# *Back-office infrastructure*

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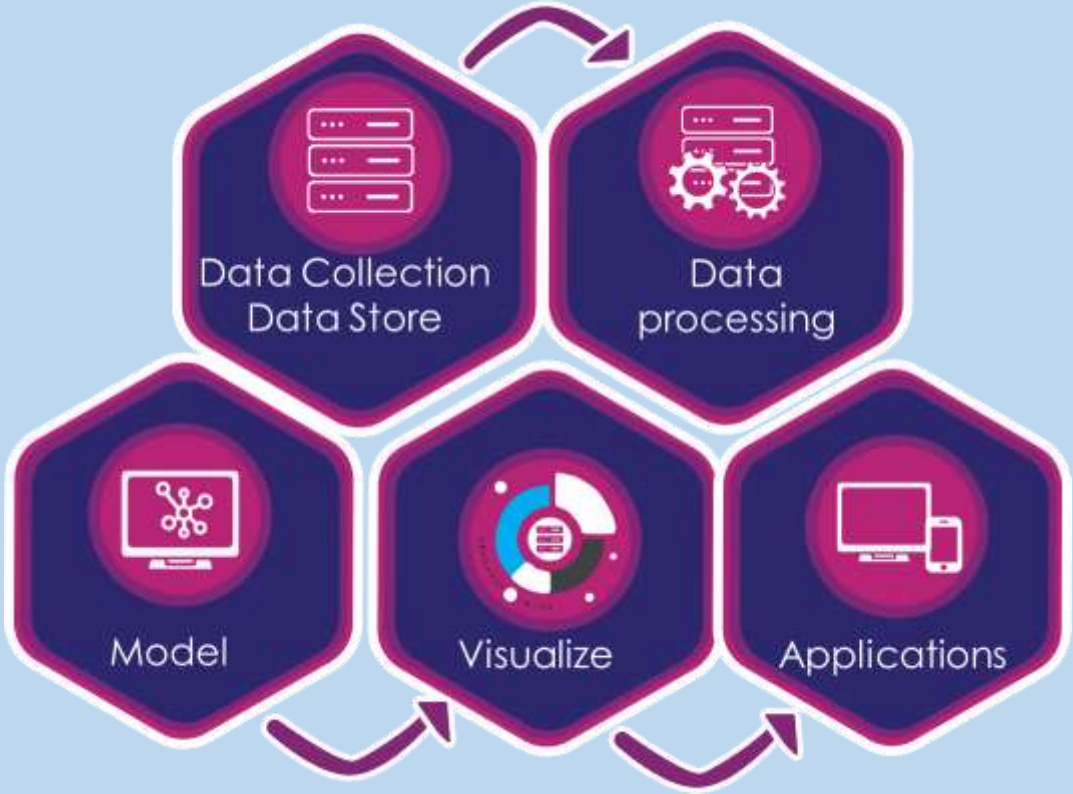
Athanasios Tolikas

# HIT Portal

The H.I.T. Portal is a web-based data collection, management and aggregation provisioning platform designed, developed and maintained since 2008.



# Ecosystem

## 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

## Industry and technology providers

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

SWARCO HELLAS A.E.

ΚΥΚΛΟΦΟΡΙΑΚΗ ΤΕΧΝΙΚΗ

DOTSOFT

## Transport network operators

taxiway
http://www.taxiway.gr

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

Thessbike

Egnatia Odos S.A.

OASTH

Attiko Metro S.A.

TPAINOSE
Trainose

## Public Administration

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

City of Thessaloniki
www.thessaloniki.gr

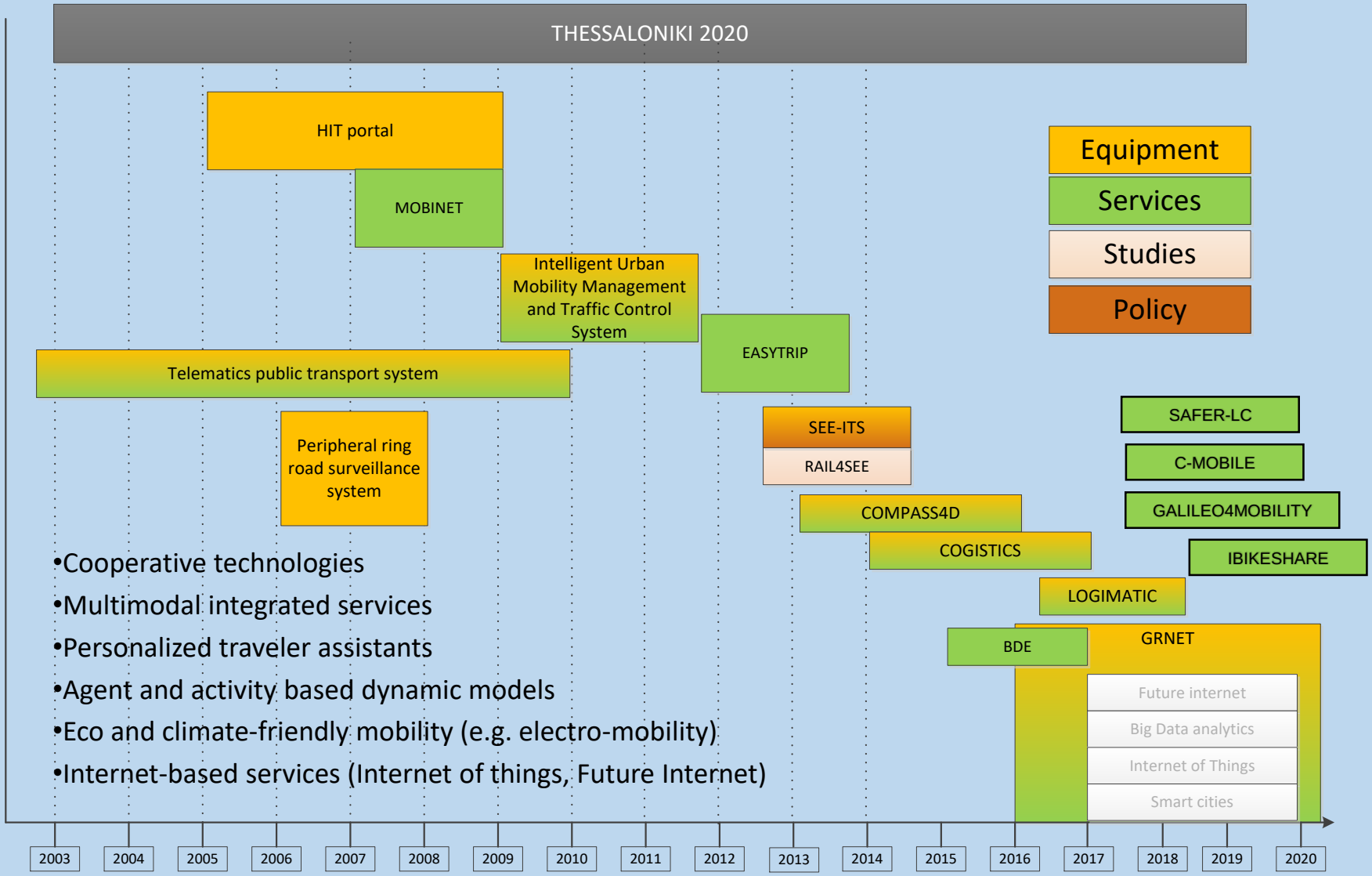
Region of Central Macedonia (RCM)

# HIT PORTAL/KOMVOS Identity

## MAIN FUNCTIONALITIES /ROLES

- **Content aggregator** for the Transport domain
- Data management and **observatory**
- **Hosting** of internal services and services for third parties
- **Platform** for service development
- Provision of **research infrastructure**, datasets and software
- **Support** to researchers and academics
- **Provision of services** to public and organizations/ administrations

# HIT Portal




- Cooperative technologies
- Multimodal integrated services
- Personalized traveler assistants
- Agent and activity based dynamic models
- Eco and climate-friendly mobility (e.g. electro-mobility)
- Internet-based services (Internet of things, Future Internet)

# HIT Portal

- **Physical (hardware - Sensing)**
  - Research infrastructure (owned by HIT)
  - Public infrastructure open research
- **Digital (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]

# HIT Portal – Hardware Infrastructure (1)

The supporting hardware of the H.I.T. Portal is being continuously upgraded in order to follow the latest technological standards. The hardware infrastructure that supports the H.I.T. Portal consists of the following parts:

- Web, Application, Database and Virtualization servers (Windows Server and Linux)
- High Performance Clusters (HPCs)
- Network Switches, Routers, Firewalls

# HIT Portal – Hardware Infrastructure (2)

- HIT's main infrastructure is located at Thessaloniki
- GRNET provides significant processing power located in Athens
- Other, smaller infrastructure components are located in different cities of Greece

# HIT Portal – Hardware Infrastructure (3)

## HIT Portal Infrastructure

20 Servers
2 High Performance Cluster (HPC) Servers
2 Network Access Storage (NAS)
12 Virtual Servers
2 Routers
2 Hardware Firewalls
5 Manageable Switches
29 Workstations
6 Notebooks
4 Tablets

Processing hardware
+
Management hardware

## GRNET Infrastructure

**Hardware**

- Two high processing virtual machines
  - Web Server
  - Database

**Software**

- Apache Flink
- Apache Kafka
- Postgresql

# HIT Portal – Hardware Infrastructure (4)

## External Hardware Infrastructure

**Low cost smart city sensors: 43 Bluetooth Devices Detectors**

**Cooperative Intelligent Transport Systems: 7 Cooperative Road Side Units and 4 Cooperative On Board Units**


# HIT Portal – Software

**Operating Systems**

**Management Tools**
- Microsoft System Center Operation Manager
- Hewlett Packard Insight Manager
- Cisco LMS

**Database Tools**
- Microsoft SQL Server 2005
- Microsoft SQL Server 2008
- Post SQL
- MySQL
- ESRI ArcSDE 9.2

**Development Tools**
- Microsoft Visual Studio
- **Android Studio**
- Microsoft SharePoint Designer
- MathWorks MATLAB
- IBM Rational Rose
- ESRI ArcGIS MapObjects
- ESRI ArcGIS Crystal Reports
- ESRI ArcPAD Application Builder

**Statistical Tools**
- SPSS
- SPSS SmartView

**GIS Tools**
- ESRI ArcGIS Server 9.2
- AutoDesk Map Server
- ESRI ArcGIS ArcInfo/ArcView Desktop 9.2
- ESRI ArcLogistics Route

**CADTools**
- AutoDesk AutoCAD Mechanical
- AutoDesk AutoCAD Electrical
- AutoDesk AutoCAD Architectural Desktop

**Transportation Tools**
- VTG Vista
- Emm2
- PTV AG Visum
- PTV AG Vissim
- McTrans HCS+
- TRL Transyt
- AIMSUN

**Dedicated transport simulation/modelling software**

**OpenStreetMap Tile Server**

**Programming Tools**
- AMPL
- CPLEX
- C++
- C#
- Visual Basic
- Java
- J#

**Dashboards**
- Kripis
- ThessReports
- Mobility Lab
- Safer-LC
- ThessTraffic

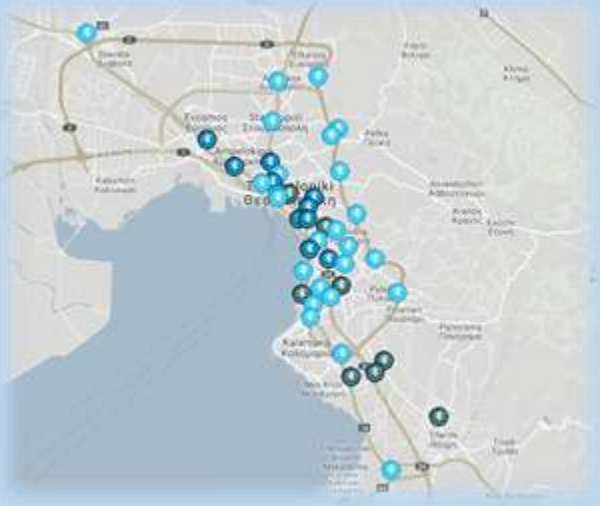
**Services**
- Map Matching
- Web Services
- Mobile Services
- Routing
- Data Analysis
- Data Visualization
- Traffic prognosis
- …

**Data Grabbers**
- Facebook
- Twiiter
- OASTh

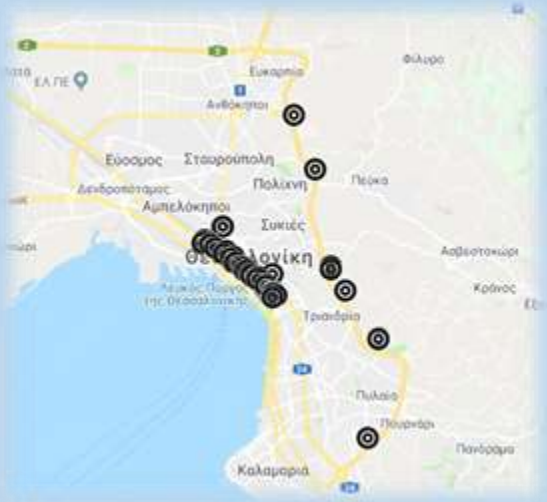
# HIT Portal – Data Sources

We aggregate data from our eco system with different types of Detectors.

Bluetooth Detectors



Loops and Cameras

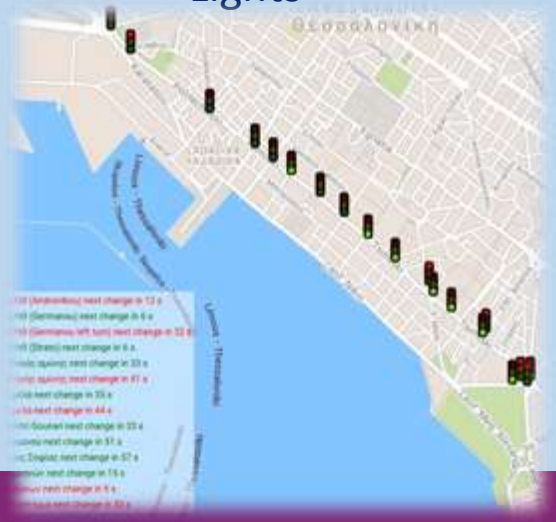



Floating Car Data

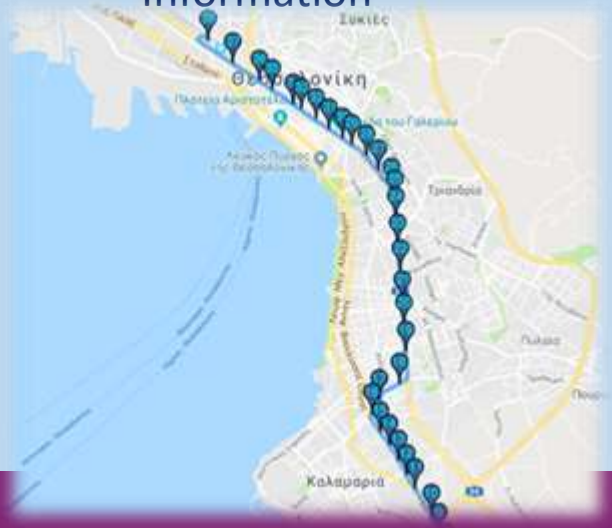
# HIT Portal – Data Sources

The processing of these data can lead to useful conclusions about current land use and may also reveal mobile mobility patterns that can be used to predict traffic conditions.

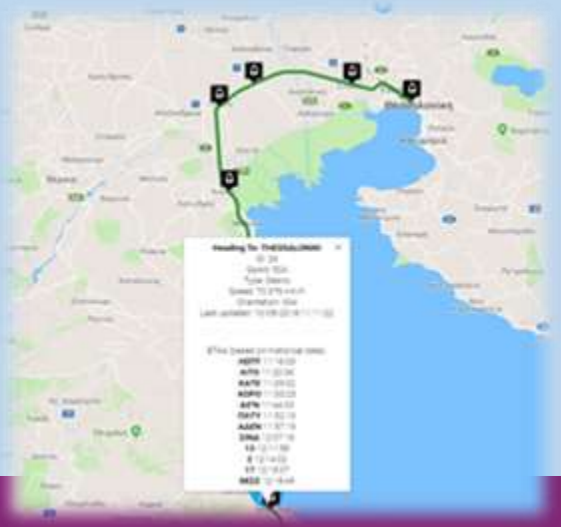
Smart Traffic Lights



Urban Buses Information



Floating Train Data



# HIT Portal – Data Sources

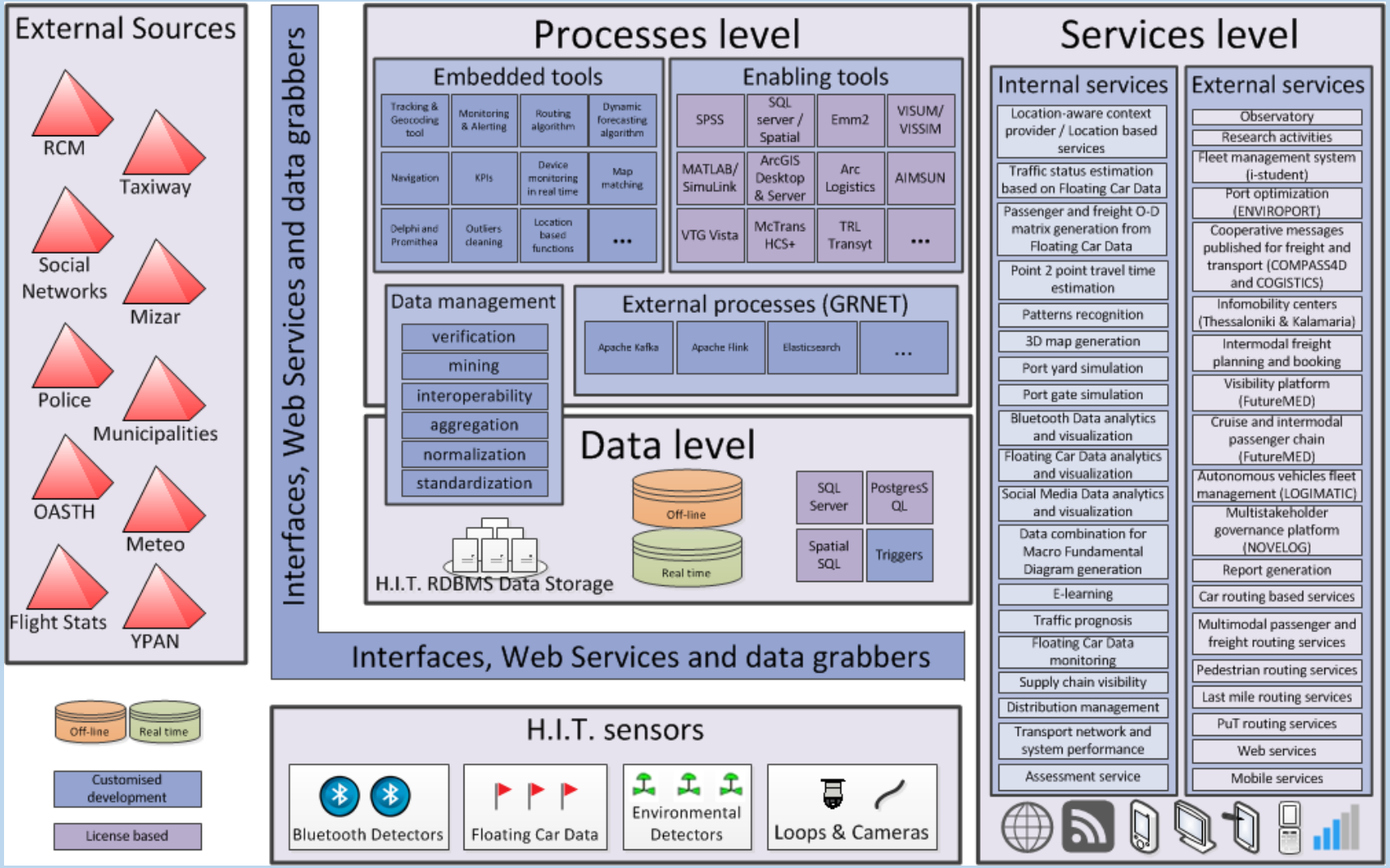
Data from multiple sources are combined to better understand any correlation and dependencies among them

Digitized networks

Points of Interest

Facebook Graph API

# PORTAL SYSTEM



# Processes level

## Embedded tools

| | | | |
|---|---|---|---|
| Tracking & Geocoding tool | Monitoring & Alerting | Routing algorithm | Dynamic forecasting algorithm |
| Navigation | KPIs | Device monitoring in real time | Map matching |
| Delphi and Promithea | Outliers cleaning | Location based functions | ... |

## Enabling tools

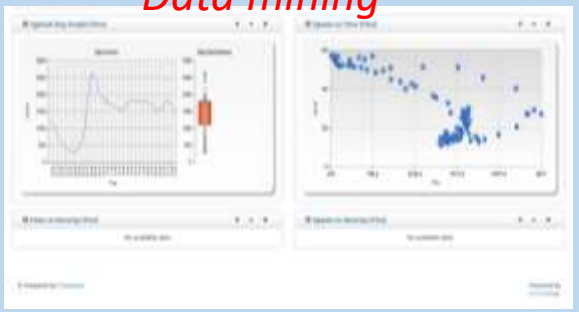
| | | | |
|---|---|---|---|
| SPSS | SQL server / Spatial | Emm2 | VISUM/ VISSIM |
| MATLAB/ SimuLink | ArcGIS Desktop & Server | Arc Logistics | AIMSUN |
| VTG Vista | McTrans HCS+ | TRL Transyt | ... |

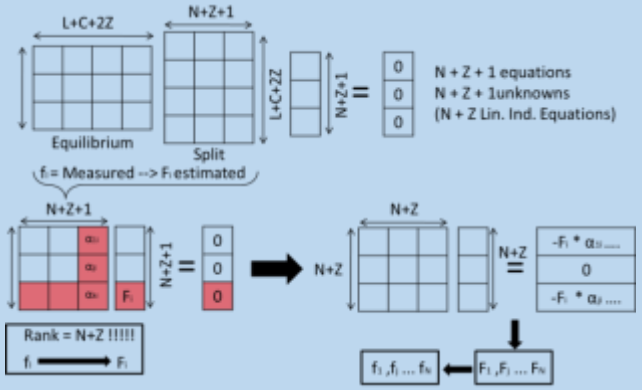
## Data management

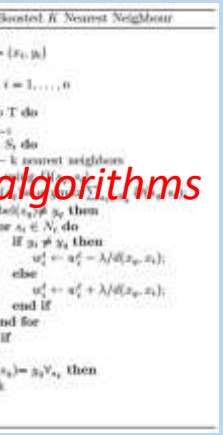
verification | interoperability | normalization
mining | aggregation | standardization

Automation functions

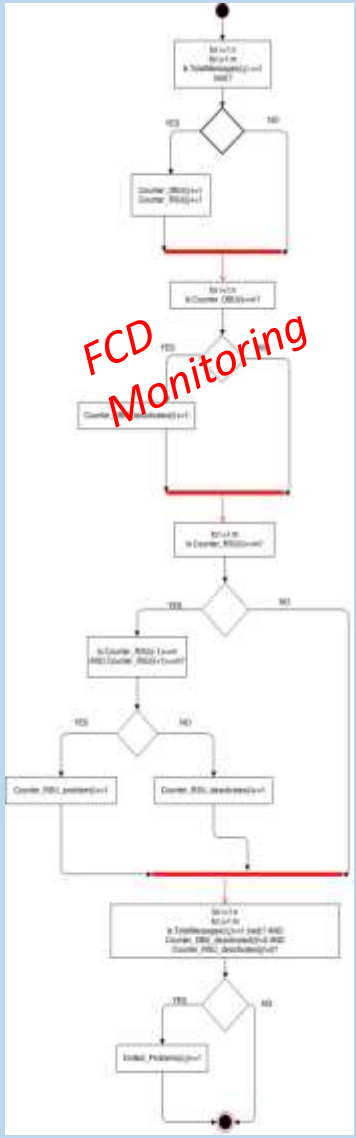
Data mining





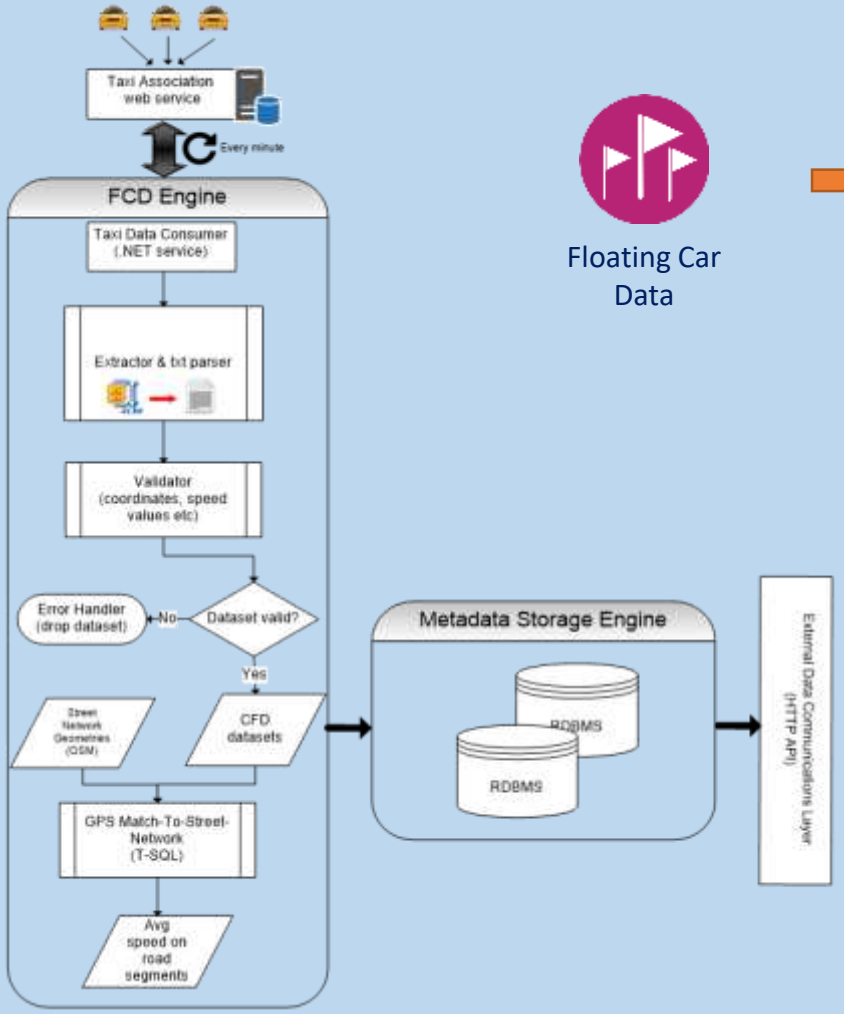




algorithms



FCD Monitoring

- Real time traffic status by estimating the average moving speed of the vehicles on the road network. The speed estimations are produced every 15 minutes although it is possible for this frequency value to change in the future

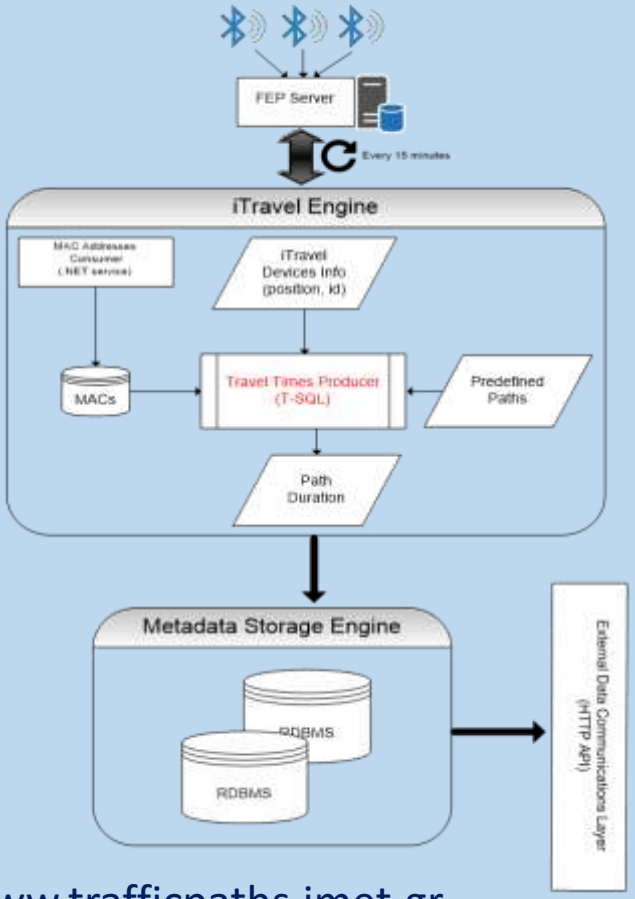



Floating Car Data

Real-time traffic status

www.trafficthess.imet.gr

- The procedure of calculating travel times runs every 15 minutes and utilizes the sensors' data collected within the previous hour. All sensors' data collected are then probed based on the unique MAC addresses of the detectable mobile devices and the exact time of occurrence of each detection. Consequently, the travel time estimation for each mobile device between the sensors is being estimated.




www.trafficpaths.imet.gr

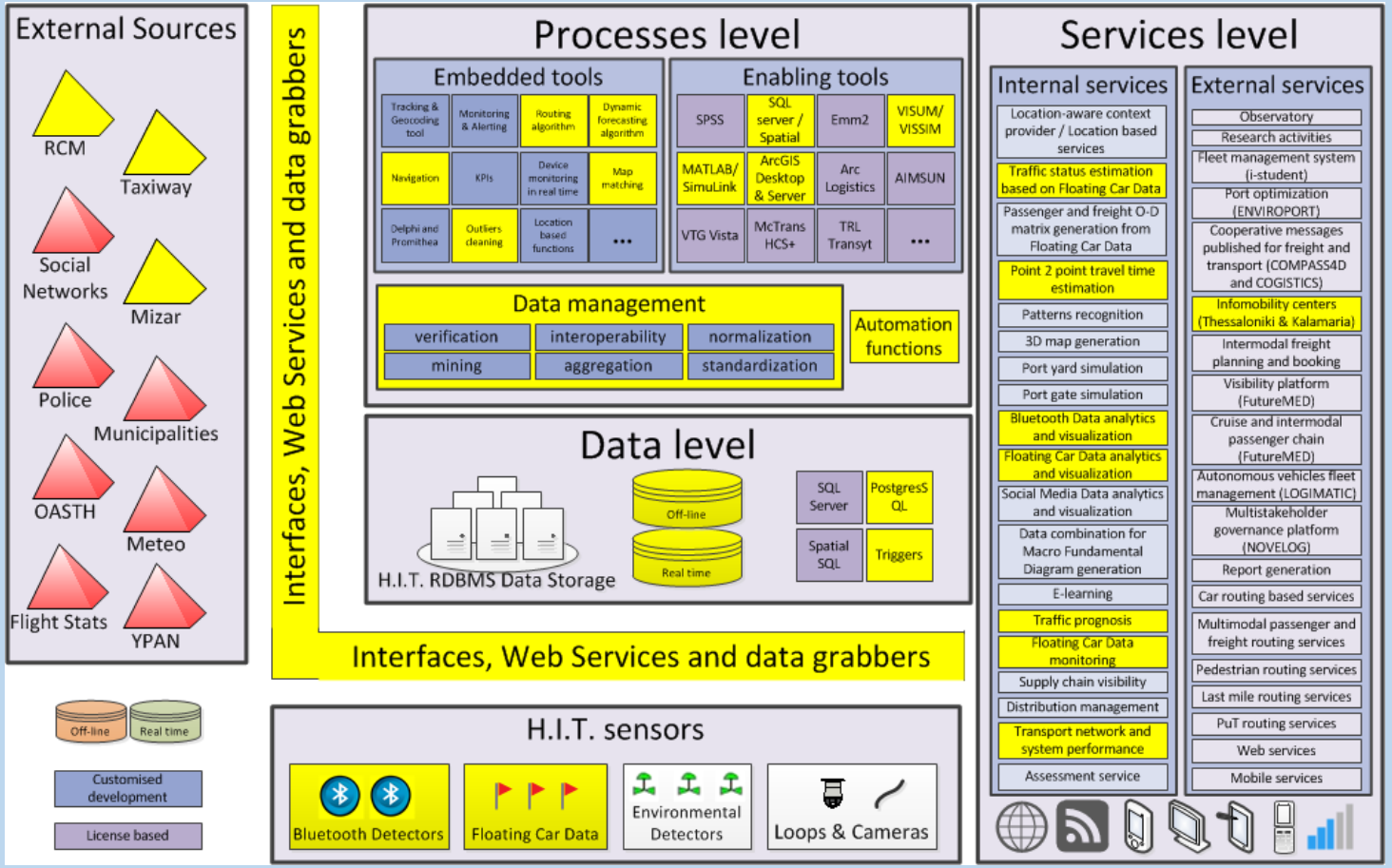
Bluetooth Detectors

Floating Car Data

Travel time estimation for pre-defined paths in Thessaloniki

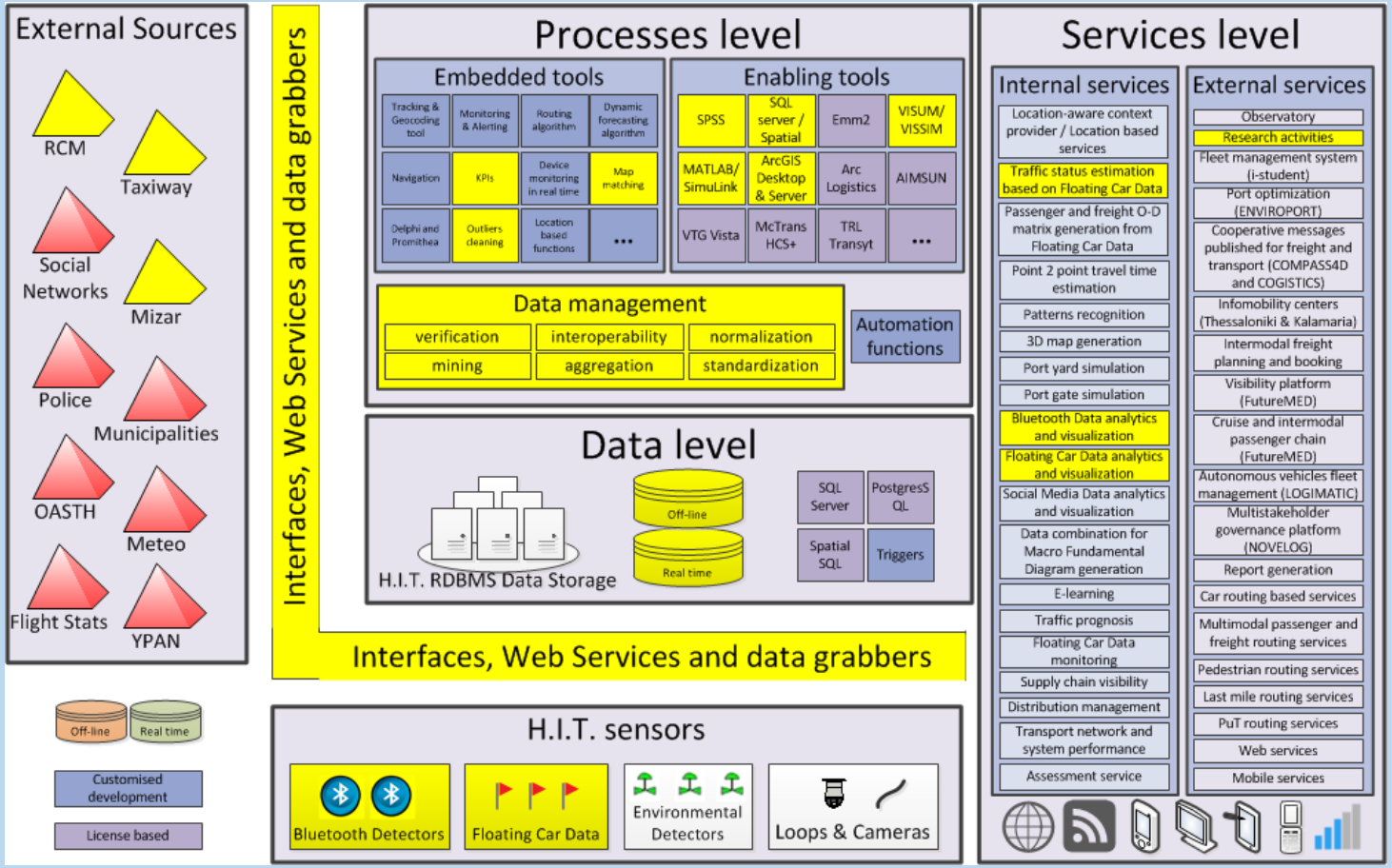
# *HOW we use KOMVOS for commercial projects and internal basic research*

# HIT PORTAL (Project sample)




www.mobithess.gr

# HIT PORTAL (Research sample)




E. Mitsakis, I. Stamos, Diakakis M., J.M. Salanova Grau, (2014) **Impacts of high intensity storms on urban transportation: Applying traffic flow control methodologies for quantifying the effects**, International Journal of Environmental Science and Technology, November 2014, Volume 11, Issue 8, pp. 2145-2154 - DOI 10.1007/s13762-014-0573-4.

# HIT Portal – Open Data

- Part of the collected data are also available as open data

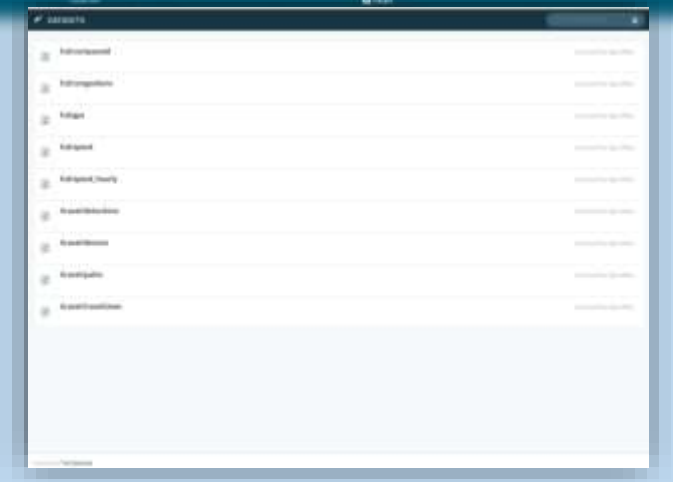
www.opendata.imet.gr


For real-time data an HTTP REST API Endpoint is also available

# HIT Portal – Open Data APIs

The H.I.T. Open Data portal is intended to be a unique access point 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)"

# Useful Links

www.mobithess.gr/

www.thessmd.imet.gr/

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

www.opendata.imet.gr

www.certh.gr/
www.imet.gr/

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# THANK YOU!