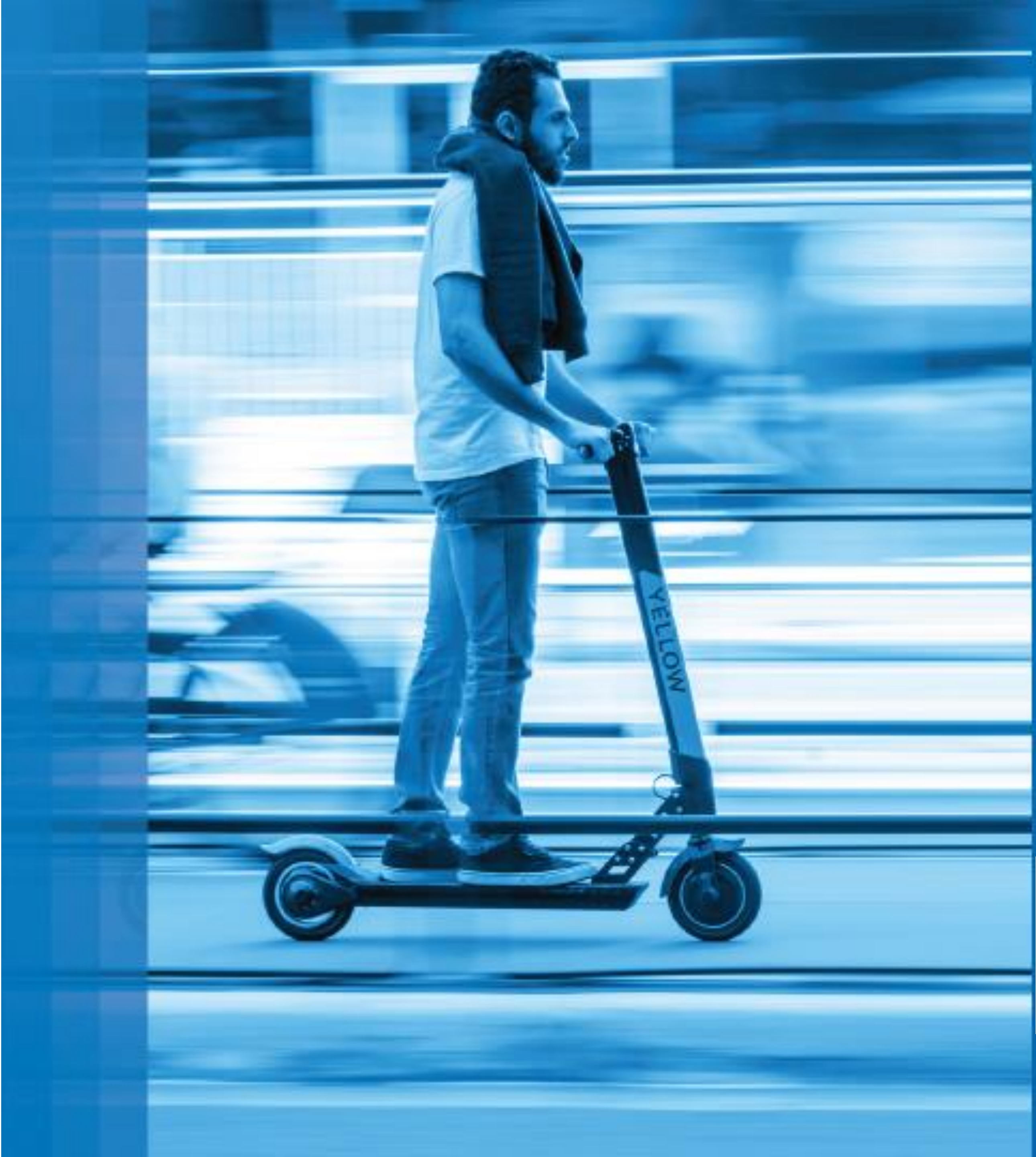
An efficient solution for modelling and simulating demand-responsive transport systems

aimsun.ride

aimsun.



MOMENTUM

This project has received funding from the European Union´s Horizon 2020 research and innovation programme under grant agreement No 815069 (MOMENTUM – Modelling Emerging Transport Solutions for Urban Mobility)

MultiDEPART

Objective:

To define a common methodology and decision support tools to plan, design and monitor DRT services for PT authorities

Project Partners

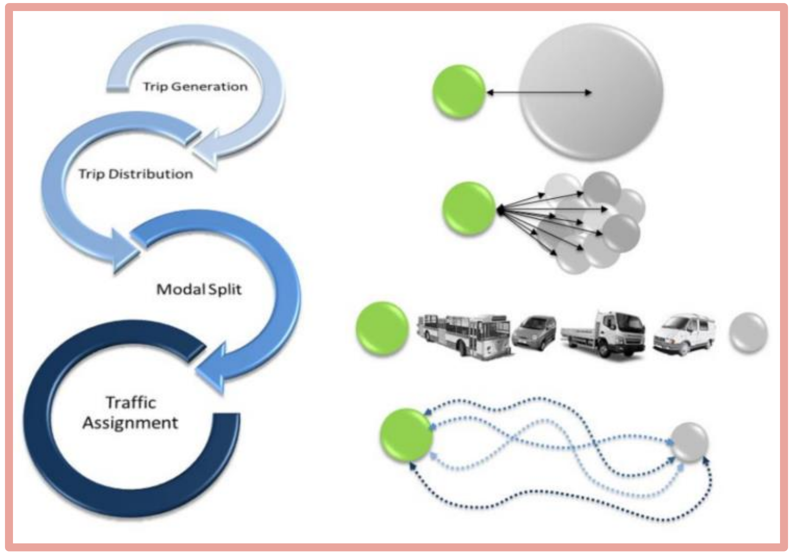
Motivation and objectives

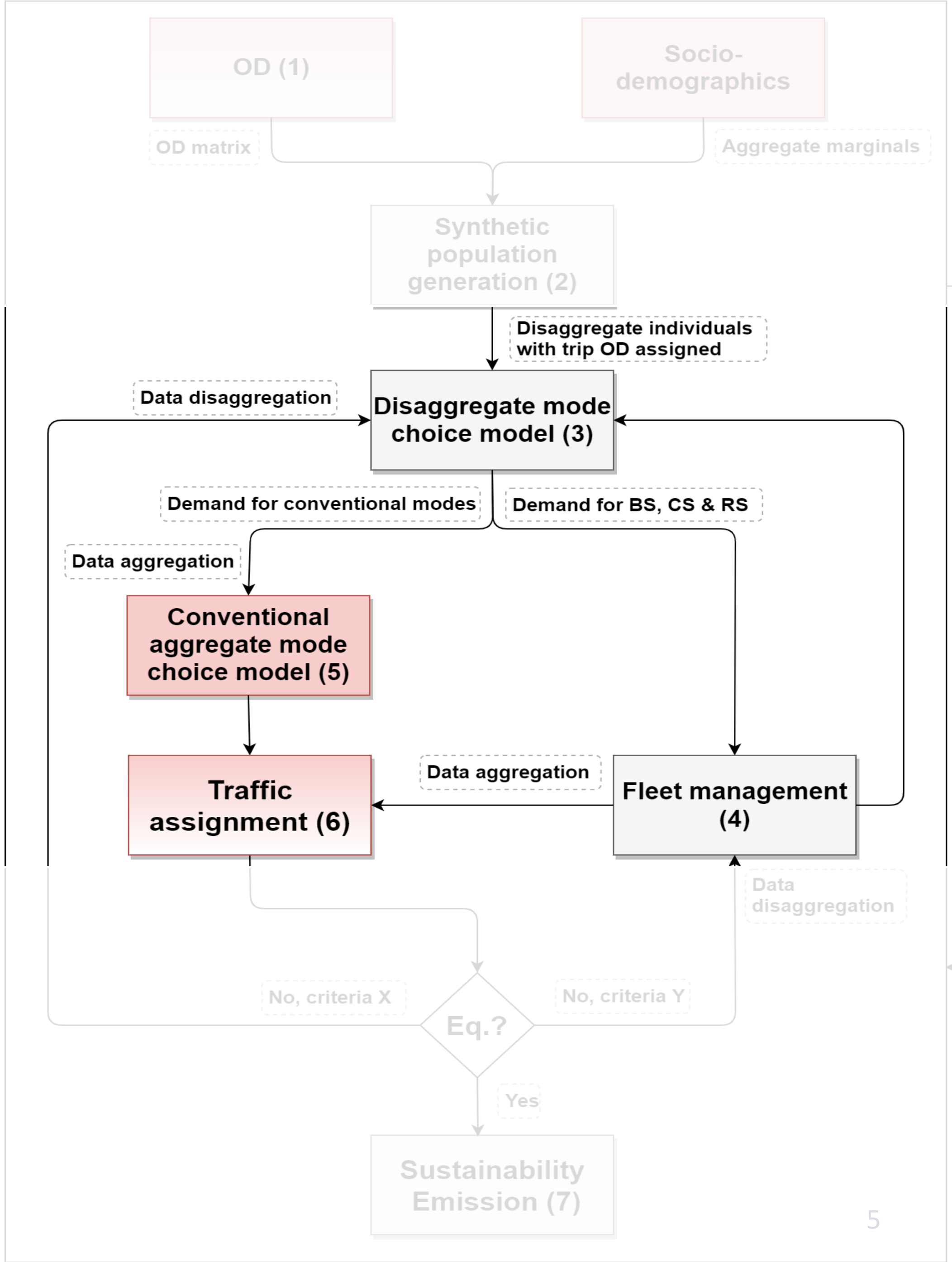
- Introduction of **Shared mobility services** in our cities requires for **proper planning, modelling and assessment**
  - How can we estimate the demand for shared mobility services?
  - Develop a tool for designing and monitoring such services.

- Many cities continue to use the traditional **four-step** modelling approach
- Modelling of shared mobility requires **agent-based** approaches for a detailed representation of the service demand and supply
- Need for an **intermediate modelling approach**, which can be integrated into the existing strategic transport models, enabling cities to evaluate and integrate shared mobility systems and design long-term planning strategies

Intermediate modelling approach

The framework consists of demand and supply models that combine principles of agent-based and traditional strategic transport models





aimsun.

Simulation of shared mobility services and fleet management

Demand and supply information

Individual travel requests:
- Origin and destination coordinates
- Individual departure times (timestamps)

Network information
- Historical travel times, simulated travel times, or FFT
- Flexibility to use multi-resolution simulation (macroscopic, mesoscopic, microscopic)

Fleet planning (strategic) solution

- **Fleet characteristics (size, type and capacity)**
- **DRT candidate stops and locations**

Optimal Operational solution

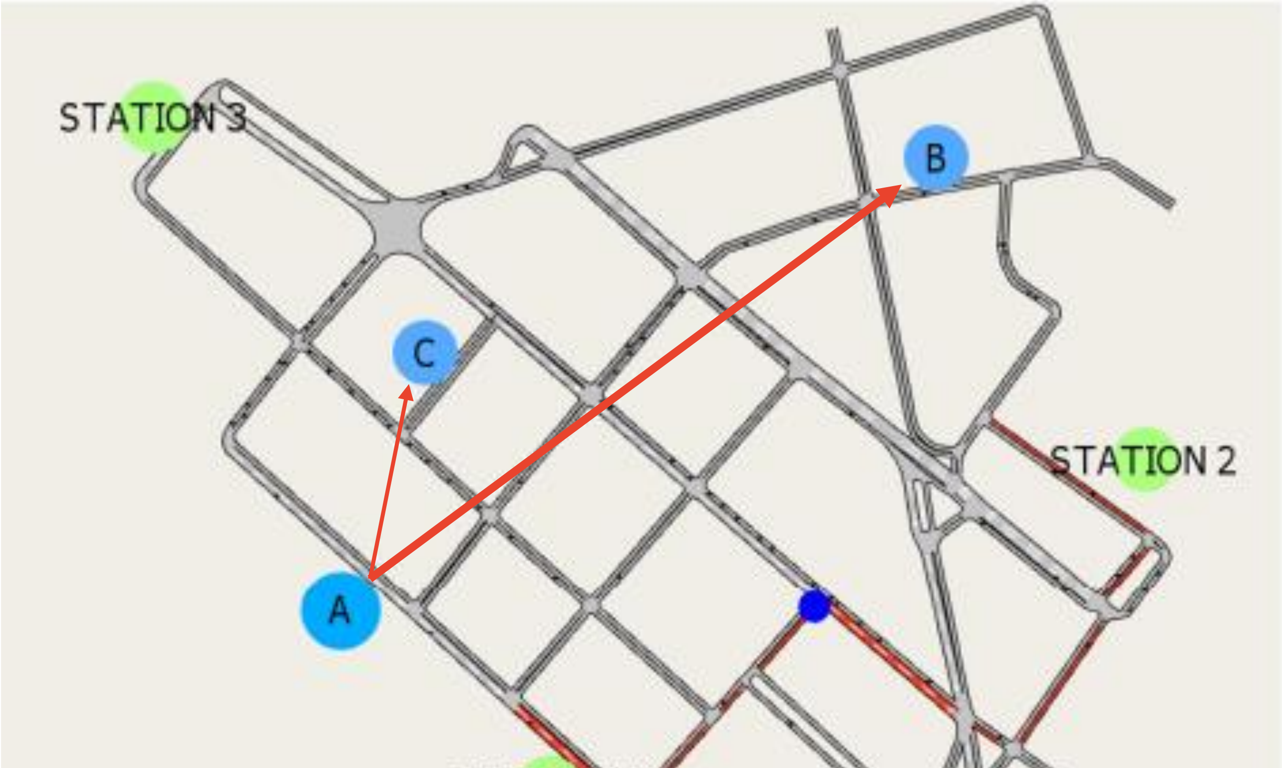
- **Trip execution and duration**
- **Sequence of stops**

aimsun.ride

Service and User related KPIs:
- Travel times
- Travelled distances
- Waiting times
- Demand coverage
- Fleet utilization
- Network performance,
- …

Aimsun Ride is designed as a plug-in inside the Aimsun Next software

Example : Bike-sharing



Request:

Point A: origin of three trip requests

Point B: destination of requests 1 and 2

Point C: destination of request 3

Constraint: Maximum walking 10 min

Request 3 is rejected due to a maximum walking constraint (10 minutes)

MOMENTUM

Madrid case study: Deployement of BiciMAD in a new district

Deployment of BiciMAD in the district of Villa de Vallecas:

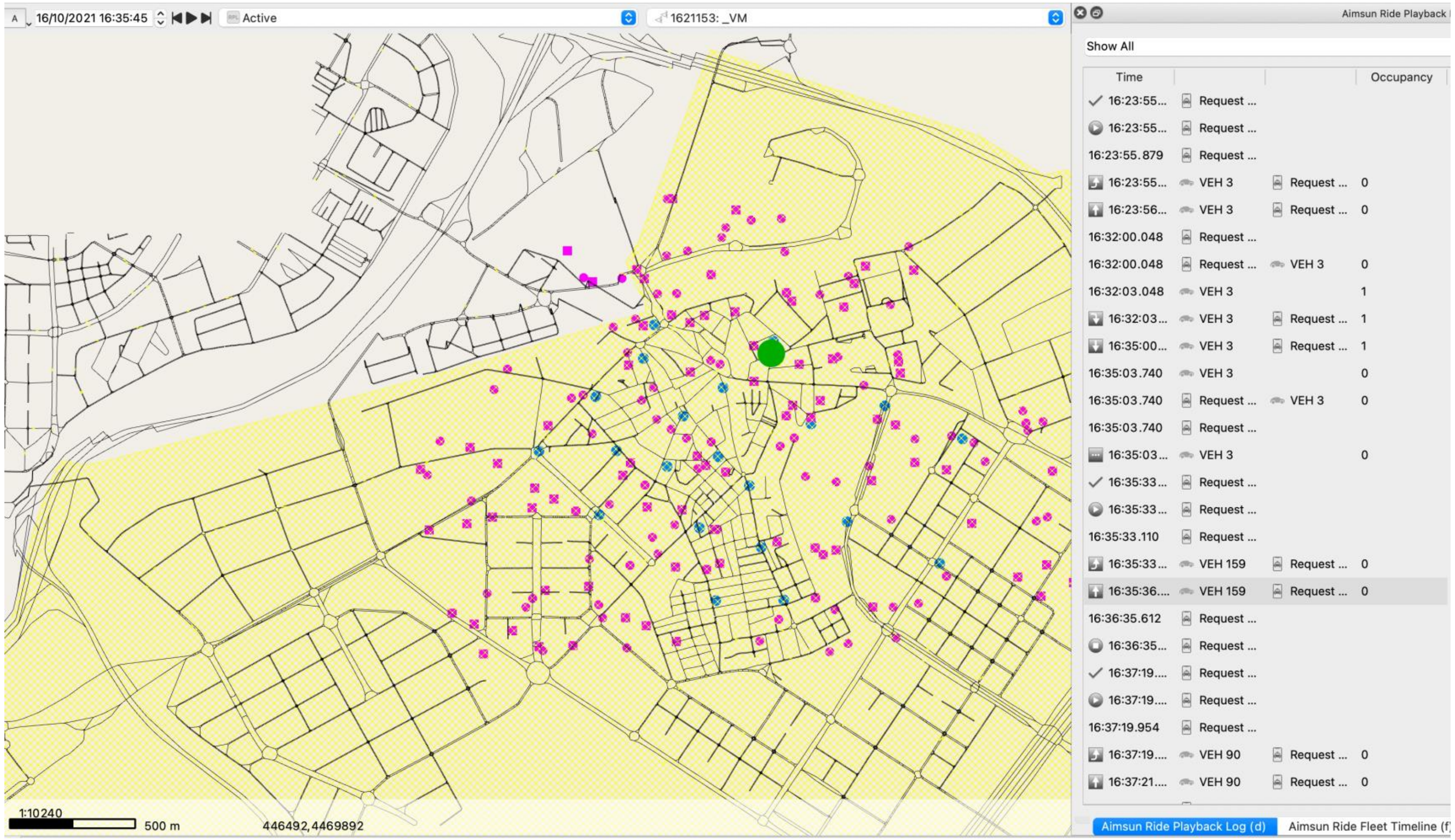
BiciMAD is a public shared Bicycle Service

MOMENTUM has developed a tool set for the assessment of the impact of shared mobility services

How these tools can help in the design of the deployment of the service in a new district:

- Design of the service's infrastructure
- Simulation of the service for different demand and supply scenarios.

Madrid bike-sharing – Simulation demo



No. Stations	**34**		
No. Bicycles	**476**	**476**	**762**
Penetration	**Low**	**High**	**High**
Scenario	**E1.1**	**E1.2**	**E1.3**
Satisfied trips	1024	1917	5435
Unsatisfied trips	912	9820	6277
% of unsatisfied trips	47.1	83.6	53.6
Average travel distance (km)	2.7	2.7	2.6
Time in vehicle (%)	39.8	38	39.7
Trips per vehicle	2.7	5.4	7.4
Time of use per vehicle (%)	1	1.7	2.9
No. of vehicles without trips	82	74	97
Vehicles without trips (%)	17.2	15.5	12.7

aimsun.

Thessaloniki case study:

- Introduction of future DRT service for suburban areas with sparse public transport network to increase the accessibility and connectivity with the city center

- Main inputs for the modelling and simulation of the services:
    - Synthetic population
    - Modal split for the new service requests
    - City transport network
    - Optimized planning and operational solutions from the developed **fleet management** algorithms

aimsun.

Key outcomes

- Simulation provides the possibility to analyse shared mobility service within coexisting **transport system** in an efficient and reliable manner.
- Various service configurations can be implemented and assessed
- It will help cities and transport planner in performing strategic planning and evaluation of emerging shared mobility services
- Suitable **KPIs** can be derived
- Flexibility of utilising different traffic flow resolutions


6 Av