Open Digital Twin Platform (ODTP): status of the project and first use case applications

Dr. Stefan Ivanovic, Centre for Sustainable Future Mobility
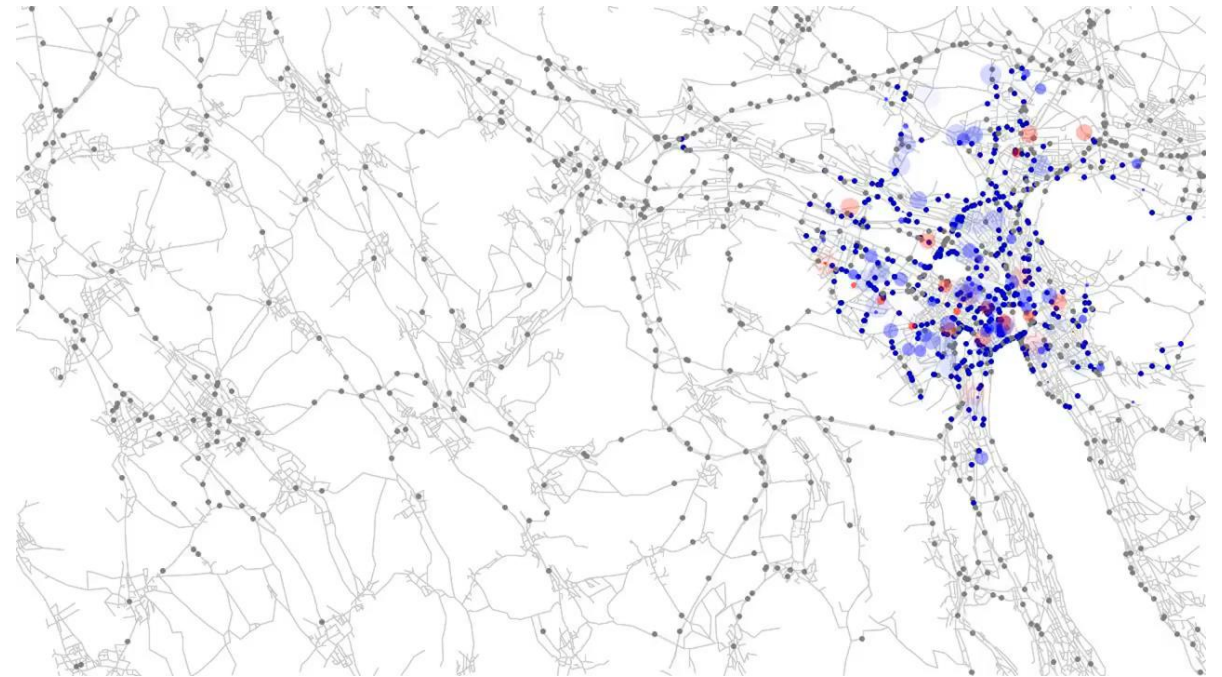
Open Digital Twin Platform – current state
Components

MATSim
Multi-Agent Transport Simulation

- Large-scale agent-based transport simulations

- An Open-Source framework
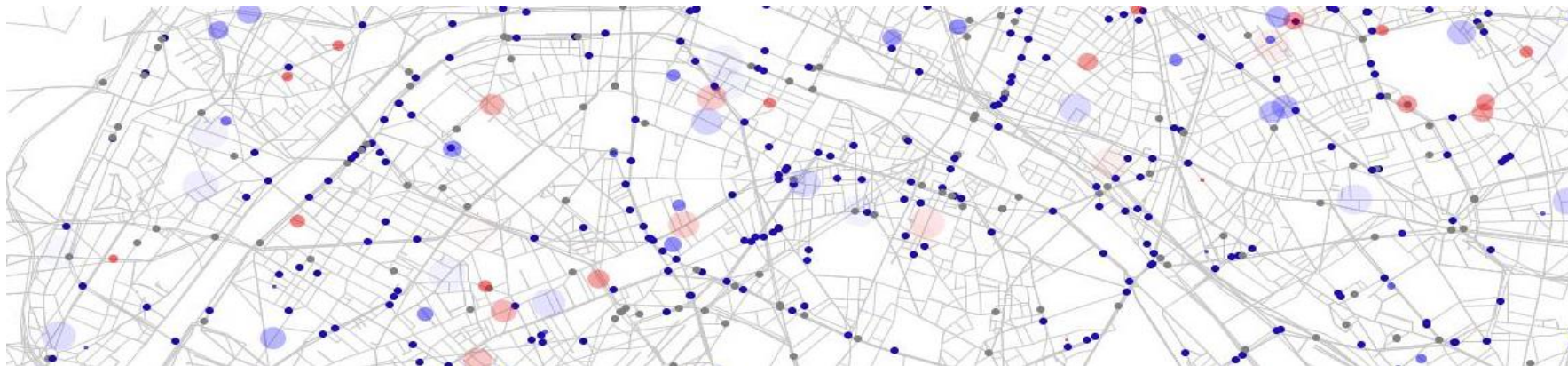
- Developed by ETH IVT group
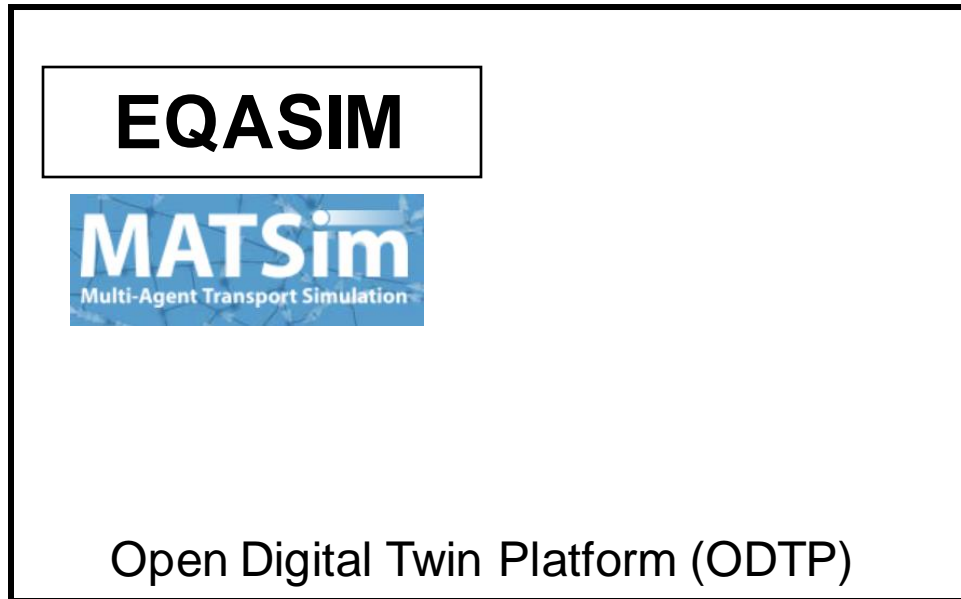
Open Digital Twin Platform – current state
Components

EQASIM

- Synthetic population generating from census data

- Input data for Matsim simulations

- An Open-Source pipeline

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Open Digital Twin Platform – current state
Components

EQASIM

MATSim
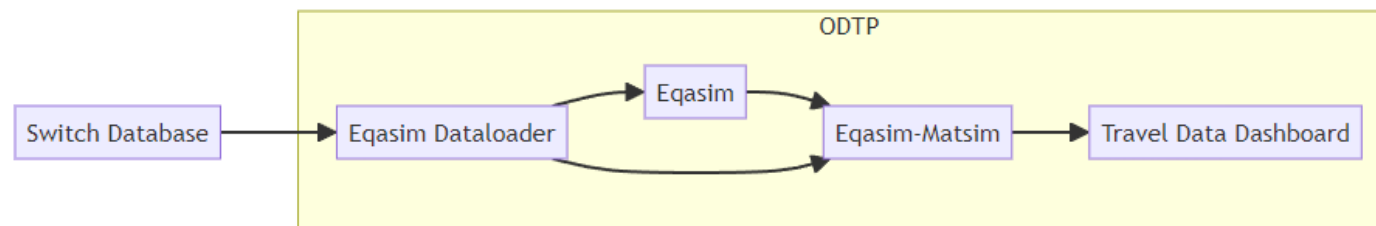Multi-Agent Transport Simulation

Open Digital Twin Platform (ODTP)

- Two scenarios implemented:
  - Île-de-France scenario
  - Swiss scenario

- Methods are containerized within the ODTP

- No need to set up working environment, dependences, versions etc.

ODTP

Switch Database → Eqasim Dataloader → Eqasim → Eqasim-Matsim → Travel Data Dashboard

Matsim/Eqasim pipeline in the ODTP

ODTP 3rd use case
Autonomy-enabling Infrastructure for future mobility systems
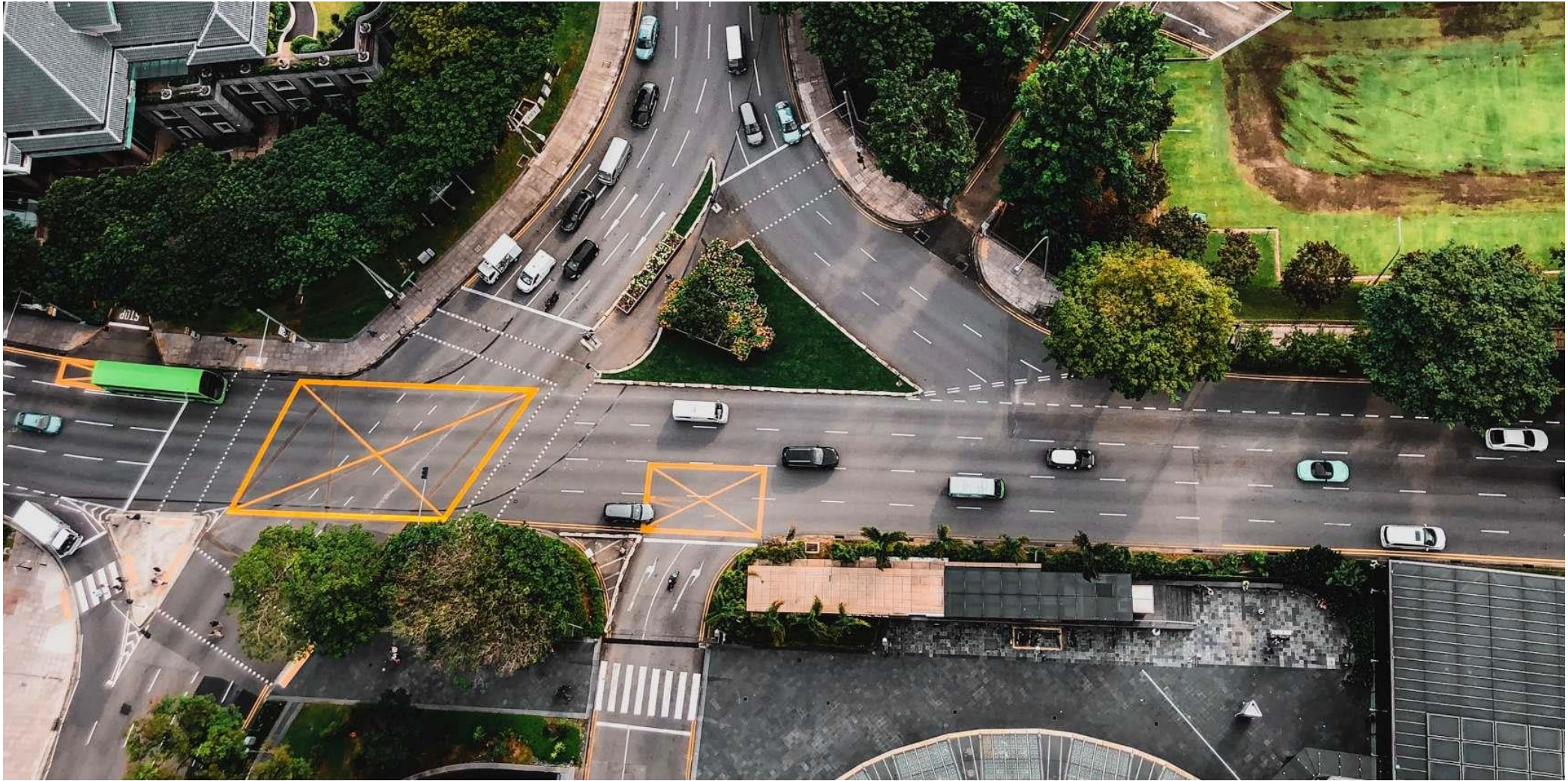
# InsideOut (Autonomy- enabling Infrastructure for future mobility systems)

Project background

- 3 years project financed by the Mobility initiative

- Investigate the rationale of autonomy-enabling infrastructure and its effects on future mobility systems featuring Autonomous Mobility-on-Demand (AMoD) systems.

- Study the possibility of outsourcing part of the autonomy stack of AVs to the public infrastructure, analyzing costs, benefits, scalability, and trade-offs.

- Extend state-of-the-art simulation frameworks for AMoD and mobility systems to assess the effects of infrastructural changes.

- Design sound case studies for Swiss and international realities (both urban and rural).
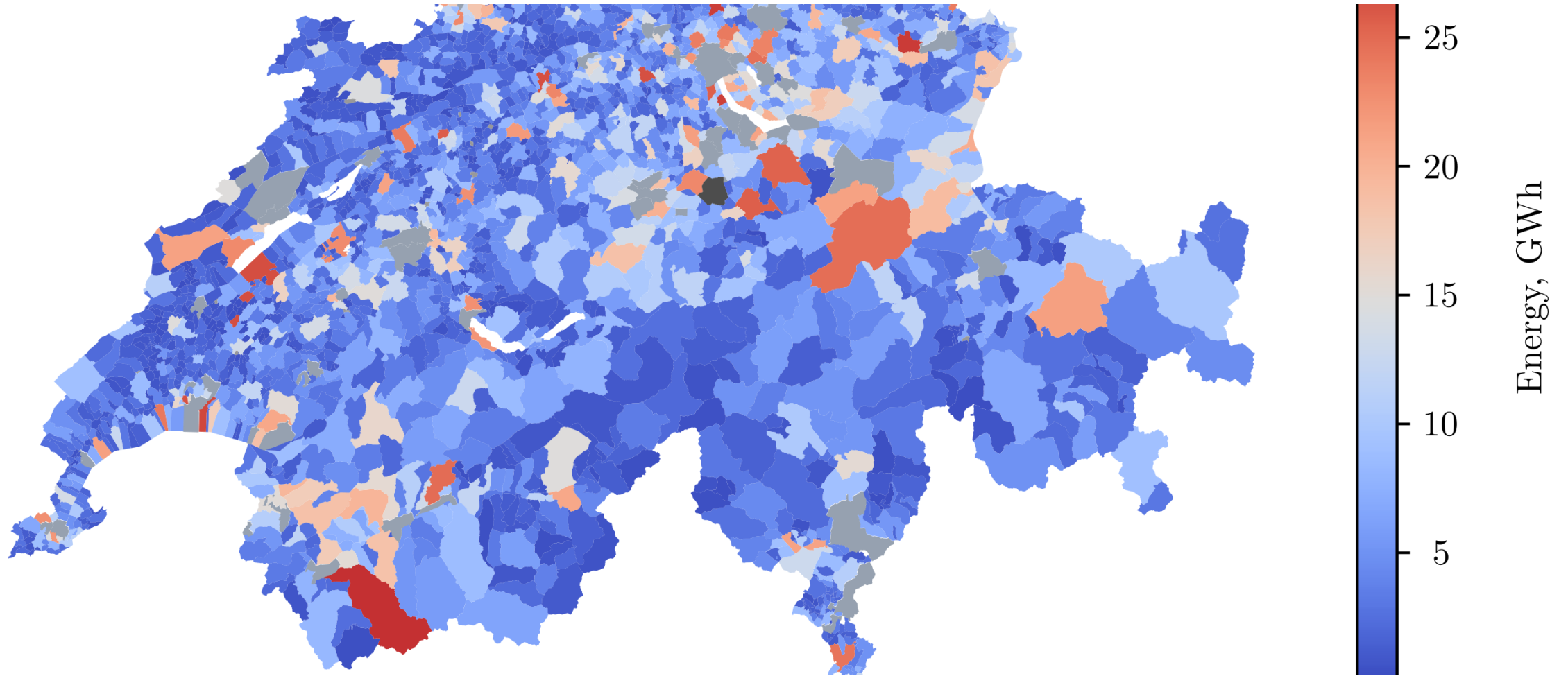
InsideOut in the ODTP

- Relies on:
  - EQASIM as an input

  - MATSIM run within the project algorithm

- The algorithm assigns AV mode to the roads in the network

- Optimize AV infrastructure by evaluating which roads should be used for AVs
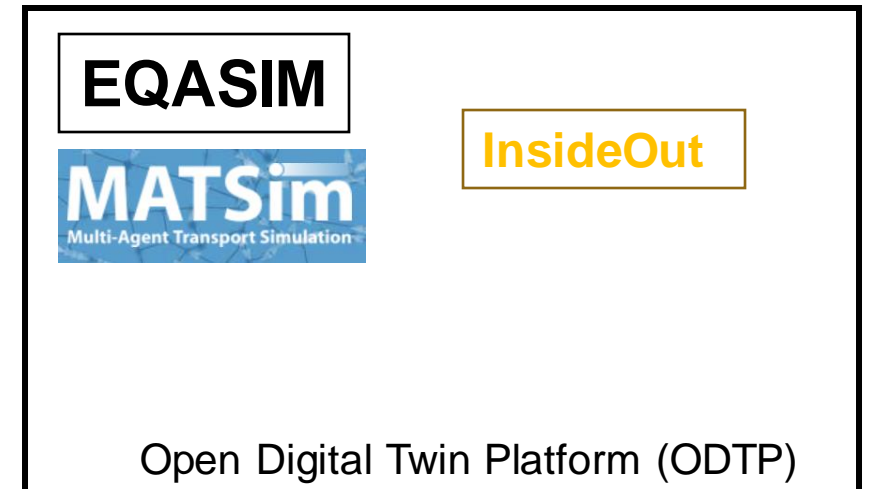
ODTP 3rd use case
Transport Electrification in an Evolving Power System

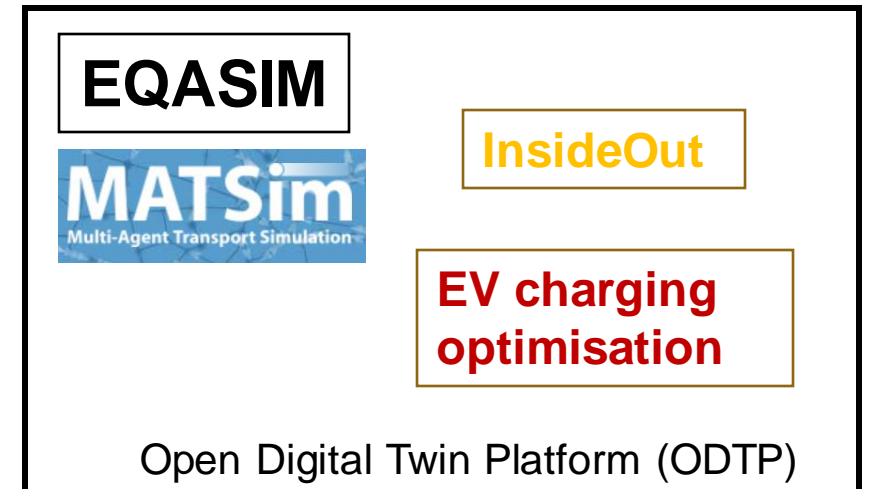# Transport Electrification in an Evolving Power System
Project background

- Develop bottom-up models of passenger-car fleets using geo-referenced mobility data.

- Calculate traction, heating, and cooling energy needs for driving and analyze charging decisions.

- Assess charging demand profiles and their flexibility across different geographic regions and power system levels.

- Provide insights into the necessary charging infrastructure to meet drivers' mobility needs and ensure grid-friendly integration.

- Promote beneficial flexibility of the charging load across different system levels.

# Transport Electrification in an Evolving Power System
Overview

1. Using MATSIM output (daily trips)

2. Transform MATSIM trips to more detail trips to calculate energy demand in Switzerland

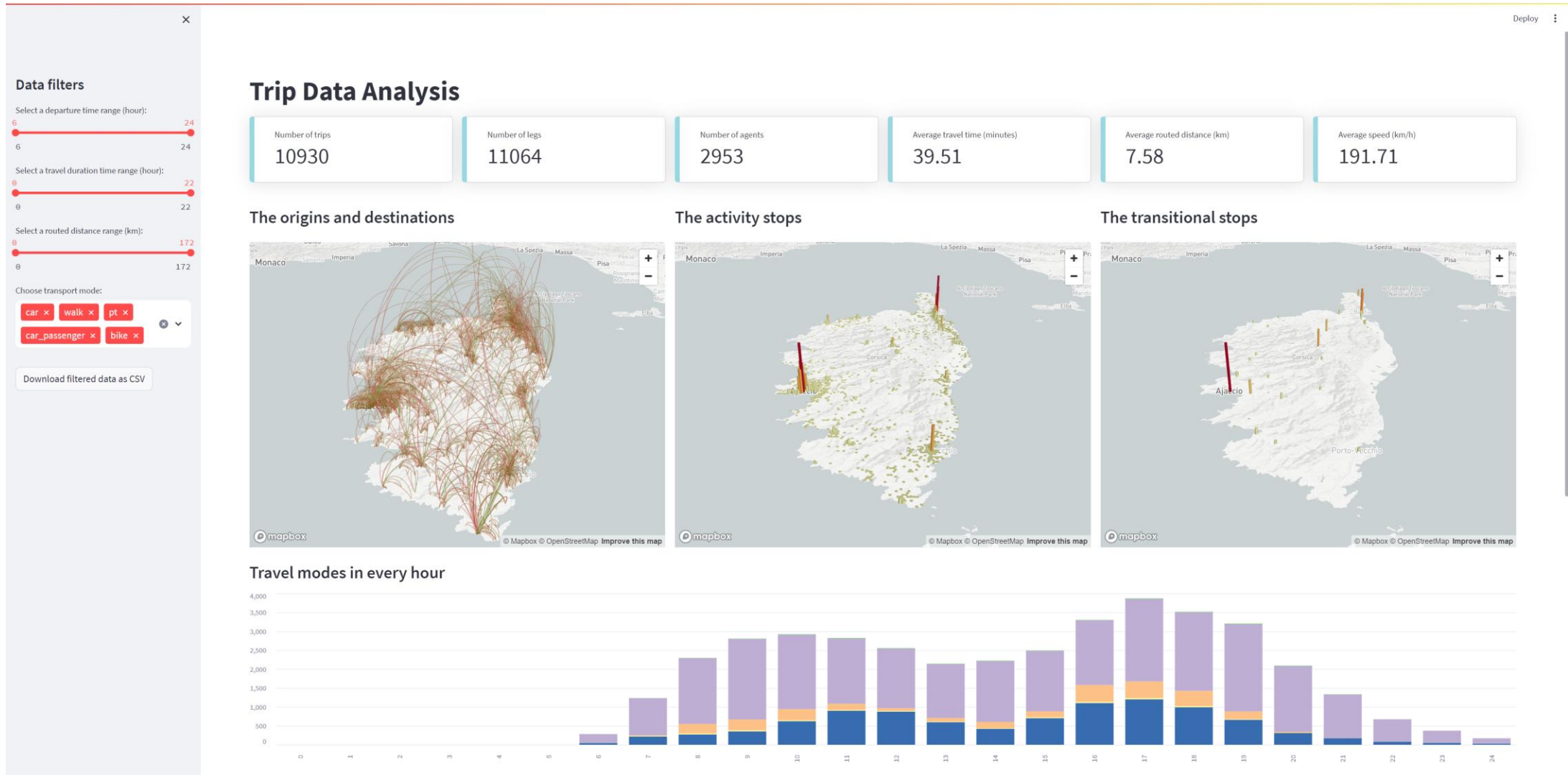3. Evaluating different charging strategies

EQASIM

MATSim
Multi-Agent Transport Simulation

InsideOut

EV charging optimisation

Open Digital Twin Platform (ODTP)

InsideOut and Transport Electrification in an Evolving Power System components in the ODTP

Conceptual model
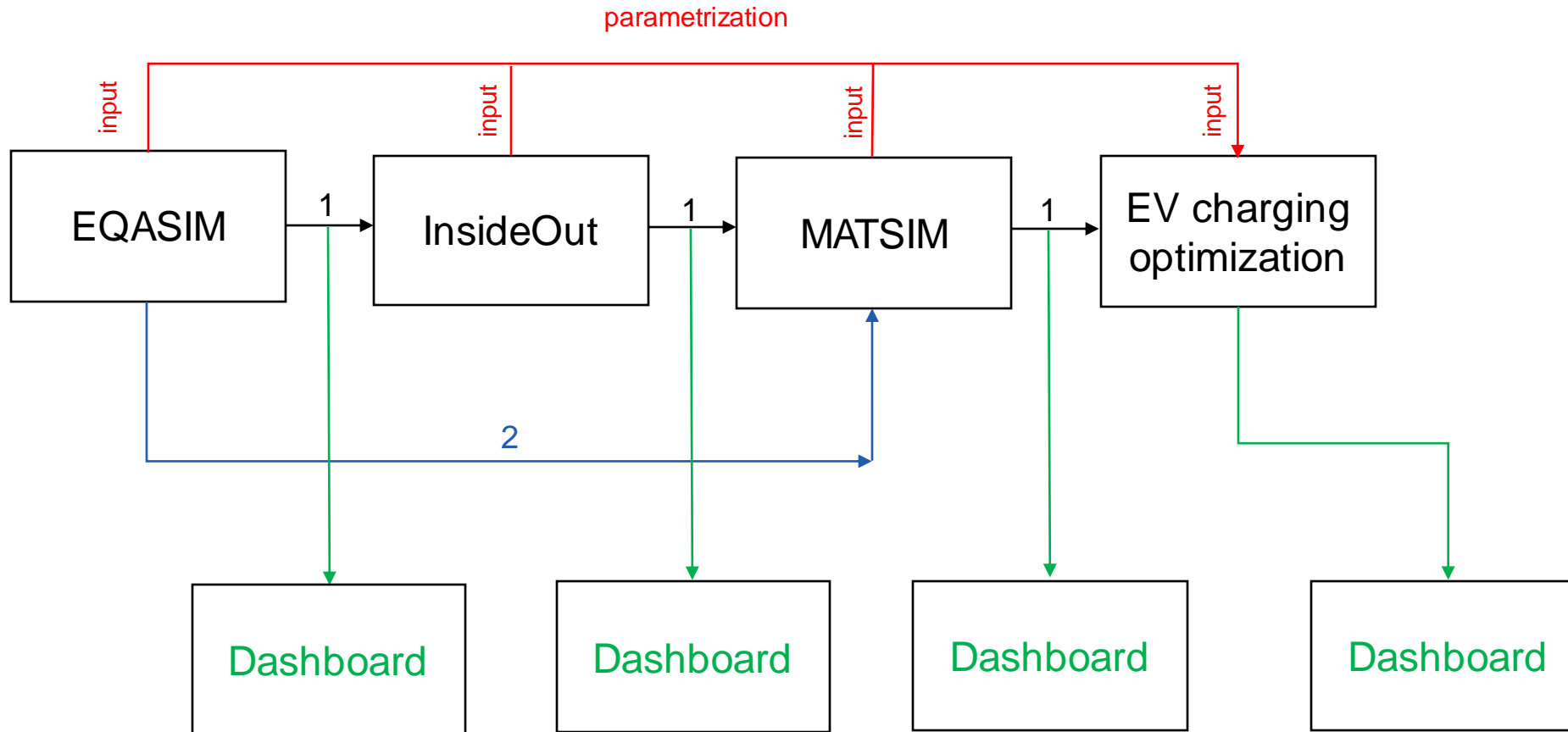
Dashboards for visualization in the ODTP

Dashboard for Matsim output

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InsideOut Visualization in the ODTP

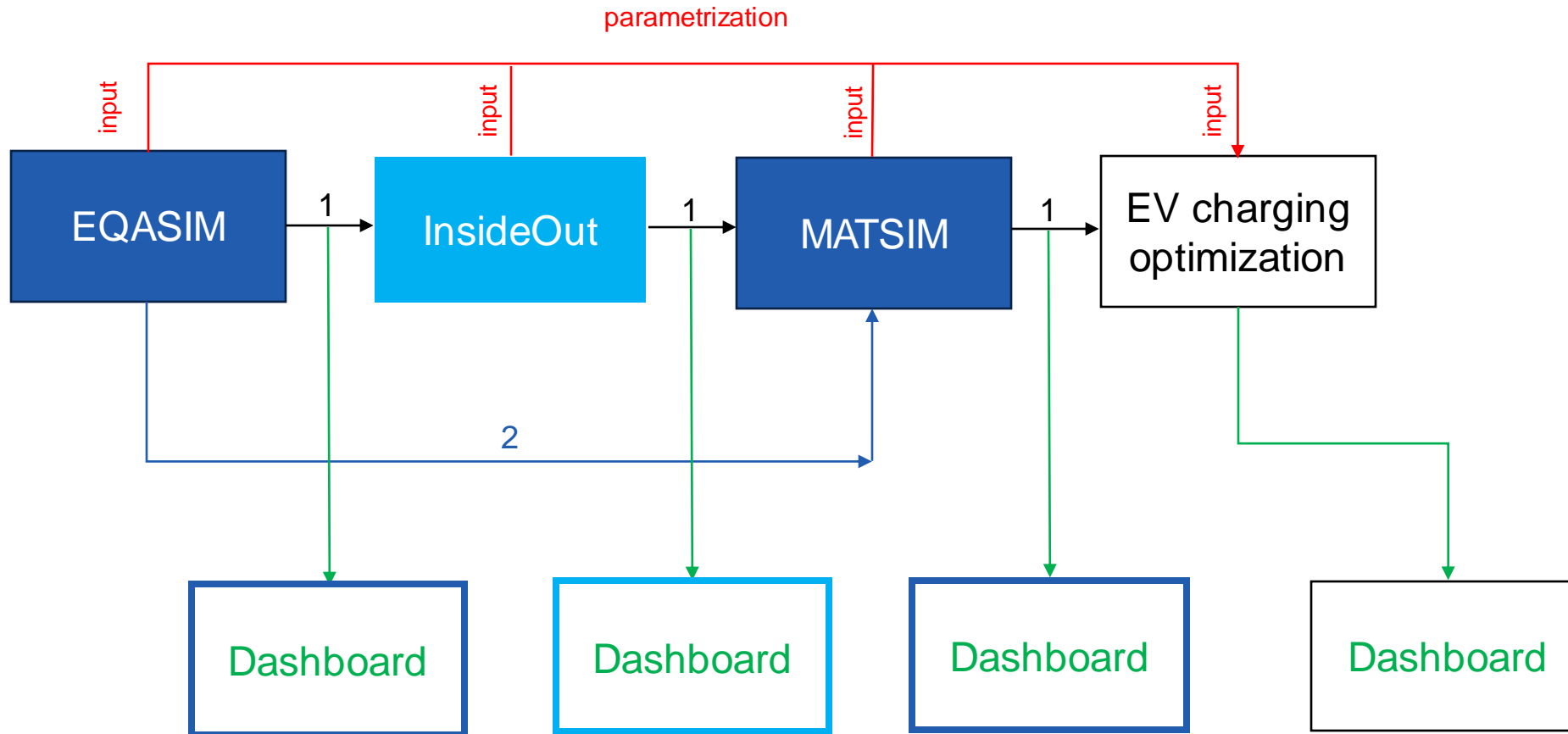Visual comparisons of the Matsim outputs

Center for Sustainable Future Mobility (CSFM)

InsideOut and Transport Electrification in an Evolving Power System components in the ODTP

Conceptual model

Thank you!