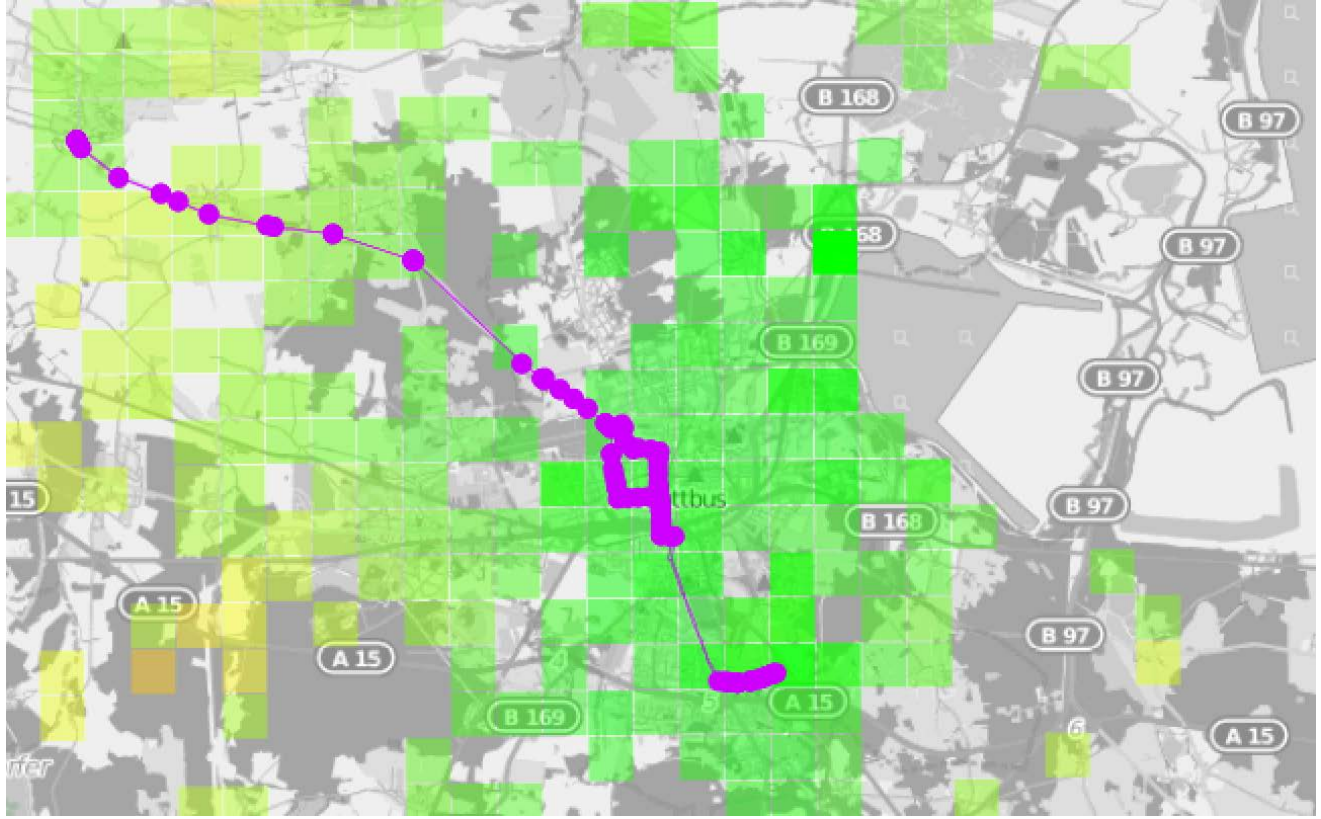

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An Accessibility-Driven Transit Network Design

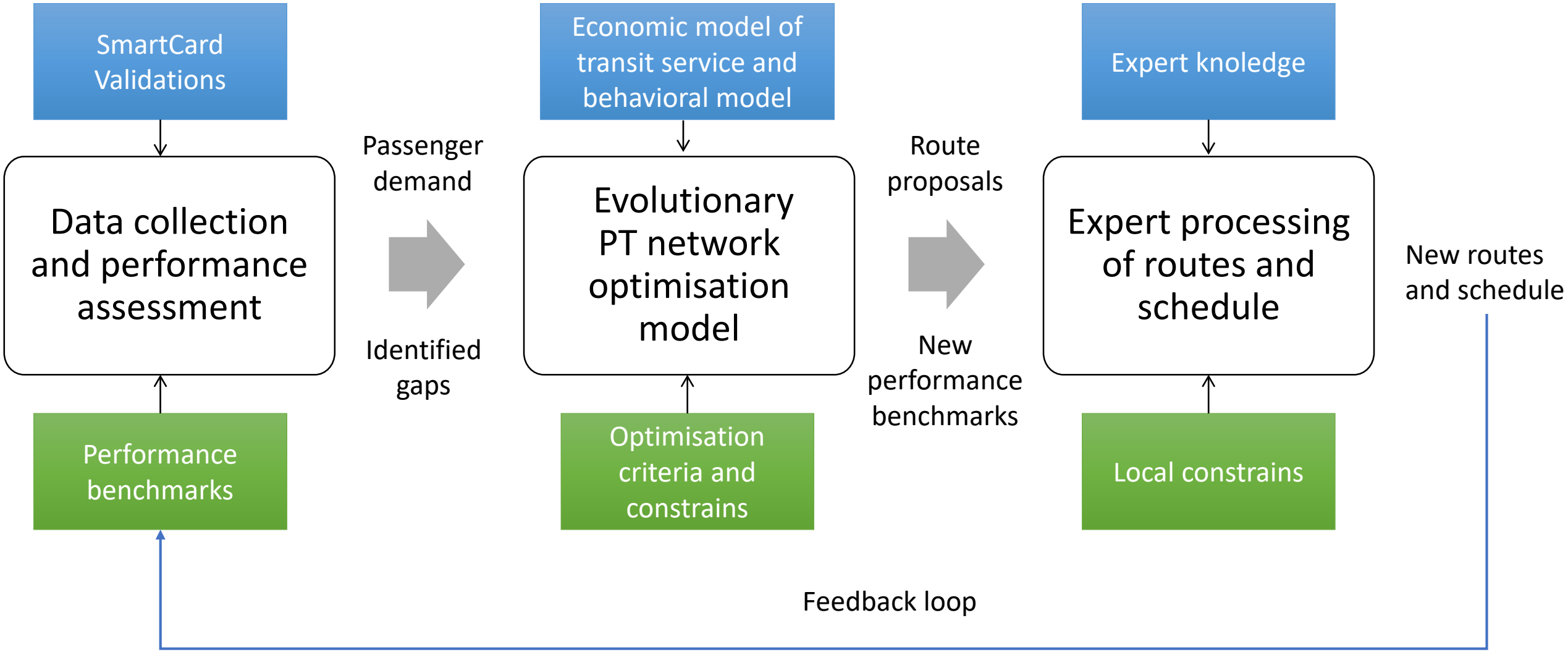
Timofey Volotskiy, Kai Nagel, Yaroslav Smirnov

ITM 26.06.2018

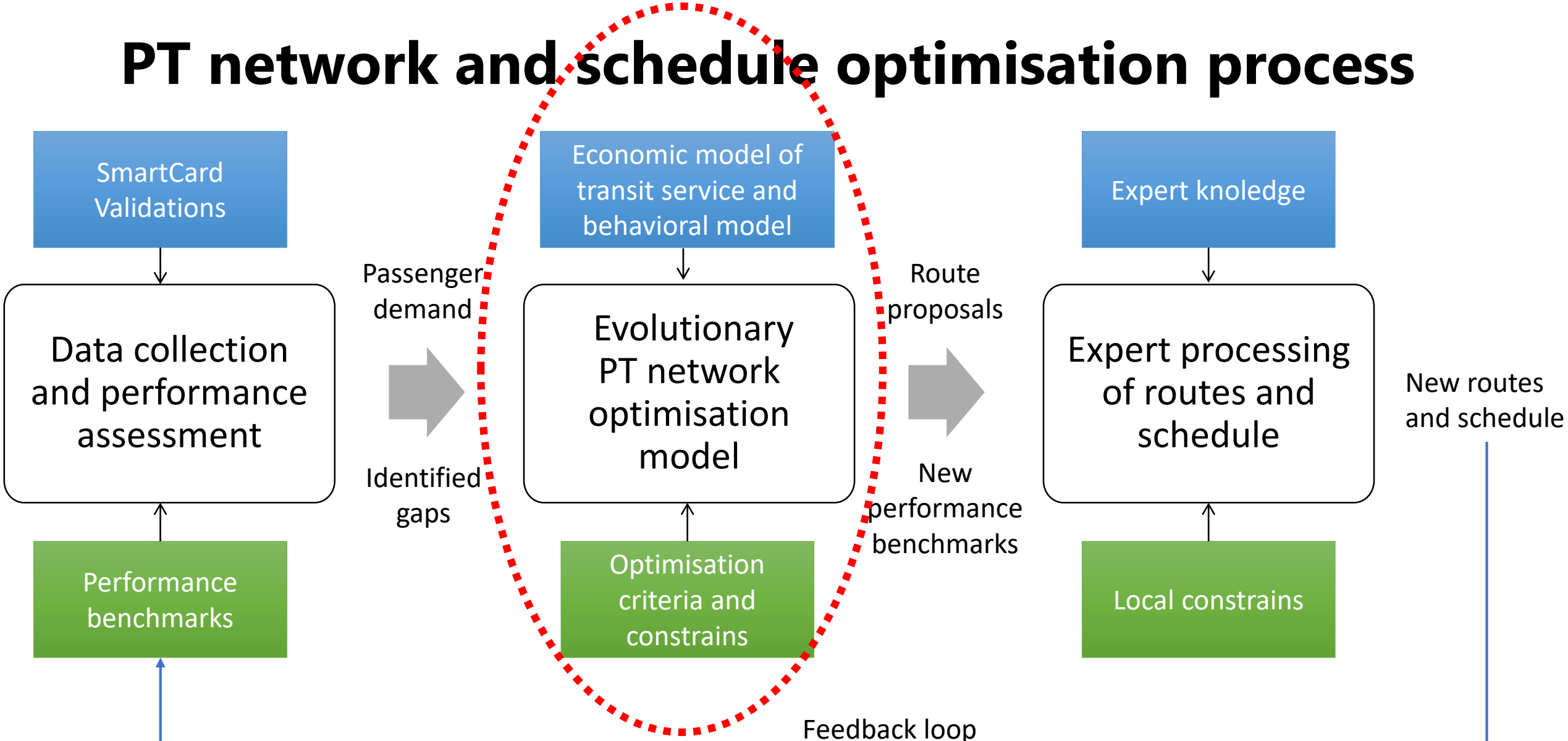
Motivation

- High quality and useful public transit service is still essential to reduce the car dependency
- Basic accessibility of opportunities by PT is often subsidized
- How to allocate those subsidies in a clever way?

PT network and schedule optimisation process



PT network and schedule optimisation process

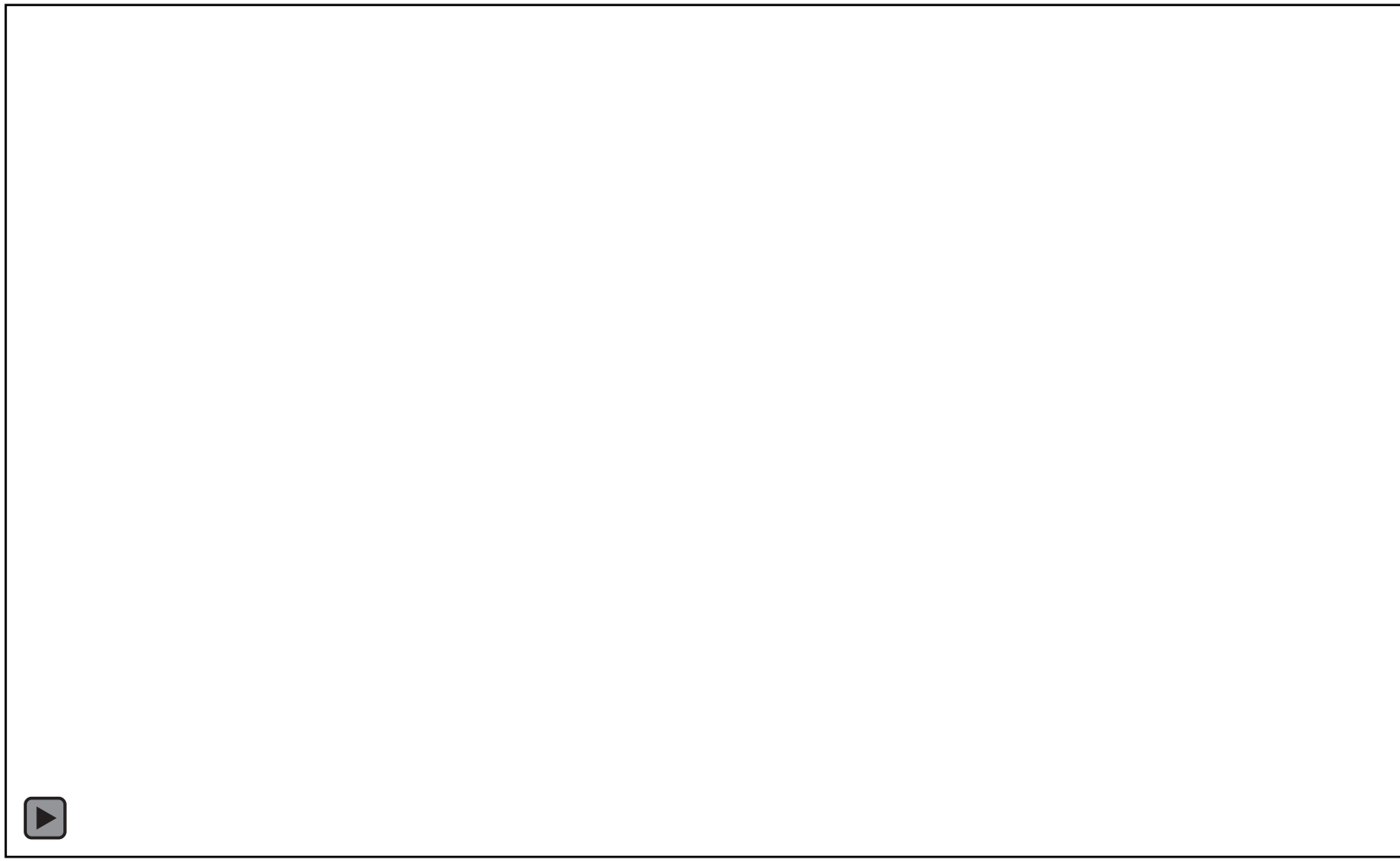


Evolutionary PT network optimization approach

Developed by A. Neumann and K. Nagel. [1]

Produces routes, optimal from the operator's **profit perspective.** Successfuly used in a number of applications.

Case study: modelling optimal BRT corridors and routes for Krasnoyarsk, Russia (host city of the Universiade-2019)



1 - Andreas Neumann and Kai Nagel. A paratransit-inspired evolutionary process for public transit network design. 2011.

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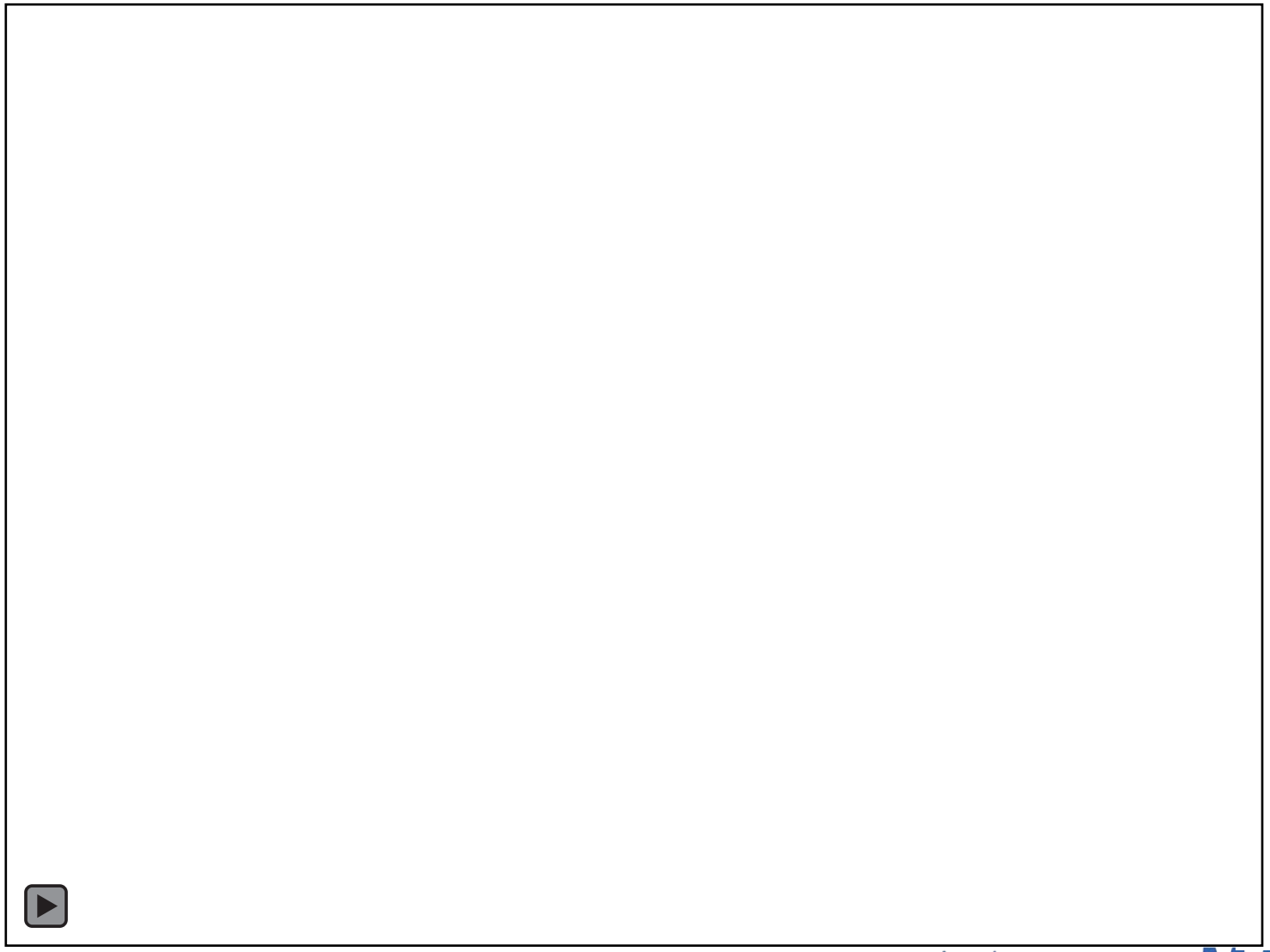
Multi-Agent Transport Simulation

Accessibility driven network design

- Econometric high-resolution accessibility is calculated
- Targeted accessibility improvements for specific regions are set
- Incentives to improve the accessibility are introduced via subsidies
- Additional guidance on the location of subsidized directions is provided to the operators
- Performance measurements indicate, if sufficient subsidies were provided
- The amount of subsidies is a subgect of optimization process

Illustrative scenario



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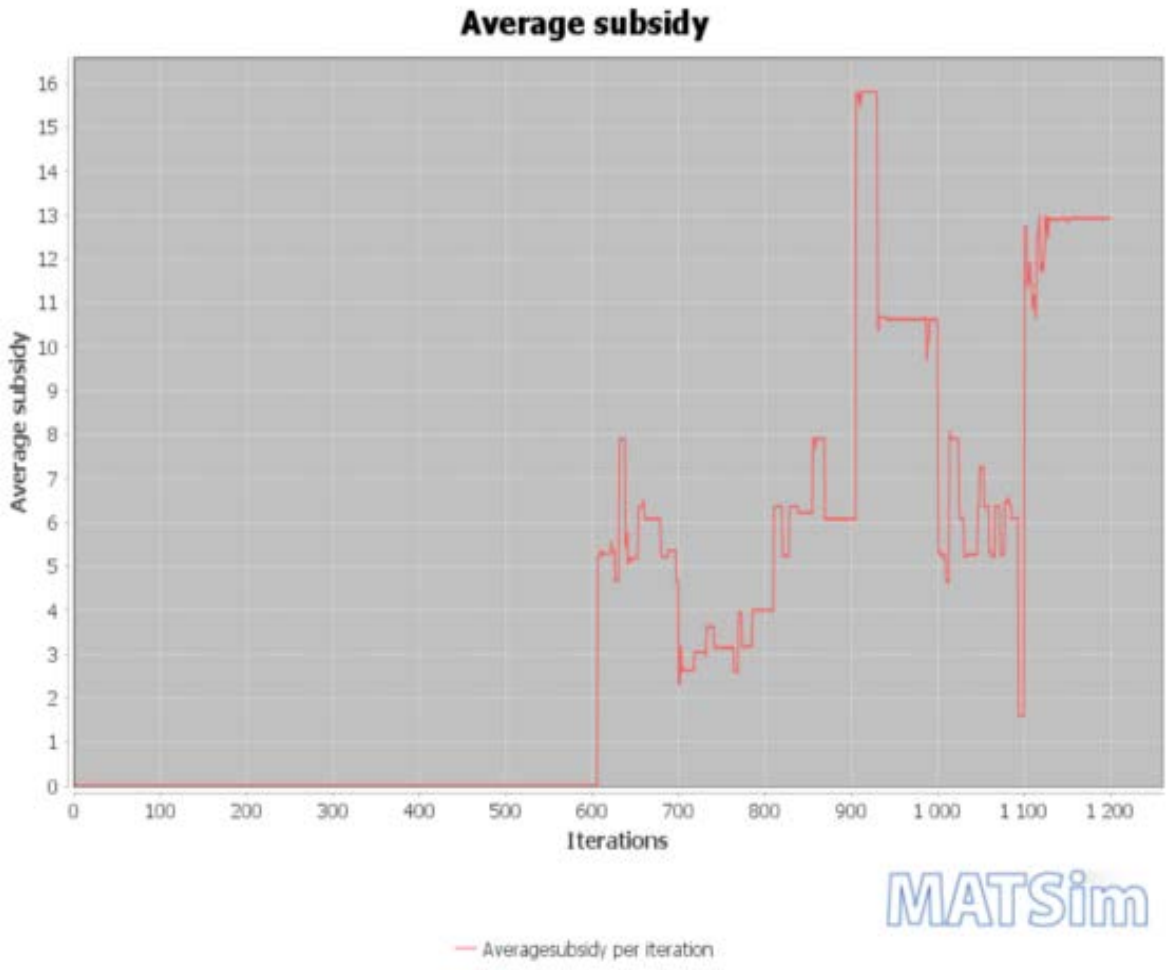
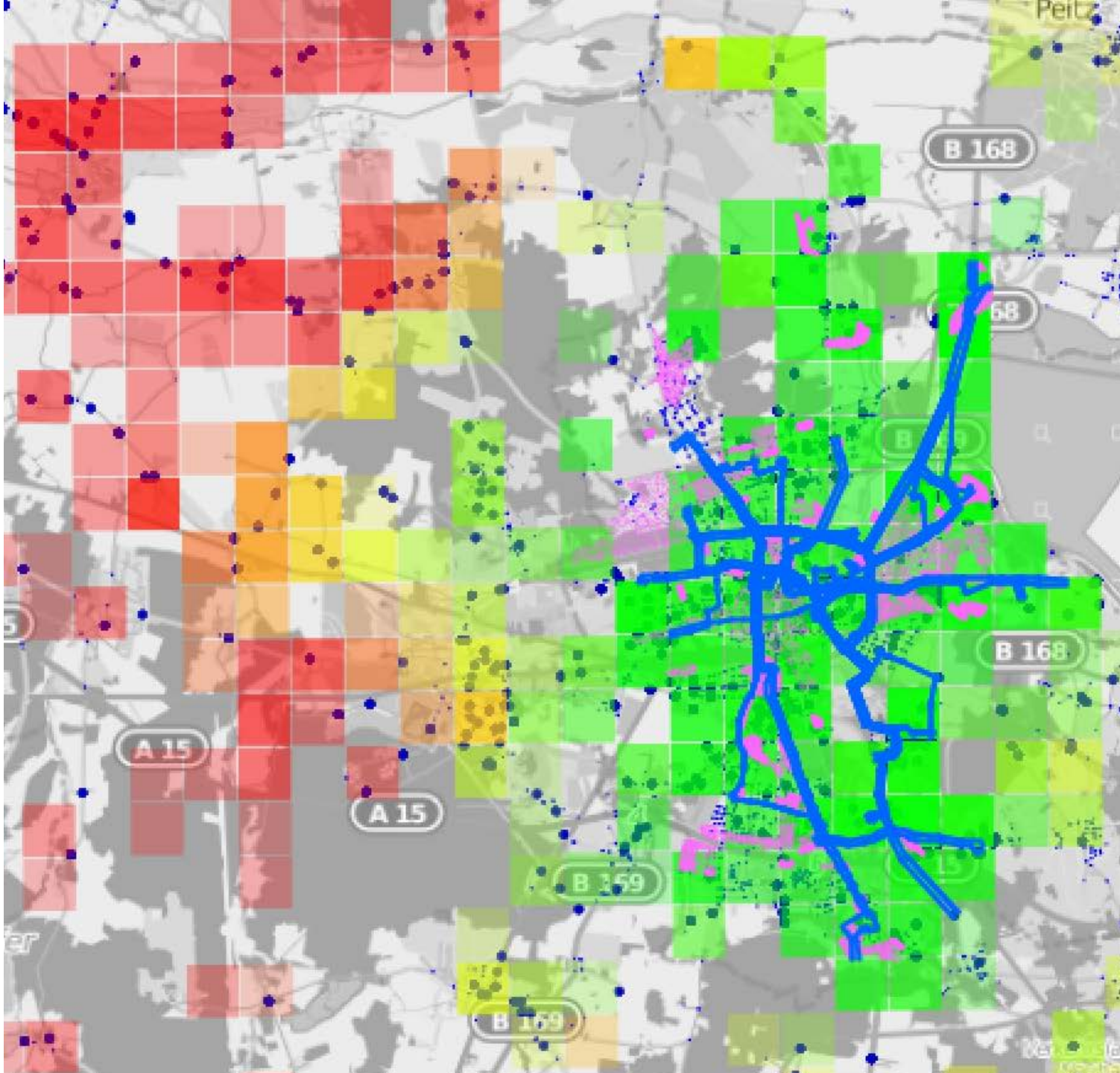
Illustrative scenario



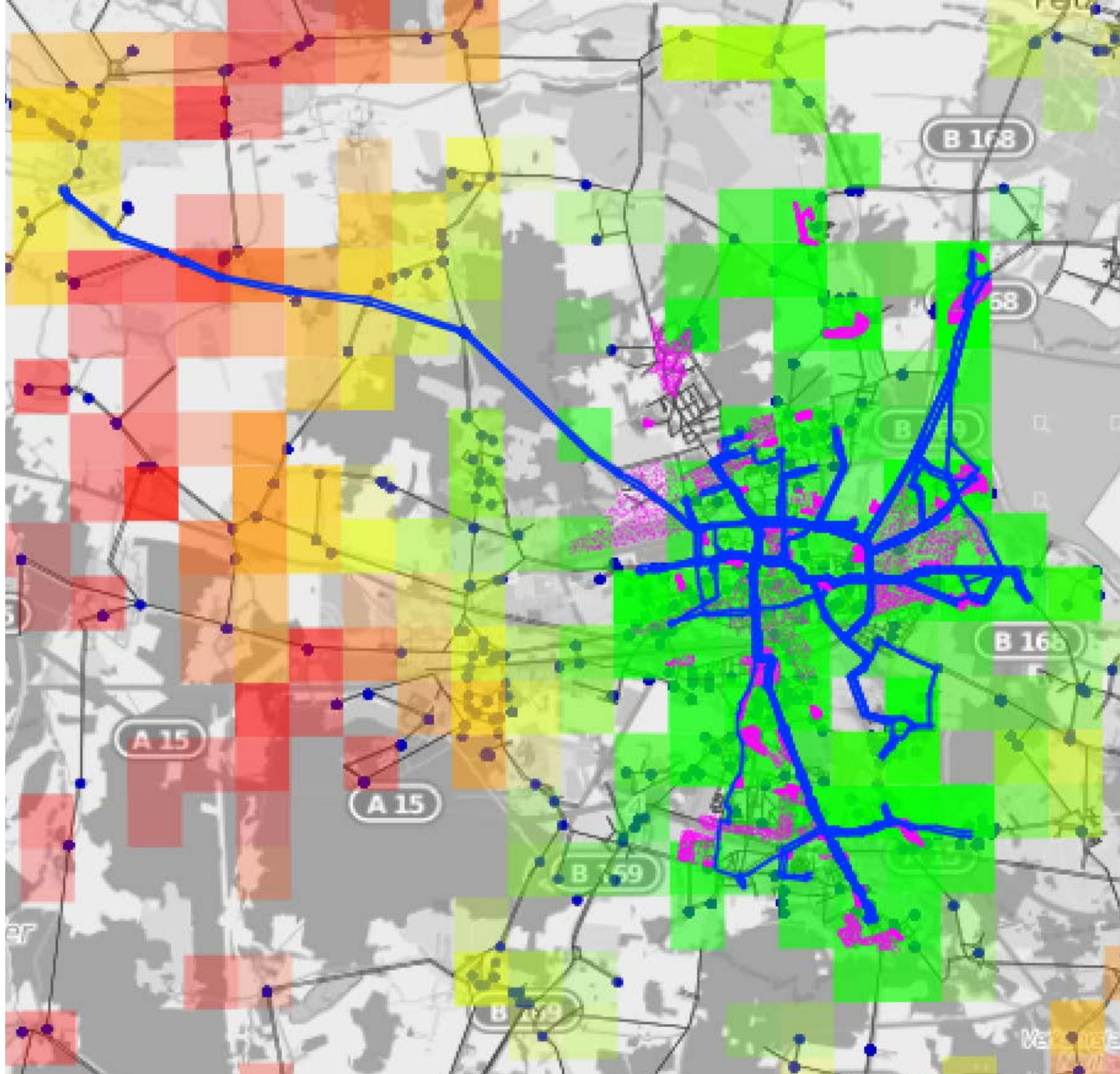
Identifying accessibility gaps

- Regular paratransit algorithm resulting routes (blue)
- Accessibility of working places at 08:00 (red to green)
- Population density (transparency)



Bridging the gaps with optimal routes

- After the introduction of subsidies, the sustainable routes to the low-accessibility area were found by the algorithm
- The subsidy was then gradually reduced until the service become unsustainable to define the optimal level



2-step PT network optimization approach

Step1:

Developing/optimisation of the backbone PT network with profit-driven paratransit approach

objectives: high ridership, profitability

Step2:

Developing/optimisation of complimentary PT network with accessibility-driven approach

objectives: maximizing accessibility

Conclusions

- Paratransit approach proven to produce feasible profitable routes
- Extended model allows inclusion of social benefits into the operator scoring, produces feasible routes and optimizes the the subsidy level
- The model is demand driven, which ensures the efficient use of the transit fleet
- The outputs are a subject to be considered by planners, thus delivering robust data-driven optimization cycle

Thank you for your attention

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