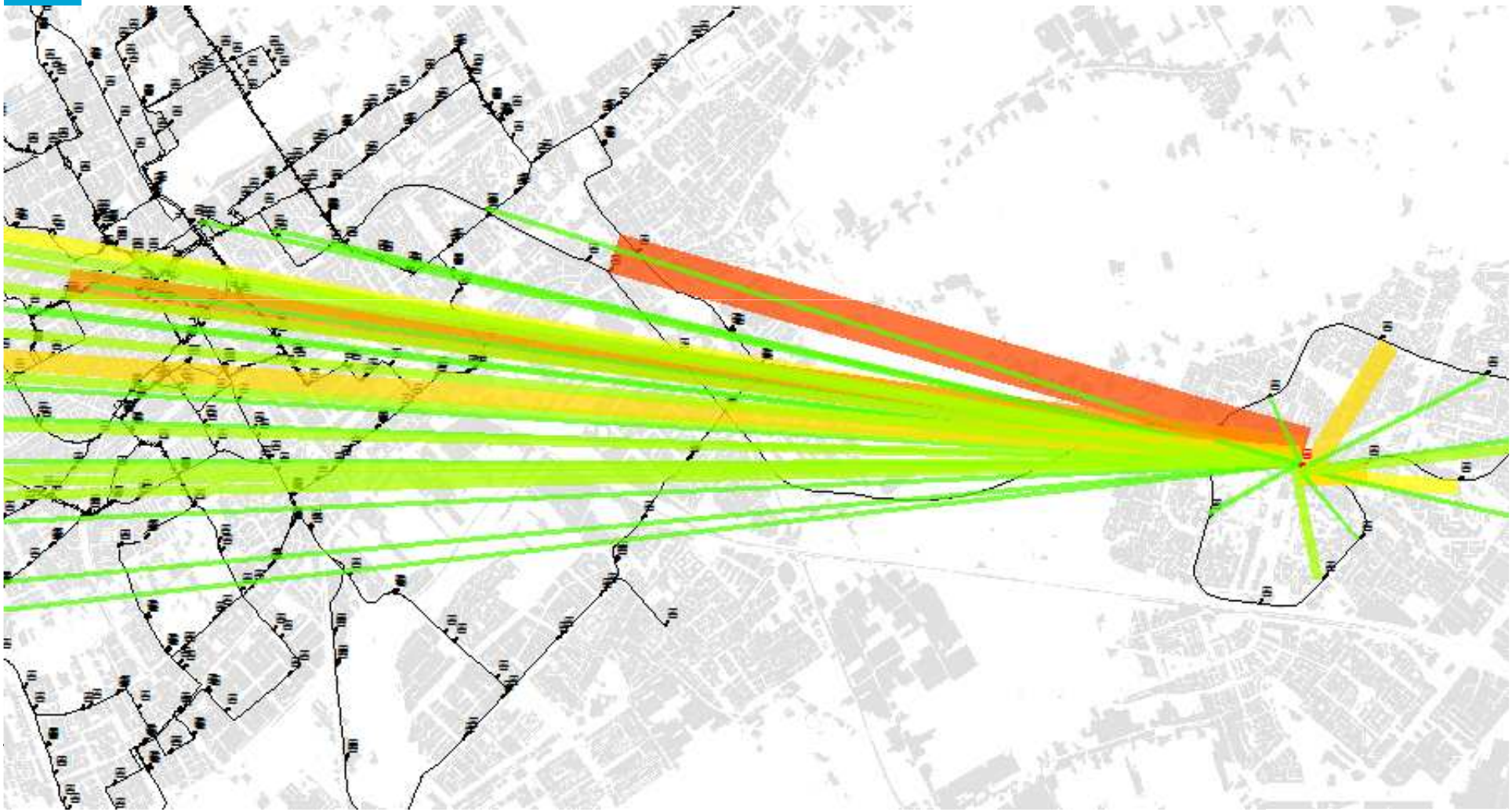
OD-patterns



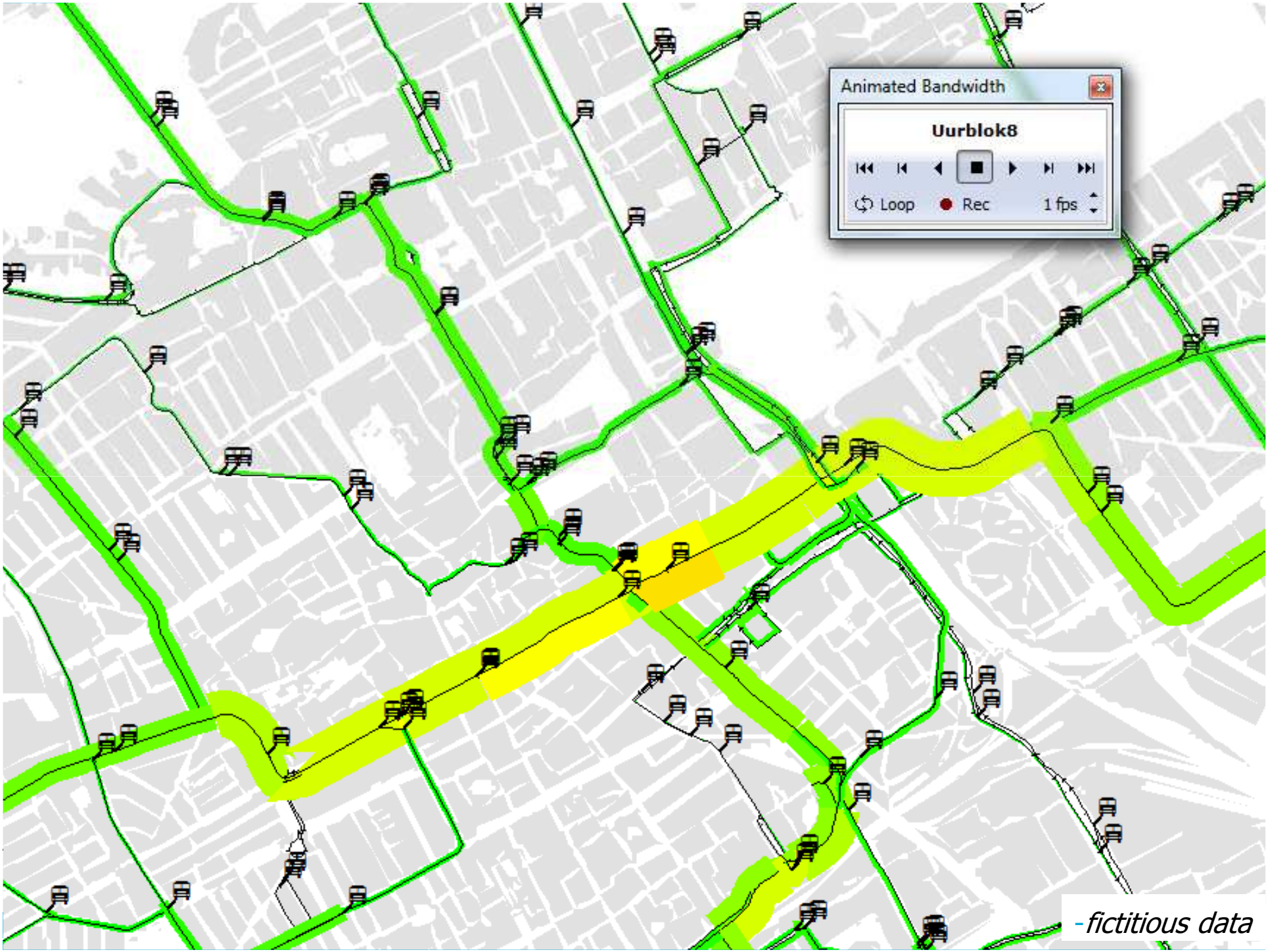


fictitious data

OD-patterns



fictitious data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Whatif scenarios

Adjusting

- Speed
- Fares
- Time of operations
- Number of stops
- Routes
- Frequency

Illustrating impacts on (indicators):

- Cost coverage
- Occupancy
- Ridership
- On time performance
- Revenues

Whatif results: Flows increased frequencies

Vehicle performance

The Dutch approach: GOVI

GOVI is a nationwide initiative to make transit data available to authorities and the public.

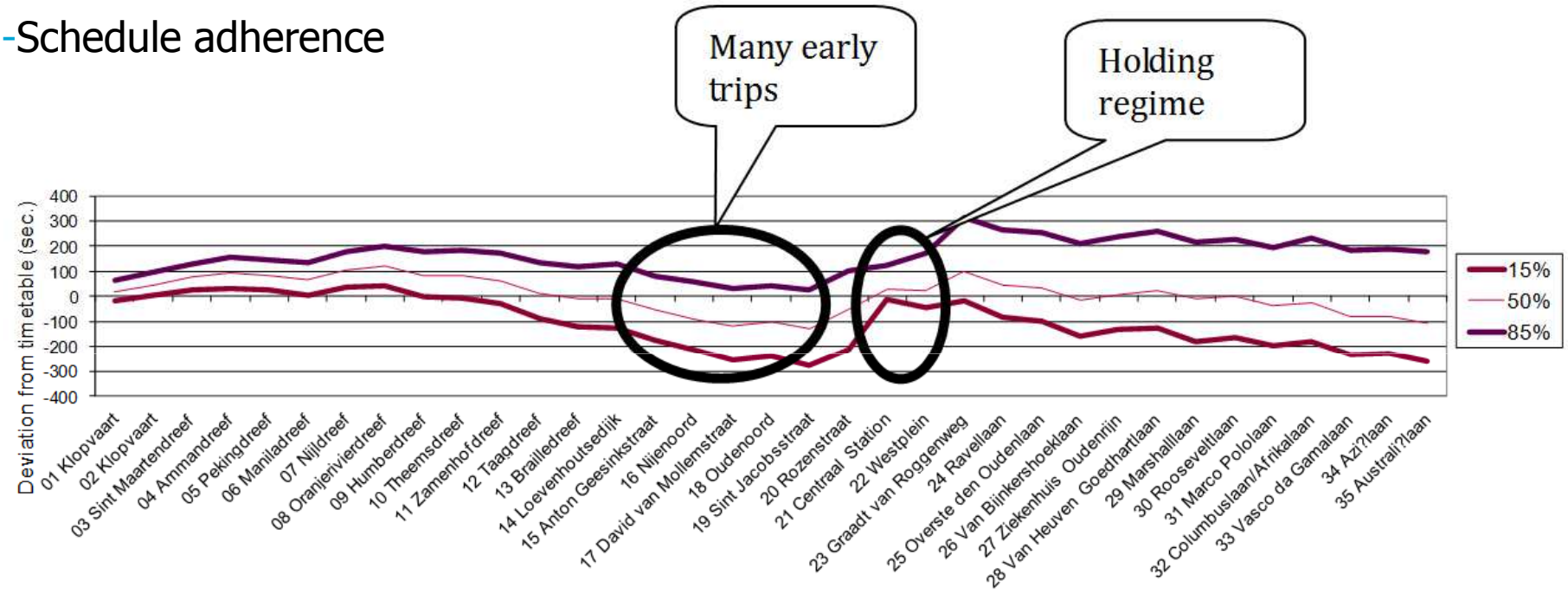
Focus on dynamic traveler information

Timetable and AVL data available from the majority of the transit vehicles.

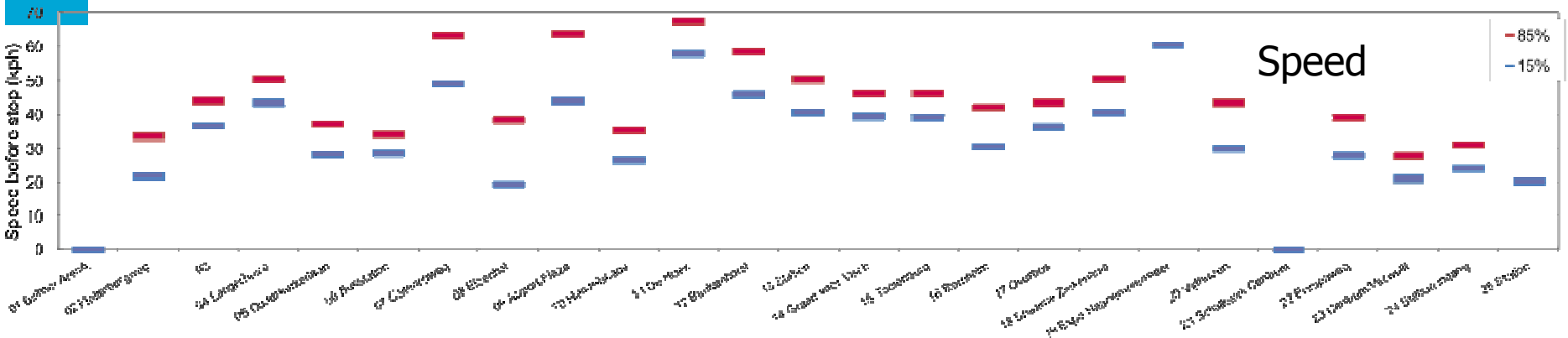
-(source: GOVI)

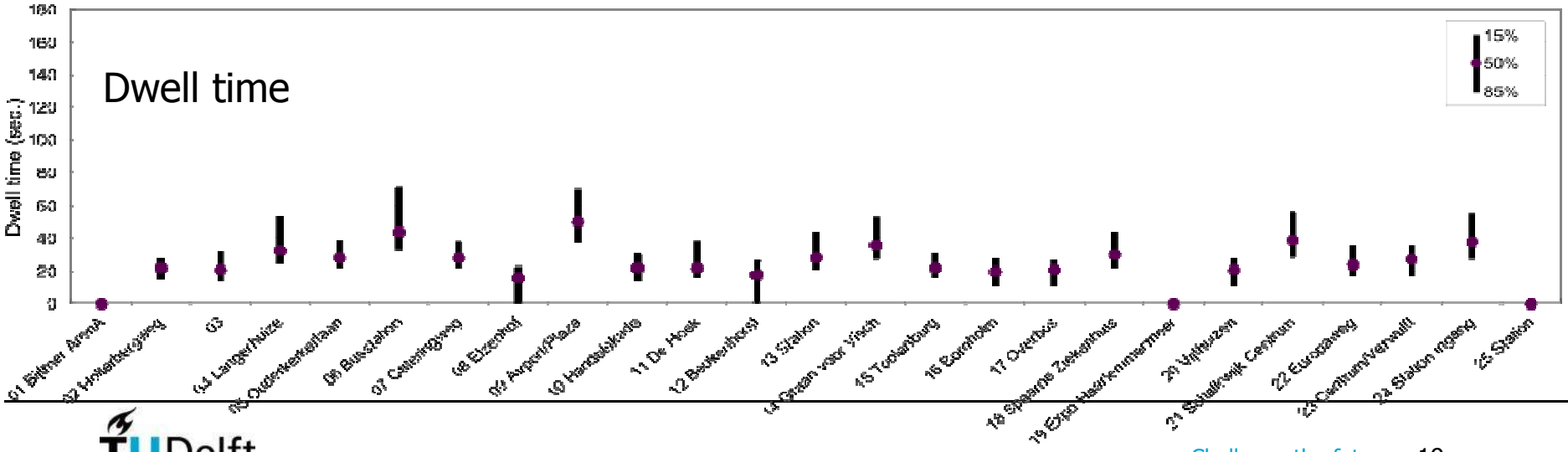
GOVI insights

- Schedule adherence

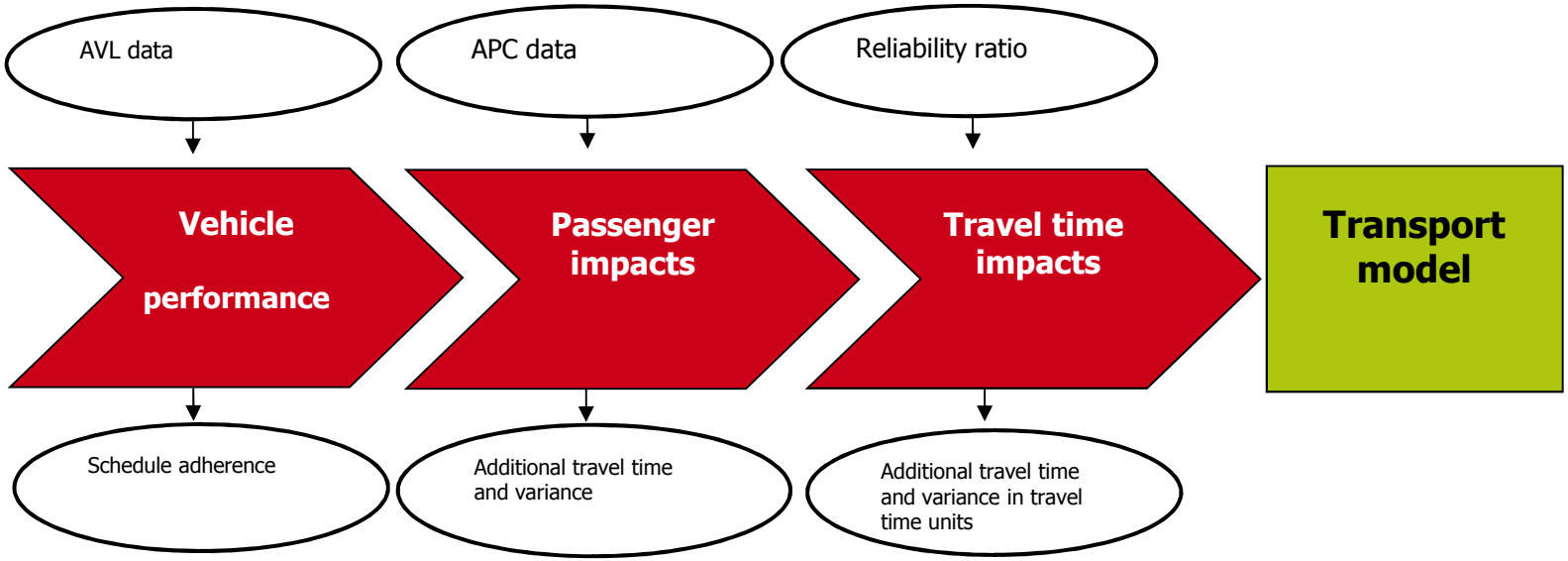


GOVI insights





Predicting service reliability



- Improved predictions
- Predicting and assessing impacts of enhanced service reliability

Summary

- Much data available
- Data enables quality increase and enhanced efficiency

- Evaluating and controlling -> predicting and optimizing
- Data-> Information -> Knowledge -> Improvements

- Two applied examples
  - Passenger data and whatif analysis
  - Vehicle performance and service reliability

Questions / Contact

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Research papers:
https://nielsvanoort.weblog.tudelft.nl/