CIrClE 2019

Challenges for the Islands in the era of the Circular Economy

Big & open data for mobility:

Smart mobility Living Labs for sustainable and innovative mobility services development

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Deputy Director Hellenic Institute of Transport

Research Director CERTH-HIT

Under the auspices of

ENV MOVE

SMile 2019

6th **Sustainable Mobility & Intelligent Transport conference**

Who we are?

No1 in the top list of research organizations in terms of EU Funding in Greece

CERTH

no.17 in the top-50 list of research organisations in terms of EU funding

CERTH
CENTRE FOR RESEARCH & TECHNOLOGY HELLAS

5 INSTITUTES
www.certh.gr

HELLENIC INSTITUTE OF TRANSPORT
CERTH / HIT

HIT's main objective is the conduct and support of **applied research** activities in the field of **transportation** in Greece

CERTH/HIT

- established in **2000**
- scientific team: **100 members**
- successfully participated in more than **280 projects**
- currently participating in **more than 30 European and national projects**

Research Sector A
Vehicle & Driver - Vehicle Safety - Accessibility

Head: M. Panou

- **Laboratory A1:** Road Safety and Security — Head: E. Gaitanidou
- **Laboratory A2:** Clean Vehicle Technologies — Head: M. Gemou
- **Laboratory A3:** Intelligent Materials and Manufacturing in Transport — Head: M. Gemou
- **Laboratory A4:** Personalized and Accessible Systems and Services — Head: M. Panou

Research Sector B
Intelligent Sustainable Mobility - Infrastructure & Networks - Freight Transport & Logisticcs

Head: G. Ayfadopoulou

- **Laboratory B1:** Demand and Mobility Management - Development of Sustainable Mobility Systems — Head: M. Morfoulaki
- **Laboratory B2:** Data Collection and Processing and Use of Specialized Transport Software Packages — Head: J. Salanova
- **Laboratory B3:** Infrastructure and Traffic Management in Land Transport — Head: E. Mitsakis
- **Laboratory B4:** Intelligent International Freight Transport and Logistics — Head: G. Ayfadopoulou
- **Laboratory B5:** Rail Transport Systems and Services — Head: A. Kortsari

Research Sector C
Non-land Transport - Economic & Environmental Issues

Head: M. Boile

- **Laboratory C1:** Maritime Transport Systems and Services — Head: M. Boile
- **Laboratory C2:** Air Transport Systems and Services — Head: E. Sdoukopoulos
- **Laboratory C3:** Environmental and Energy Impacts of Transport Systems — Head: A. Tromaras
- **Laboratory C4:** Economic and Social Impacts of Transport Systems — Head: A. Anagnostopoulou

Research Sector D
Horizontal Activities

Head: E. Bekiaris

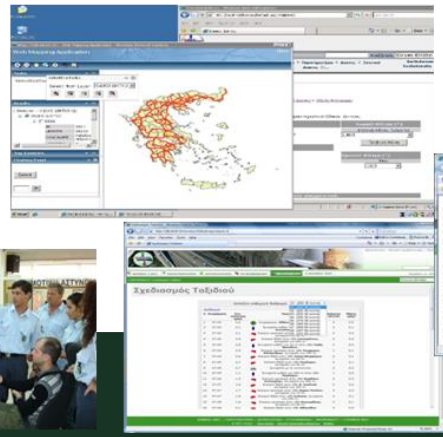
- **Laboratory D1:** International Relations and Representation of HIT - Transportation Policies — Head: M. Panou
- **Laboratory D2:** Software Engineering - Maintenance of IT Infrastructure — Head: K. Kalogirou
- **Laboratory D3:** Education-Knowledge Management - Information and Public Awareness, Publicity and Promotional Campaigns — Head: M. Morfoulaki
- **Laboratory D4:** Institute Data Analysis, Impact Factors and Success Indicators Assessment — Head: D. Margaritis
- **Laboratory D5:** Commercial Exploitation of Research Results and IPRs - Patents — Head: S. Nikolaou

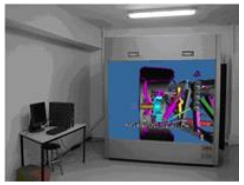
3 Research Divisions
14 Research Laboratories
4 Offices
(Thessaloniki –Athens – Pireaus- Rodes).

Important research infrastructure

Clean Vehicles Technologies

- Fast charging station of 10 vehicles.
- 2 own electric vehicles (BMW i3).
- Data lagers in all vehicles.
- V2I module.
- Vehicle dynamics simulation in driving and riding simulators.





HIT's role in the development of sustainable mobility systems

HIT applied research emphasises on :

- Sustainable Urban Mobility Plan (SUMP) development specifications
- Capacity building to cities for SUMP implementation
- Support innovation adoption in mobility
- ITS , C-ITS, connected vehicles, shared electromobility

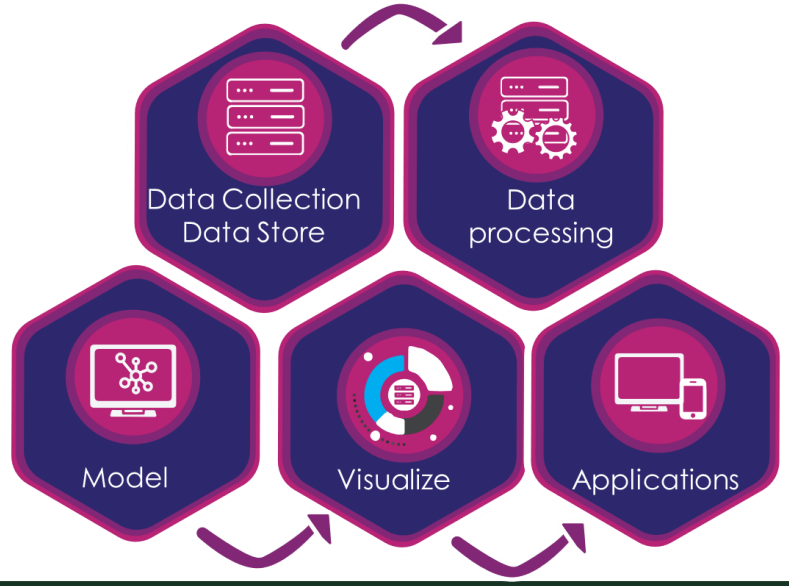
HIT's services also include:

- Revision of SUMP ToR - ELTIS editorial board
- Guidelines for ITS in SUMP development
- Guidelines for SULP development

- Intelligent city logistics
- **Thessaloniki Smart mobility Living Lab**
- Proof of new smart mobility & smart city services
- Support innovative entrepreneurship in smart & green mobility

Thessaloniki Smart Mobility Living Lab components: 1. HIT Portal

The H.I.T. Portal is a web-based data collection, management and aggregation provisioning platform designed, developed and maintained since 2008 for enabling development of e-services in transport.



Physical infrastructure (hardware - Sensing)

- Research infrastructure (owned by HIT)
- Public infrastructure open research

Digital infrastructure (software - Knowledge creation)

- Modeling and simulation environments
- Big data analytics tools

Test beds

- C-ITS (COMPASS4D and C-Mobile projects)
- Big data analytics (Big Data Europe project)
- Traffic Management Systems interoperability [future]
- National Access Point (CEF – Crocodile2) [future]
- i-mile [future]

Thessaloniki Smart Mobility Living Lab components: 2. ECOSYSTEM

Industry and technology providers

ITS HELLAS Intelligent Transport Systems
Intelligent Transport Systems
http://www.its-hellas.gr/gr/

Public Administration

Region of Central Macedonia
http://www.pkm.gov.gr/

City of Thessaloniki
www.thessaloniki.gr

Transport network operators

taxiway http://www.taxiway.gr

ΣΑΣΘ Thessaloniki's Integrated Transport Authority
www.thita.gov.gr

Research and Academia

HIT (Hellenic Institute of Transport – Center for Research and Technology Hellas) Greece
www.hit.certh.gr

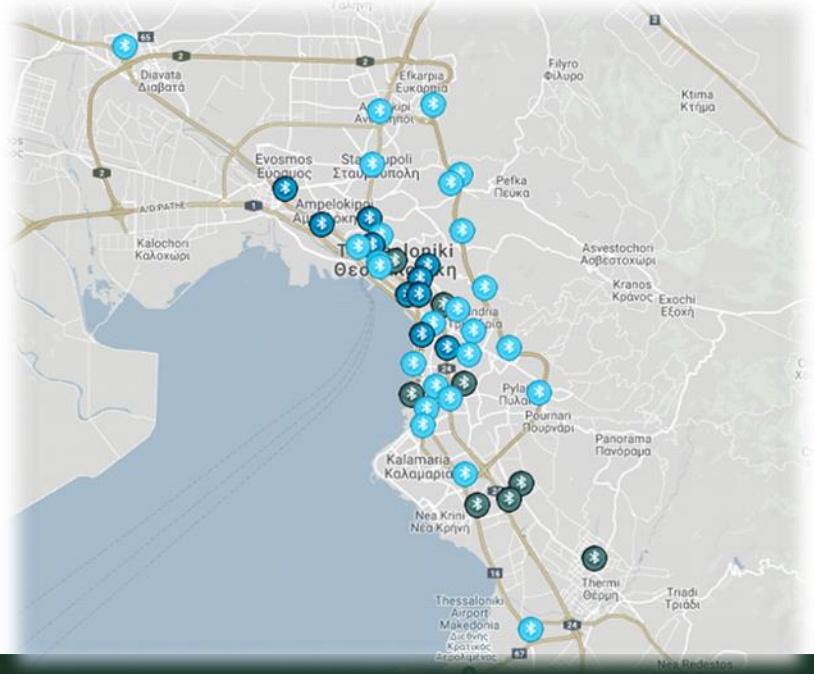
ARISTOTLE UNIVERSITY OF THESSALONIKI
www.auth.gr/en

- Region of Central Macedonia (MoU)
- Taxiway association (MoU)
- TRAINOSE
- Open Knowledge foundation Greece (MoU)
- NEC laboratories (MoU)
- Municipality of Thessaloniki (MoU)
- Local police
- Student transportation operators / schools
- Other organizations
- Citizens

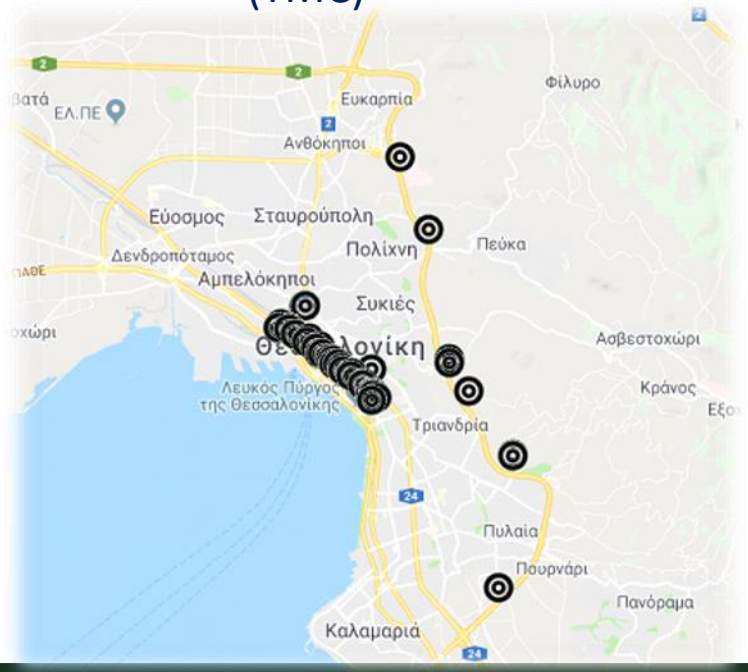
The ITS city infrastructure integrated with the Institute the research Infrastructure

Thessaloniki Smart Mobility Living Lab components: 3. Multiple Data Sets

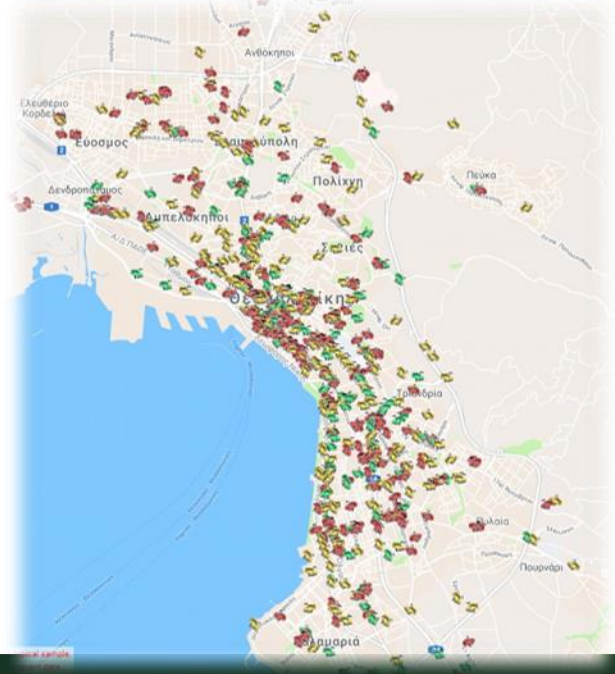
Bluetooth Detectors (HIT)



Loops and Cameras (TMC)

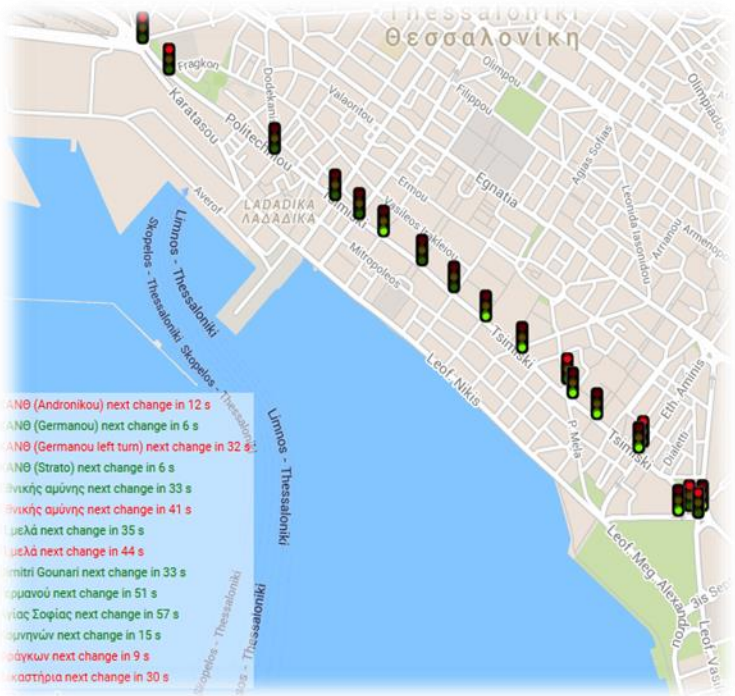


Floating Car Data (taxis & commercial fleets)

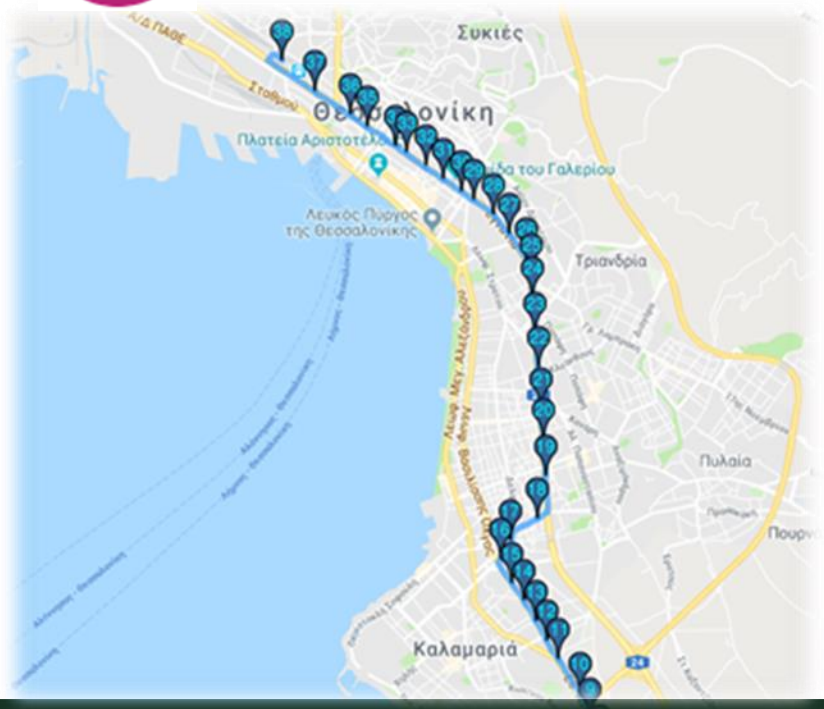


Thessaloniki Smart Mobility Living Lab components: 3. Multiple Data Sets

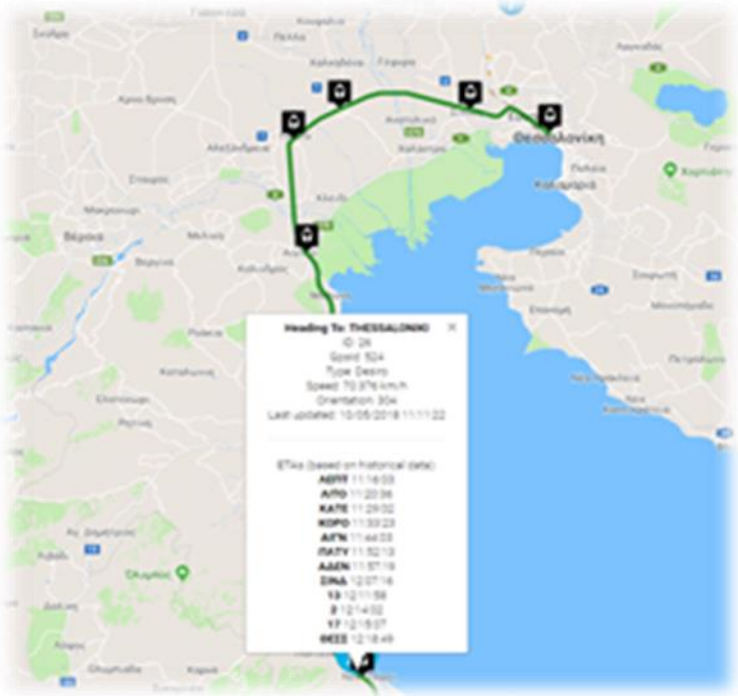
Smart Traffic Lights



Urban Buses Information



Floating Train Data



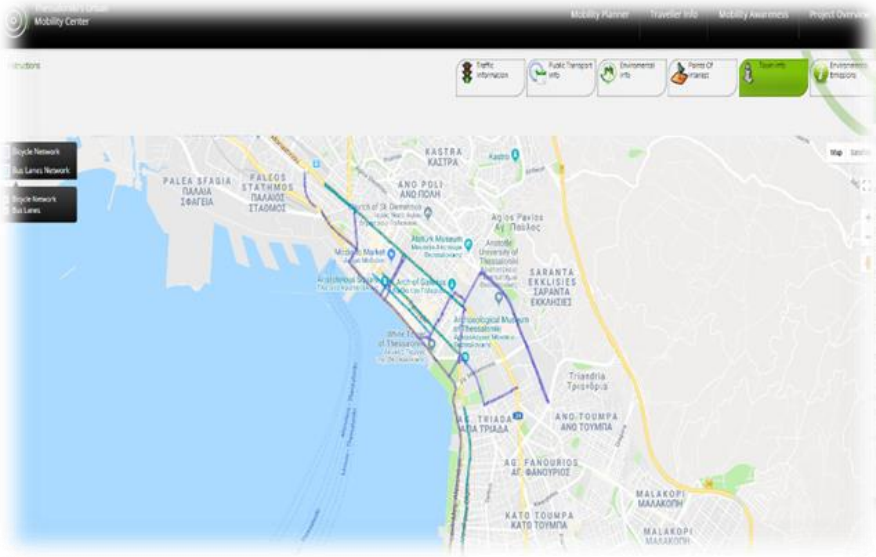
Thessaloniki Smart Mobility Living Lab components: 3. Multiple Data Sets

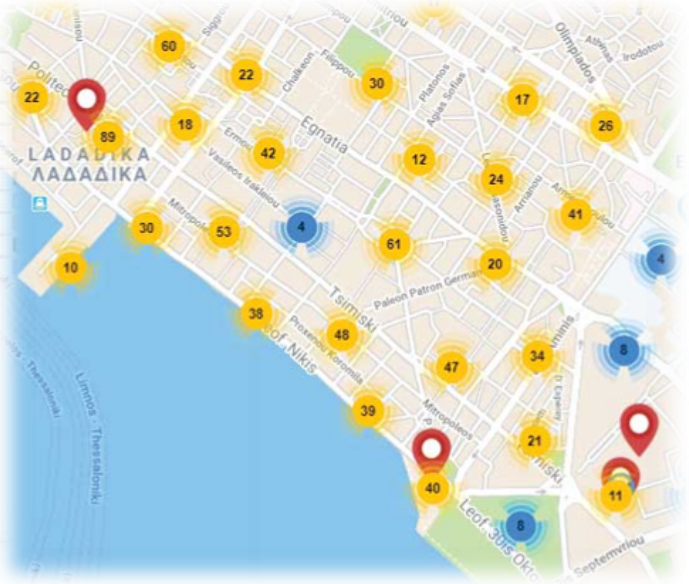
Data from multiple sources are combined to better understand any correlation and dependencies among them

Digitized networks

Points of Interest

Facebook
Graph API





Thessaloniki Smart Mobility Living Lab components: 4. SERVICES & APPLICATIONS

Transport & mobility Observatory
Search and retrieve transportation related content.

Traffic & Routing Management
Provides information about traffic status in a region. Gives the ability to schedule a route from one point to another by different means of transport.

Network modeling and simulation
Provides tools to model and simulate transportation networks.

Application Development & Testing Platform
Enables users to develop and test their own applications using H.I.T. Portal.

Freight routing and logistics fleet management algorithms

Thessaloniki Smart Mobility Living Lab components: 4. SERVICES & APPLICATIONS

Transport & mobility Observatory

Support problems common understanding & policy formulation & assessment

Traffic & Routing Management

Support technology enabled solutions for improved city operations like dynamic & environmentally friendly Traffic Management and integration of ITS infrastructure. Multimodal routing, environmentally friendly routing etc

Network modeling and simulation

Support Planning (SUMPs) and Research in developing: a) new techniques for forecasting models b) “simulated environments” for new modes(shared-electric-green) & technologies (connected vehicles) impact assessment .

Application Development & Testing Platform

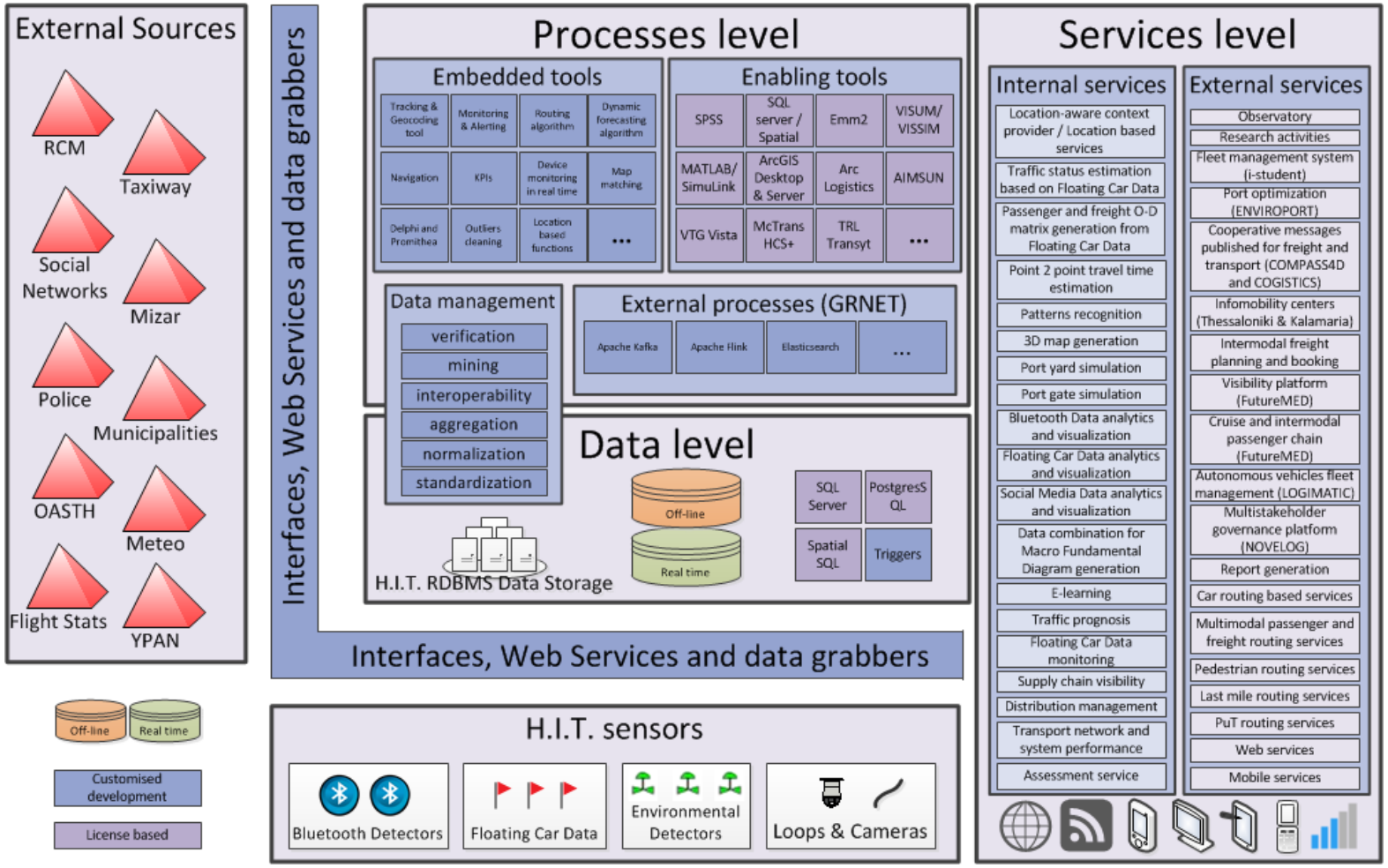
Proof of concept of smart services . Returning Value to stakeholders & the citizens

Freight routing and logistics fleet management algorithms

Returning Value to business

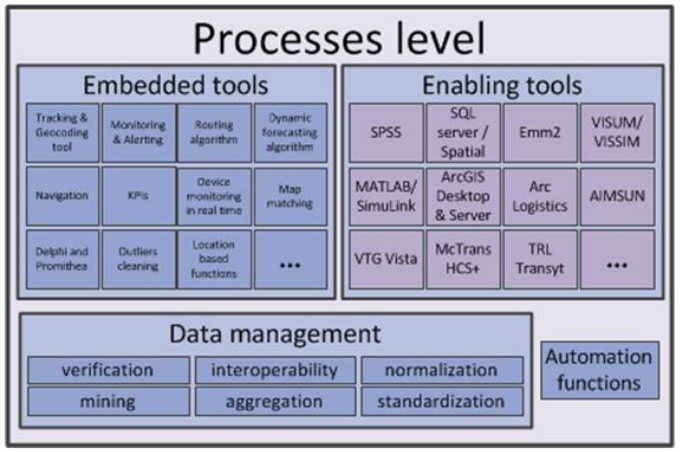
Architecture

- Data sources and interfaces
- External infrastructure
- Processing layer
- Services layer

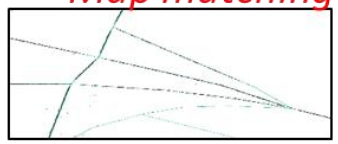


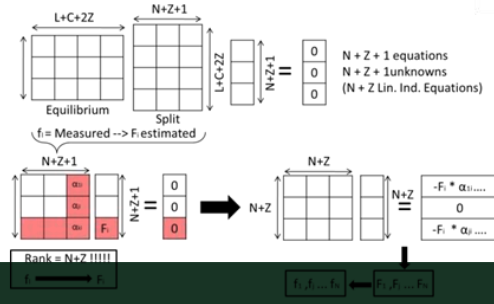
Thessaloniki Smart Mobility Living Lab components: 5. Analysis for knowledge creation

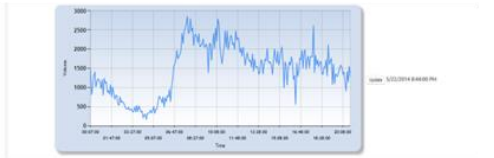
Returning Value to the stakeholders



Map matching

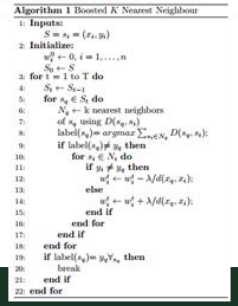






Data mining

algorithms

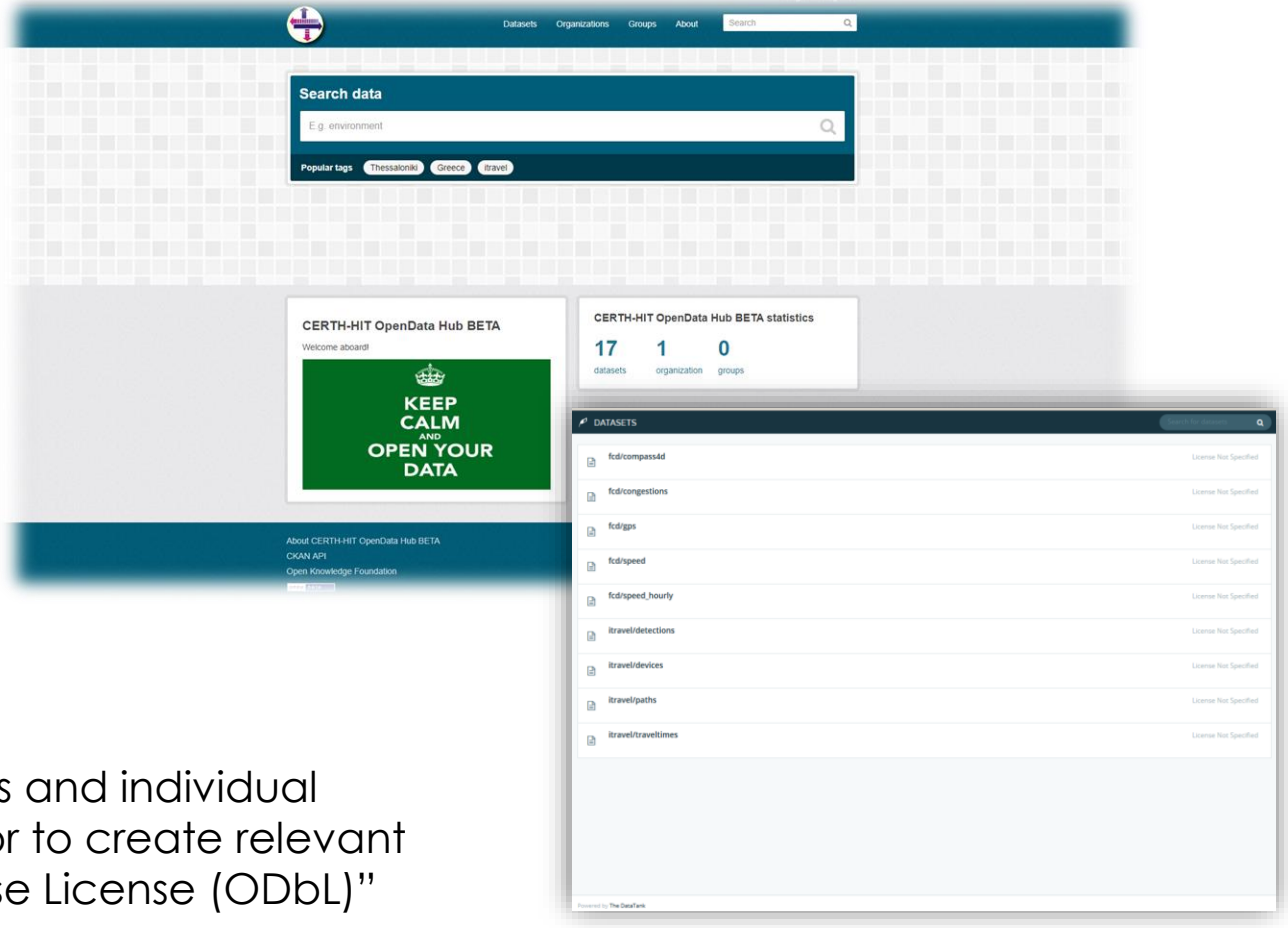


FCD Monitoring

Open Data APIs

The H.I.T. Open Data portal is intended to be a unique access point GDPR-compliant for open data on transport research in Greece.

- Historical datasets renewed on a monthly basis
- Powerful restful HTTP API (powered by “The Datatank”) which serves real-time datasets in different machine readable formats (JSON, XML, CSV, KML etc.)



The datasets are freely available to universities, companies and individual developers who are willing to use them for their research or to create relevant services, under the “Open Data Commons Open Database License (ODbL)”

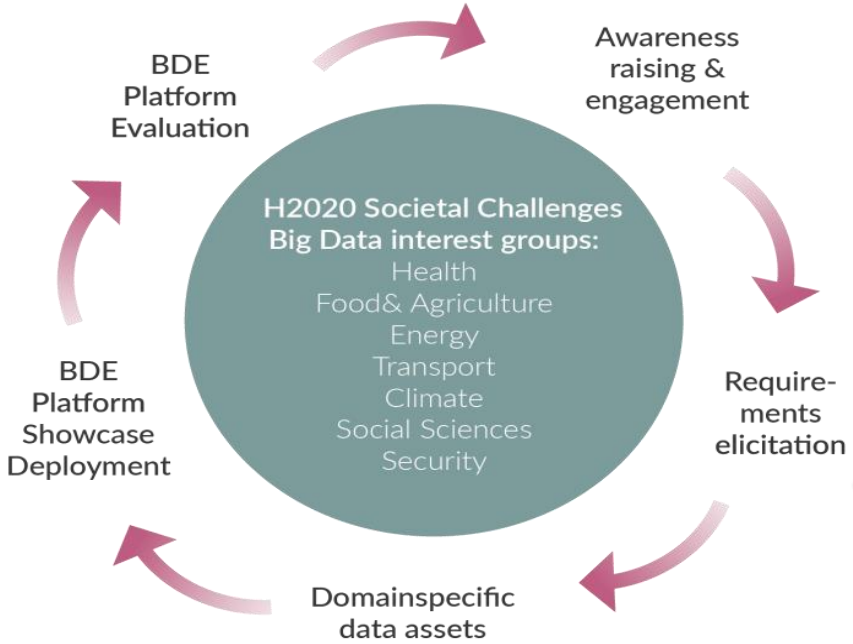
Thessaloniki Smart mobility living lab

Examples of achievements

Big Data Europe

Empowering Communities with Data Technologies

BIG DATA EUROPE
Empowering Communities with Data Technologies



Health
Heterogeneous data linking and integration, biomedical semantic indexing

Food & Agriculture
Large-scale distributed data integration

Security
Real-time monitoring, stream processing and data analytics, image data analysis

Energy
Real-time monitoring, stream processing, data analytics, decision support

Transport
Streaming sensor network and geospatial data integration

Climate
Real-time monitoring, stream processing and data analytics

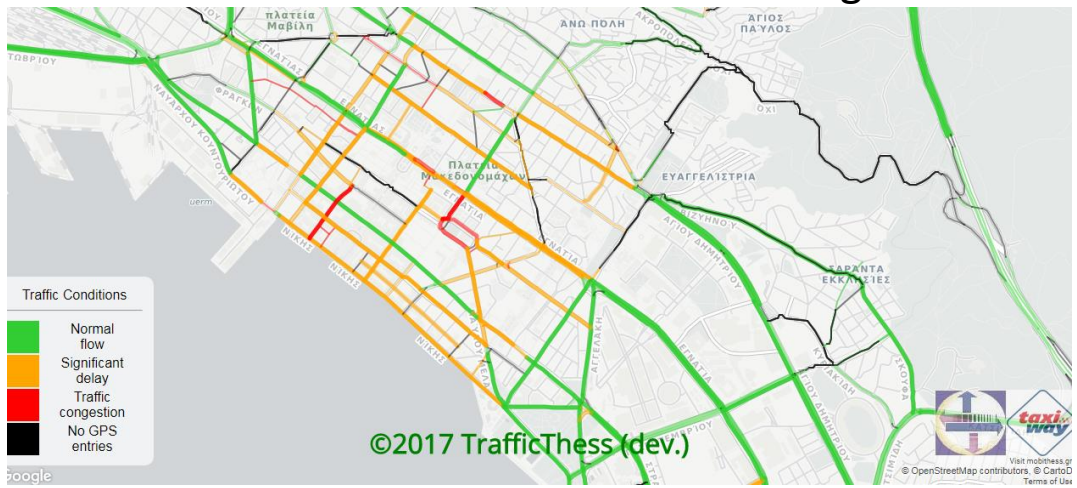
Social Sciences
Statistical and research data linking and integration

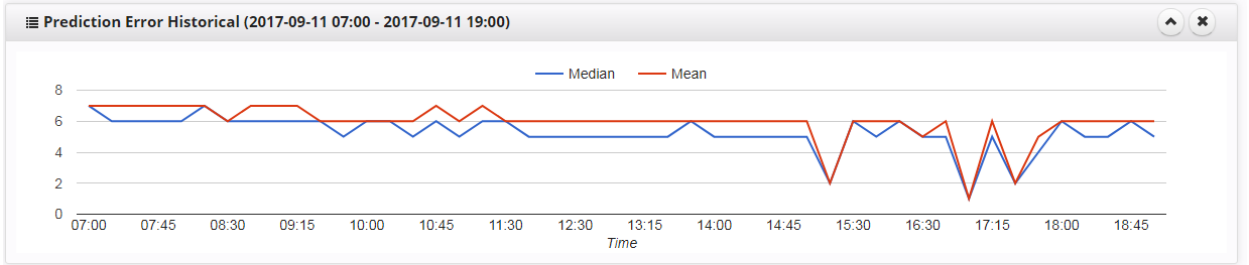
BIG DATA EUROPE
Empowering Communities with Data Technologies

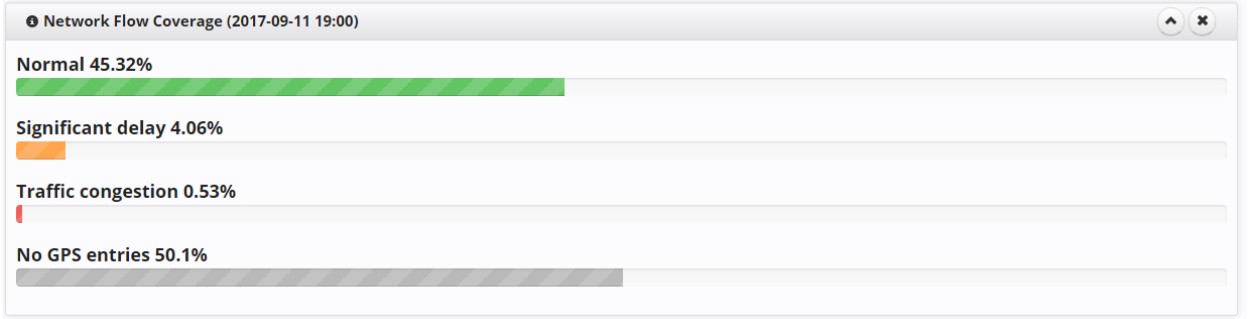
Big Data Europe

Empowering Communities with Data Technologies

In the transport pilot implemented in Thessaloniki Big Data tools were used for providing short-term traffic status estimation for non-recurrent congestion







Visualization of predicted traffic status with 50% coverage of the road network and an average error of 5-6 km/h

Big Data supporting ITS and C-ITS services in…

- Supporting Traffic Management and Control
- Supporting decision making and planning (SUMP)
- Providing mobility information and services
- Supporting operations of the local professional fleets
- Supporting the Municipal police operations planning
- Feeding AI systems for autonomous and connected driving

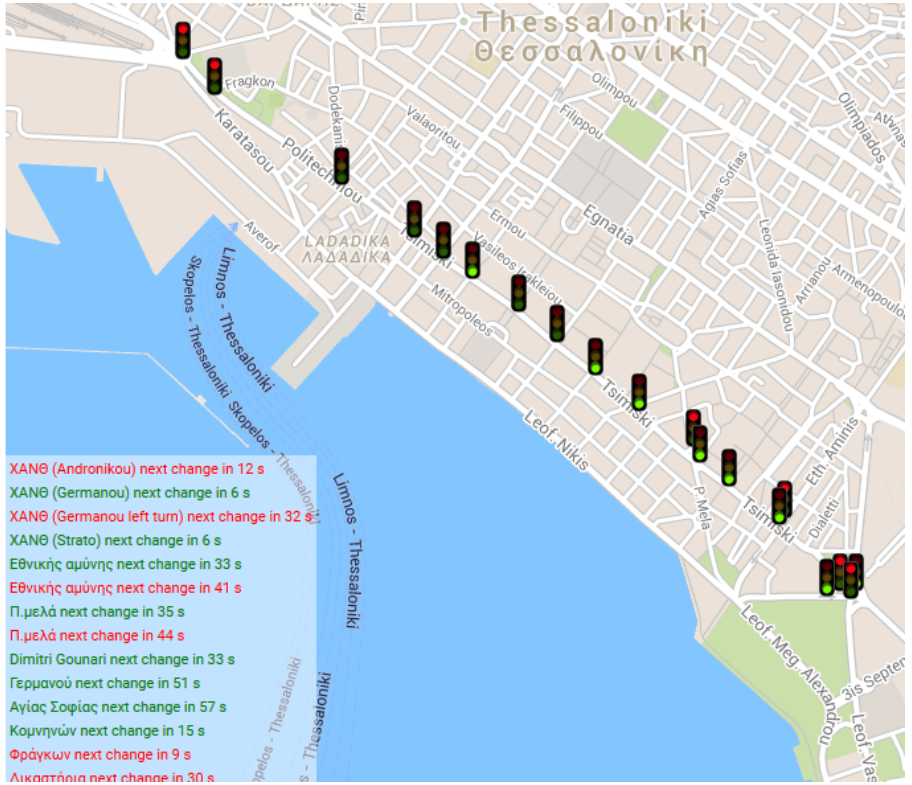
easytrip

compass4D

ΣΥΣΤΗΜΑ ΔΙΑΧΕΙΡΙΣΗΣ ΑΣΤΙΚΗΣ ΚΙΝΗΤΙΚΟΤΗΤΑΣ
URBAN MOBILITY MANAGEMENT SYSTEM

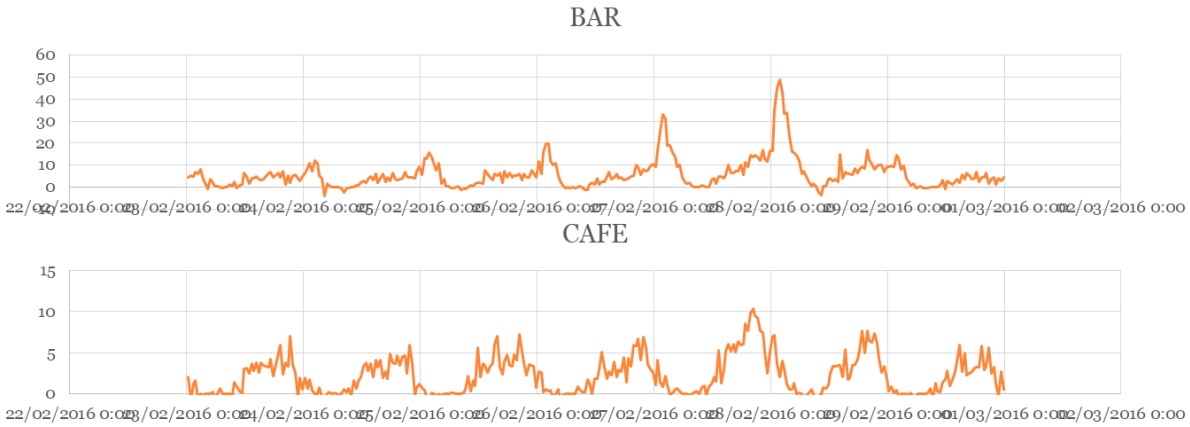
C-MOBILE

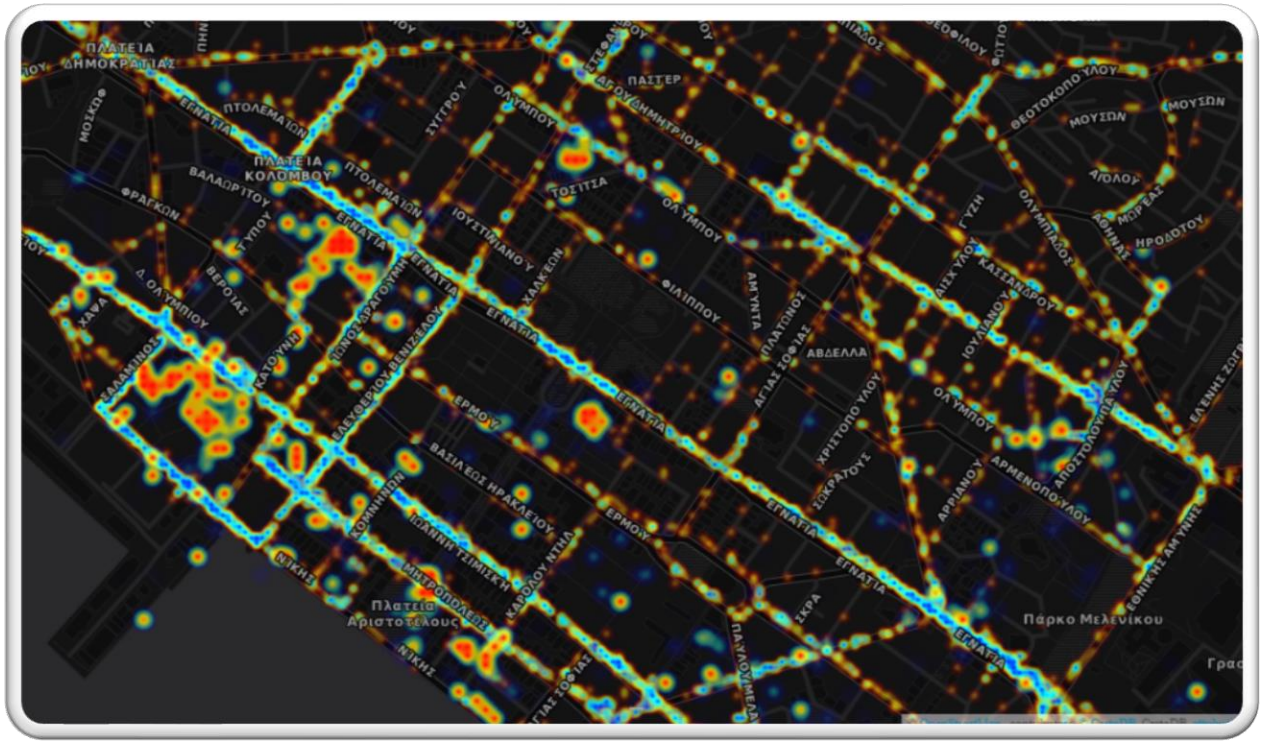
CO-GISTICS Deploying Cooperative Logistics



Business case: Social media data for ride prediction

Check-in events from Facebook are used to predict taxi ride in Thessaloniki

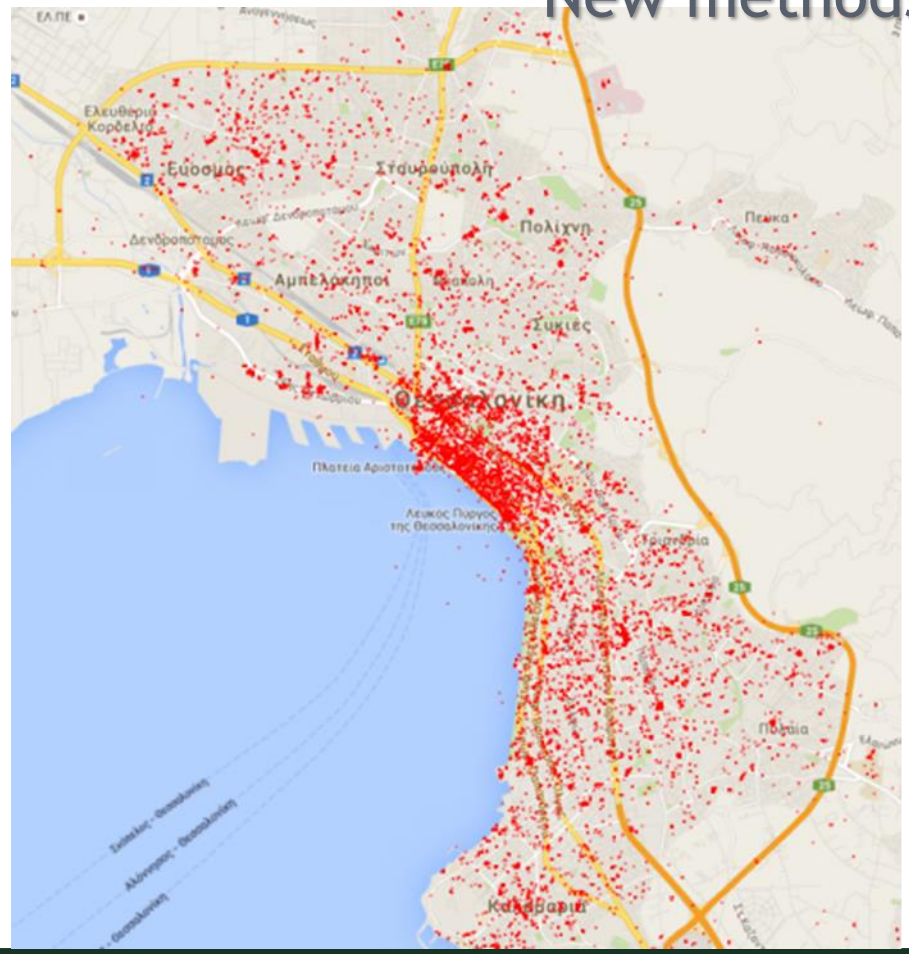


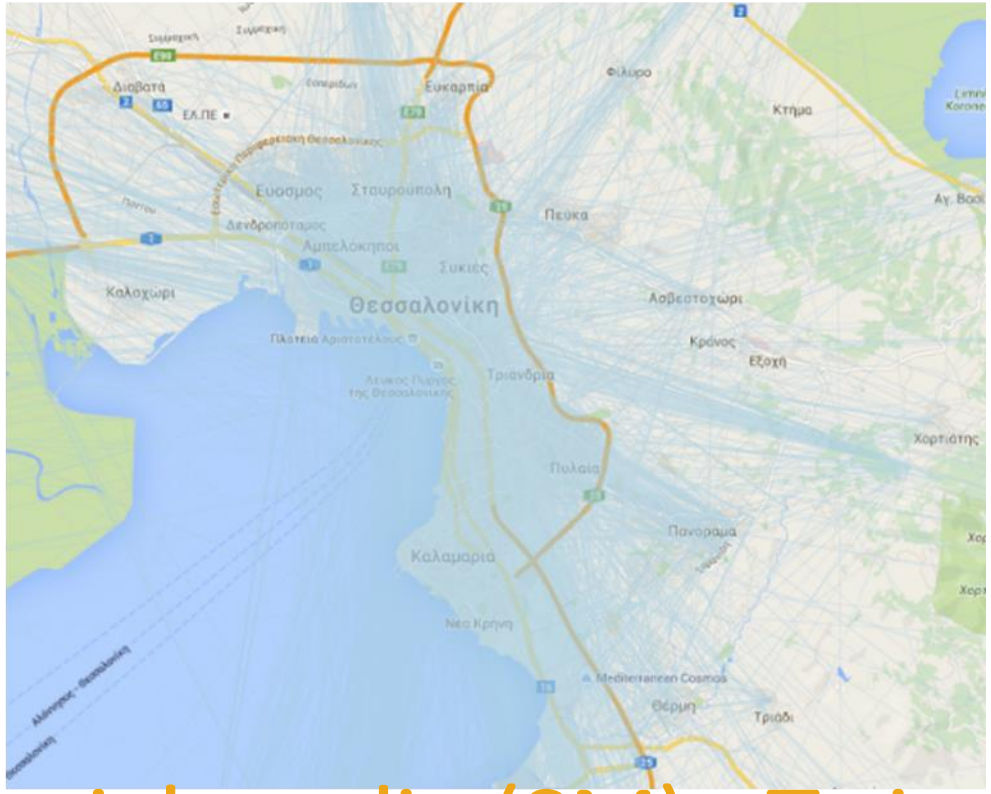


Real time travel time provision to drivers also through Traffic Control Center to VMS, & internet, smart device

K. Karamanli (Psaron/Kleanthous) - Platia CHANTH (CHANTH)	20'
K. Karamanli (Psaron/Kleanthous) - Platia Sintrivaniou (Sintrivani)	17'
Lagada (Ag. Panton) - Platia Dimokratias (Vardaris)	03'
Platia Sintrivaniou (Sintrivani) - Lefkos Pyrgos	02'
V. Olgas (Arch. Mousiou) - Platia CHANTH (CHANTH)	03'
Platia CHANTH (CHANTH) - Platia Sintrivaniou (Sintrivani)	04'
Platia Dimokratias (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 Dimokratias (Vardaris)	08'
Platia Dimokratias (Vardaris) - Lagada	03'

New methods for mobility patterns recognition for planning

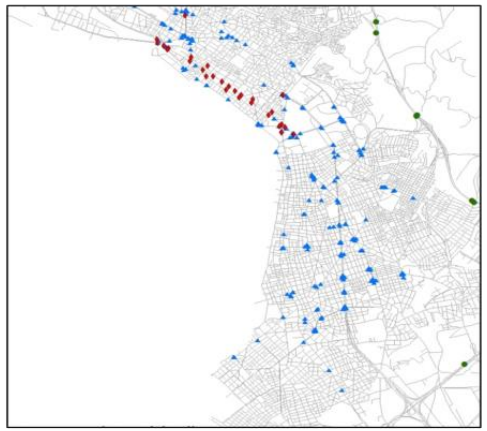




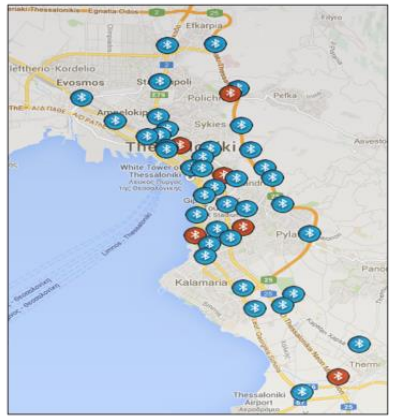
Social media (SM) - Twitter

Datasets at a glance

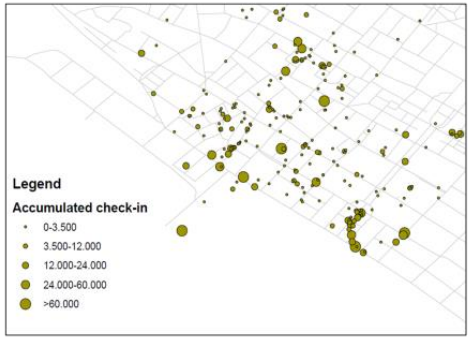
- Bluetooth devices detectors
- Loops and Cameras
- Floating Car Data
- Smart Traffic Lights
- Urban Buses Information
- Floating Train Data
- Digitized networks
- Facebook Graph API



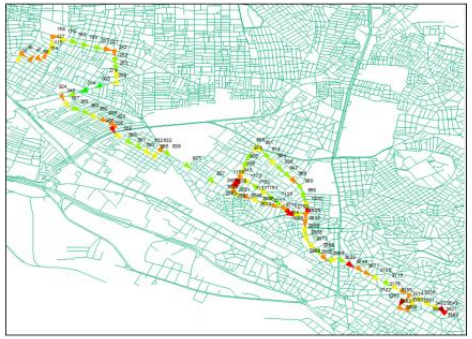
Conventional traffic data sources



Stationary probe data



Data from social media



Dynamic probe data

Thessaloniki Smart city for smart mobility

- 1st award on excellence for ITS research, 2014-2015
- Award for the contribution to the development of the National ITS Strategy and ITS Architecture
- Presidency of ITS Hellas
- Chairing of TM2.0 platform WG
- Chairing of ECTRI TG Mobility
- Co-chairing of i-mobility forum WG
- IBEC management board
- Fiware Foundation membership
- Expert Group of Digital Transport & Logistics Forum DG MOVE

Services and open data portal links of Thessaloniki Smart mobility Living Lab

www.mobithess.gr/

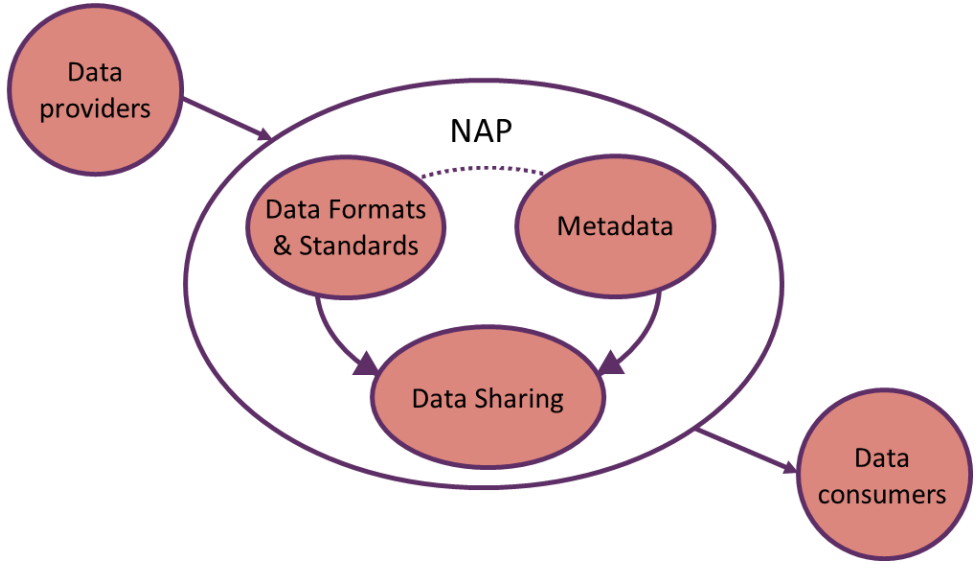
www.thessmd.imet.gr/

www.trafficthess.imet.gr
www.trafficpaths.imet.gr
www.trafficthessreports.imet.gr

www.opendata.imet.gr

Ready to support city's and citizens' ideas …..for smart & green mobility…….

National Access Points for traffic & safety data



National Access Points (NAP) for traffic & safety data

NAP Background

The European approach

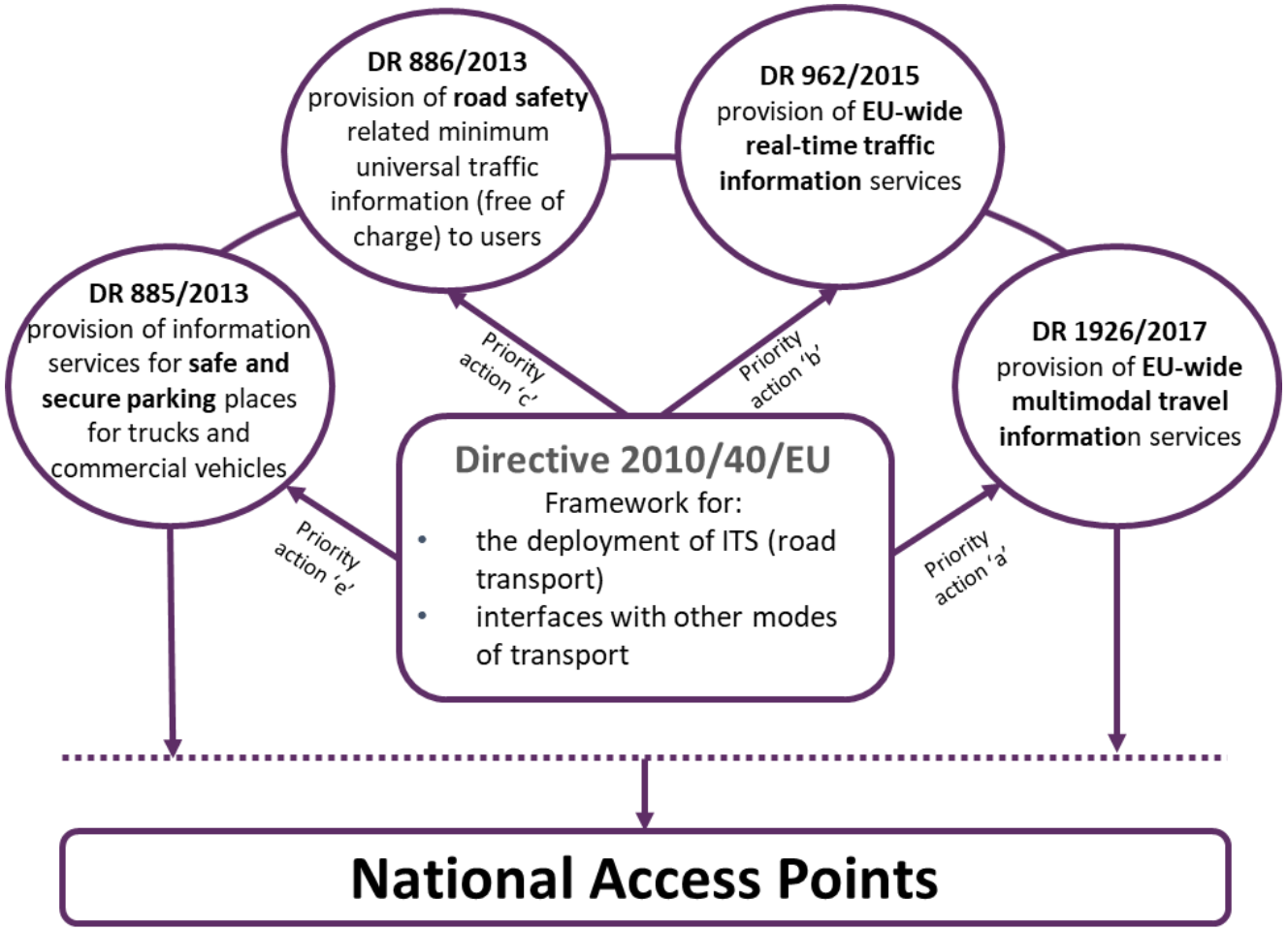
The **need for standardized and centralized ITS data exchange** has been formally recognised by the European Commission.

NAP Background

A conceptual definition of a NAP

A NAP comprises a **digital point of access, where data are collected, properly formatted**, and together with the corresponding metadata, are made available for exchange and reuse.

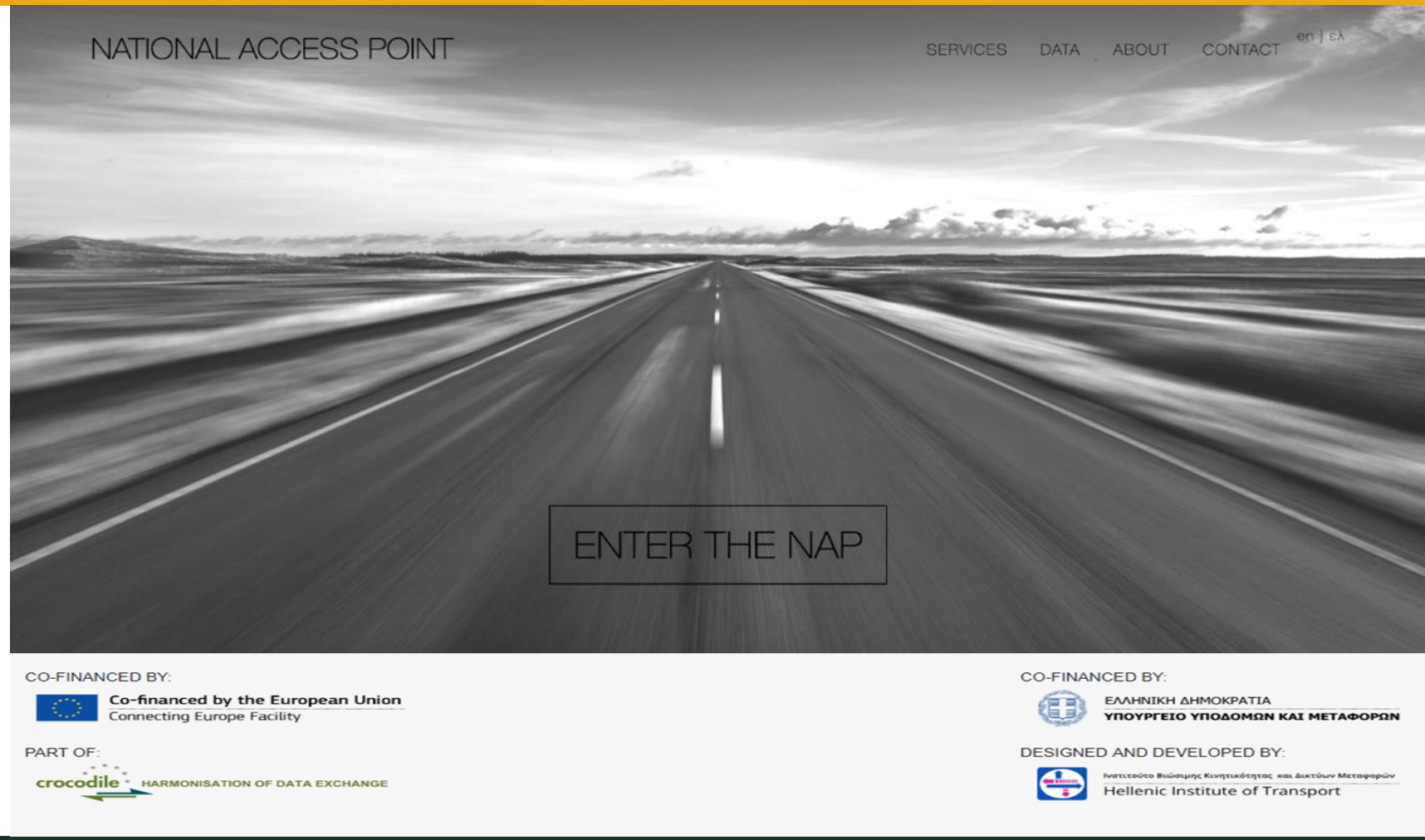
National Access Points for traffic & safety data



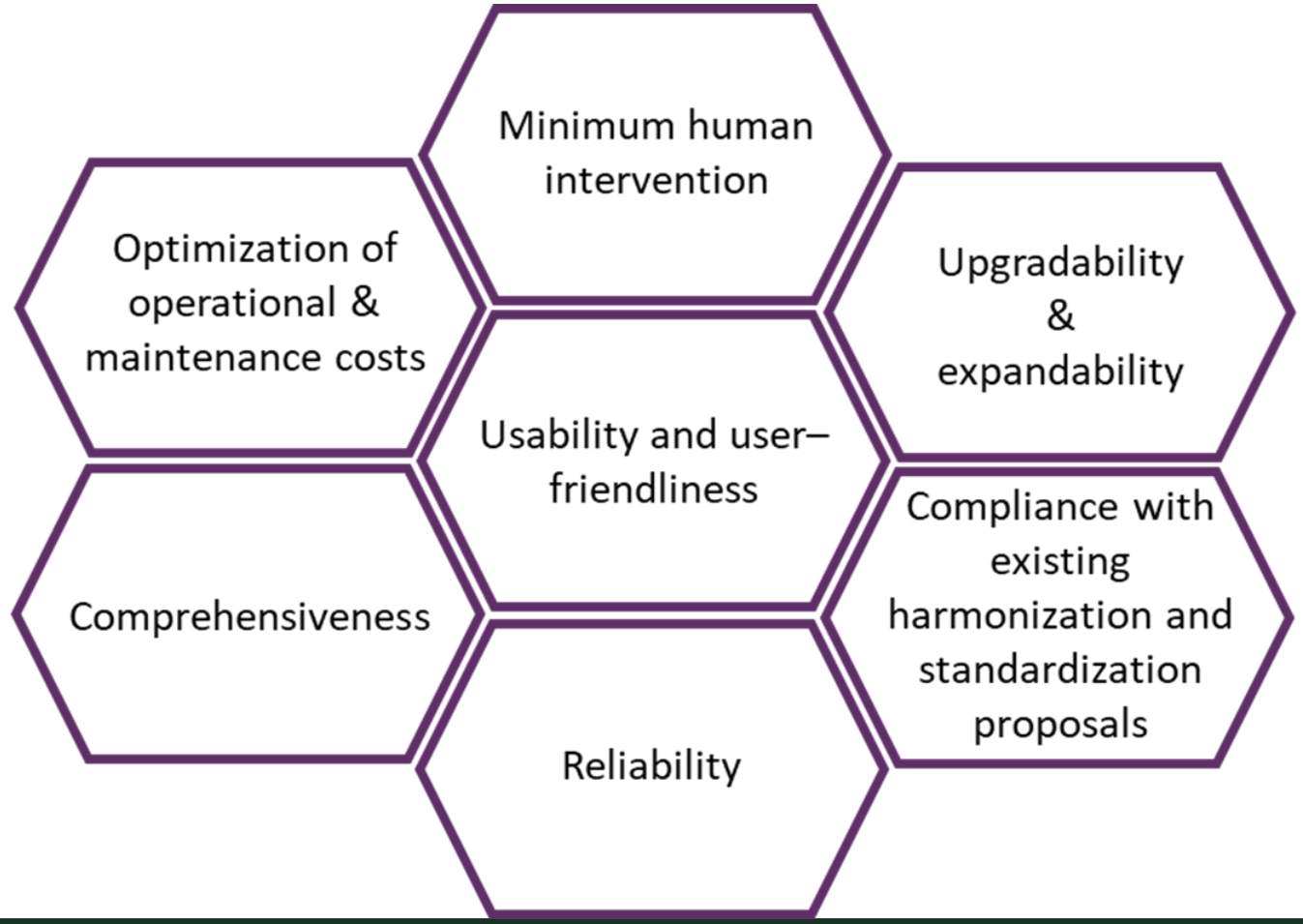
National Access Points EU survey

- The concept of a NAP **varies** from country to country
- NAPs **integrated** in **existing** platforms: a)**Smaller** and more **localised** data providers b)**Lower** levels of **DATEX II** adoption
- **NAPs designed as such**: a) **Fewer** data providers that **aggregate** a larger number of datasets b) **Higher** levels of **DATEX II** adoption
- 6 countries have **multiple platforms** at a national level
- **Openness**: Countries such as Austria, The Netherlands, and Germany do not follow the “paradigm”
- Several countries have chosen to go beyond the **Priority Actions** that focus on road and to include **more transport modes**
- Most countries recognise the **importance of metadata &** have adopted **data formats** which support the **real-time exchange** of data and **machine-to-machine communication**

Greek National Access Point for traffic & safety data

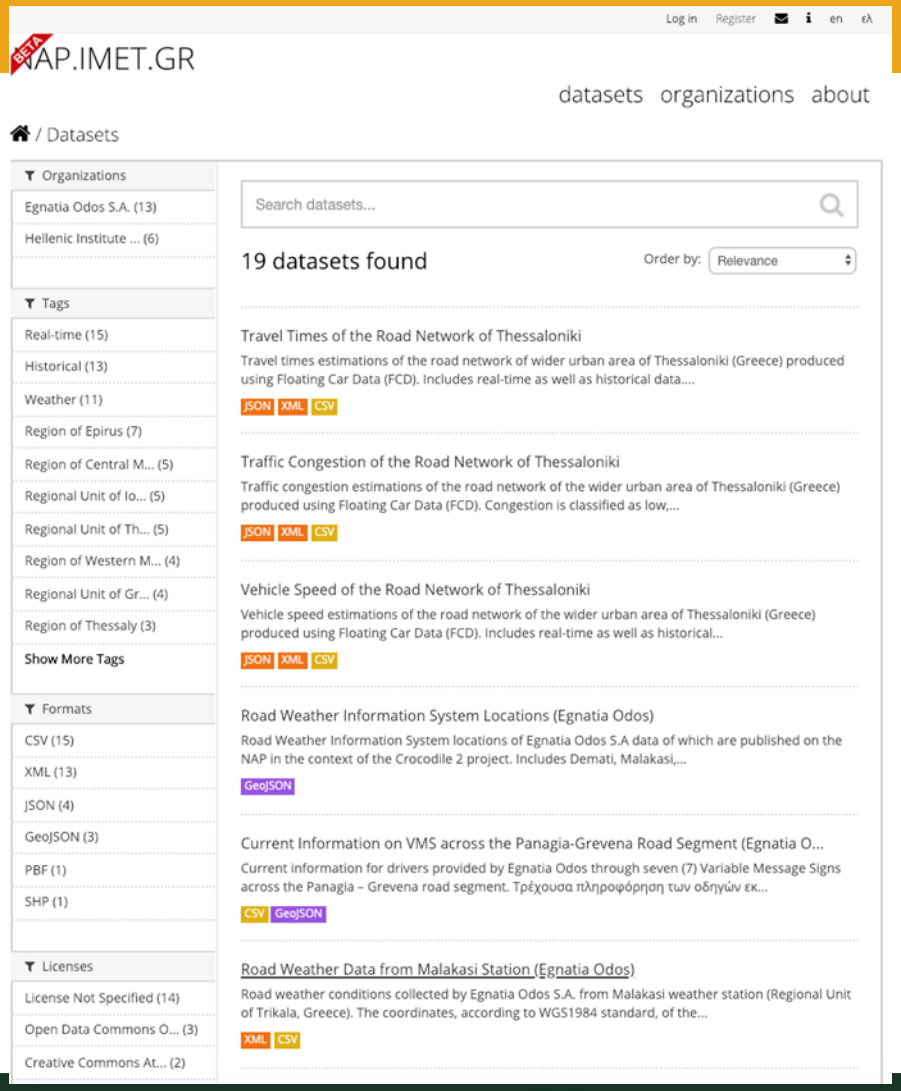


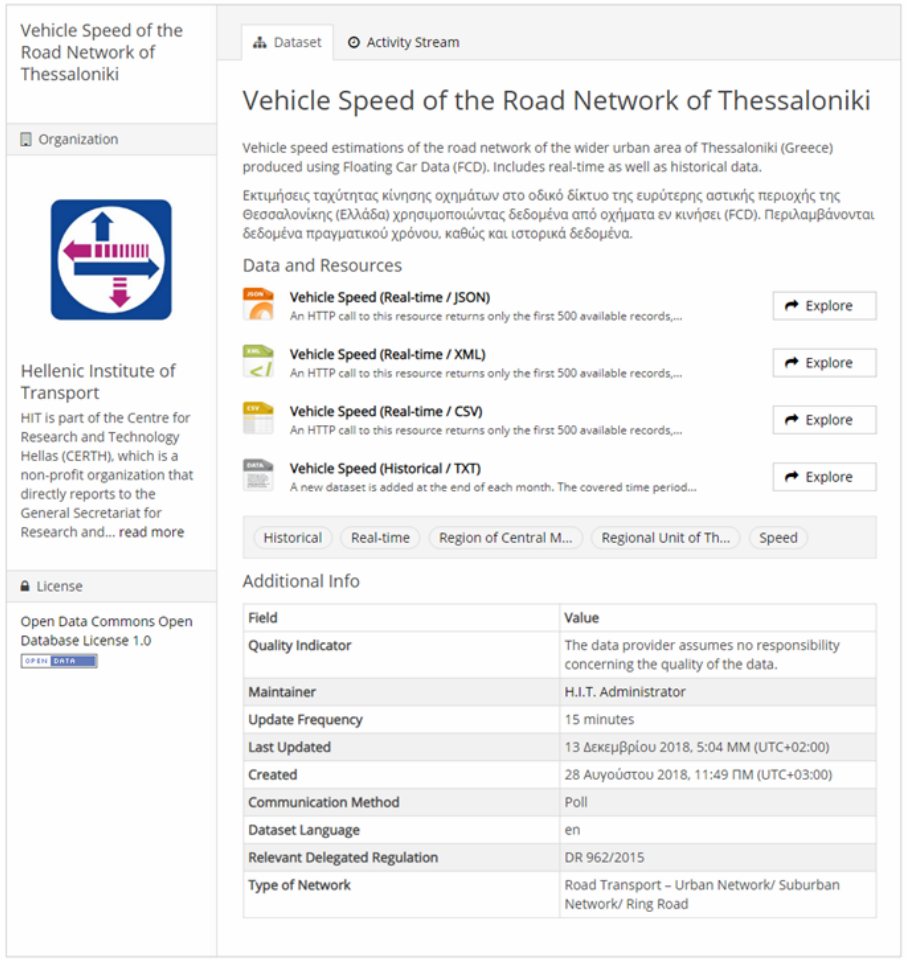
Greek National Access Point Design Principles



Greek National Access Point content

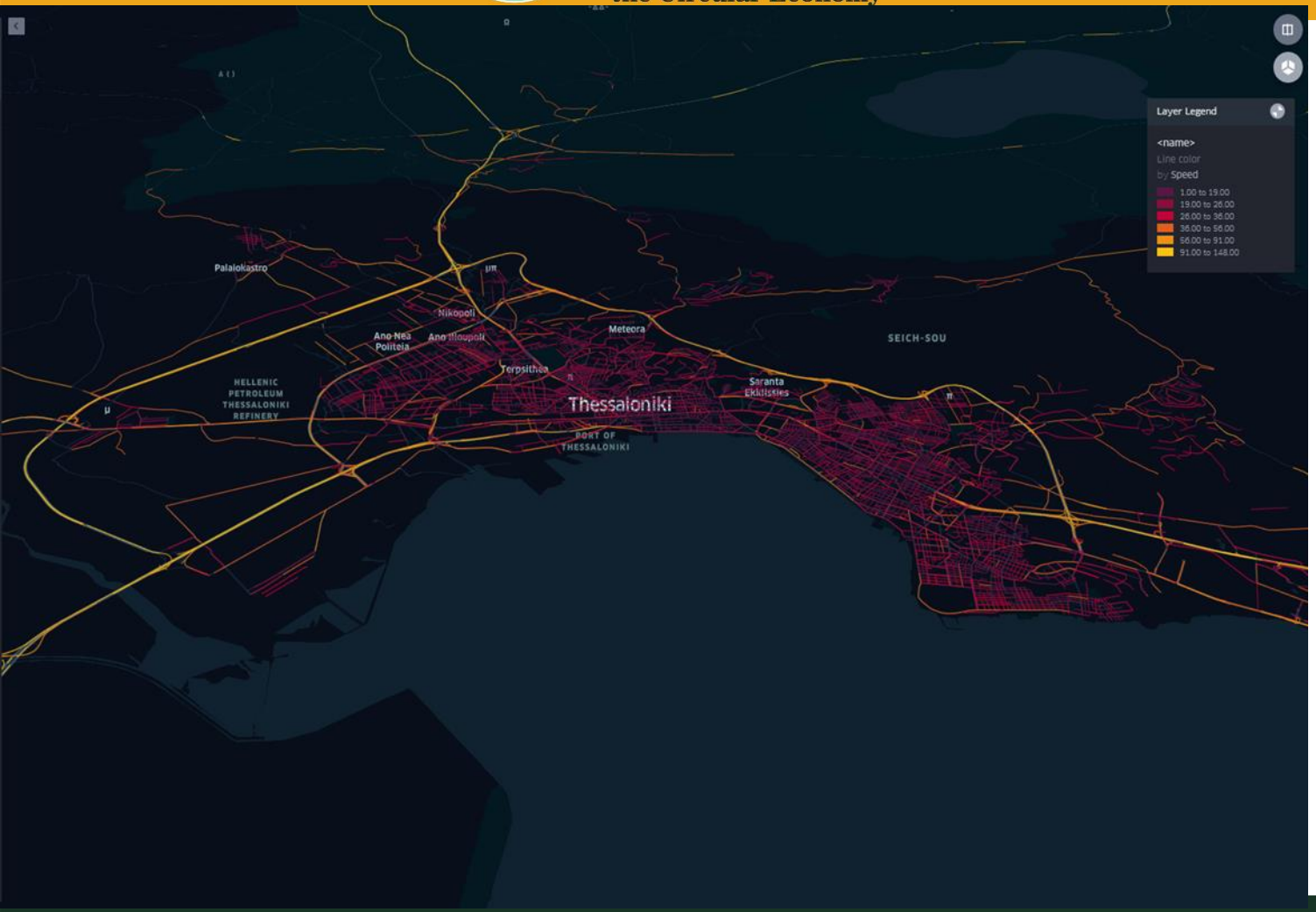
- The User Interface includes the appropriate filters in order to facilitate the locating of relevant data
- Datasets are accompanied by identifiable tags
- Most current data are open





Greek National Access Point content

- Datasets are accompanied by the appropriate metadata
- Most data are real-time
- Historical records are also made available
- Most data are provided in multiple formats
- Data formats facilitate machine-to-machine communication



Greek National Access Point visualization services

Visualization example of a dataset provided through the Greek NAP

Thank you for your attention

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HELLENIC INSTITUTE OF TRANSPORT
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CIrCIE 2019
Challenges for the Islands in the era of the Circular Economy
Thursday 28 - Friday 29 March 2019, Nicosia, Cyprus

under the auspices of ENV MOVE

SMile 2019
6th Sustainable Mobility & Intelligent Transport conference

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)

Bluetooth 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