Paris area case study

METROPOLIS

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OUTLINE

A: Data
- ❑ Demand (zones)
- ❑ Supply (Network)

B: Some results of the first run
- ❑ Presentation of the DREIF network in METROPOLIS
- ❑ Estimating the O-D matrix
- ❑ Results

C: METROPOLIS calibration method
- ❑ Procedure to estimate a traffic variables in METROPOLIS
- ❑ Calibration of the congestion law
- ❑ Calibration based on travel times
- ❑ Final check of flows

D: Interaction between METROPOLIS and UrbanSim
- ❑ Architecture of simulation scenarios
- ❑ Interaction over time between the different models

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PART A

Data

DATA – OVERVIEW OF MODUS

MODUS = transportation model

- o developed by the Direction Régionale de l'Equipement d'Ile-de-France (DREIF)
- o for evaluation of public policies on the mobility of people and especially the traffic studies
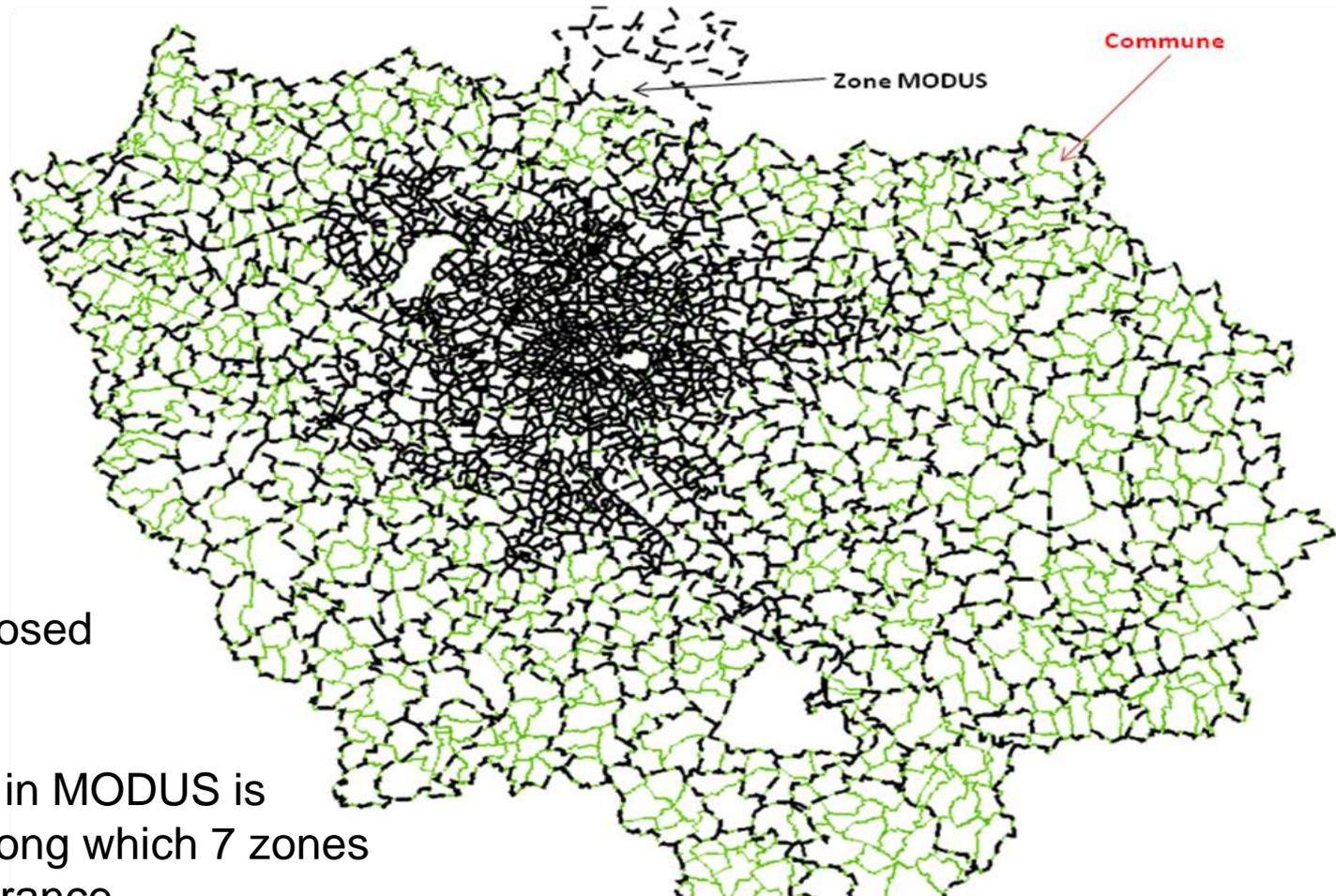
Main features

- o 4-step model
- o Multimodal

Main characteristics :

❑ Simulated horizons: 2007, 2020 & 2030

❑ 2 periods of peak hours are modeled : morning, evening

❑ Approximately 1300 zones

❑ 36000 links

DATA – DEMAND


Île-de-France is composed of 1300 Communes.

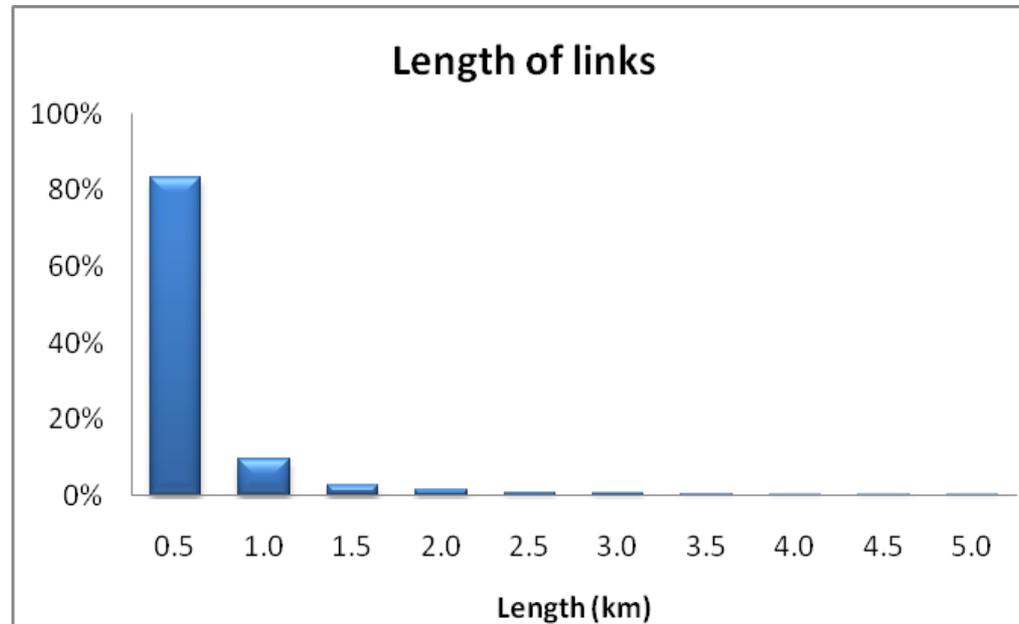The network modeled in MODUS is cut in **1277 zones** among which 7 zones are outside of Ile-de-France

The road network is composed of **36600 links** and 18000 nodes.

Each link is defined geometrically by a origin node and destination node and characterized by several attributes: length, capacity, free speed, type of curve flow-speed,...
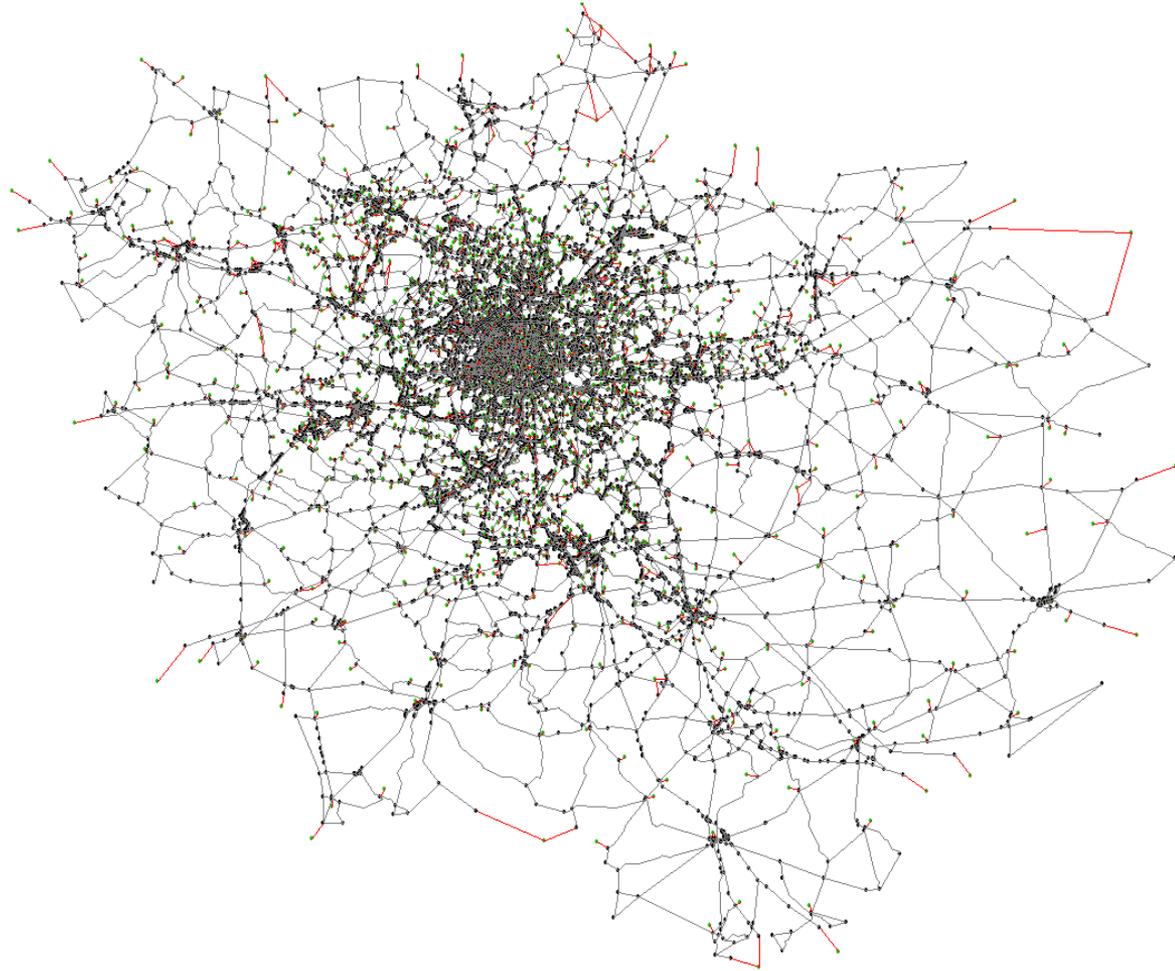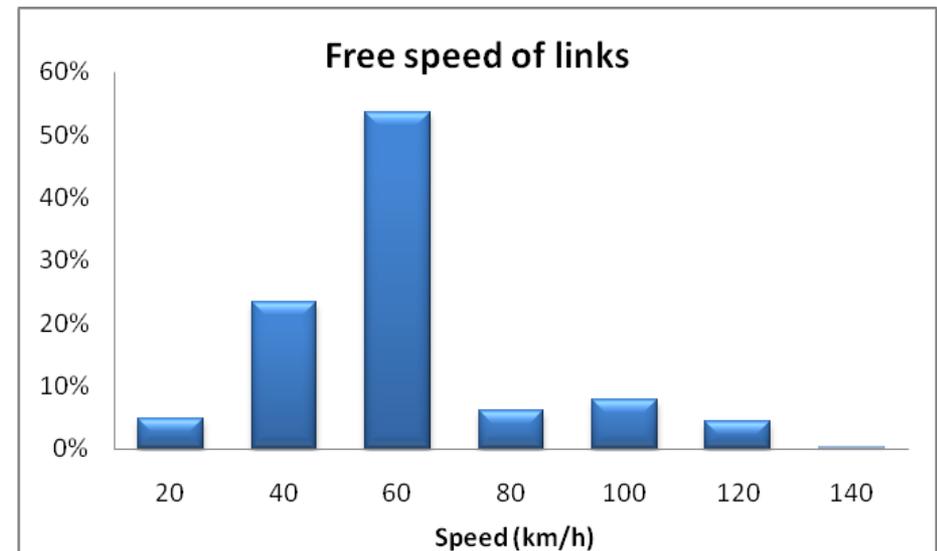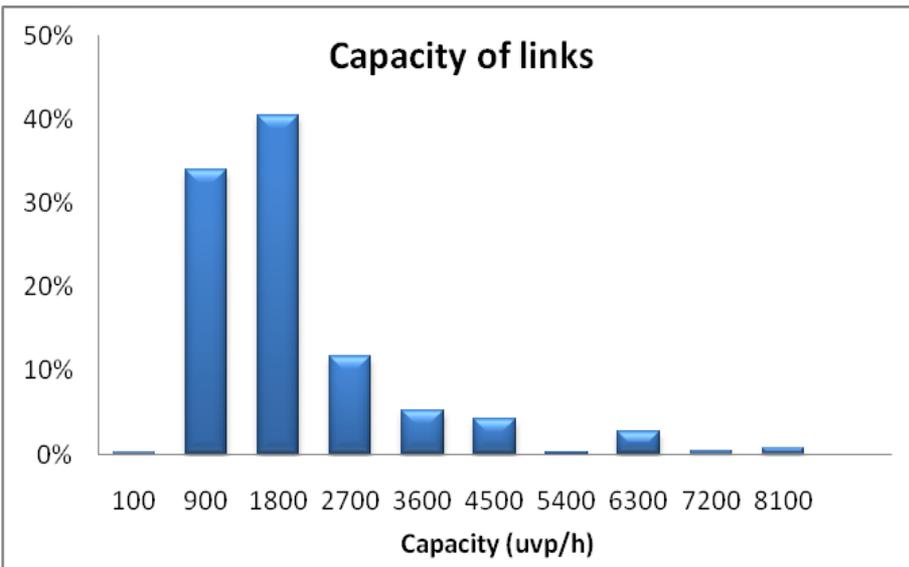
DATA – SUPPLY

	Average	Min	Max	Standard deviation	Total
Length (km)	0.34	0.00	10.95	0.67	12364
Capacity (uvp/h)	1,742	100	10,500	1,328	-
Free speed (km/h)	57	3	130	25	-

Length of links

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DATA - SUPPLY

PART B

Some results of the first run

DREIF NETWORK IN METROPOLIS

Utilisateur:SS, Date:12 mai 2010, Base de données:Seghir, Simulation:Simulation_25-Iterations, Heure:08:30

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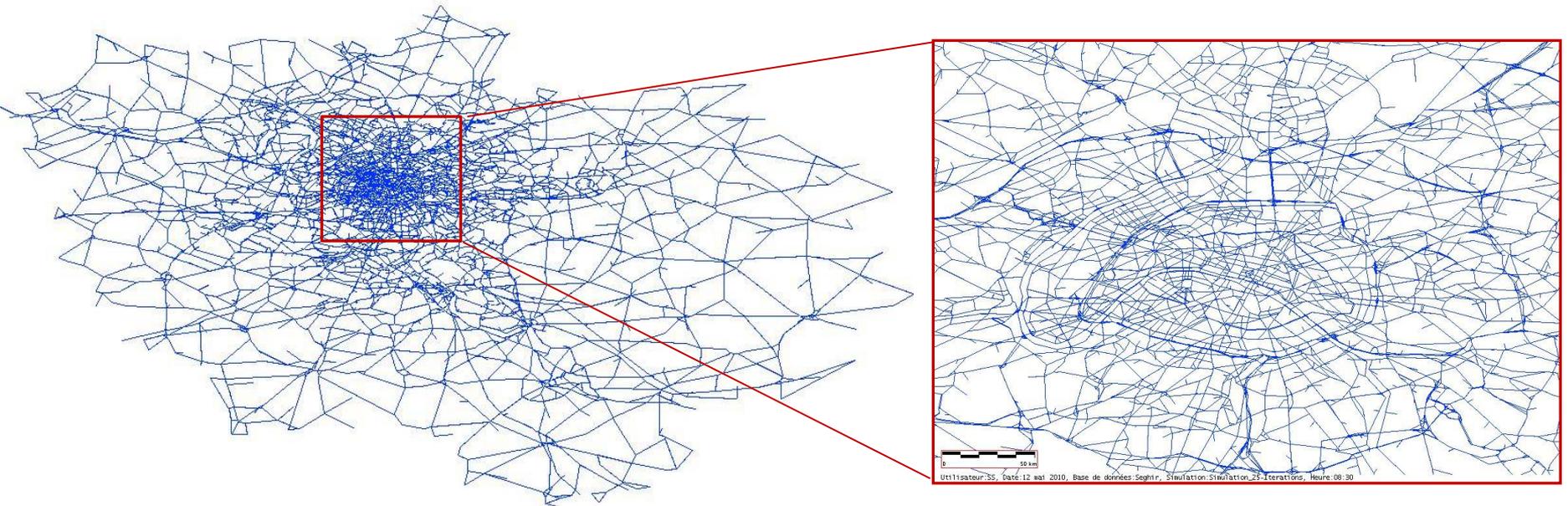
Estimating the OD matrix (1)

The static model MODUS is designed to work on average one hour of the morning peak (8:00 to 9:00) and evening (4:00 p.m. to 5:00 p.m.) periods . To extrapolate a broader peak, we analyzed data from hourly counts of the road network in the Île-de-France from 2006 to 2009

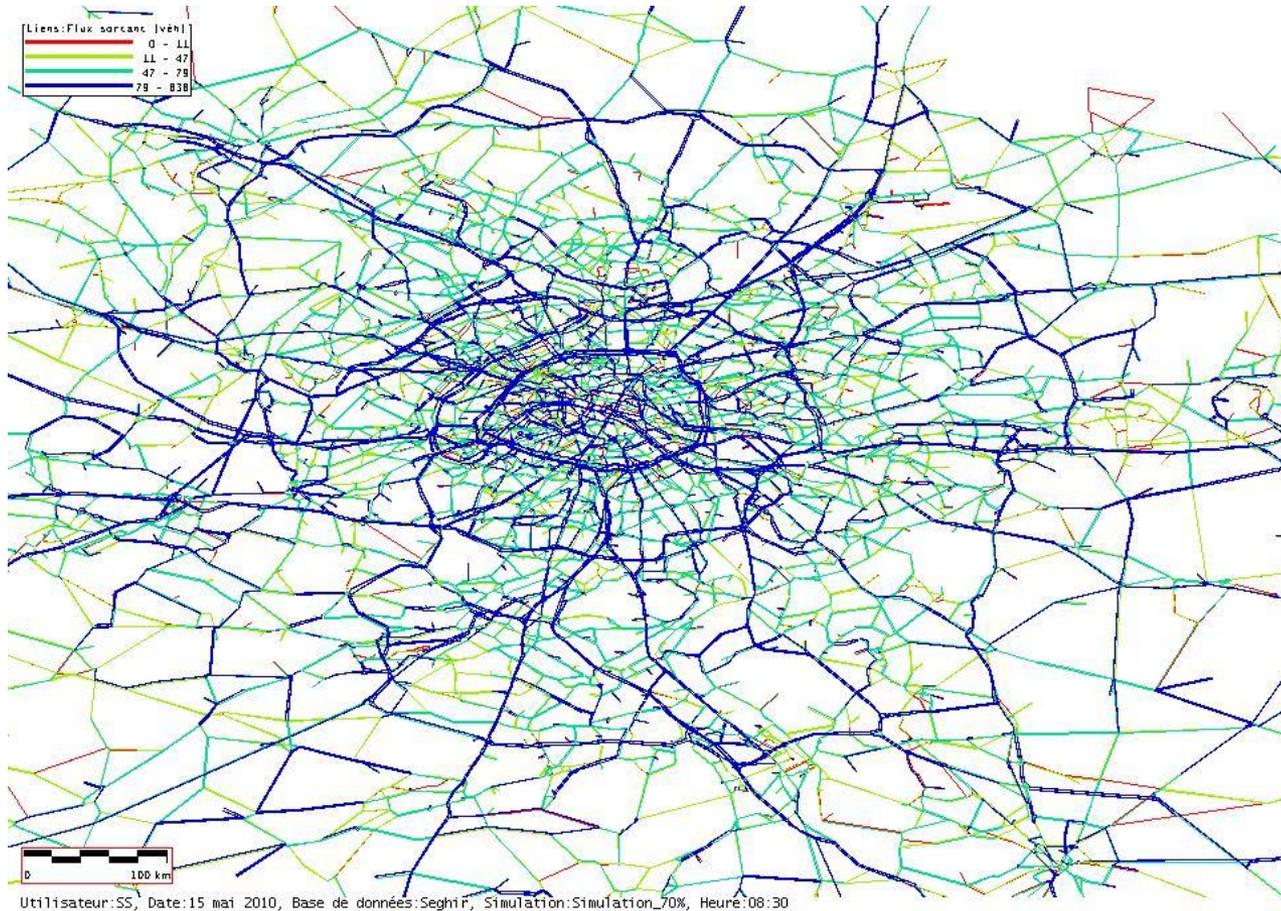**Trafic horaire moyen en Ile-de-France 2006-2009**
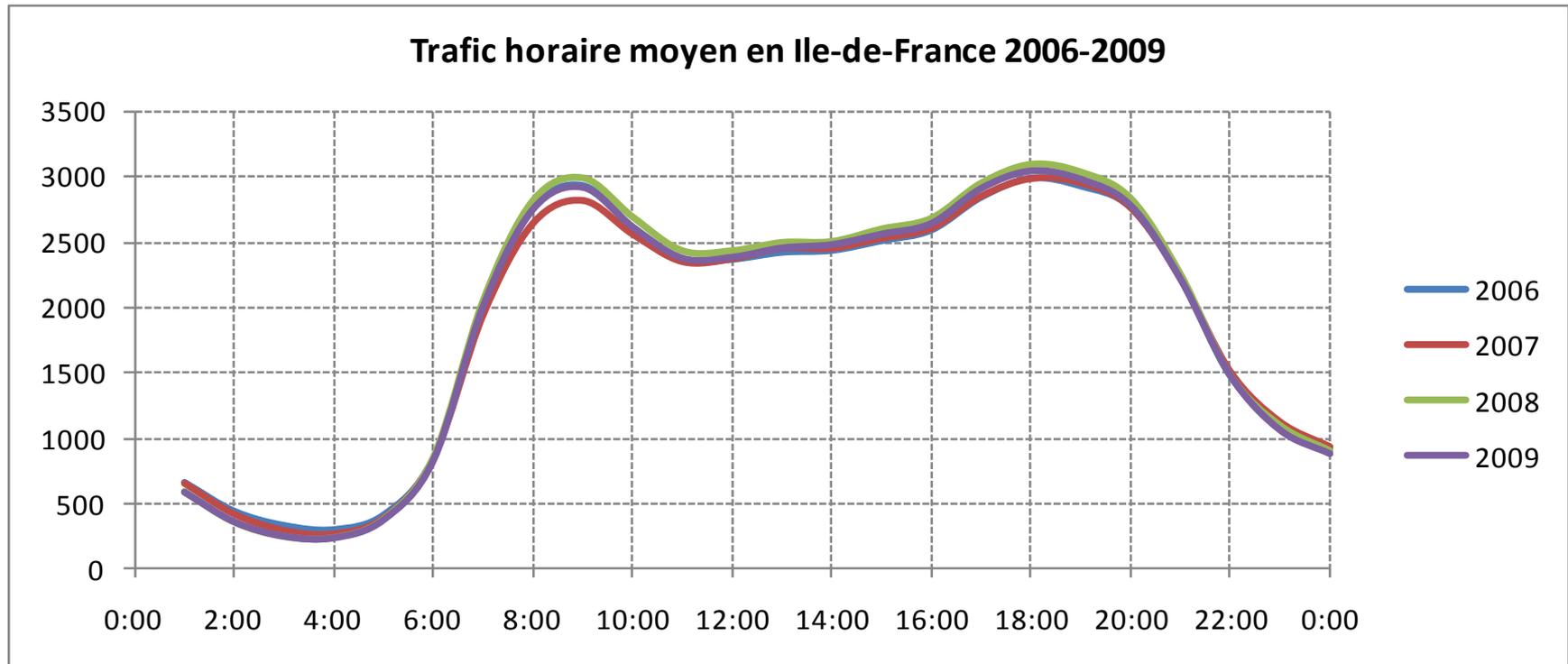
Estimating the OD matrix (2)

From the request of the peak hour 8am-9am (1,249,349 vehicles), the demand injected into METROPOLIS between 6:00 and 11:00 is shown in the figure below. At this time of five hours, the total volume of traffic injected into METROPOLIS 5.5 million vehicles.
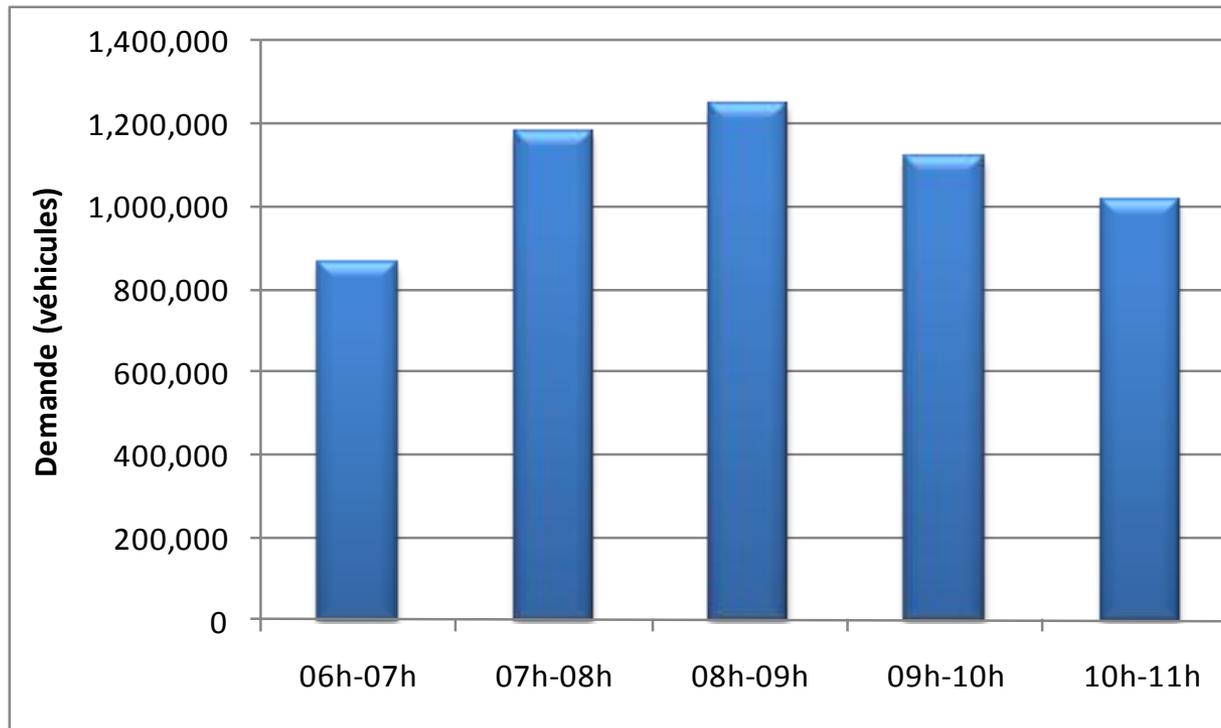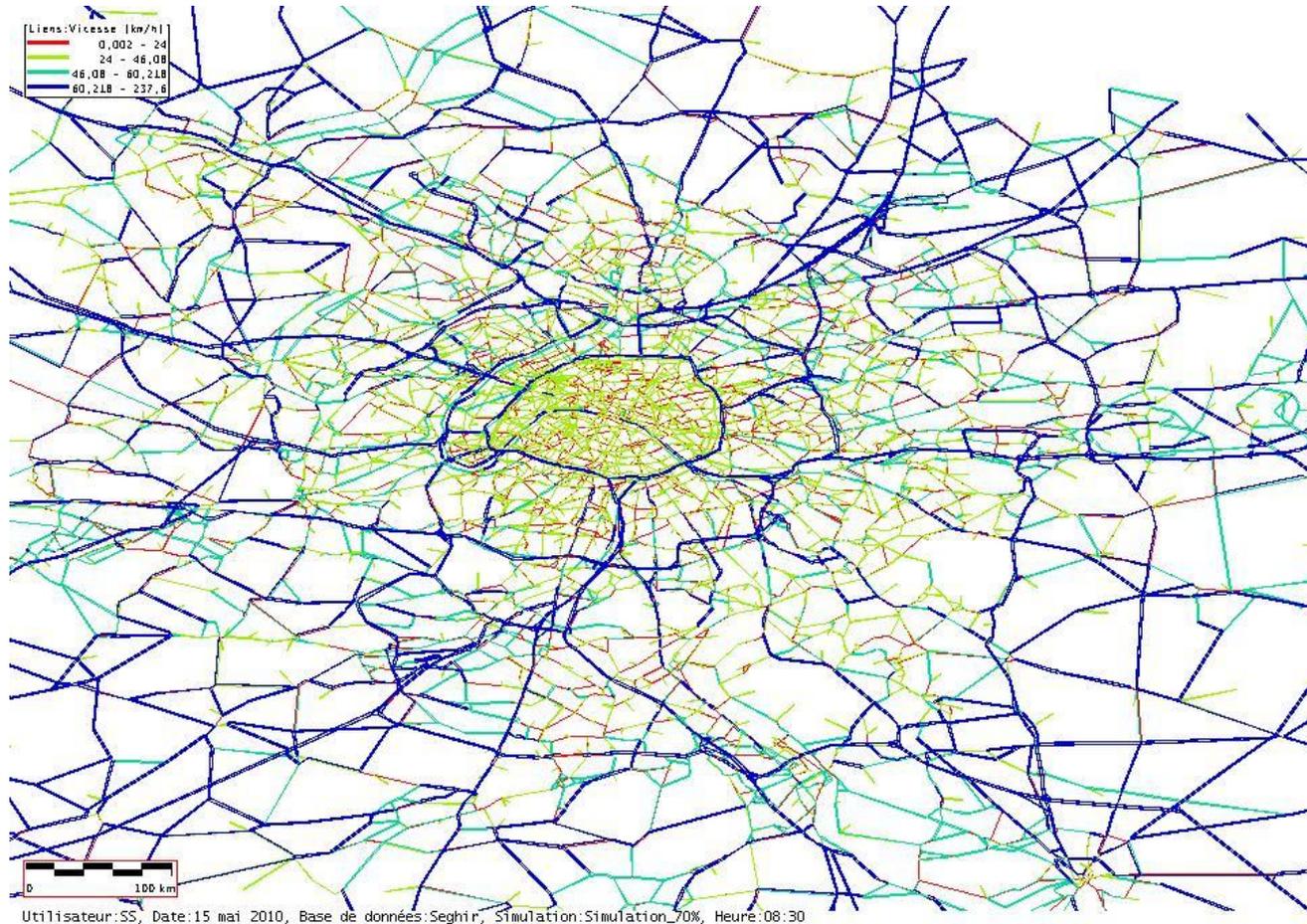
Results of the first run

Traffic volume in the interval 8:30 to 8:36

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RESULTS OF THE FIRST RUN

Speed in the interval 8:30 to 8:36

Utilisateur:SS, Date:15 mai 2010, Base de données:Seghir, Simulation:Simulation_70%, Heure:08:30

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PART C

METROPOLIS
calibration method
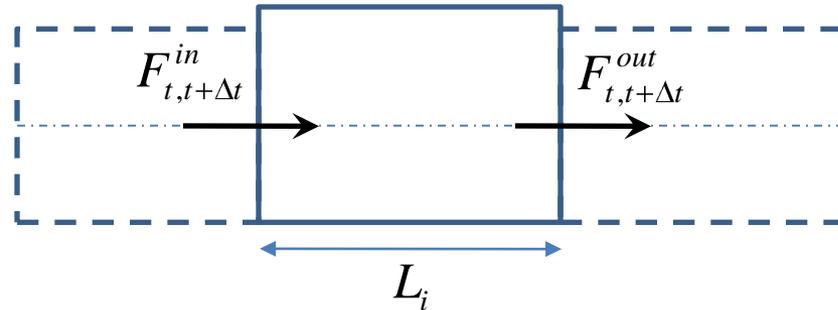
Metropolis implementation

1. Observation of data on counting stations
2. Estimation of the congestion function (differentiate by type of road)
3. Introduce the congestion formula in Metropolis
4. Run simulations
5. Compare METROPOLIS output and observations
6. Perform calibration: go to step 3 (if calibration calls for the adjustment of congestion function parameters) or step 4 (if it is not the case)

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F, D and S are respectively flow, density and speed in the link i

1. Flow

$F_t \leq Capacity$

$F_{t,t+\Delta t}^{in}$ $F_{t,t+\Delta t}^{out}$

L_i

2. Density

$$D_{t,t+\Delta t} = \frac{\displaystyle\int_{t}^{t+\Delta t} \left(F^{in}(t) - F^{out}(t) \right) dt}{L_i} + D_{t-\Delta t,t}$$

3. Speed / Travel time

S

$S_{t,t+\Delta t}$

$D_{t,t+\Delta t}$

D
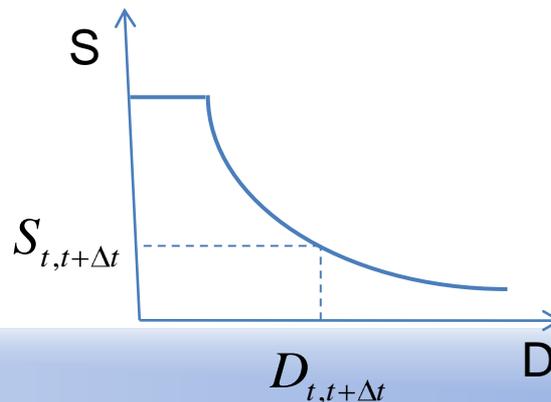
and we verify

$$F_{t,t+\Delta t} = V_{t,t+\Delta t} * D_{t,t+\Delta t}$$

ESTIMATION OF THE CONGESTION LAW

The congestion law allows reconstructing the traffic conditions on a given link. It should be noted that this step is exogenous to METROPOLIS.

Based on data on the variables (flow, speed and occupancy) in the functioning of macroscopic traffic conditions on a homogeneous link, we estimate a congestion law.
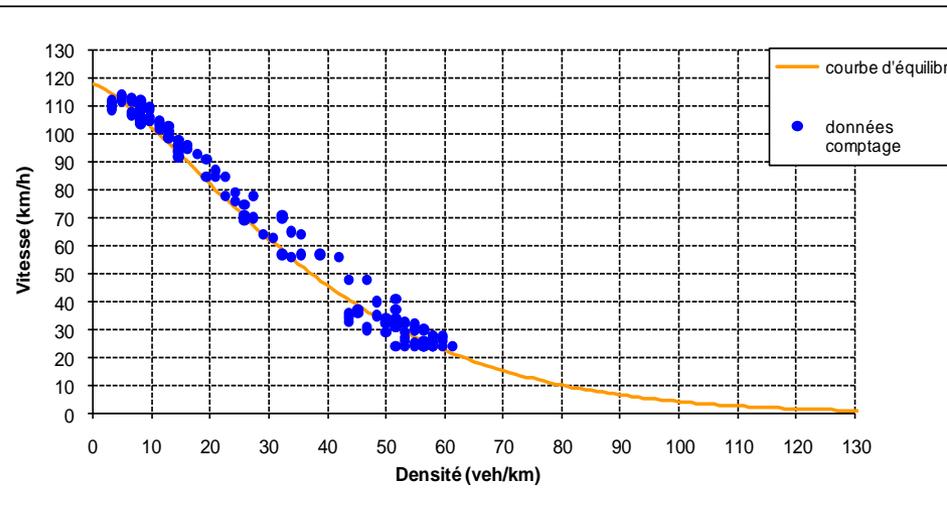
Speed-Density Relationship
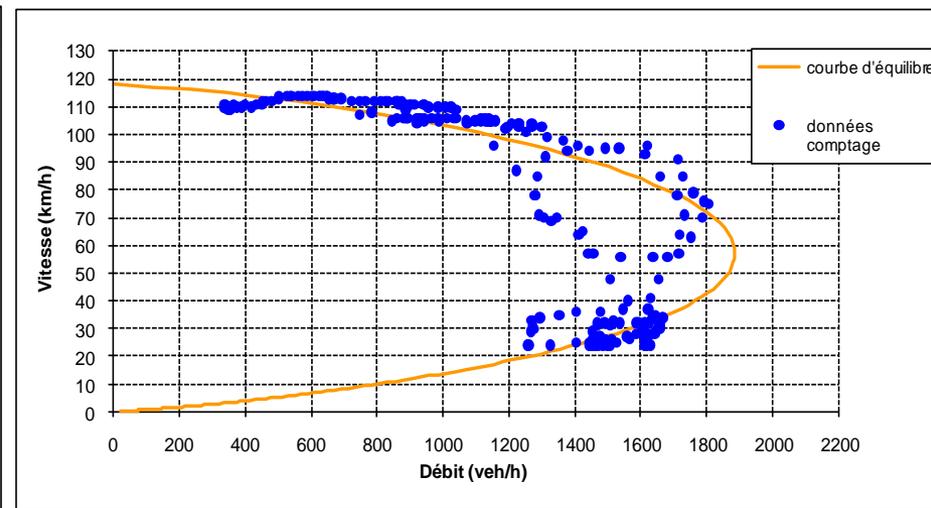
Speed-Flow Relationship
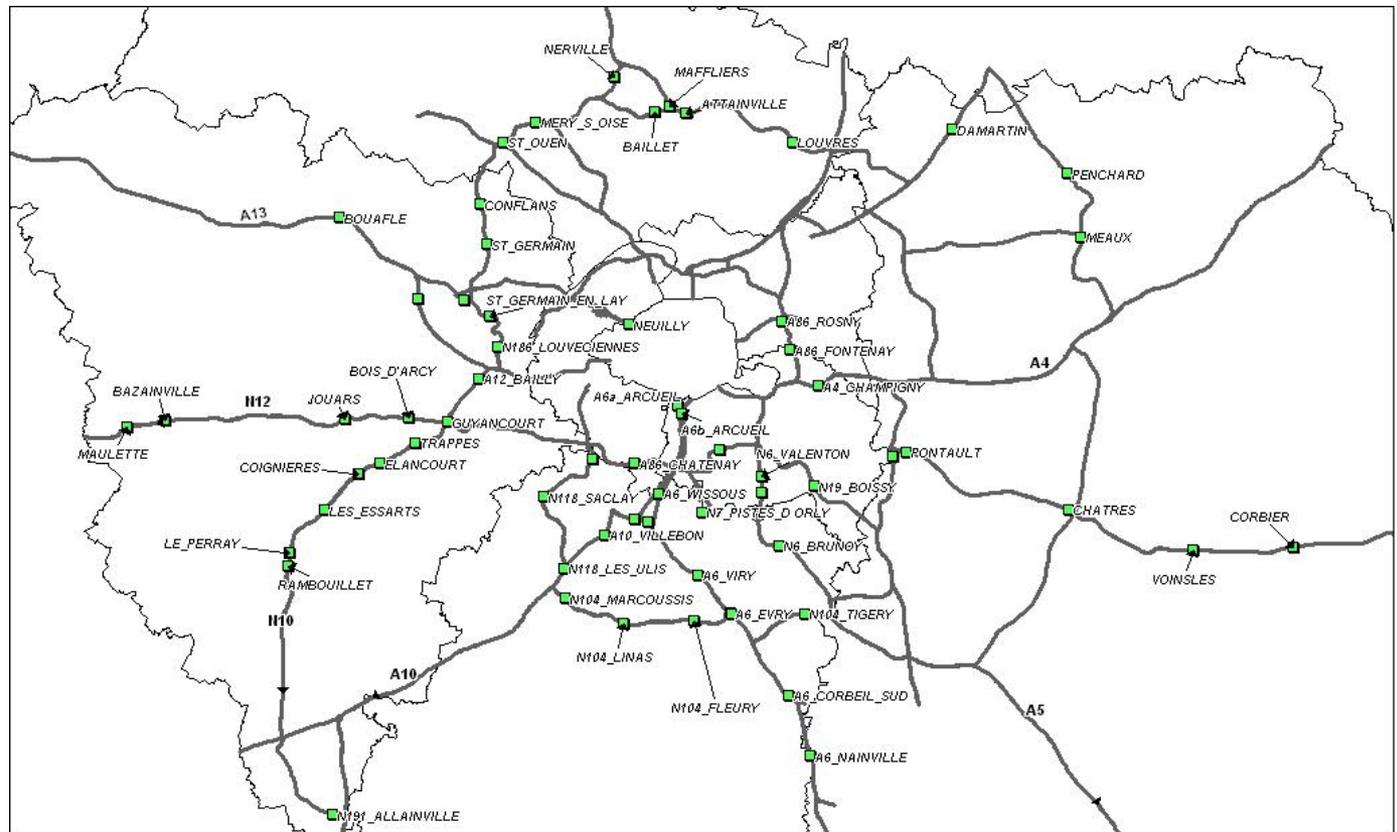
CALIBRATION BASED ON O-D TRAVEL TIMES

In the first it is necessary to verify that the O-D travel times calculated by METROPOLIS are realistic.

This step is very important in the SustainCity project : the interaction between METROPOLIS and UrbanSim is based on the matrix of travel time, which METROPOLIS will estimate.

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Check of flow links

The approach can be adopted in this study to calibrate METROPOLIS,
will be based on the comparison between counting data and simulation
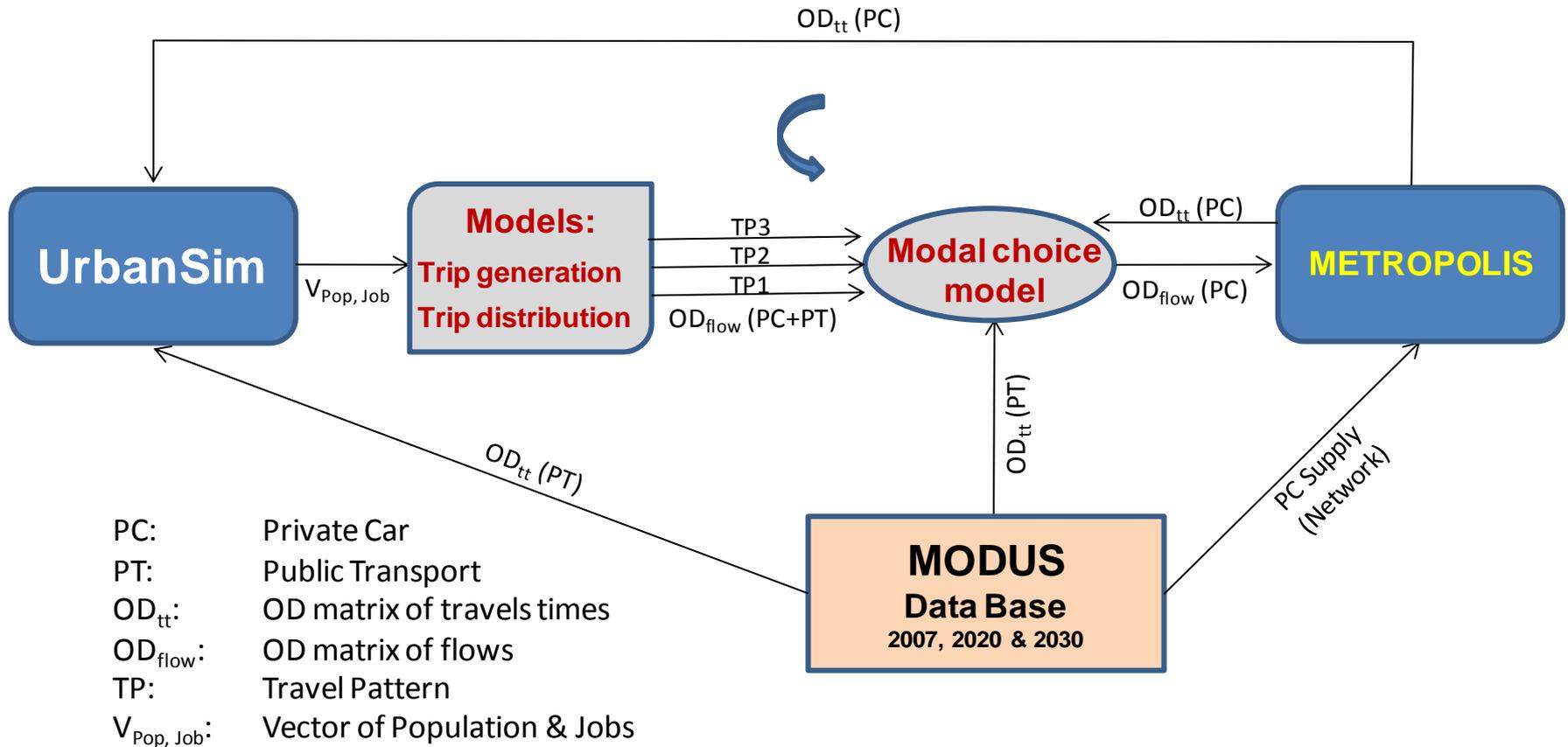results by METROPOLIS on each link containing a counting station.

*Counting station
in Île-de-France*

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Interaction between METROPOLIS and UrbanSim

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Interaction over time of different models

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