



# ***From Wireless Sensor Networks to Internet of Things and Future Internet***

***A Western Balkan  
Perspective***

Srdjan Krčo

# What shall I talk about...

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- › FP7 PROSENSE
  - Support action project, WSN in the WB
  
- › FP7 SENSEI
  - IP project, sensors and actuators in Future Internet
  
- › Future Internet Assembly (FIA)
  - Coordinating efforts of 100+ FP7 projects aiming to design Future Internet

# A few words about me

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- › FP7 PROSENSE coordinator
- › FP7 SENSEI, participating, task leader, SC member
- › One of the caretakers for FIA's RWI activities
- › Leading research & innovation team
  - FP7 LOLA, Challenge 1, LTE and M2M
  - FP7 SmartSantander, FIRE, to start in September
  - ...

# PROSENSE

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- › Support action project focused on Western Balkan area
- › March 2008 – August 2010
- › Budget 900kEUR
- › Partners
  - Ericsson Ireland
  - FEEIT Macedonia
  - INRIA France
  - Univ. of Birmingham
  - Warsaw University of Technology
  - ETF Serbia
  - Insitute Jozef Stefan Slovenia

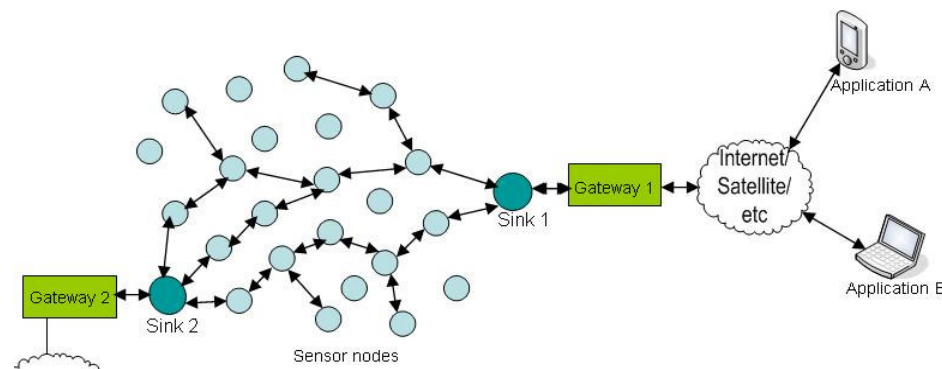
# Objectives

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- › Set up 2 WSN research labs in Skopje and Belgrade
- › Build up competence of researchers in WBC
- › Provide opportunities for mobility of researchers
- › Provide opportunities for networking with a wider research community
- › Raise public and research awareness in WBC regarding WSN

# What are WSNs?

- › A number of small devices, each with
  - A micro controller
  - A wireless interface
  - One or more sensors and/or actuators
- › Collaboratively monitoring an area or executing a task
- › Interact with “others” via a gateway



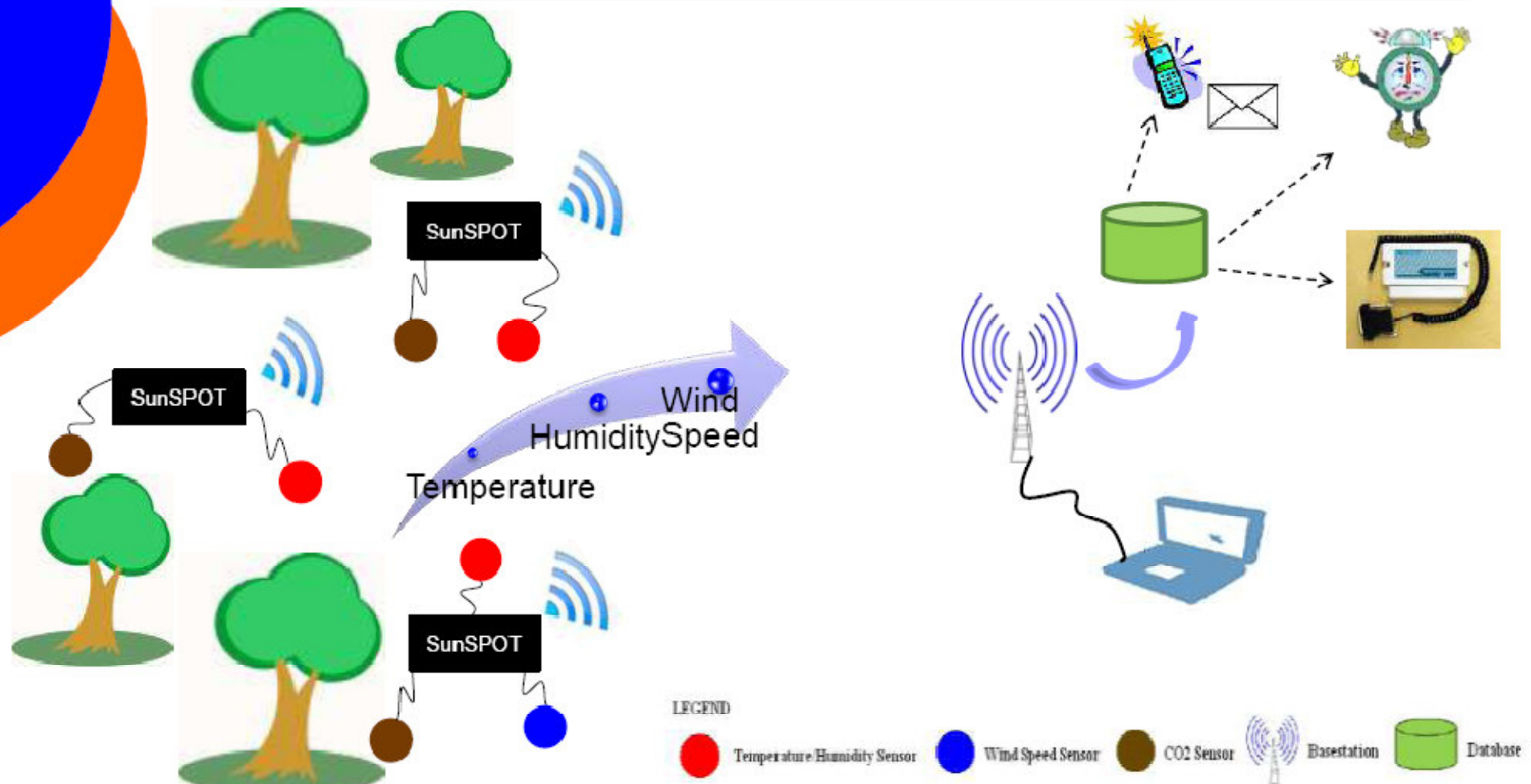
# What has been achieved so far

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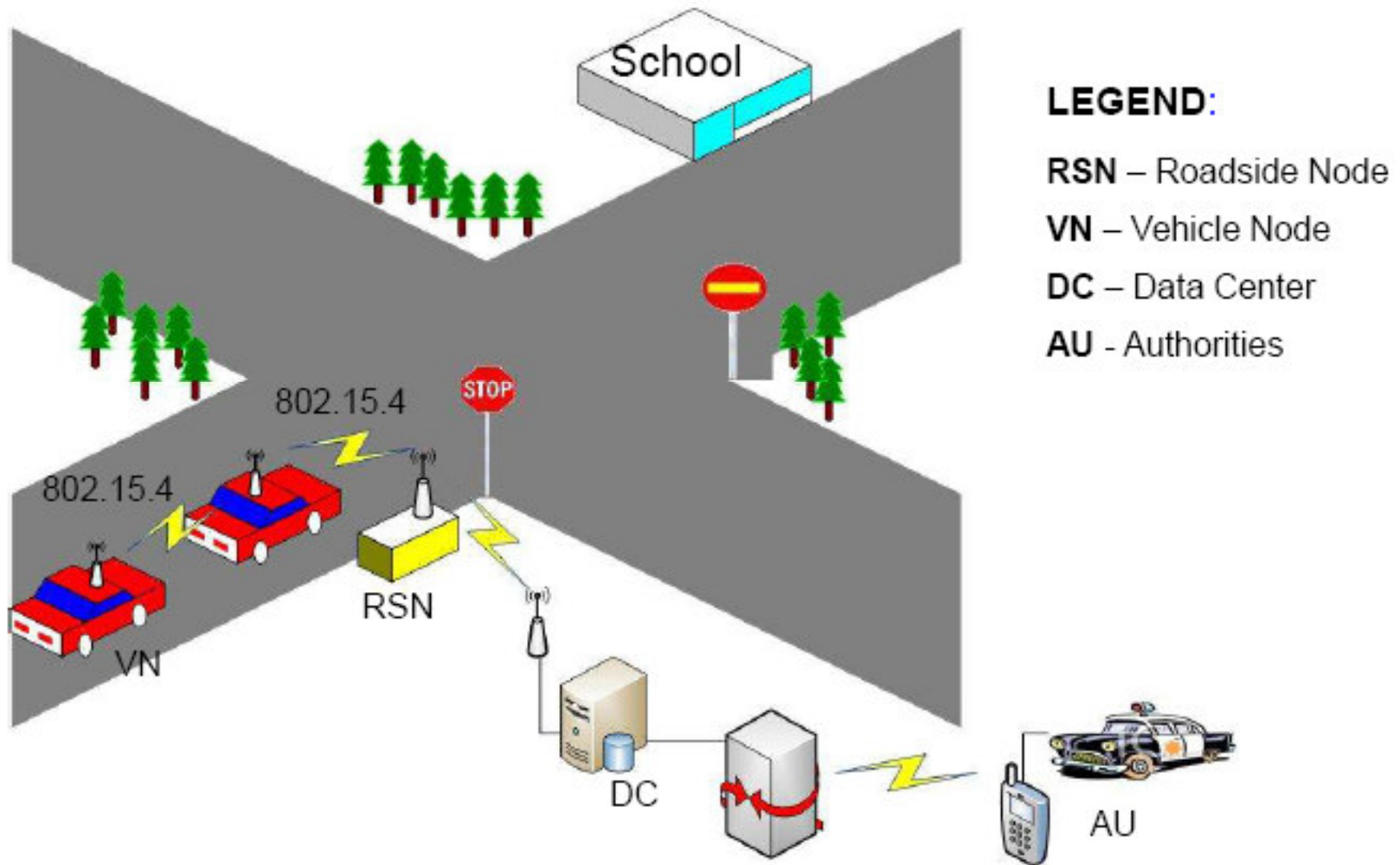
- › 4 workshops held (Dublin, Santorini, Belgrade, Ohrid)
- › 2 summer schools (Ljubljana, Ohrid)
- › 5 special sessions
  - DCOSS08 Greece, Telfor08 and 09 Serbia, KSTiT'09 Poland, WONS'10 Slovenia
- › 3 seminars
  - PhD seminar PhD-NOW at Ad HOC – NOW 08
  - 2 in Ljubljana
- › A book prepared and accepted for publishing by Springer
- › STREP proposal outline prepared
- › Joint PhD supervision initiated
- › Researcher mobility
- › New research equipment



# Description and scenario system structure



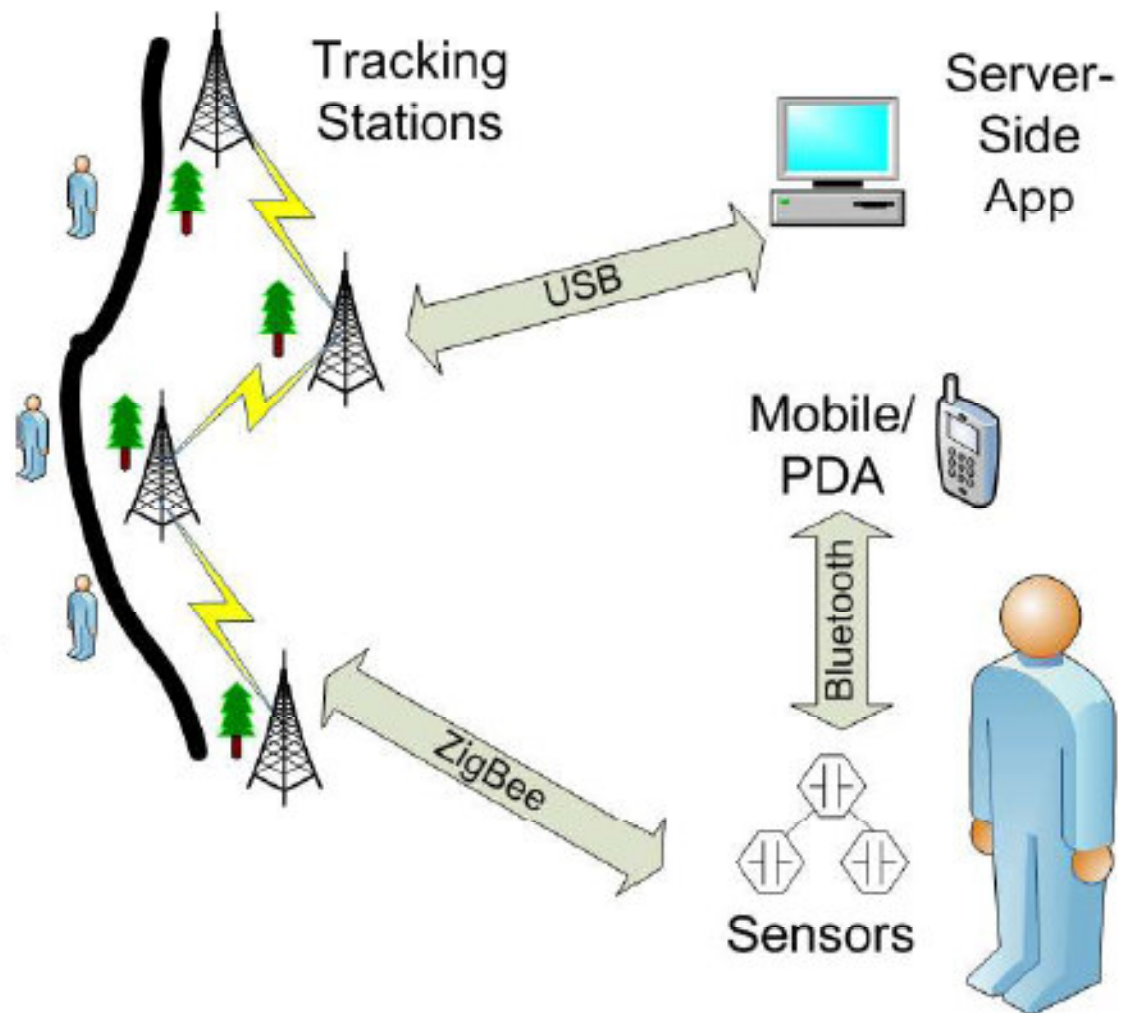
# Smart Road Monitoring





# Orig. SRT scenario - Block diag.

- Runners with sensors
- Tracking stations
- Mobile phones
- Supervisor comp.
- **Zigbee and Bluetooth**



# Waste management

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# Not just Skopje and Belgrade...

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- › Novi Sad
  - › Sarajevo
  - › Rijeka
  - › Nis
  - › Podgorica
  - › Shkoder
- 
- › Joined some project activities to learn and initiate research on WSN

# senZations'09, St. Naum, Ohrid lake

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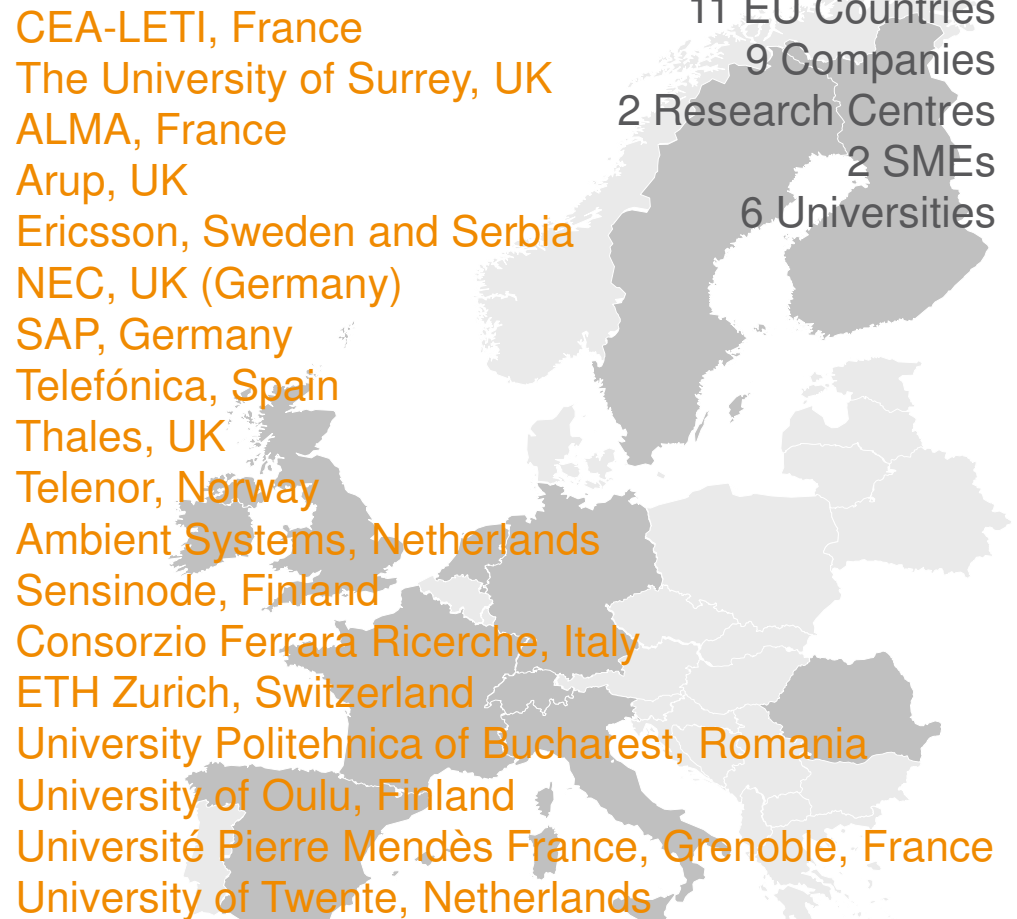
# SENSEI project facts

Coordinator:  
**Laurent Herault, CEA-LETI**

Technical Manager:  
**Alex Gluhak, University of Surrey**

Title: **Integrating the Physical with  
the Digital World of  
the Network of the Future**

Budget:	Effort:
<b>23,332,896 €</b>	<b>1879.3 PM</b>
EC funding:	Duration:
<b>14,977,717 €</b>	<b>36 Months</b>



**CEA-LETI, France**  
**The University of Surrey, UK**  
**ALMA, France**  
**Arup, UK**  
**Ericsson, Sweden and Serbia**  
**NEC, UK (Germany)**  
**SAP, Germany**  
**Telefónica, Spain**  
**Thales, UK**  
**Telenor, Norway**  
**Ambient Systems, Netherlands**  
**Sensinode, Finland**  
**Consorzio Ferrara Ricerche, Italy**  
**ETH Zurich, Switzerland**  
**University Politehnica of Bucharest, Romania**  
**University of Oulu, Finland**  
**Université Pierre Mendès France, Grenoble, France**  
**University of Twente, Netherlands**

**11 EU Countries**  
**9 Companies**  
**2 Research Centres**  
**2 SMEs**  
**6 Universities**

# SENSEI vision

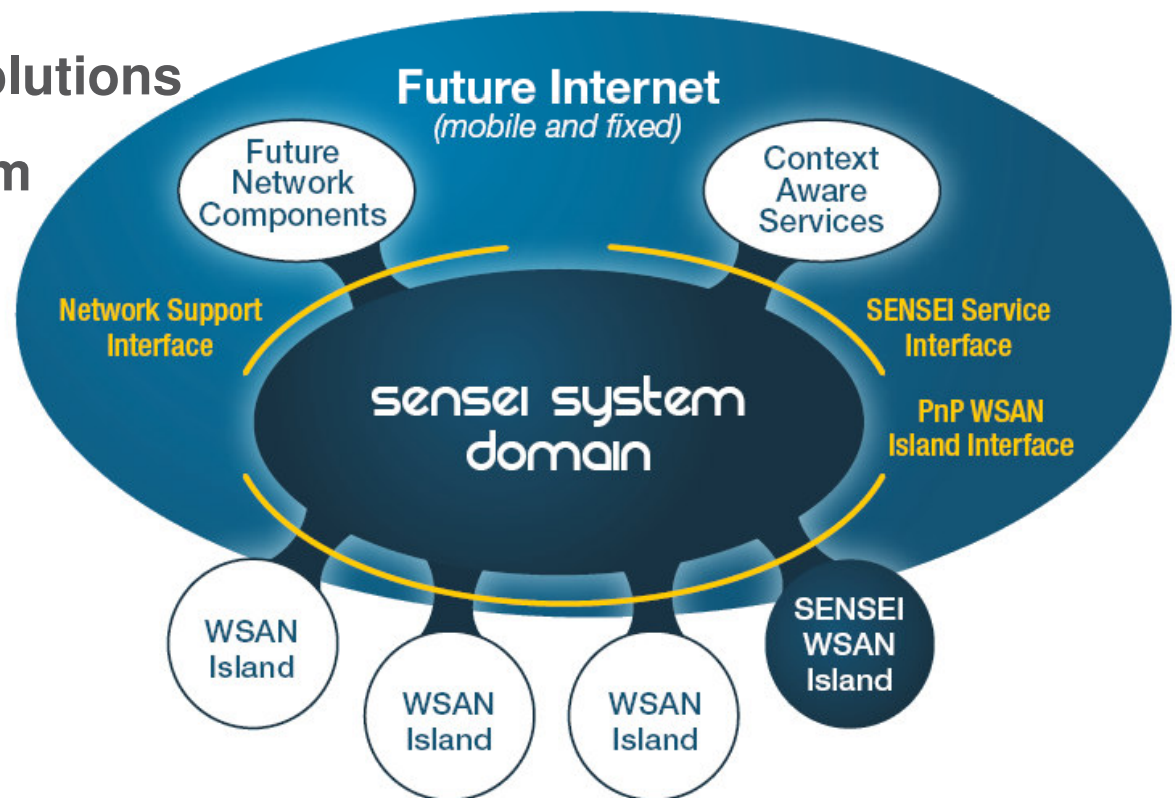
- > A framework that enables an open market place for real world information and interaction

Easy plug and play integration of a large number of WS&AN

Open service interface

Efficient WS&AN island solutions

Pan European test platform

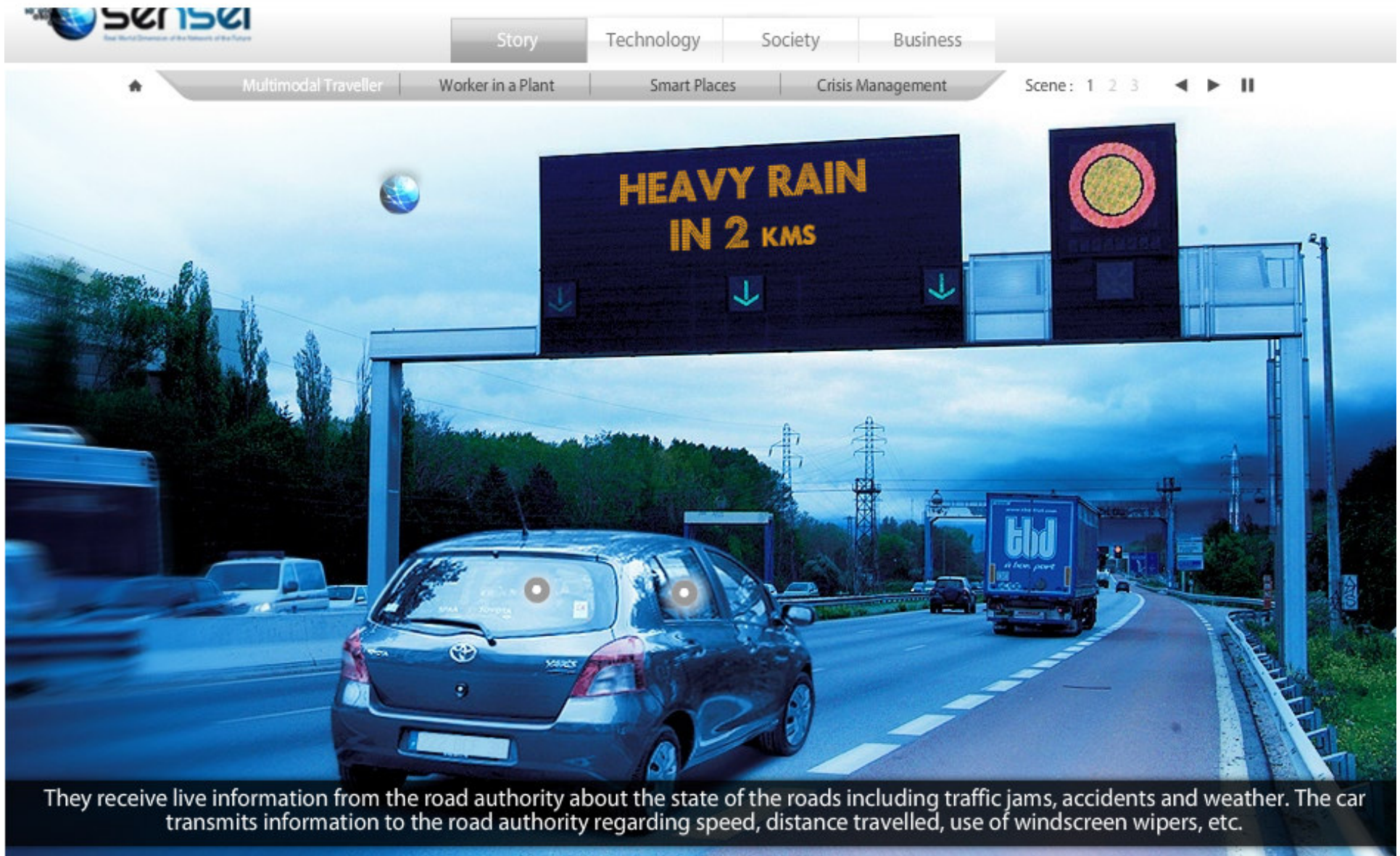


# Internet of things

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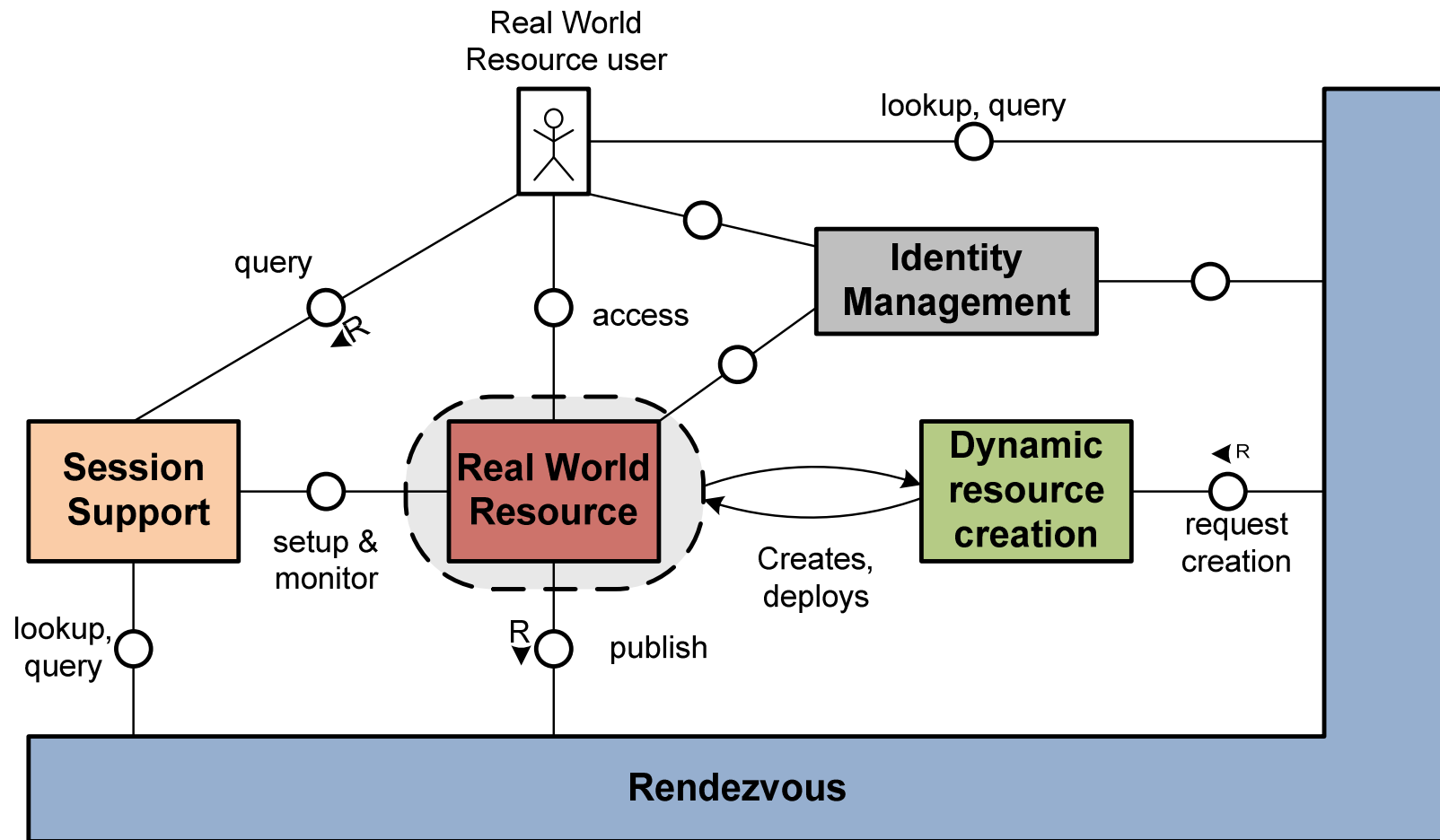
- › Everything on Internet
- › Everybody on Internet
  
- › Technology to
  - Interconnect individual WS&AN, smart devices
  - Enable access to information about the real world
  - Interact and influence the real world

# Smart city scenario – [www.sensei-project.eu](http://www.sensei-project.eu)

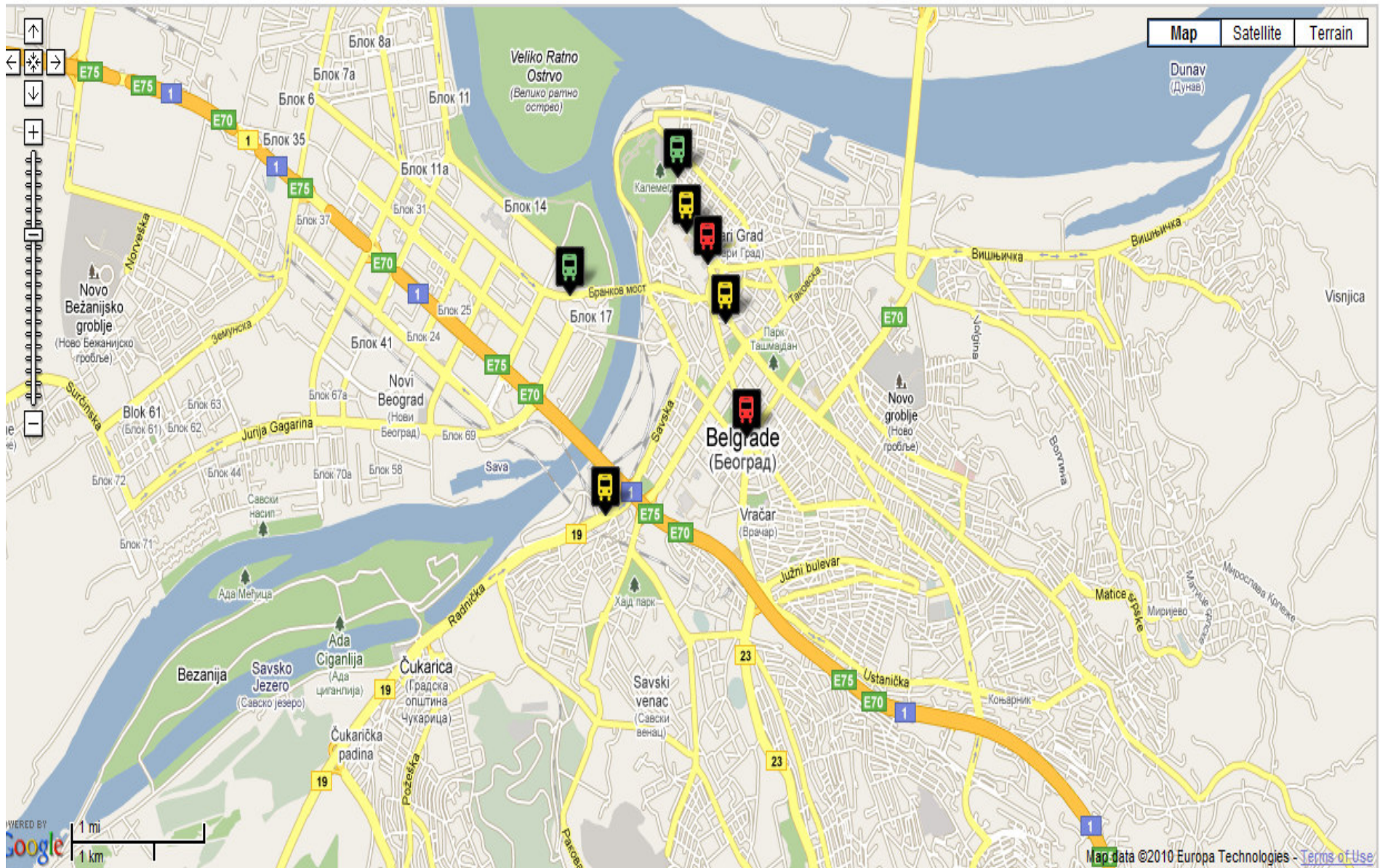


They receive live information from the road authority about the state of the roads including traffic jams, accidents and weather. The car transmits information to the road authority regarding speed, distance travelled, use of windscreen wipers, etc.

# SENSEI components – logical view



# ecoBus field trial in Belgrade



# Further development

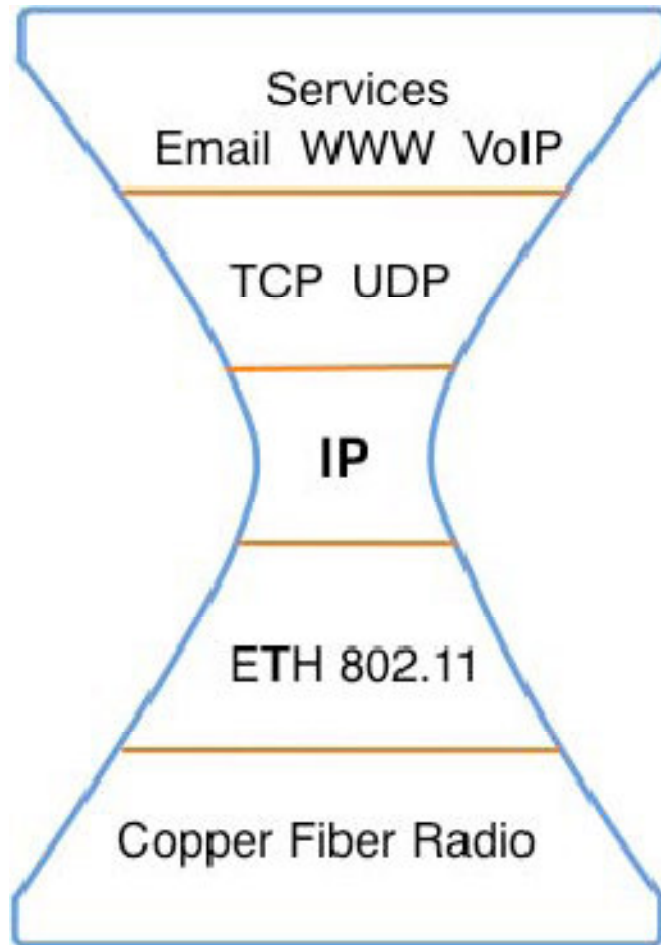
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- › Deployment of ecoBus in other cities in the region
- › Involvement of mobile operators in the region
  - In FP7 activities
  - In creation and deployment of smart city services based on Internet of Things technology
- › Supporting universities in Serbia to get involved in FI research

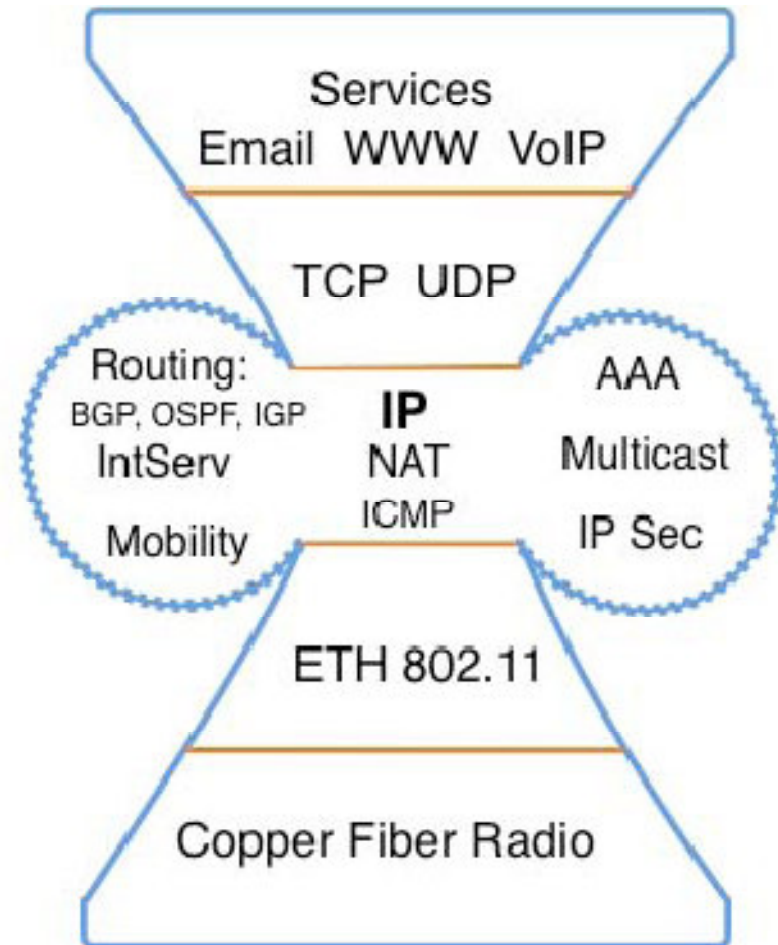


# Future Internet Assembly

# Current internet architecture



**Data Plane**



**Control Plane**

# Trends shaping the FI services

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- › Mobile and nomadic user behavior
- › Data storage on the network
- › Web interfaces for network resident applications
- › Anytime, anywhere, anyhow network connectivity
- › Interaction with the real world



## Home

- EFII - The European Future Internet Initiative
- FIA Organising Committee
- FI Assembly Ghent
- FI Conference Valencia
- FI Assembly Stockholm
- FI Conference Prague
- FI Assembly Madrid
- Bled Declaration
- FI Conference Bled
- Future Internet Assembly
- Clusters
- Future Internet at EC
- About

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## Help shape the next Future Internet Assembly in Ghent

We would like to hear of all the participants of the FIA which topics they would like to see addressed on the next FIA in Ghent. Please suggest a new topic or vote for a topic you like on

<http://www.google.com/moderator/#15/e=548b&t=548b.40&v=5>

Thanks for your participation!

## FIA book 2010 published



The Future Internet Assembly published its second book titled: "Towards the Future Internet - Emerging Trends from European Research", Edited by Georgios Tselentis, Alex Galis, Anastasius Gavras, Srdjan Krco, Volkmar Lotz, Elena Simperl, Burkhard Stiller, Theodore Zahariadis. The book is available [online](#)

## FIA Valencia, April 2010

The next Future Internet Assembly will meet in Valencia, Spain on 15-16 April 2010 in the frame of the IV conference on the FP7. → [More information ...](#)

## X-ETP Group Future Internet Strategic Research Agenda

The Strategic Research Agenda (SRA) on Future Internet of the cross-European

## Events

### [Future Internet Conference Week](#)

13-17 December 2010, Ghent, Belgium [\[more\]](#)

### [Future Internet Assembly, Ghent 2010](#)

16-17 December 2010, Ghent, Belgium [\[more\]](#)

### [TridentCom 2010 Call for Participation](#)

18-20 May 2010, Berlin, Germany [\[more\]](#)

### [First European Summit on the Future Internet](#)

2-3 June 2010, Luxembourg [\[more\]](#)

### [Future Network & Mobile Summit 2010](#)

16-18 June 2010, Florence, Italy [\[more\]](#)

→ [Full list of events](#)

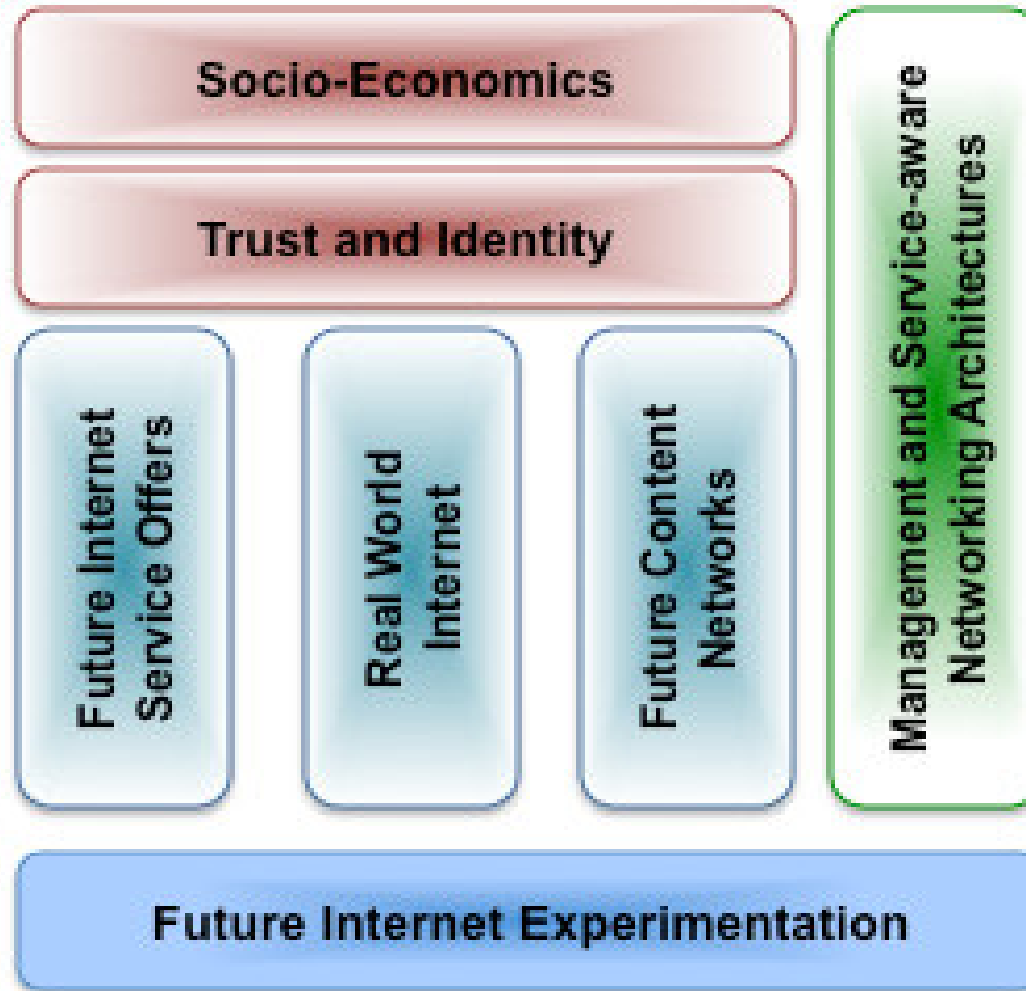
# Future Internet Assembly - FIA

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- › Open interactions and cross-fertilization across technical domains, reaching out to whoever has talent.
- › It works towards:
  - Common deliverables creating value for the projects concerned
  - Joint strategic research agenda regarding common actions and requirements
  - Developing a consolidated calendar of events aiming at avoiding fragmentation of efforts

# FIA Clusters

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# FIA recent topics

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- › FI reference architecture
- › Smart energy
- › Smart health
- › Smart cities
- › Trust
- › Economics of information
- › Enterprise
- › FIRE

# Next FIA

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- › Ghent, December 2010
- › [www.fi-ghent.eu](http://www.fi-ghent.eu)



# Instead of conclusion

3 things to remember



# FIA is a great venue

Network, interact, learn, influence

Participation from WB low

Get active, get involved!



# Internet of Things

One of the key drivers of FI

Plethora of potential applications

Real world deployments of interest

Entry ticket to FI PPP and other actions



# senZations

Summer school on IoT for WB and EE

Learn, network, enjoy

2006 Novi Sad

2007 Warsaw

2008 Ljubljana

2009 Ohrid

2010 Rijeka



**ERICSSON**

# SENSEI PET implementation

