



REFORM

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Innovative mobility data collection tools for sustainable planning

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Data requested for SUMP development

- **Existing traffic regulations (e.g. directions, pedestrian zones, etc.)**
- Existing signalized intersections and road elements for persons with mobility limitations/disabilities
- Existing signage and horizontal marking
- **Existing land uses: identification of significant attractions**
- **Traffic flows counts**
- Traffic composition and turning movements counts at intersections
- **Origin - Destination surveys**
- Existing parking characteristics and conditions
- **Public transport system: routes, route frequency, passenger traffic**

Innovative data sources

- **Static sensors network:** Point to point tracking of MAC ids along the network through Bluetooth detectors (more than 40).
- **Dynamic sensors fleet:** Floating Car Data provided in real time by a professional fleet (more than 1.200 vehicles).
- **Cooperative technologies** (COMPASS4D and COGISTICS): RSU is a static sensor and OBU is a dynamic sensors (CAM message).
- **Social media** (check-in service of facebook)

Innovative data sources











Floating car data (FCD)

Bluetooth devices detectors (BT)

Social media (SM)

	FCD	BT	SM
Network characteristics	XXX	X	
Land uses			XXX
Traffic flows	XX	XXX	
Origin-Destination matrices	XXX	XXX	X
Public Transport	XXX		

Innovative data sources

- Travel time estimation (average values and distributions) 
- Mobility patterns identification 
- OD matrices generation and validation 
- Traffic flow estimations 
- Route choice models development and calibration 
- Macroscopic traffic models calibration 
- Microscopic simulation models calibration 
- Road Hazards Detection 
- Personalized services for drivers (BMs) 
- Other activities 

FLOATING CAR DATA (FCD)

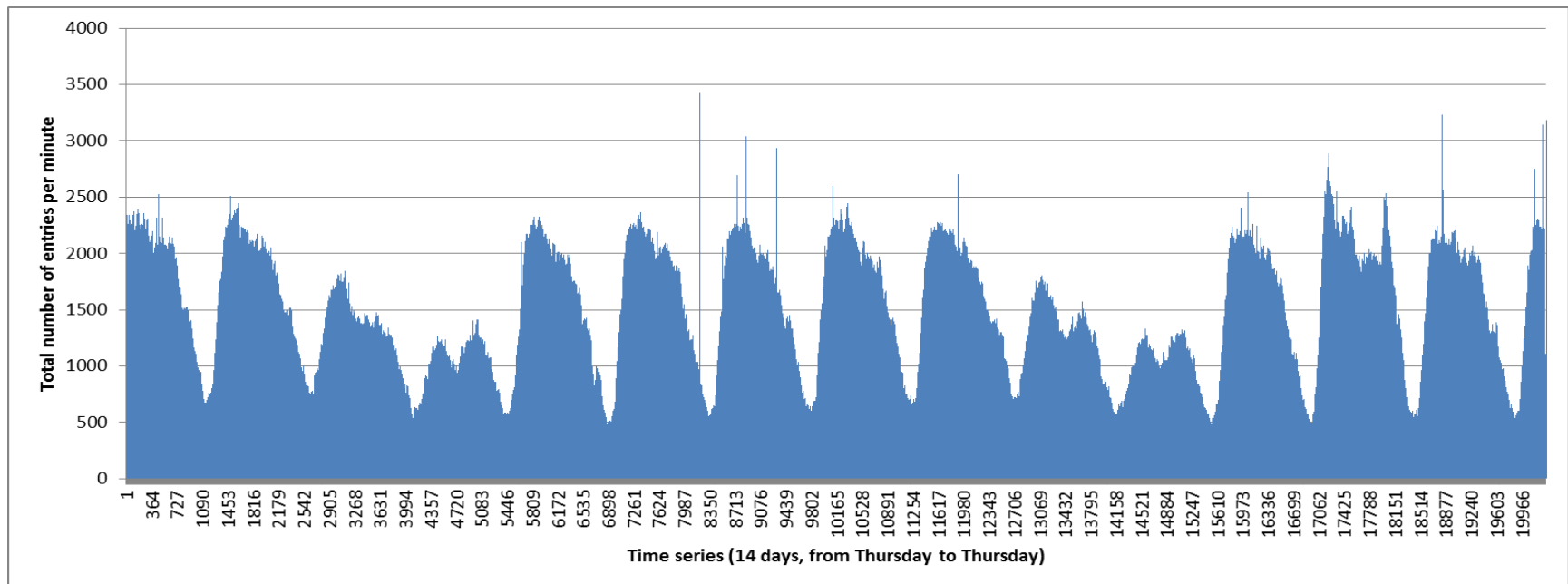
Floating car data (FCD)

- Device ID
- GPS position (X, Y, Z)
- Orientation (degrees)
- Speed (km/h)
- Timestamp
- Zone



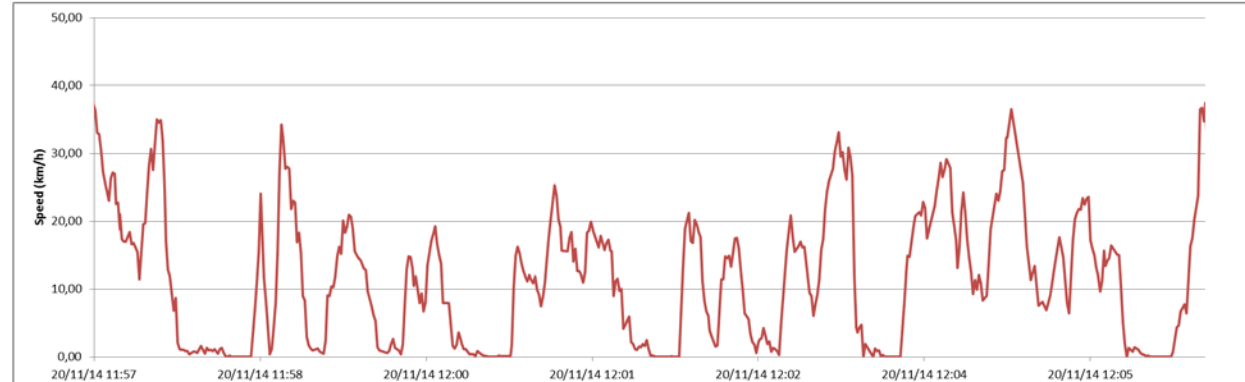
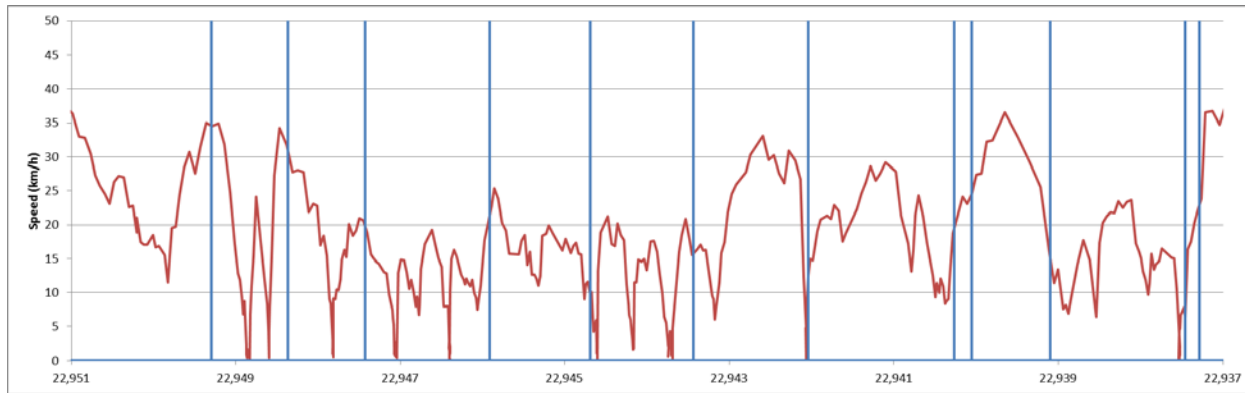
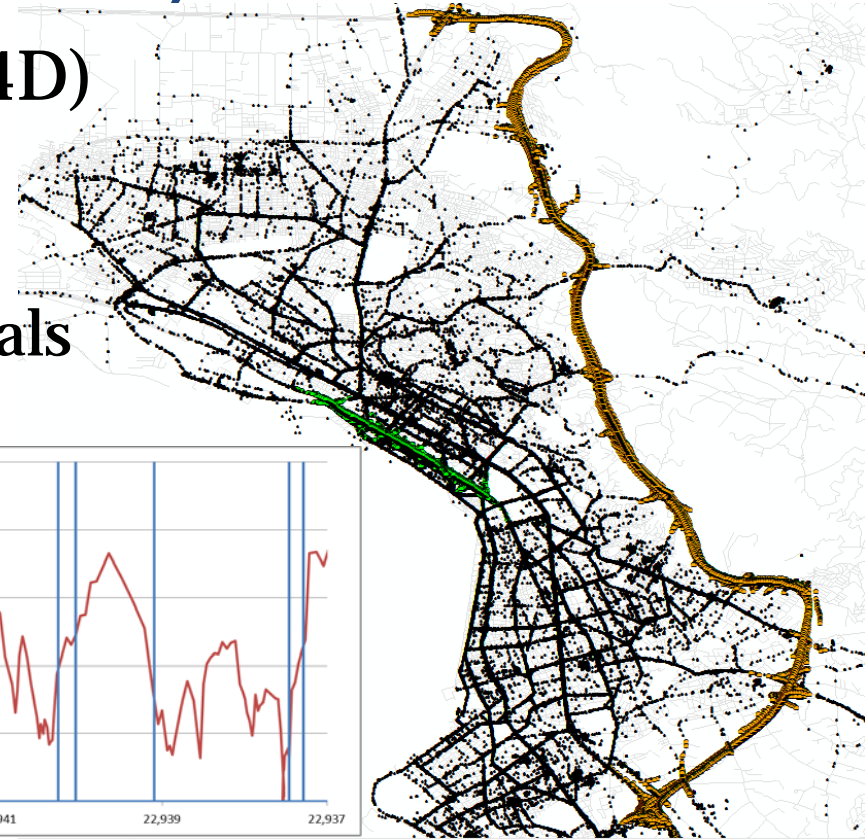
Floating car data (FCD)

- 1.200 vehicles (dispatching application)
 - Circulating 16-24 hours per day
 - Pulse generated each 100 meters (10-12 seconds)
 - 500-2.500 pulses per minute



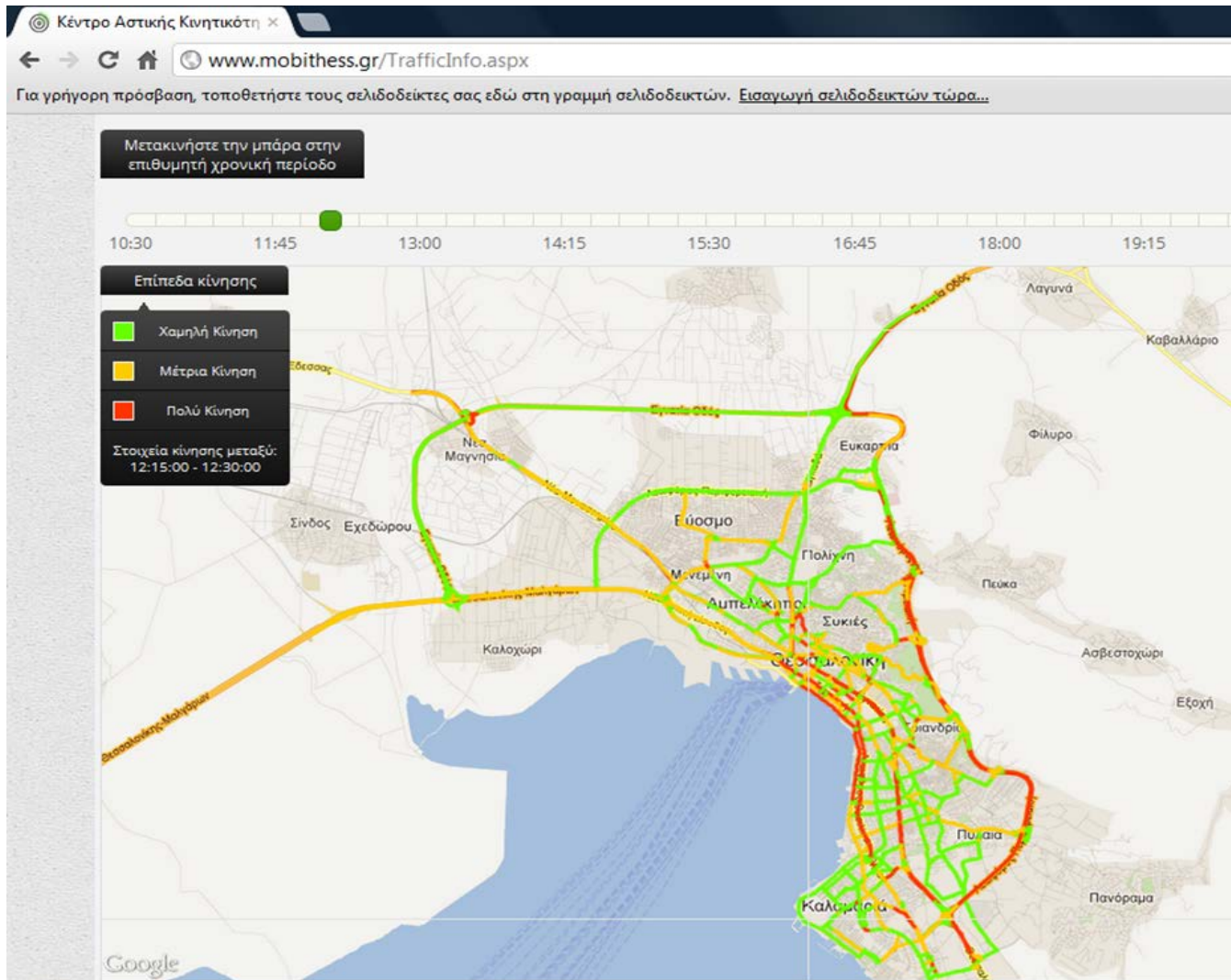
Floating car data (FCD)

- 600 vehicles (COMPASS4D)
- CAM messages (ETSI)
- One per minute
- Each second in two arterials



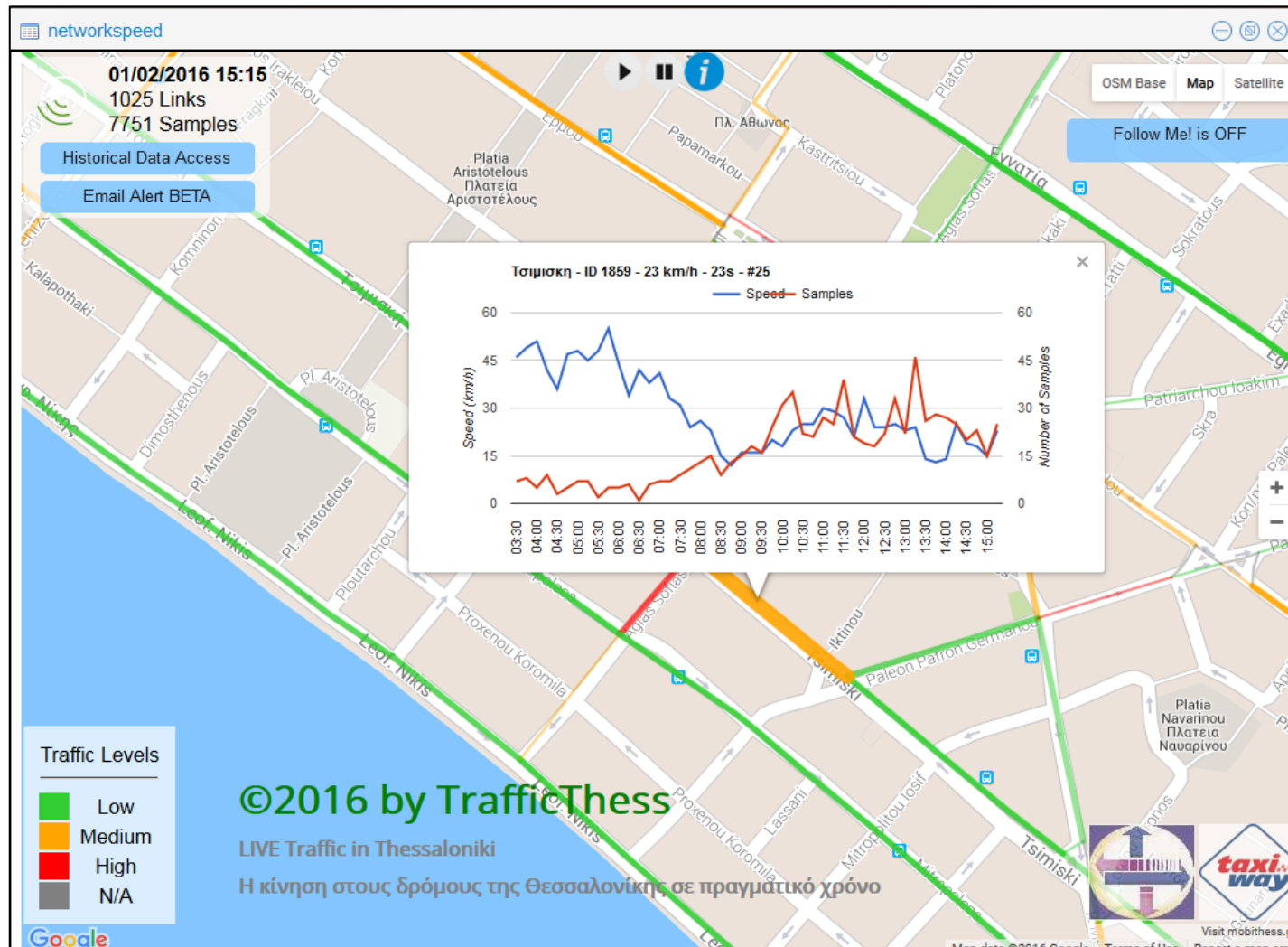
Floating car data (FCD)

Real time traffic conditions information (average speed)



Floating car data (FCD)

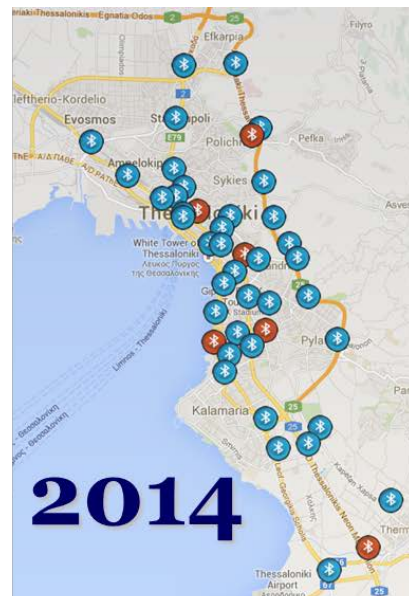
Real time traffic conditions information (average speed)



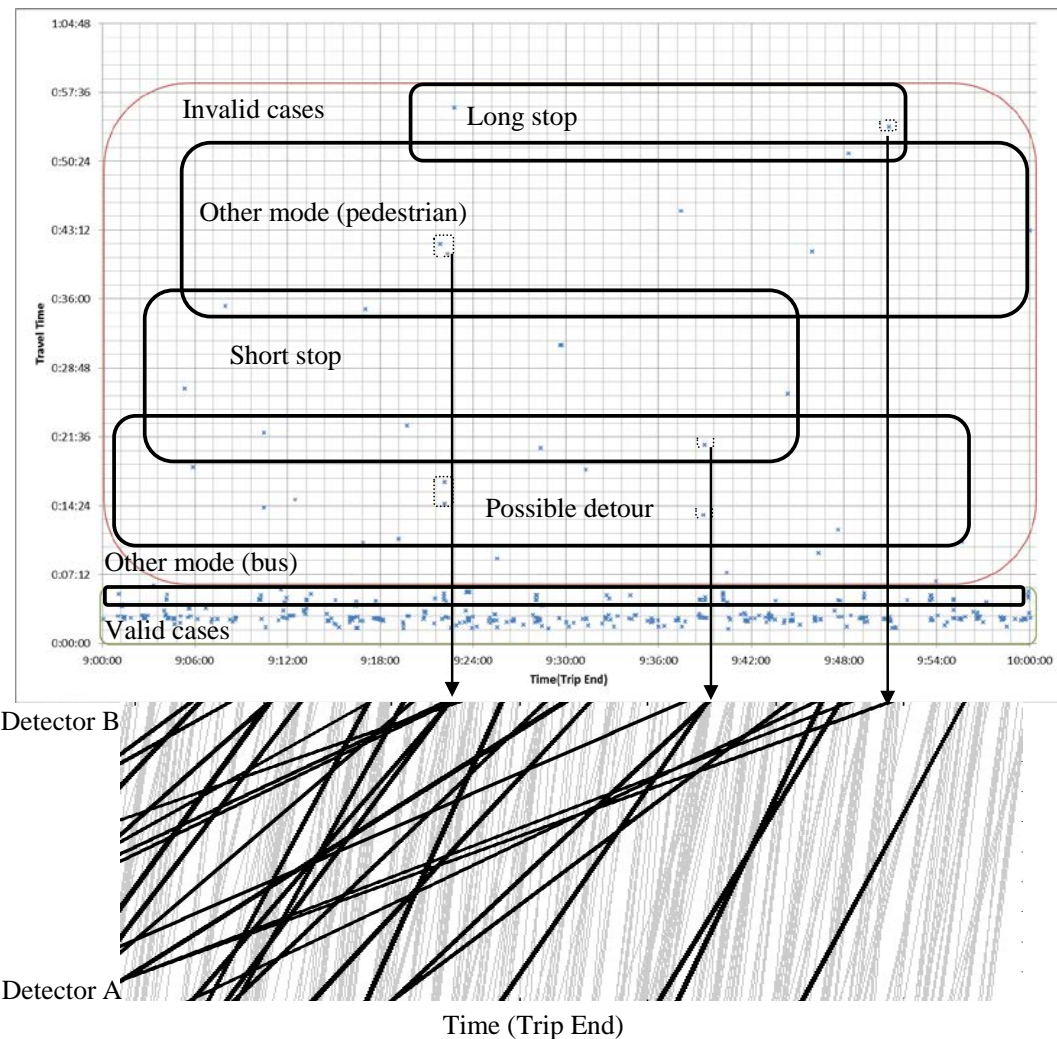
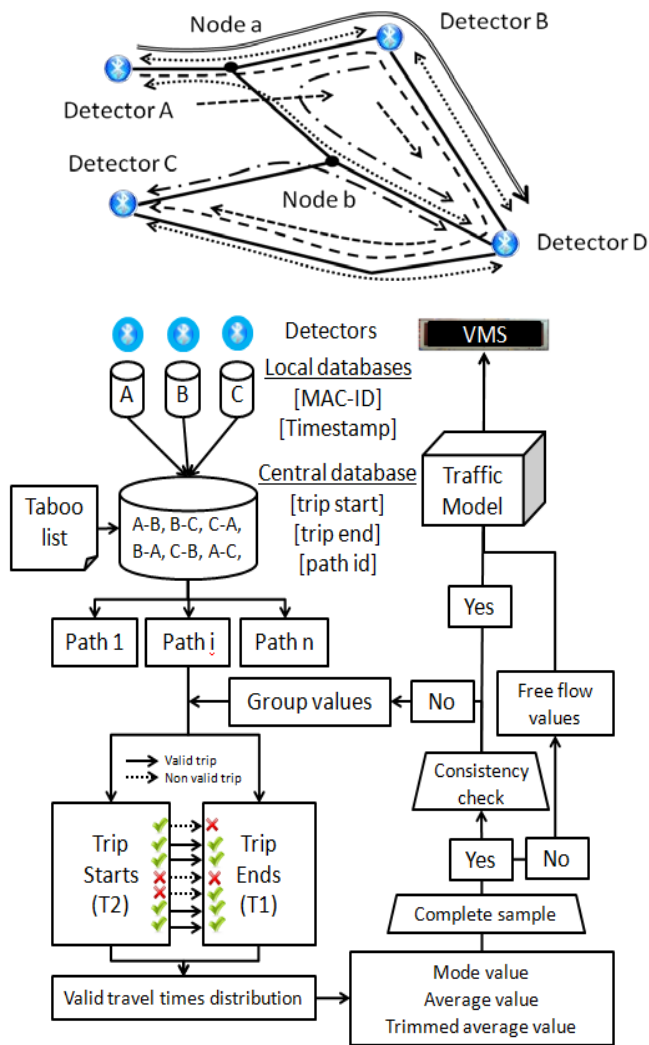
BLUETOOTH DEVICES DETECTORS (BT)

Bluetooth devices detectors (BT)

- 43 detectors (EEA, SEE-ITS & EASYTRIP)
 - 4 million detections per week (peak period)
 - 25.000 unique devices detected per day (one intersection)
 - 1 million “tracked” trips per week
 - 20.000 “tracked” trips per day (one path)
- More detectors installed in other cities and in Bulgaria (SEE-ITS & EASYTRIP)



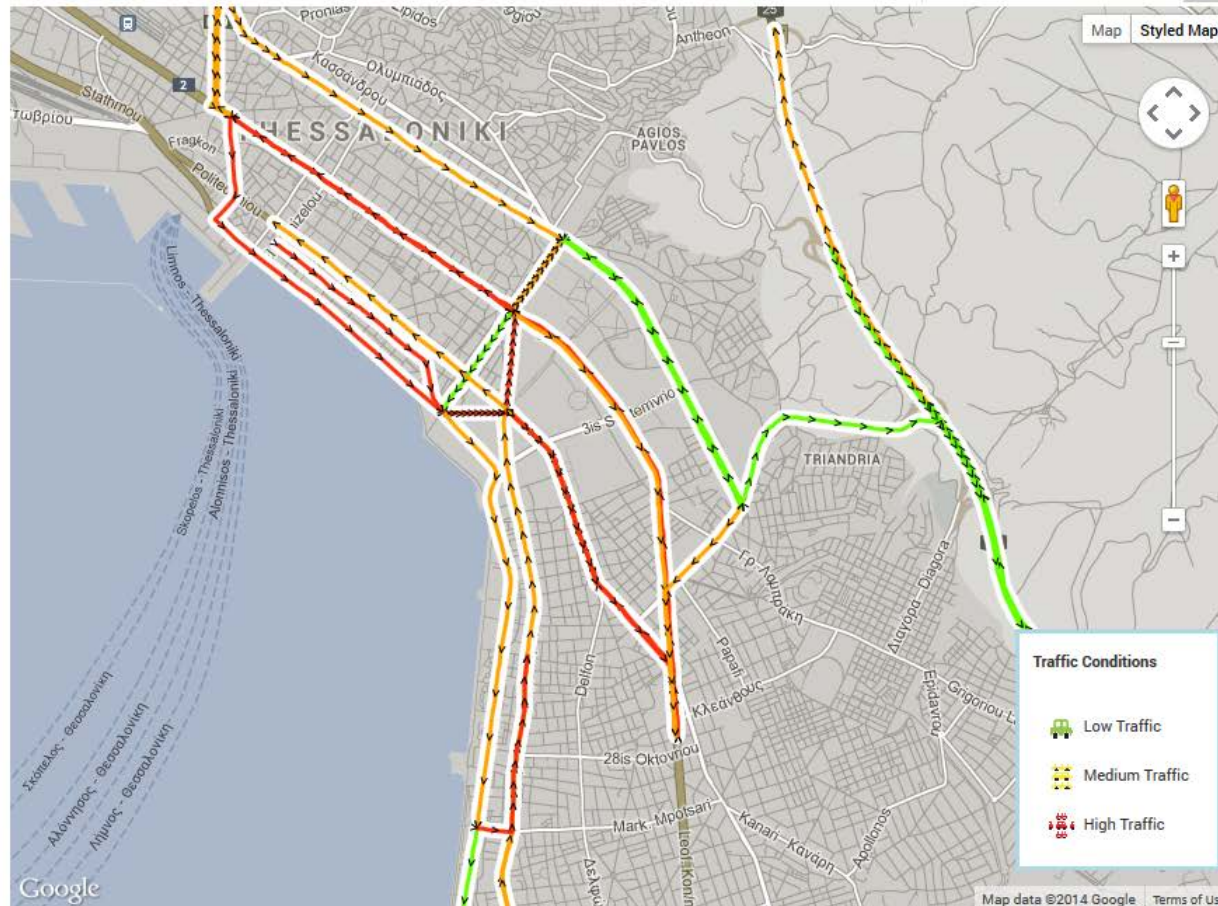
Bluetooth devices detectors (BT)



Bluetooth devices detectors (BT)

Real time travel time provision to drivers (VMS, internet, smart device)

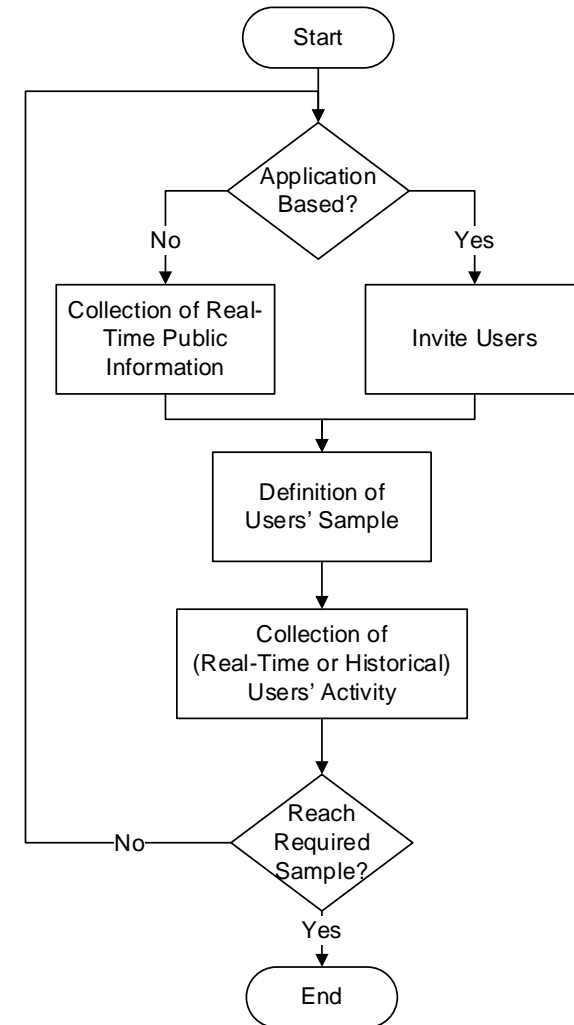
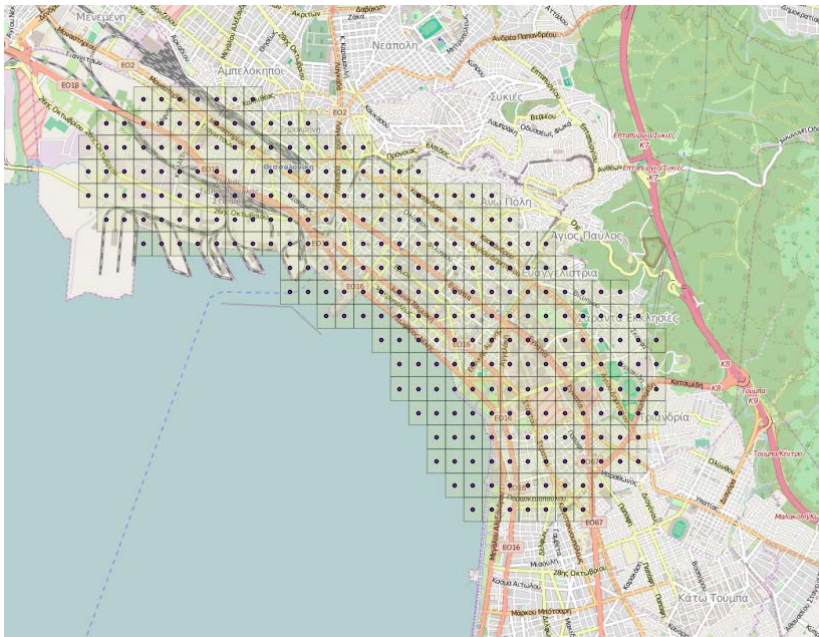
	K. Karamanli (Psaron/Kleanthous) - Platia CHANTH (CHANTH)	20'
	K. Karamanli (Psaron/Kleanthous) - Platia Sintrivaniou (Sintrivani)	17'
	Lagada (Ag. Pantou) - Platia Demokratias (Vardaris)	03'
	Platia Sintrivaniou (Sintrivani) - Lefkos Pyrgos	02'
	V. Olgas (Arch. Mousiou) - Platia CHANTH (CHANTH)	03'
	Platia CHANTH (CHANTH) - Platia Sintrivaniou (Sintrivani)	04'
	Platia Demokratias (Vardaris) - Platia Sintrivaniou (Sintrivani)	07'
	Evangelistria (Ag. Dimitriou/Ethn. Aminis) - Platia Sintrivaniou (Sintrivani)	02'
	Lefkos Pyrgos - Platia CHANTH (CHANTH)	03'
	Platia CHANTH (CHANTH) - K. Karamanli (Psaron/Kleanthous)	12'
	Platia Sintrivaniou (Sintrivani) - K. Karamanli (Psaron/Kleanthous)	05'
	Platia Sintrivaniou (Sintrivani) - Evangelistria (Ag. Dimitriou/Ethn. Aminis)	02'
	Platia Sintrivaniou (Sintrivani) - Platia Demokratias (Vardaris)	08'
	Platia Demokratias (Vardaris) - Lagada (Ag. Pantou)	03'



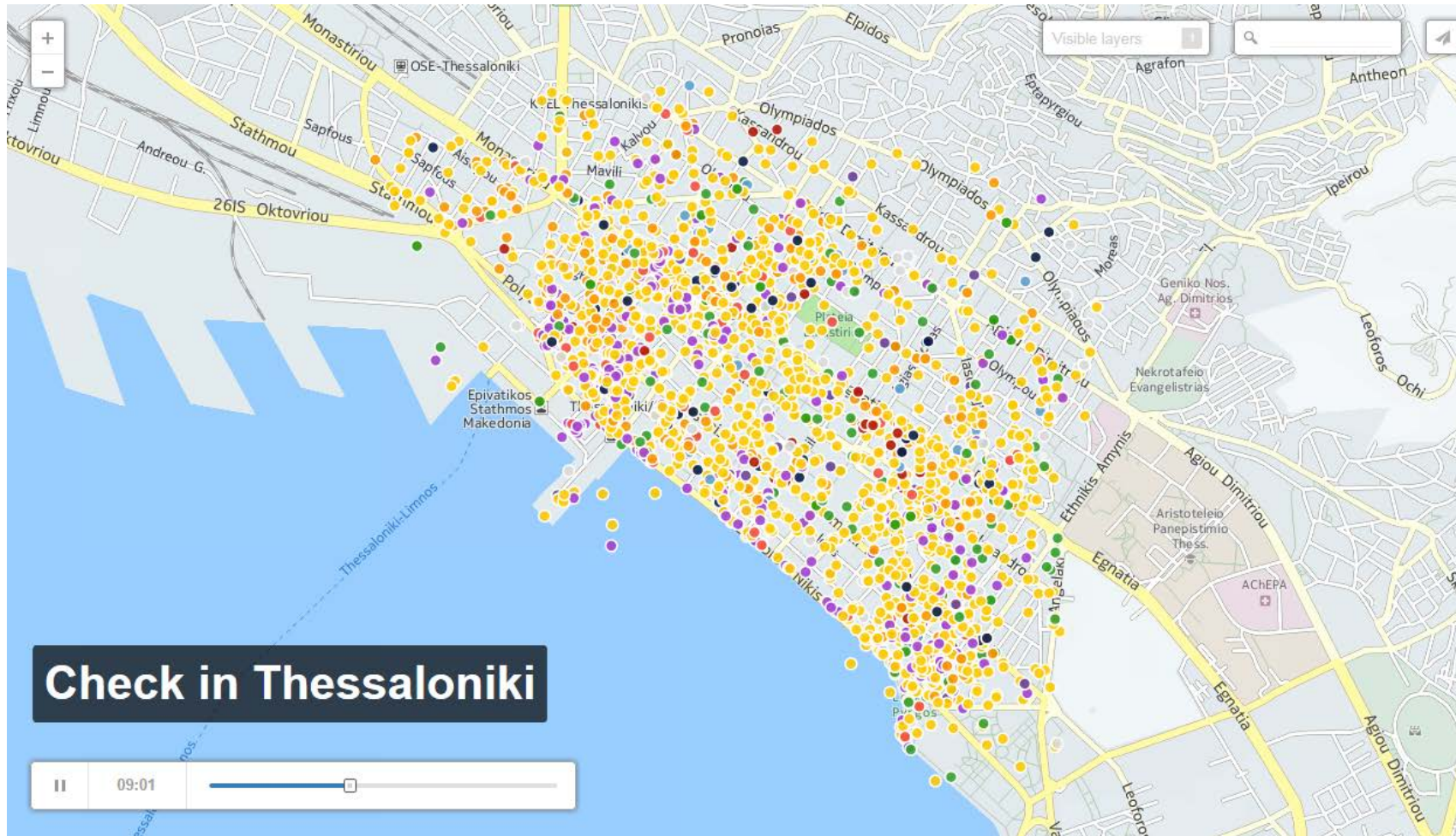
SOCIAL MEDIA (SM) - FACEBOOK

Social media (SM) - Facebook

- Data Collected from Public Graph API
- Spatial Queries using grid centroids
- 20 minutes interval



Social media (SM) - Facebook



2951 locations in the city center

Social media (SM) - Facebook

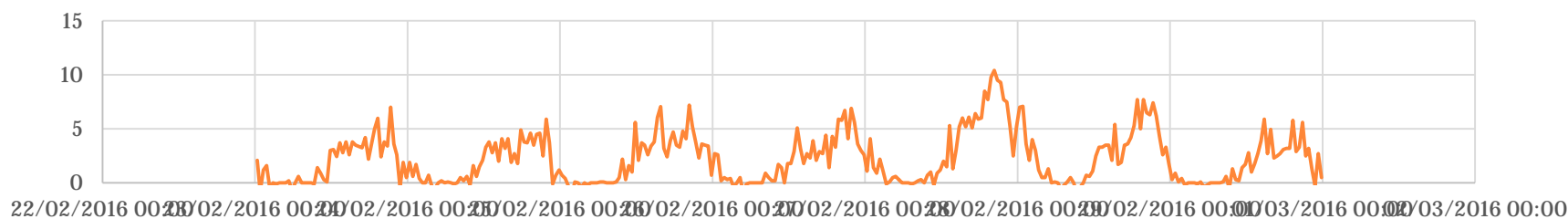
- *44.000 check-in events per week (750 locations)*
- Up to
 - 50 check-in events per minute (in the 136 locations tagged as bar)
 - 17 check-in events per minute (in the 150 locations tagged as restaurant)
 - 12 check-in events per minute (in the 32 locations tagged as outdoor)
 - 10 check-in events per minute (in the 125 locations tagged as cafe)
 - 10 check-in events per minute (in the 55 locations tagged as nightlife)
- Up to
 - 1265 check-in events during the “peak hour”
 - 920 check-in events in bars (Sunday 01.00)
 - 300 check-in events in restaurants (Saturday 22.00)

Social media (SM) - Facebook

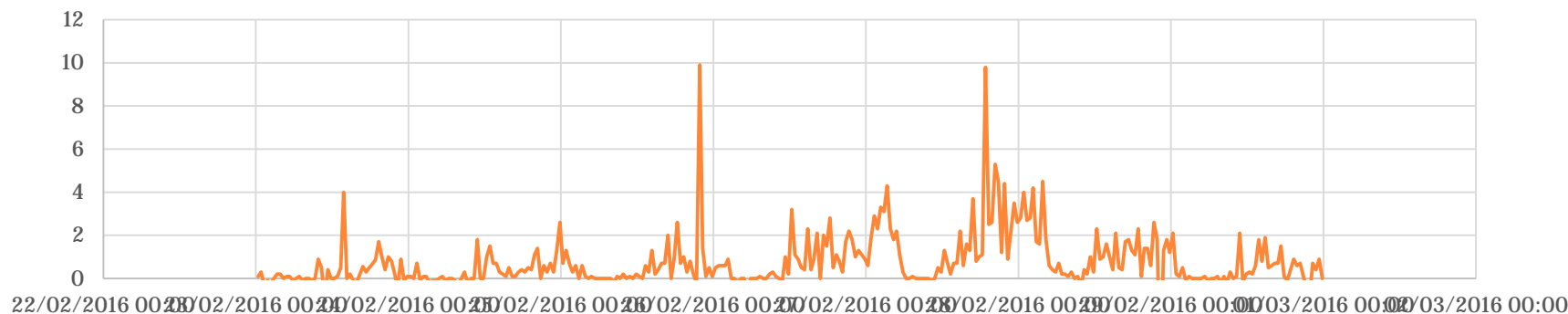
BAR



CAFE

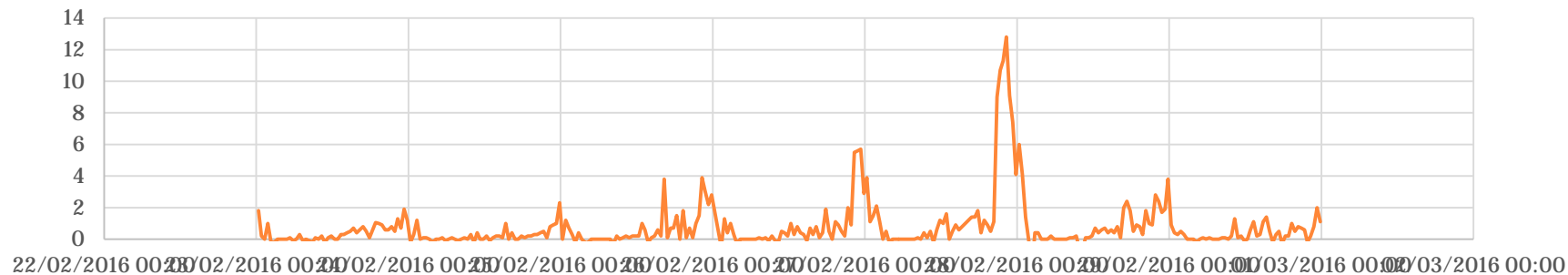


NIGHTLIFE

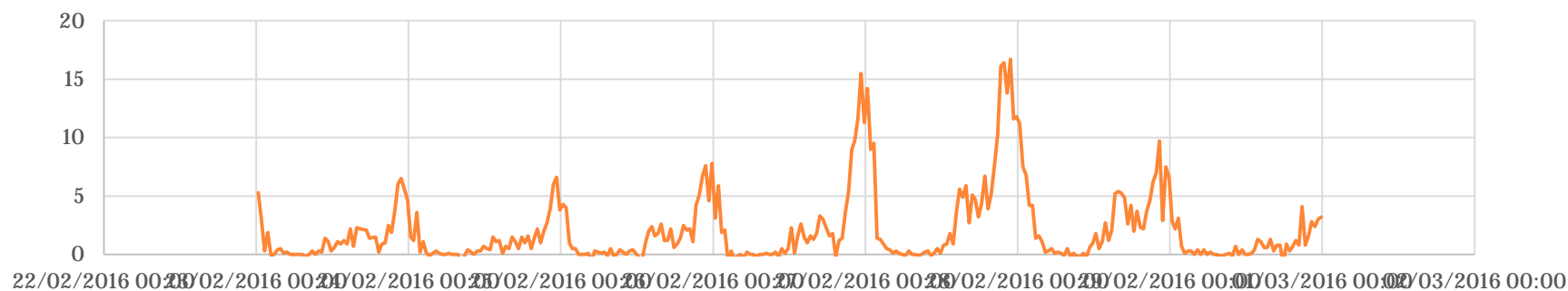


Social media (SM) - Facebook

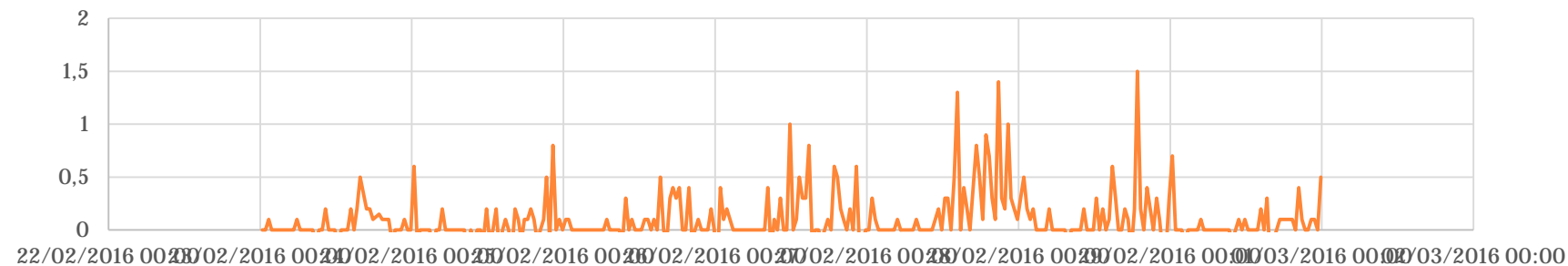
OUTDOORS



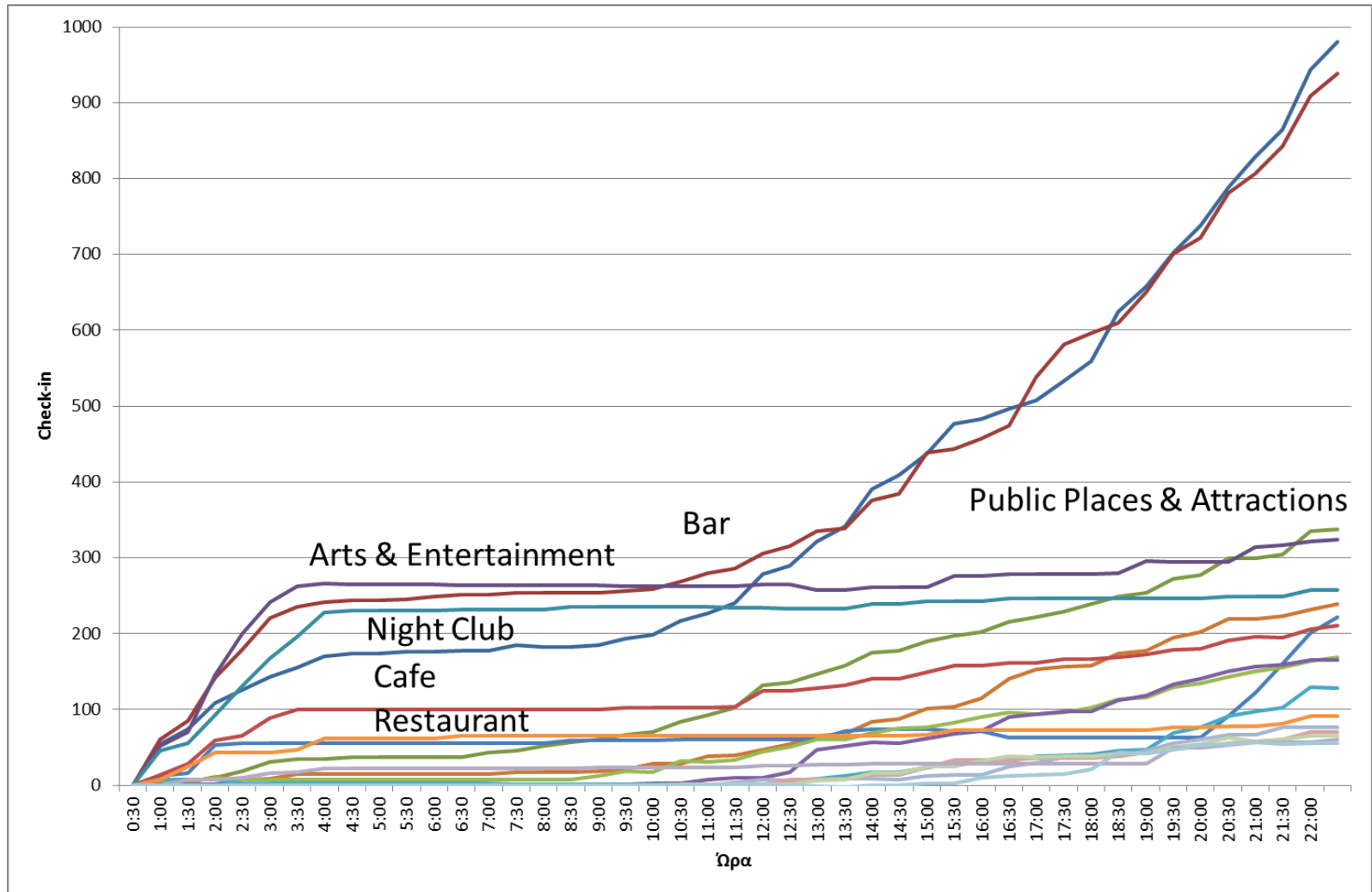
RESTAURANT



TOURIST ATTRACTION



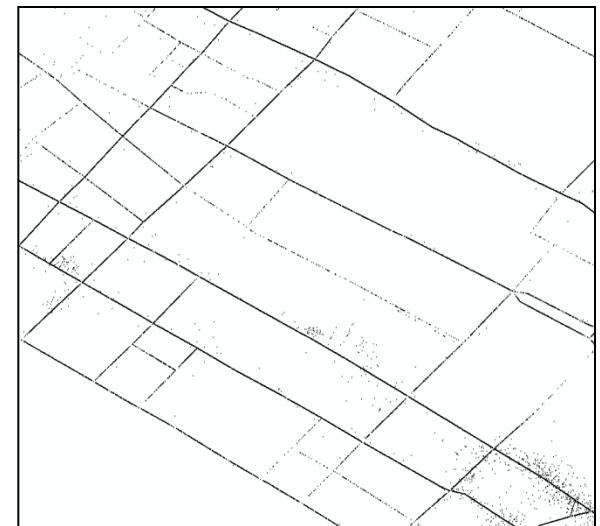
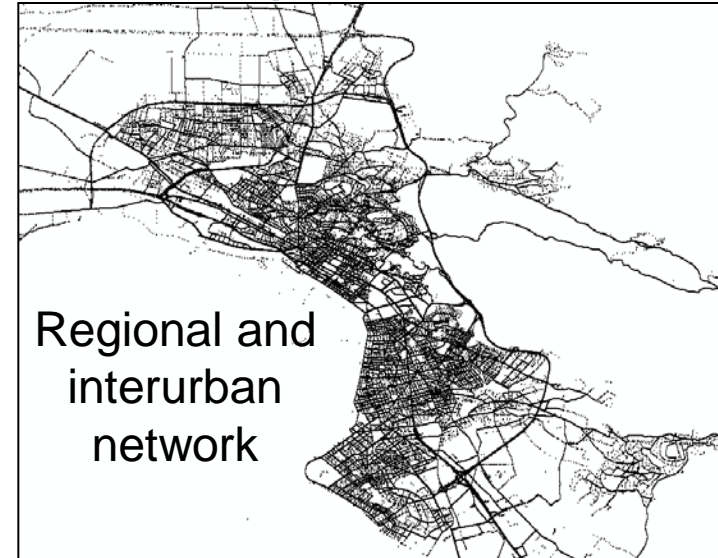
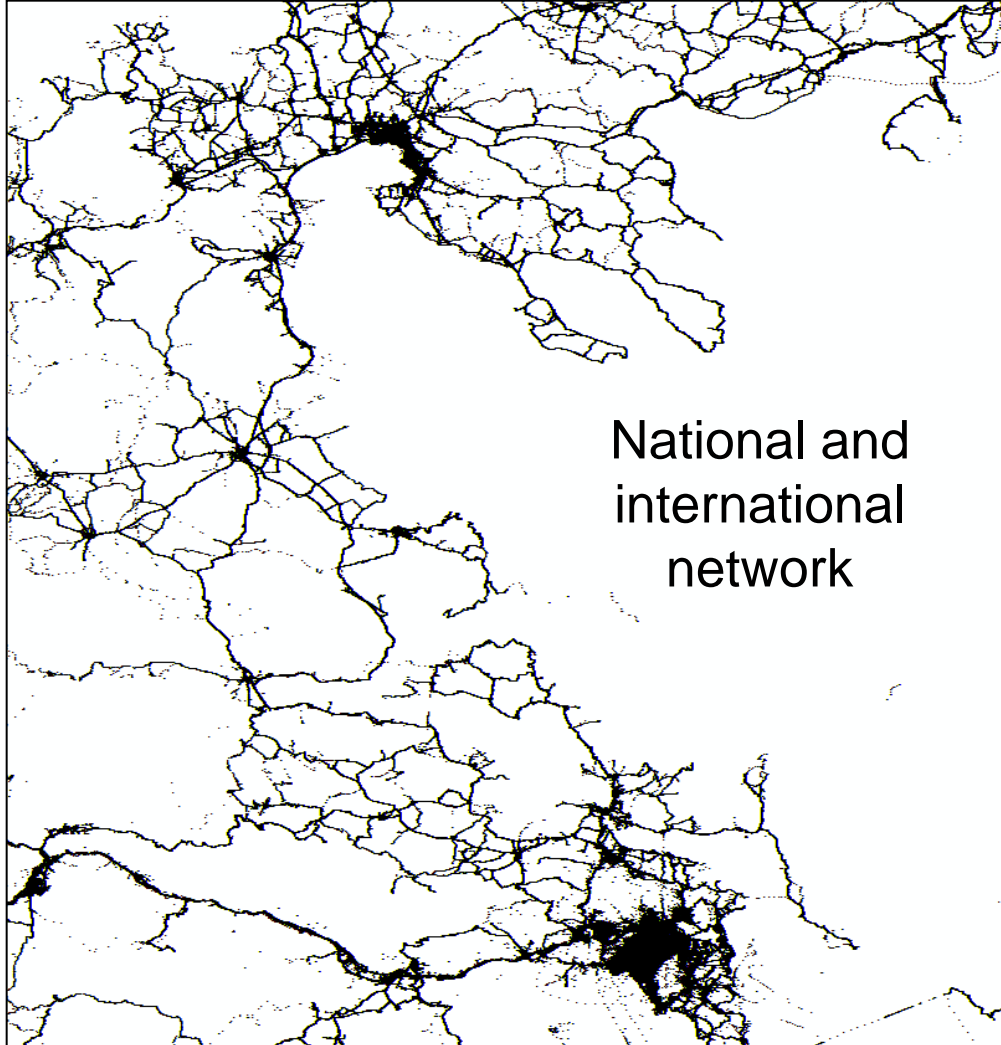
Social media (SM) - Facebook



INNOVATIVE USES OF DATA

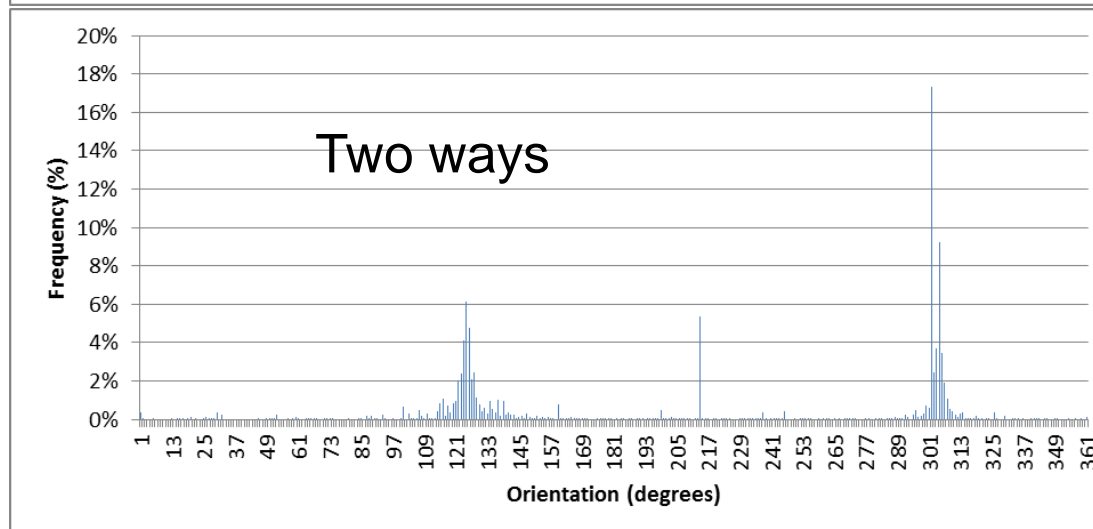
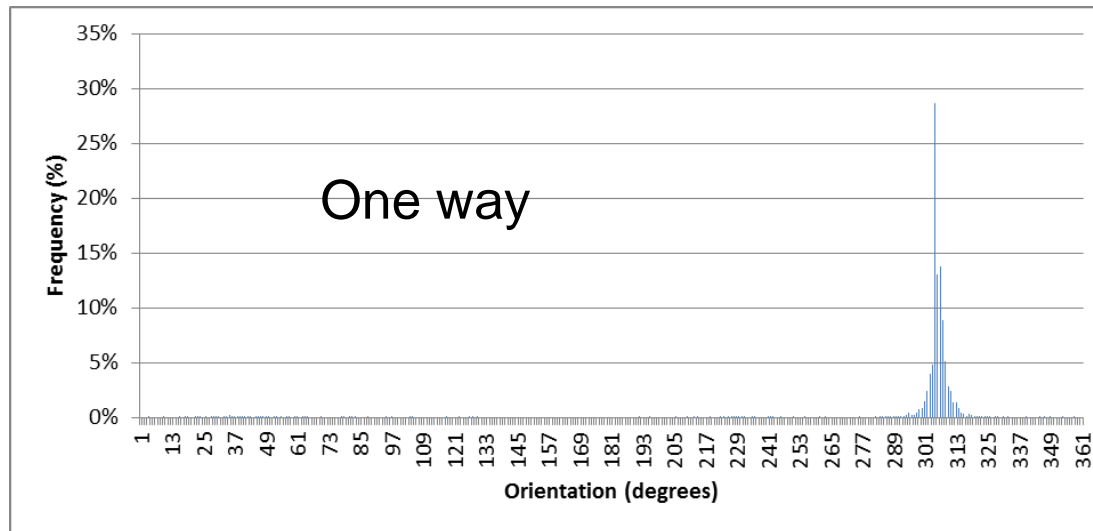
Innovative uses of data (FCD)

Network characteristics – Network geometry



Innovative uses of data (FCD)

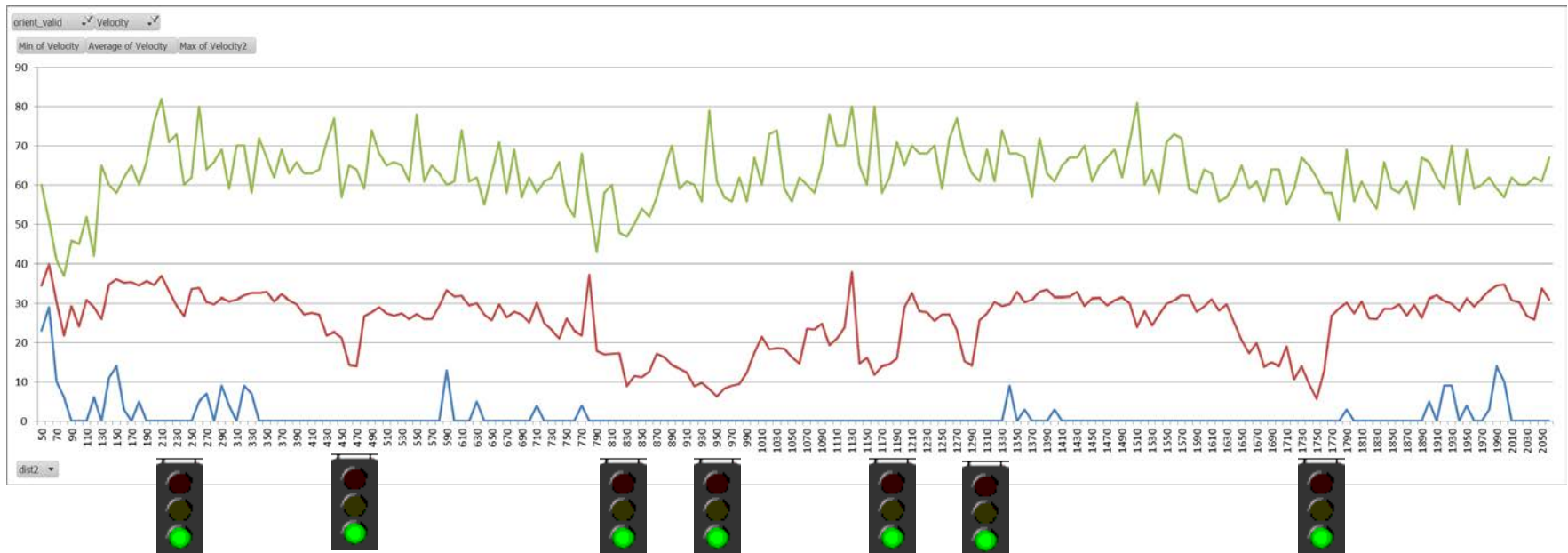
Network characteristics – Road direction



Innovative uses of data (FCD)

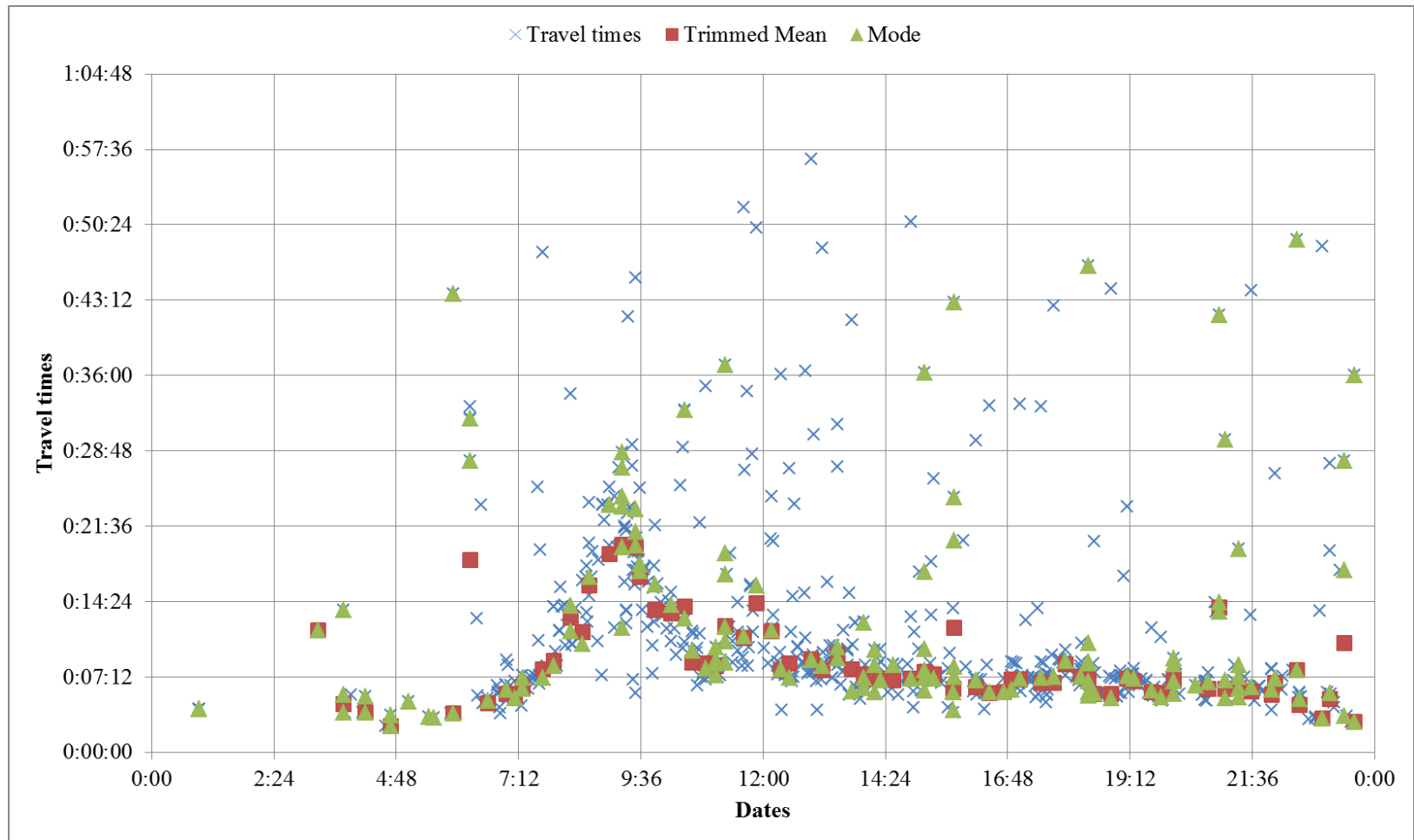
Network characteristics – Speed profile

Maximum, average and minimum speed profiles along Tsimiski (2 kilometers)



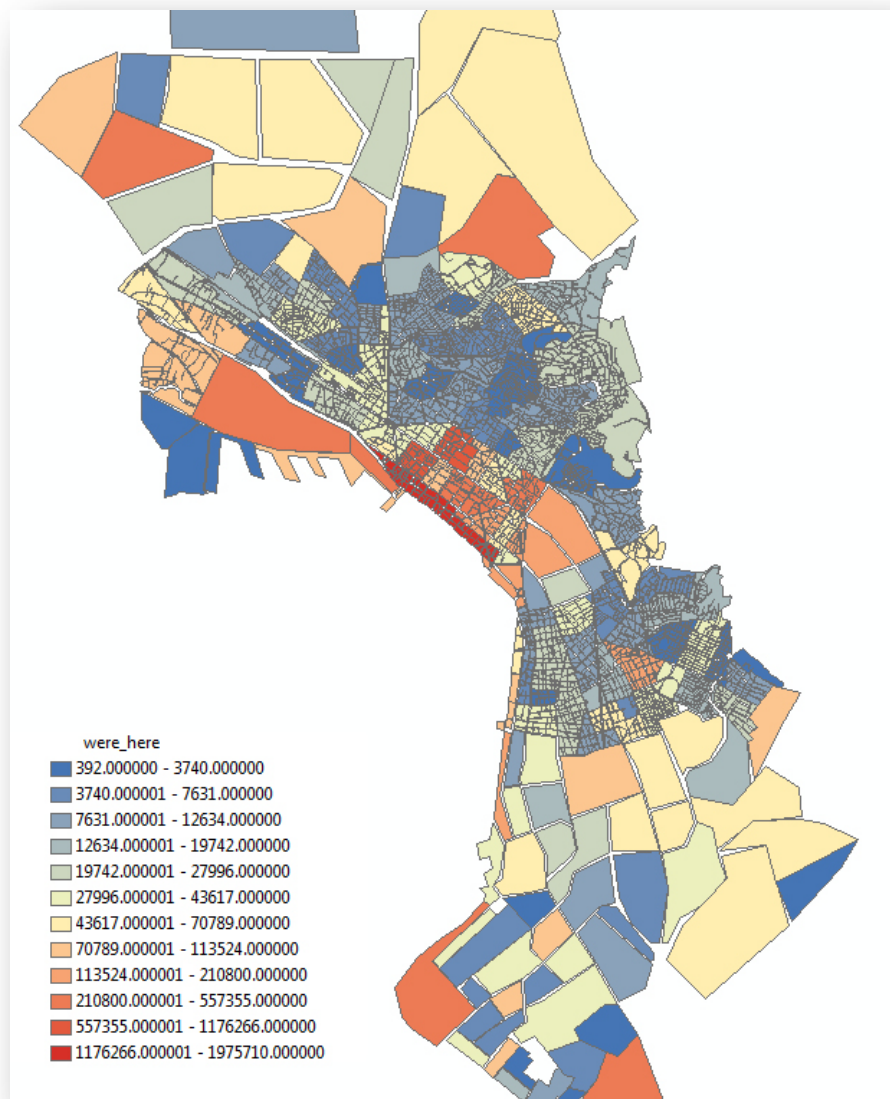
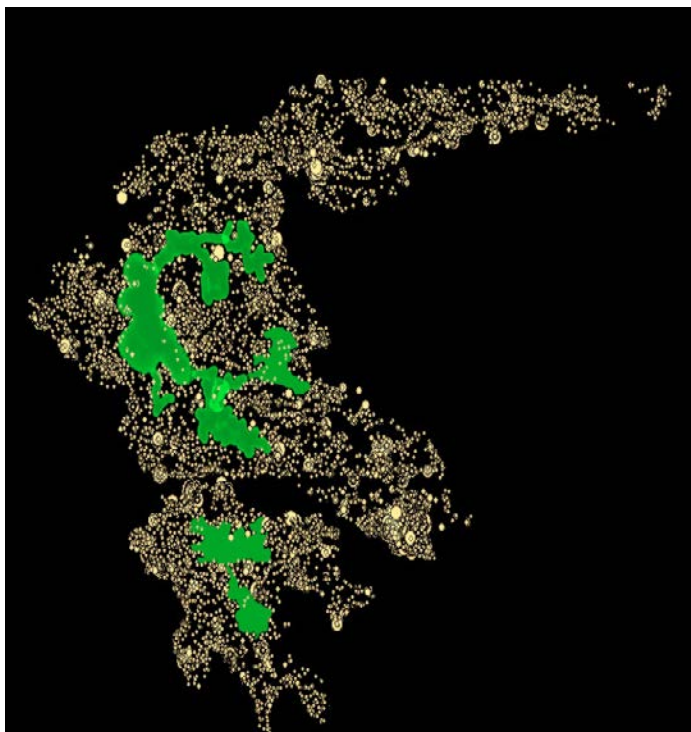
Innovative uses of data (BT)

Network characteristics – Travel time



Innovative uses of data (SM)

Land uses



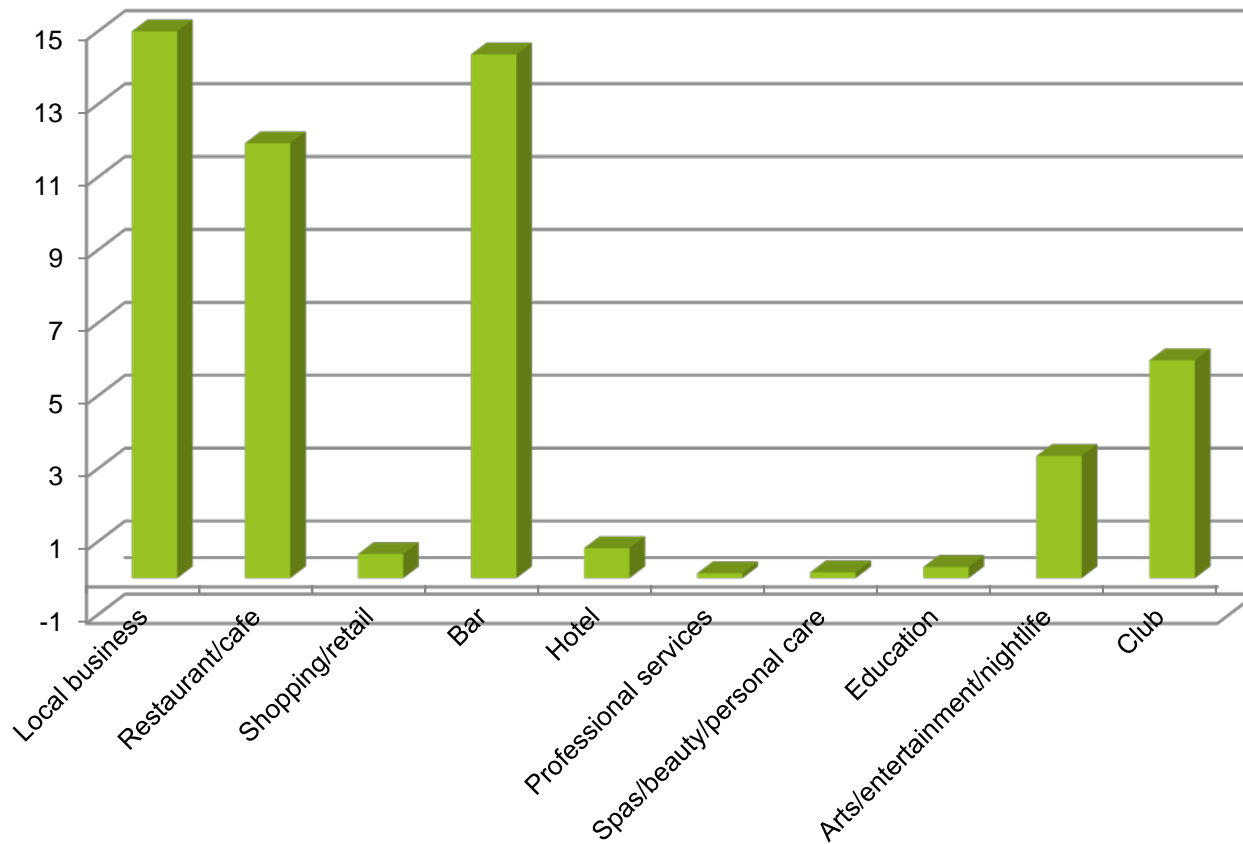
Innovative uses of data (SM)

Land uses



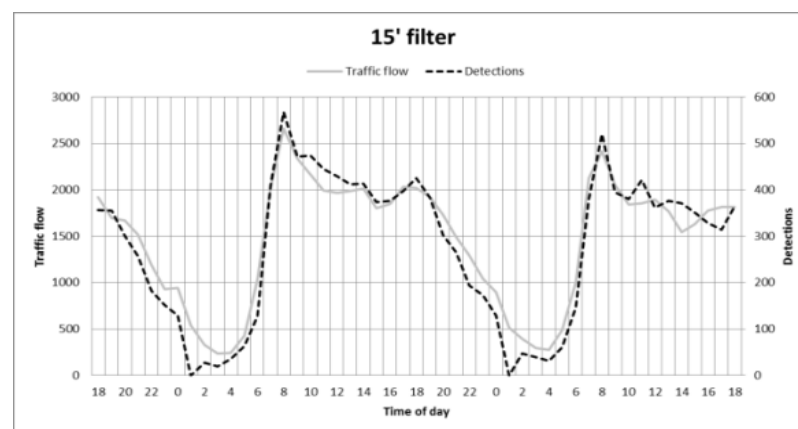
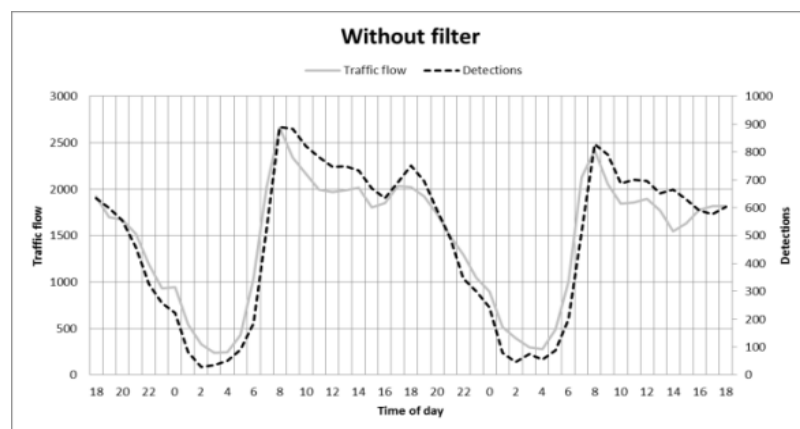
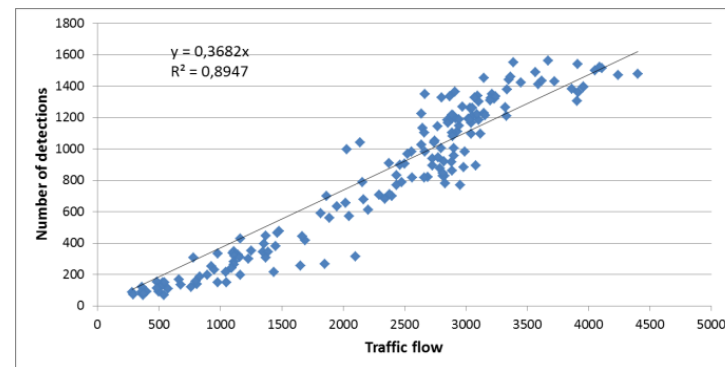
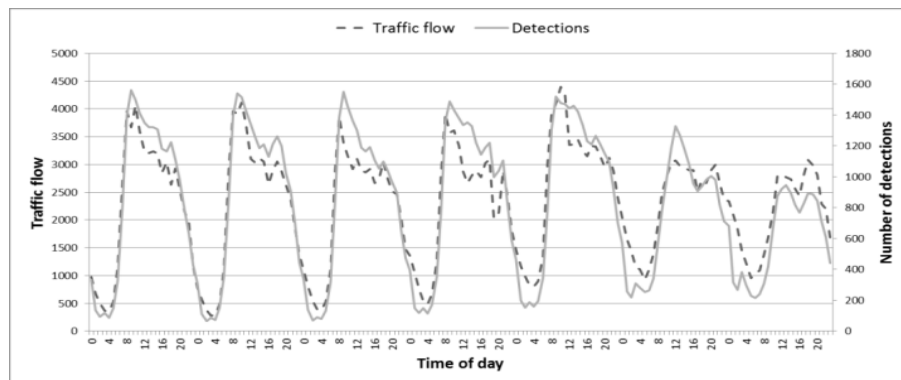
Innovative uses of data (SM)

Land uses



Innovative uses of data (BT)

Traffic flows



Time interval used for data filtering	Without filtering	5min filter	15min filter	60min filter
Correlation coefficient	0.3412	0.2179	0.1972	0.0442
R ²	0.9166	0.9193	0.9337	0.8594
Largest differences	-401 / 623	-410 / 437	-336 / 389	-536 / 767
(absolute value and percentage ranges)	-26% / 75%	-23% / 61%	-22% / 57%	-35% / 79%

Innovative uses of data (FCD)

Origin-Destination matrices

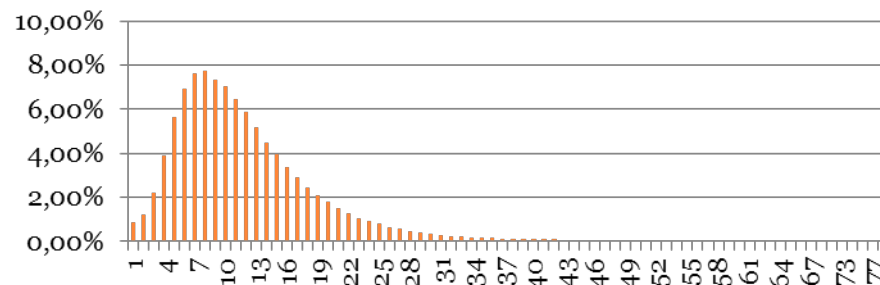
Sample: 50% of the taxis in Thessaloniki (1200 vehicles)

500.000 monthly trips

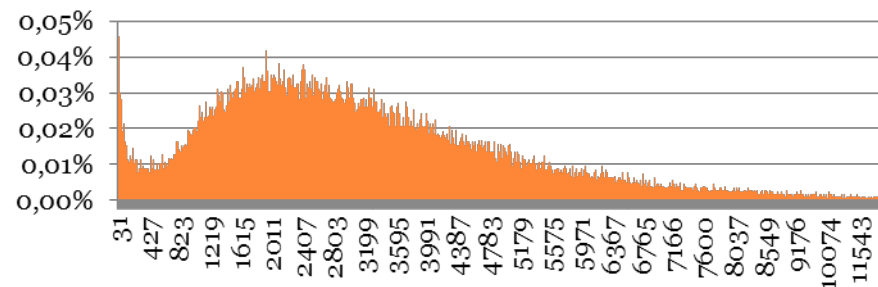
Average distance and duration: 3 km / 14 min

Average distance and duration (empty): 2,5 km / 30 min

Duration

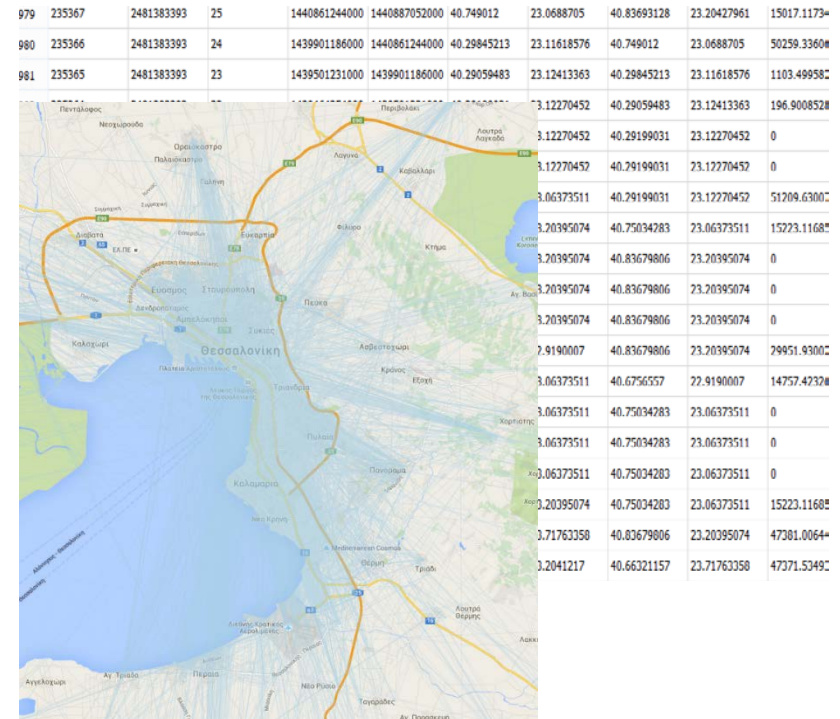
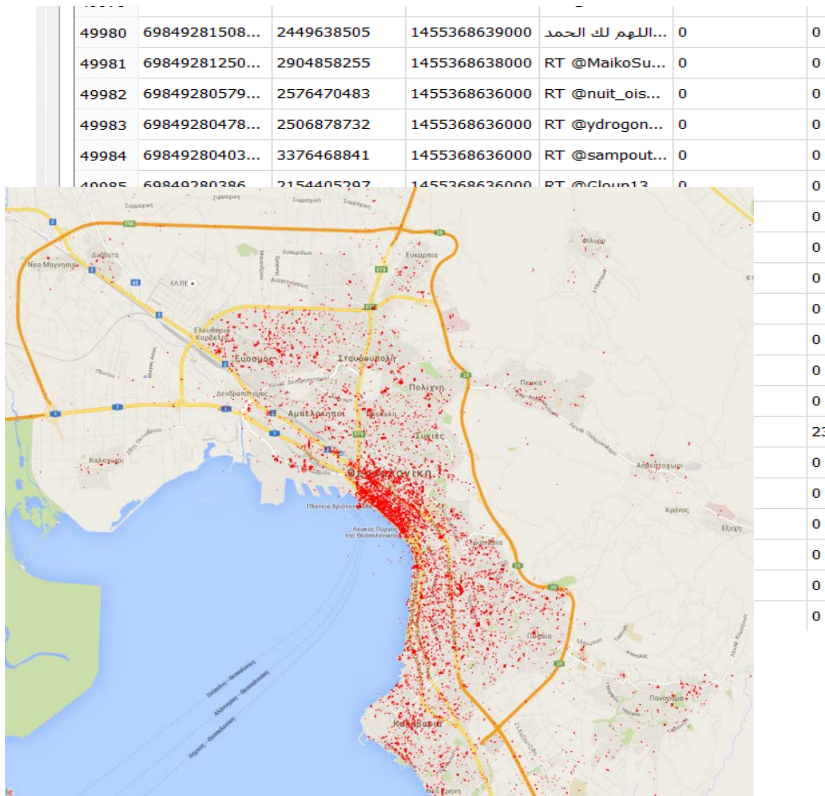


Distance



Innovative uses of data (SM)

Origin-Destination matrices



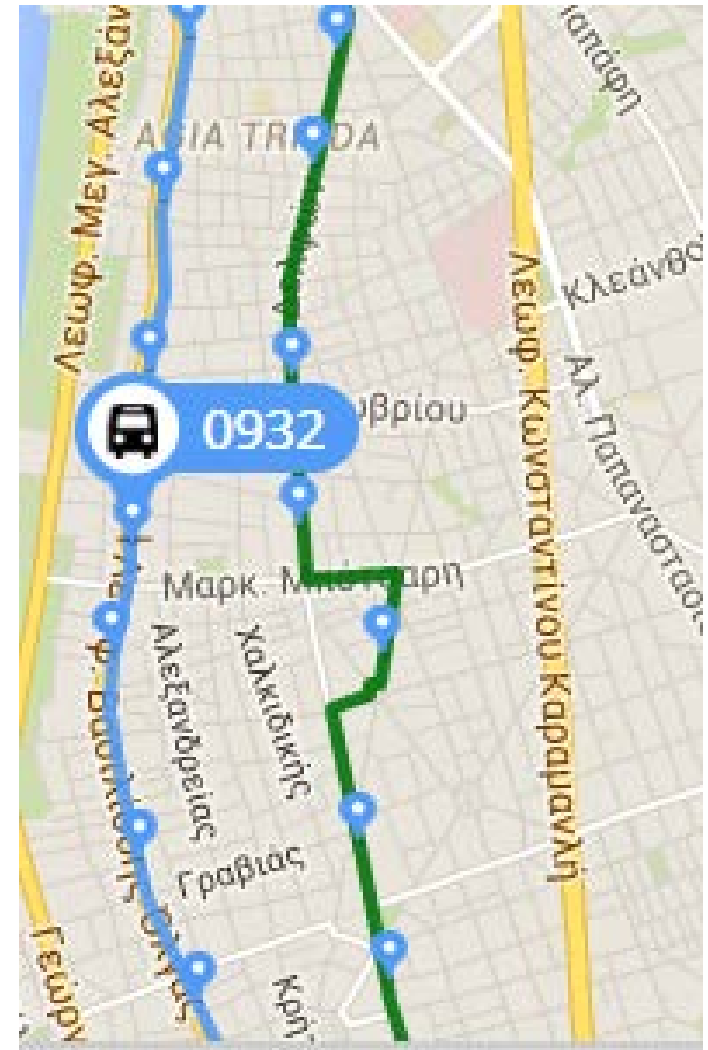
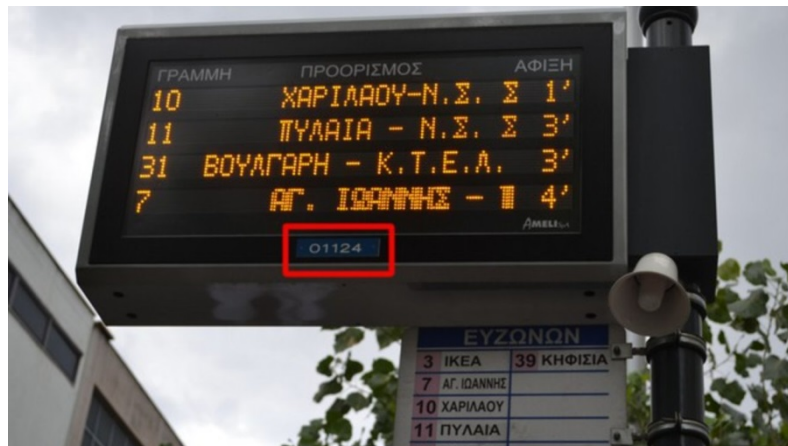
- Definition of Twitter trips
- Trip Duration <10 days
- Mean trip length 1.6 km, mean trip duration 10-20 hours

Innovative uses of data (BT)

Public Transport

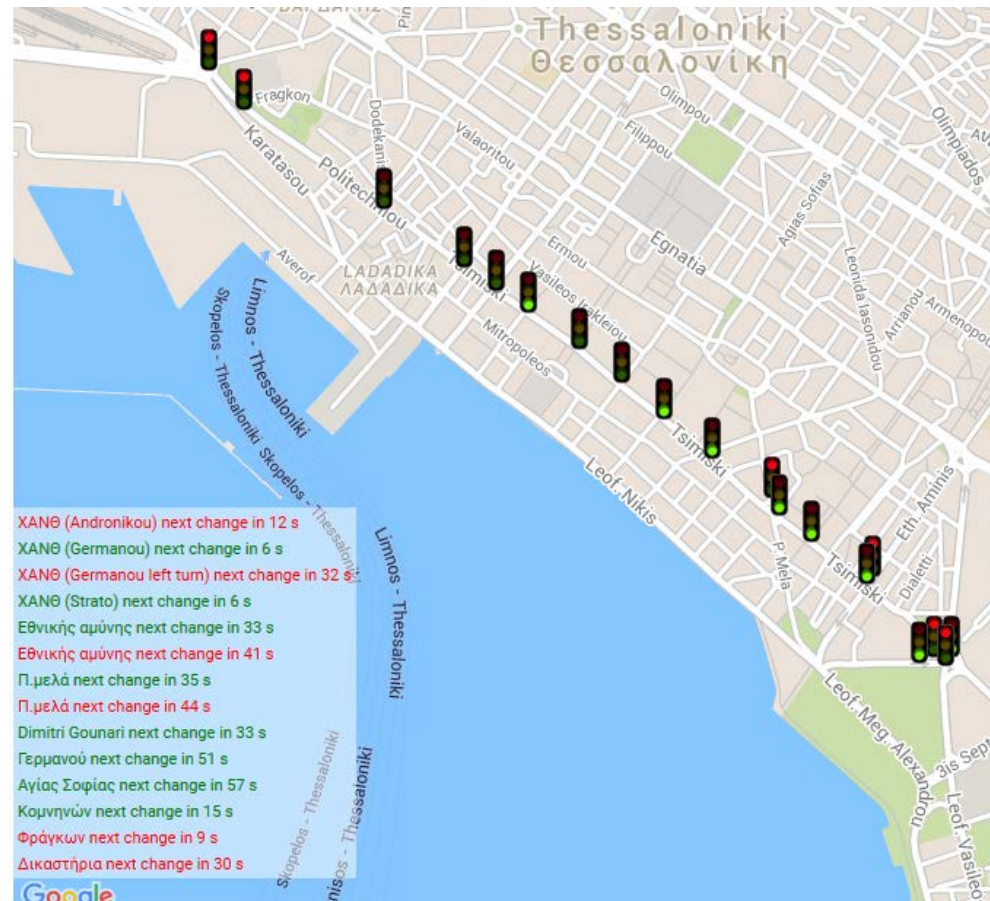
Αναχώρηση από ΑΝΑΤΟΛΙΚΟΣ ΣΤΑΘΜΟΣ ΙΚΕΑ

05	05:00	05:10	05:20	05:30	05:40	05:50
06	06:00	06:09	06:18	06:26	06:34	06:42 06:50 06:58
07	07:06	07:14	07:22	07:30	07:38	07:46 07:54
08	08:02	08:10	08:18	08:26	08:34	08:42 08:50 08:57
09	09:04	09:11	09:18	09:25	09:32	09:39 09:46 09:53
10	10:00	10:08	10:16	10:24	10:32	10:40 10:48 10:56
11	11:03	11:10	11:17	11:24	11:31	11:38 11:45 11:52 11:59
12	12:07	12:15	12:24	12:33	12:42	12:51



Traffic light status

Traffic light program (cycle length, green/red split)



Prediction (BDE project)

Probe data that is used

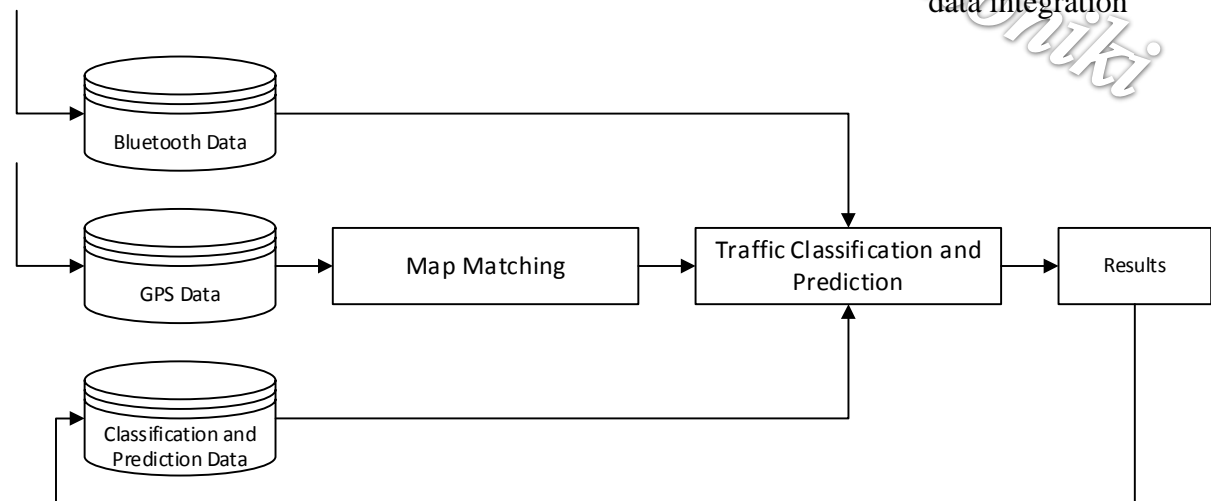
Floating Car Data (500-2.500 locations per minute)

Bluetooth detections (millions of daily detections in 43 locations)


Services that are being implemented

Improved topology-based map matching

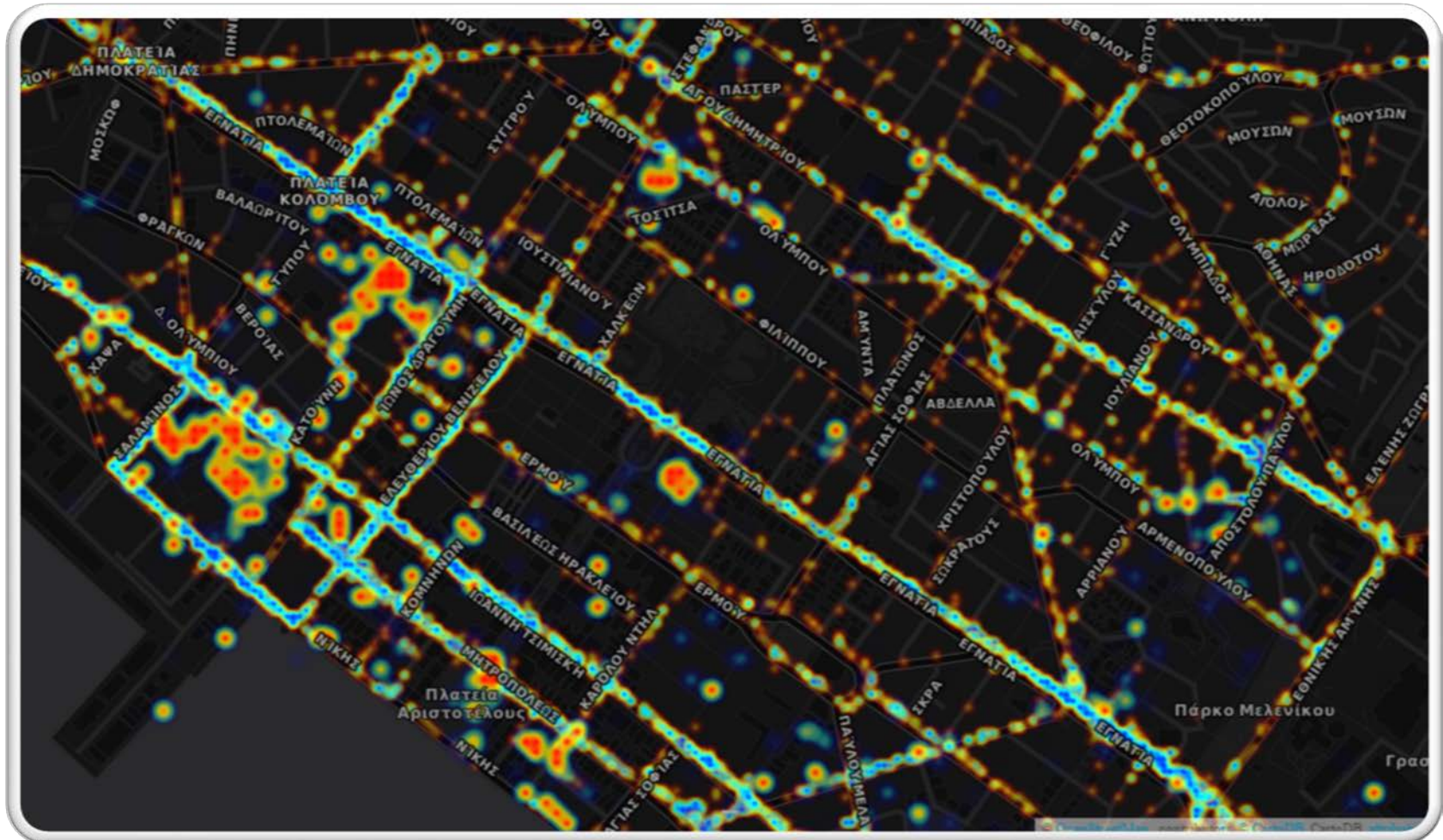
Mobility patterns recognition and forecasting



Thessaloniki

 **Transport**
Streaming sensor network and geospatial data integration

Data fusion





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Development Fund

Thank you!

Questions welcome



Project smedia