TEAM
Tomorrow's Elastic Adaptive Mobility

Application of Collaborative and Elastic Transport Solutions in Greece

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Tomorrow's Elastic, Adaptive Mobility

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Patras, 20 November 2014

This project is co-funded by the European Union – DG Connect

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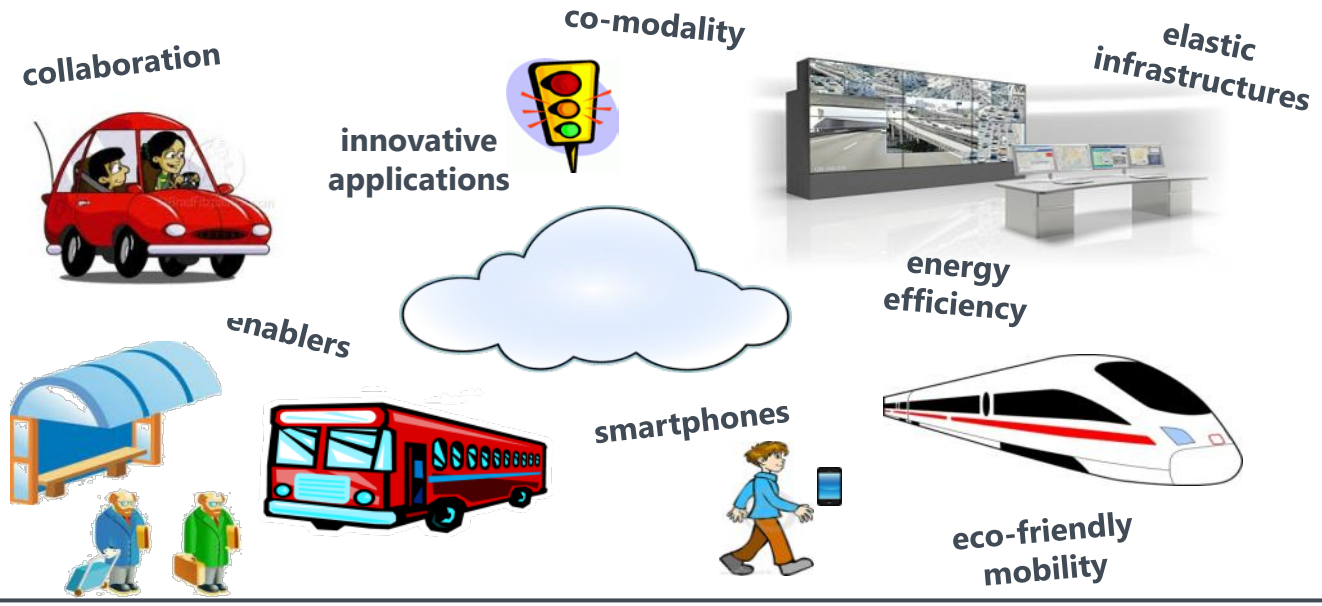
TEAM Vision

TEAM European Integrated project: Tomorrow's Elastic Mobility

Elastic mobility: joining drivers, travelers and infrastructure operators in a collaborative network balancing individual and global mobility needs. Collaboration is the key to extend the vehicle-2-x cooperative concept with interaction and participation.



Vehicles and Infrastructure communicate…

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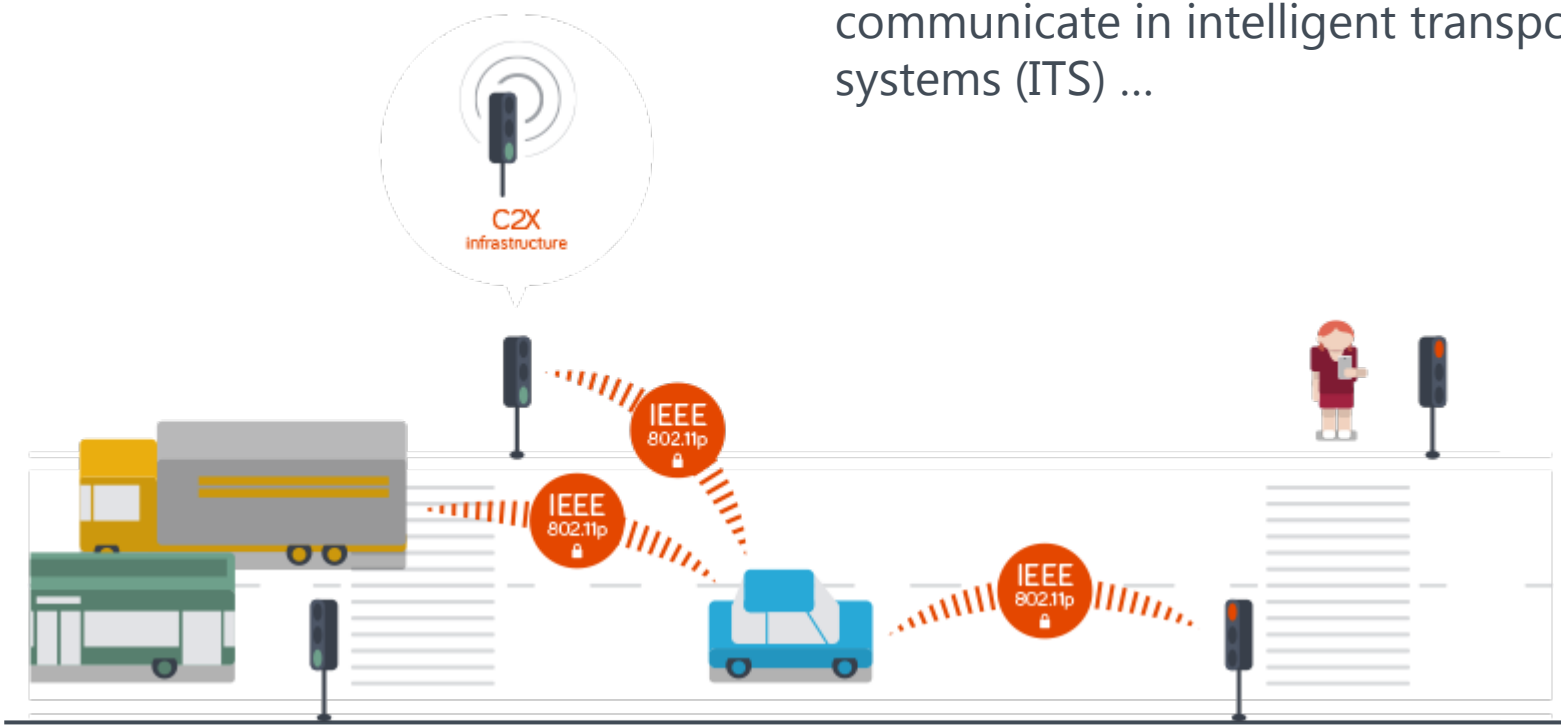
When vehicles and infrastructure communicate in intelligent transport systems (ITS) …



… Smartphones are connected, too

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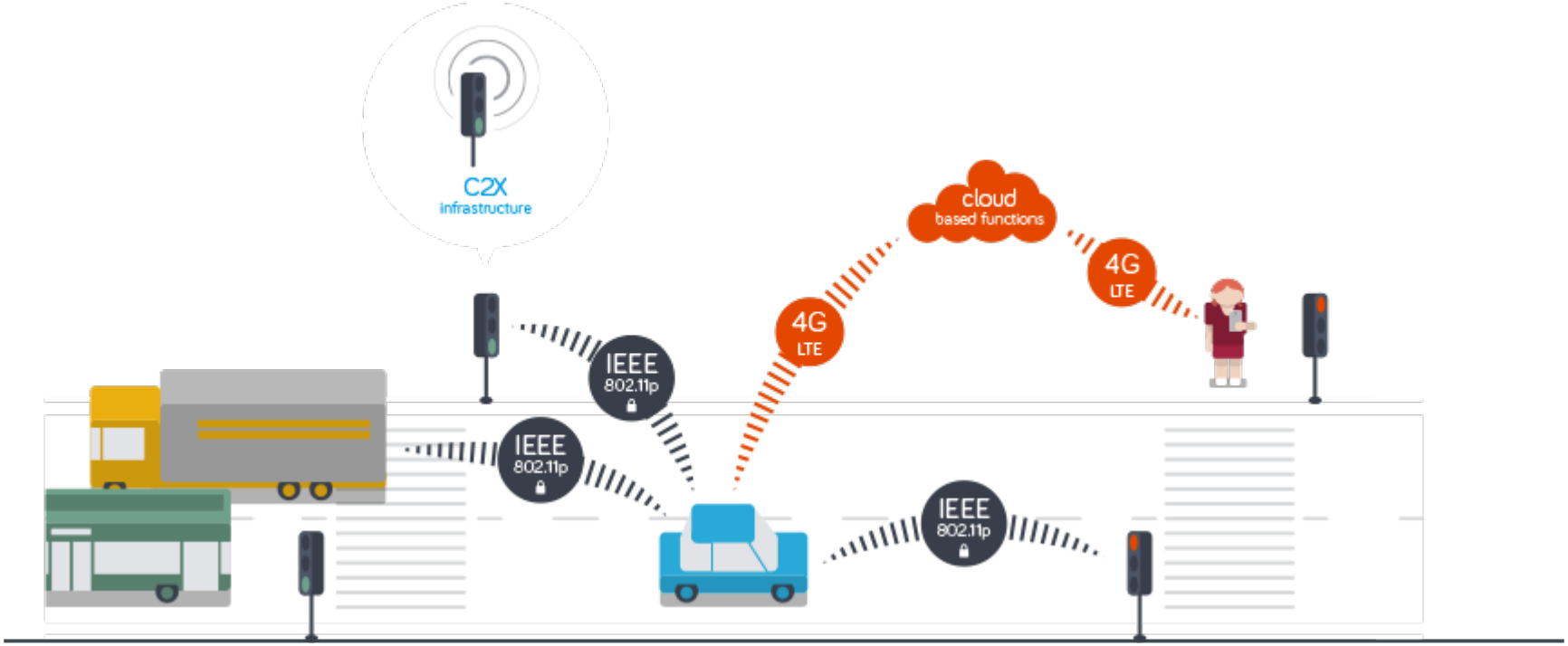
… and TEAM will also integrate smartphones and cloud services …



Now let's integrate the driver and the traveler…

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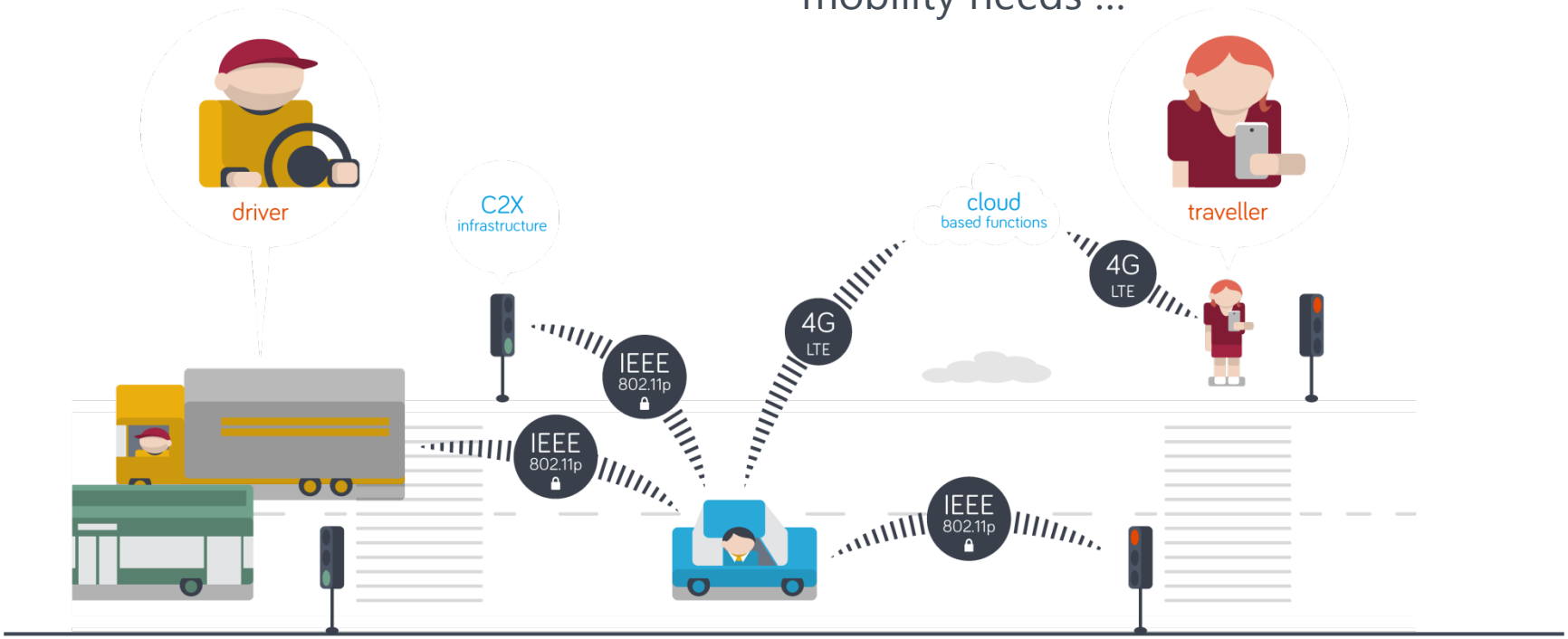
…additionally allowing drivers and travellers to participate in a collaborative network balancing individual and global mobility needs …



For an elastic and collaborative mobility system

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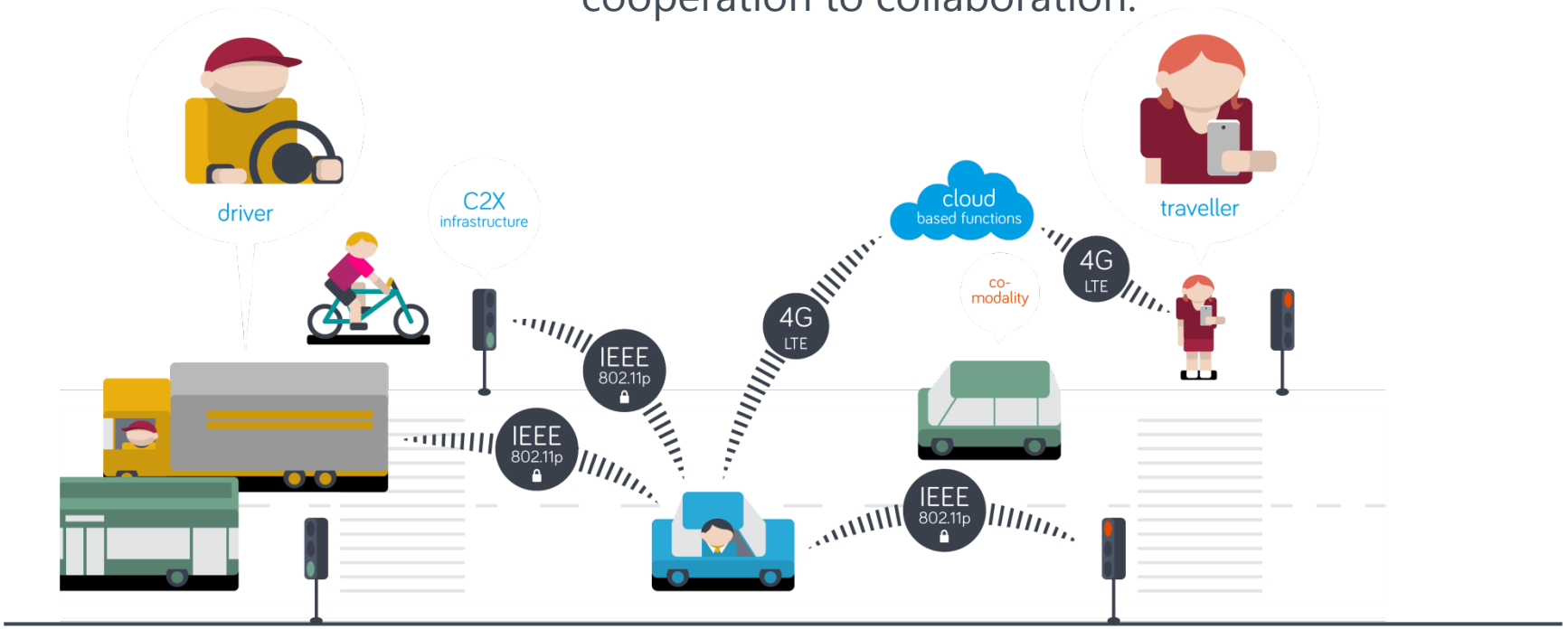
… then drivers, travellers, vehicles and infrastructure will act as a "team". The involvement of interacting participants moves vehicle-2-x systems from cooperation to collaboration.



Objectives

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Drivers, travelers and infrastructure will **act as a team** adapting to each other and to the situation, creating optimized mobility conditions.

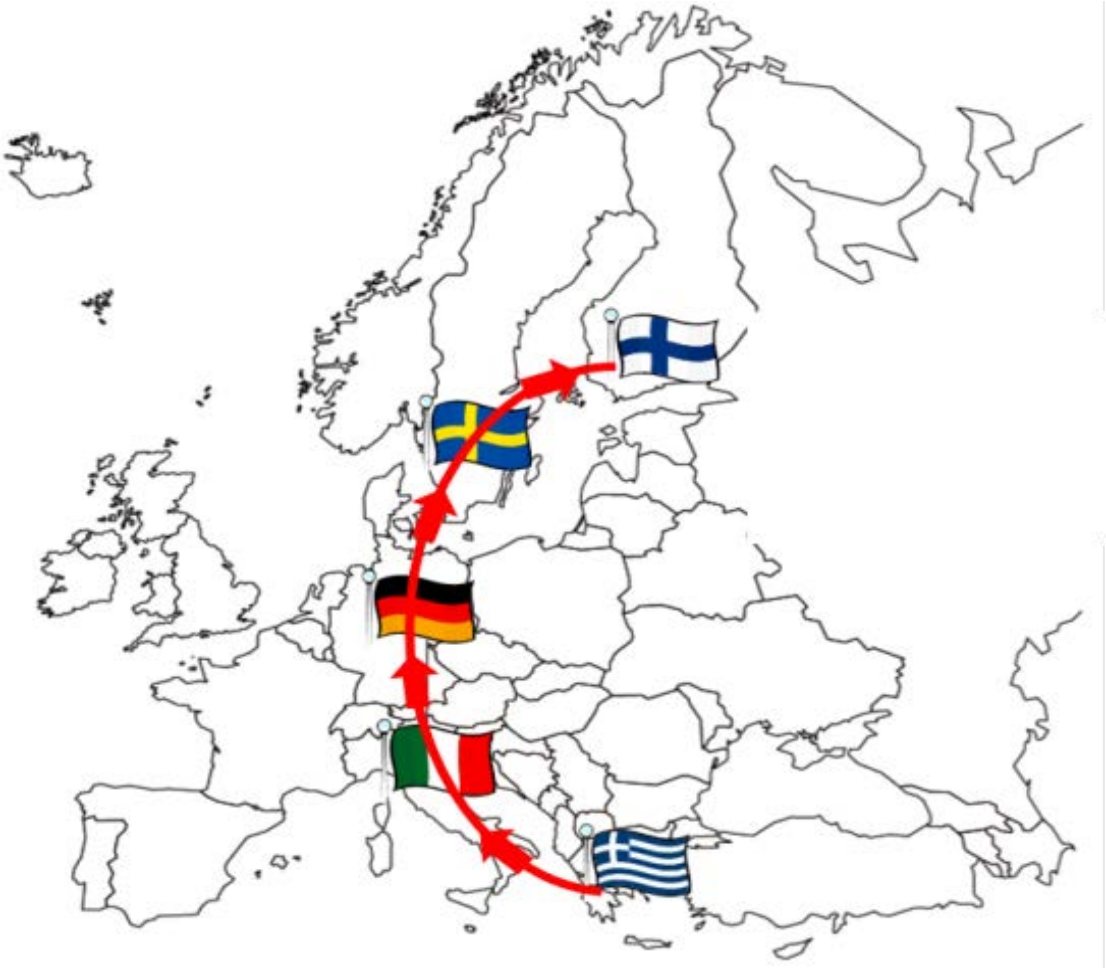
Objectives:

- Advance vehicle-2-x communication technologies by **LTE** integration and an **automotive cloud** to support decentralized traffic applications.
- Develop proactive algorithms and technologies to enable drivers and travelers **behavioral change** for improving transportation networks.
- Leverage **nomadic devices and in-vehicle systems** to realize massively distributed collaborative control and optimization concepts.
- Take into account **real-time needs of all users** and provide real-time seamless information.
- Show the benefits via the **Euro-EcoChallenge** a pan-European mobility test.

Euro-Eco Challenge

Pilot Sites

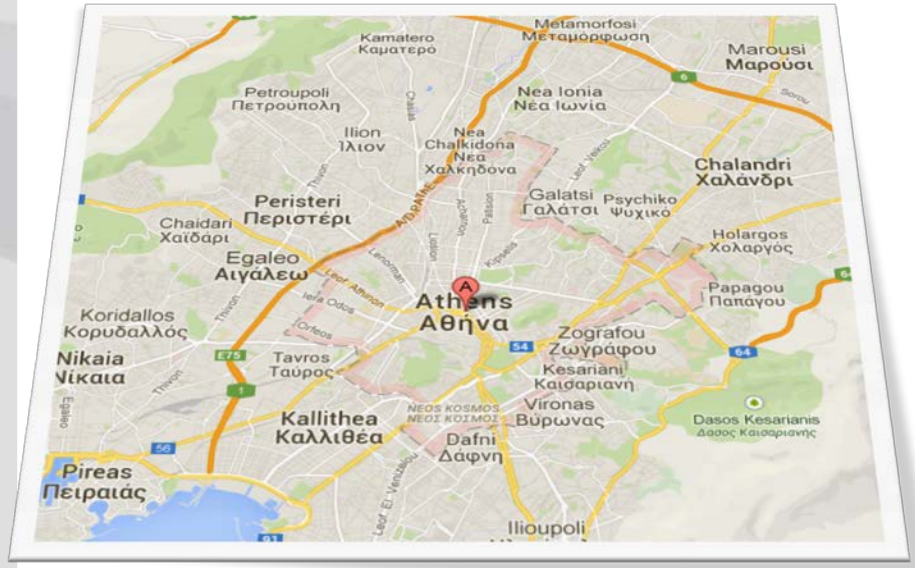
- **Greece:**
  - Athens and Trikala
- **Italy:**
  - Turin and Trento
- **Germany:**
  - Berlin
- **Finland:**
  - Tampere and Helsinki
- **Sweden:**
  - Gothenburg

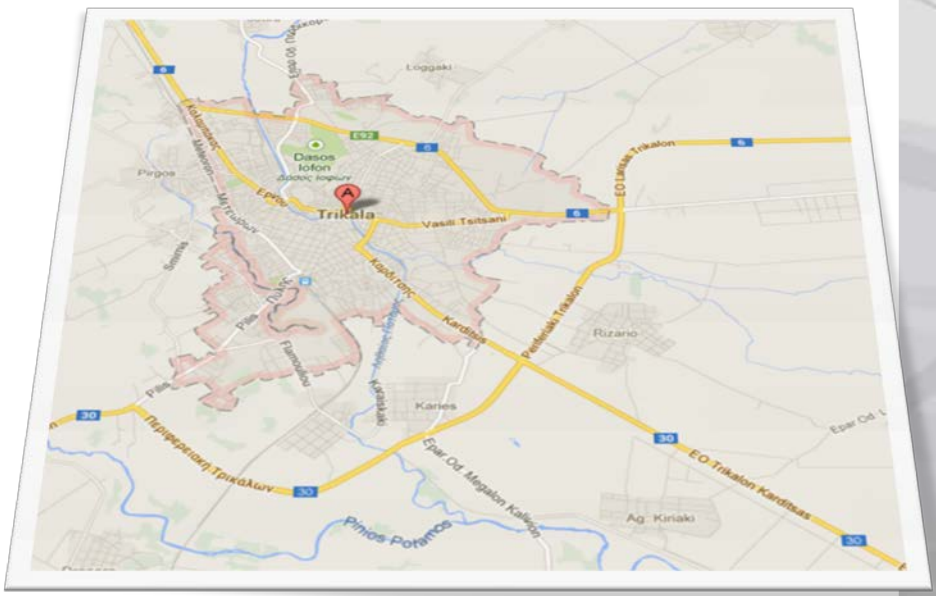


TEAM pilot: Greece

The Greek pilot site combines two locations, the Athens metropolitan area and the Trikala city in northern Greece

Athens	Trikala
Size of population: ~ 4 million Area: Urban and peripheral road	Size of the population: ~ 100.000 Area: Urban and rural





Application of Collaborative and Elastic Transport Solutions In Greece

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Solutions applied in Athens and Trikala

- Collaborative pro-active urban/inter-urban monitoring and ad-hoc control – CMC ***(Athens)***
- Collaborative co-modal route planning – COPLAN ***(Athens & Trikala)***
- Co-modal coaching with support from virtual/avatar users – CCA ***(Athens & Trikala)***
- Collaborative smart intersection for intelligent priorities – CSI ***(Athens)***
- Collaborative public transport optimization – CPTO ***(Trikala)***
- Green, safe and collaborative driving serious game and community building – SG/CM ***(Trikala)***

Reference Application in Athens

Collaborative Smart Intersection for intelligent priorities

- **Objectives:**

  Integrated application for intersections, utilizing mainly V2I communications . Mainly aiming at creating fully collaborative intersections that can dynamically optimize public transport, by giving priority to public transport vehicles.

- .**How it works:**
  - Priority techniques can generate improvements in service regularity, which usually means alignment with nominal time-tables and headways. This application also includes communication and synchronization of multiple traffic lights in a region to optimize traffic flow. The vehicles send their intended destination to the current intersection and that one will communicate with the next ones to help regulate the traffic flow, based on the number of vehicles that will follow in each direction. The vehicles will receive a speed recommendation in order to get to the next traffic light in green.

Reference Application in Athens

Collaborative Smart Intersection for intelligent priorities

- **Main characteristics & use cases:**
- *Intersection Broadcast Information*
  broadcasts periodically and/or replies on vehicle or control centre request for information

- *Intersection signal phases adaptation for priority*
  broadcasts periodically and/or replies on vehicle request for information

- *Provisioning of Optimisation Data*
  collects all vehicle relevant information and sends to the intersection for prioritization

Reference Application in Trikala

Collaborative Public Transport Optimization

- **Objectives:**

  Highlight the flexibility of the public transport infrastructure by serving dynamically the needs and demand of the cities and the citizens. It mainly focuses on buses but it can be extended to other means of transport.

- **How it works:**

  By exploiting information from the users, such as their position, destination and preferences, together with information about the road traffic and bus line characteristics, the public transport operator dynamically adapts the timetables and the routes in order to achieve specific targets. These may include optimisation of the overall network efficiency, reduced CO2 emissions, minimisation of operator cost from low demand lines and in general increase of the network efficiency.

Reference Application in Trikala

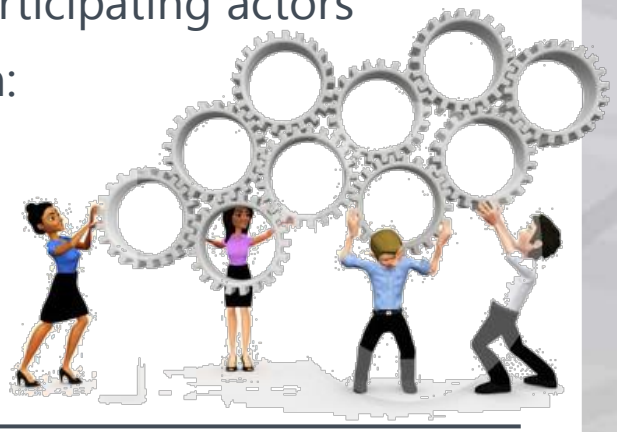
Collaborative Public Transport Optimization

- **Main characteristics and use cases:**
  - *Event based route adaptation*
    Dynamic adaptation of routes and timetables at a city region where an event is taking place resulting to a high demand on specific hours.
  - *Dynamically Adding/Skipping Bus Stops*
    ensures that bus stops are adapted to the traveller demand in order to increase public transportation efficiency and better serve travellers
  - *Provision of Real-time Information*
    collects output from the other components and requests from the travellers and send corresponding information to travellers and bus drivers

Research Challenges

Collaborative Optimisation and Control Algorithms

- Designed for large scale systems exploiting infrastructure information and mobile data
- **Key innovations:**
  - Considering all road users and their interactions (not only the needs of an individual driver or traveller)
  - Regulate the system in a decentralized best-effort manner
  - Elastically respond to the changing needs of the participating actors
- Different **algorithmic approaches** under examination:
  - Game theory
  - Control theory
  - Optimisation
  - AI/Machine learning



Conclusions and Outlook

Conclusions

- Elastic infrastructure – A key concept for addressing transport problems of modern cities
- Promising results from the stakeholders survey for future deployment and exploitation
- Select innovative applications for future deployment and exploitation (perform stakeholders survey)
- Several research challenges to be addressed:

Outlook

- Design of elastic transport infrastructure pilot in Athens and Trikala
- Implementation and integration

Acknowledgments

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TEAM Consortium:

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Other

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This project is co-funded by the European Union

Thank you!

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