

Intelligent Systems for Smart Cities

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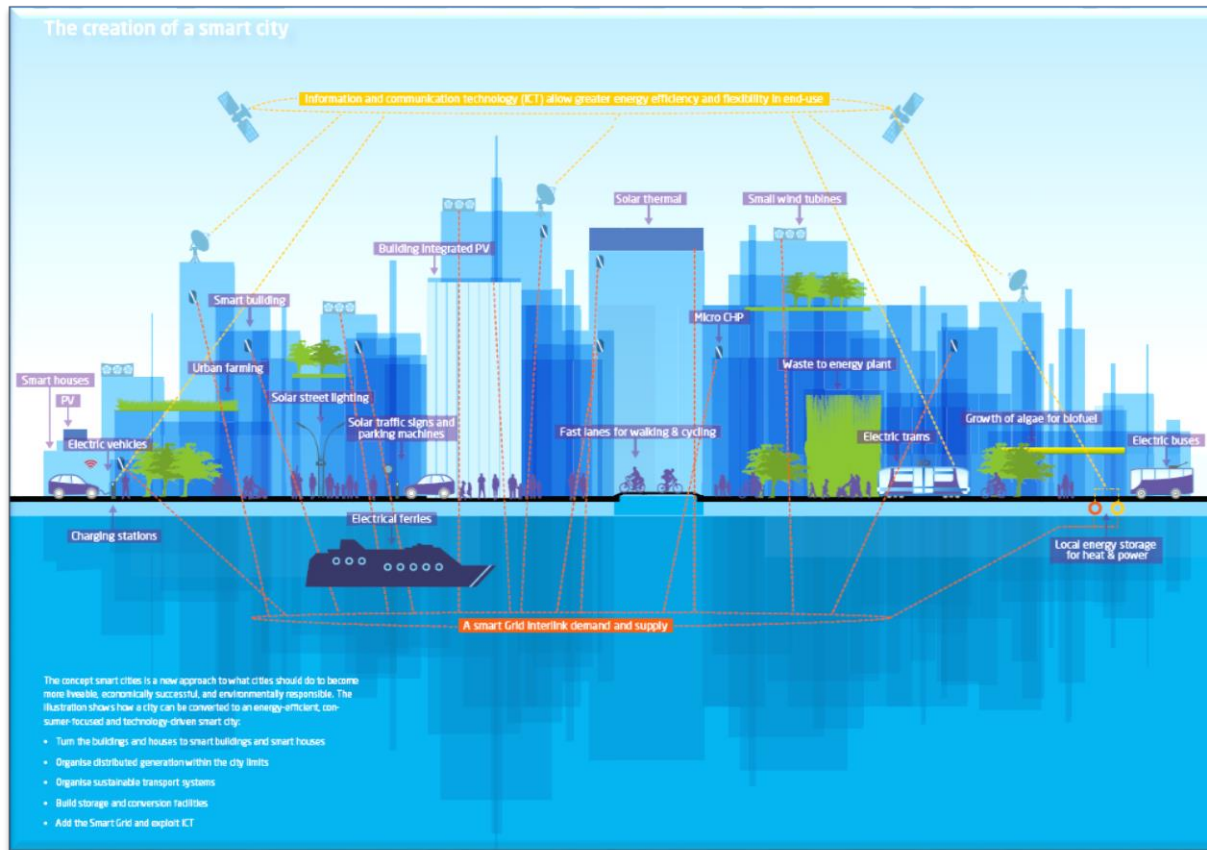
Smart cities: unique features



- HOLISTIC
- TECHNOLOGY
- INFORMATICS
- TELECOMS
- MULTIDISCIPL.
- CITIZENS
- MANAGERS



Many views: potential targets



THINK BIG

THINK SMALL

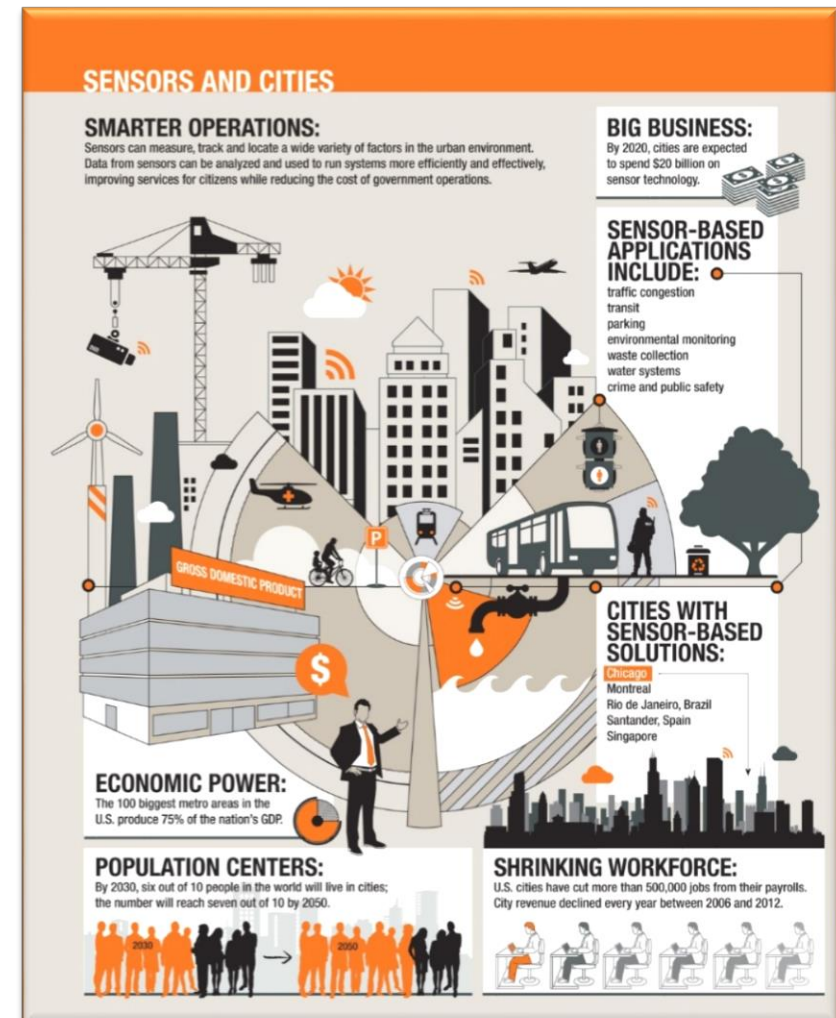


Many views: applications and infrastructure



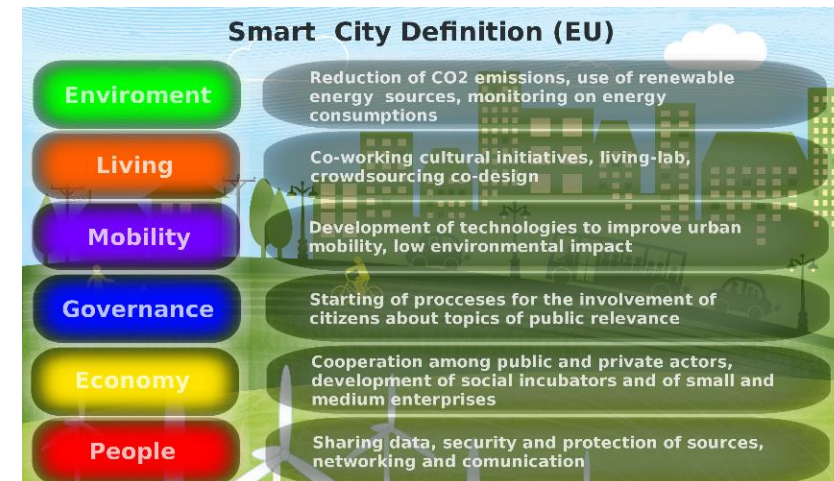
FOCUS ON SERVICES

FOCUS ON ARQUITECTURE

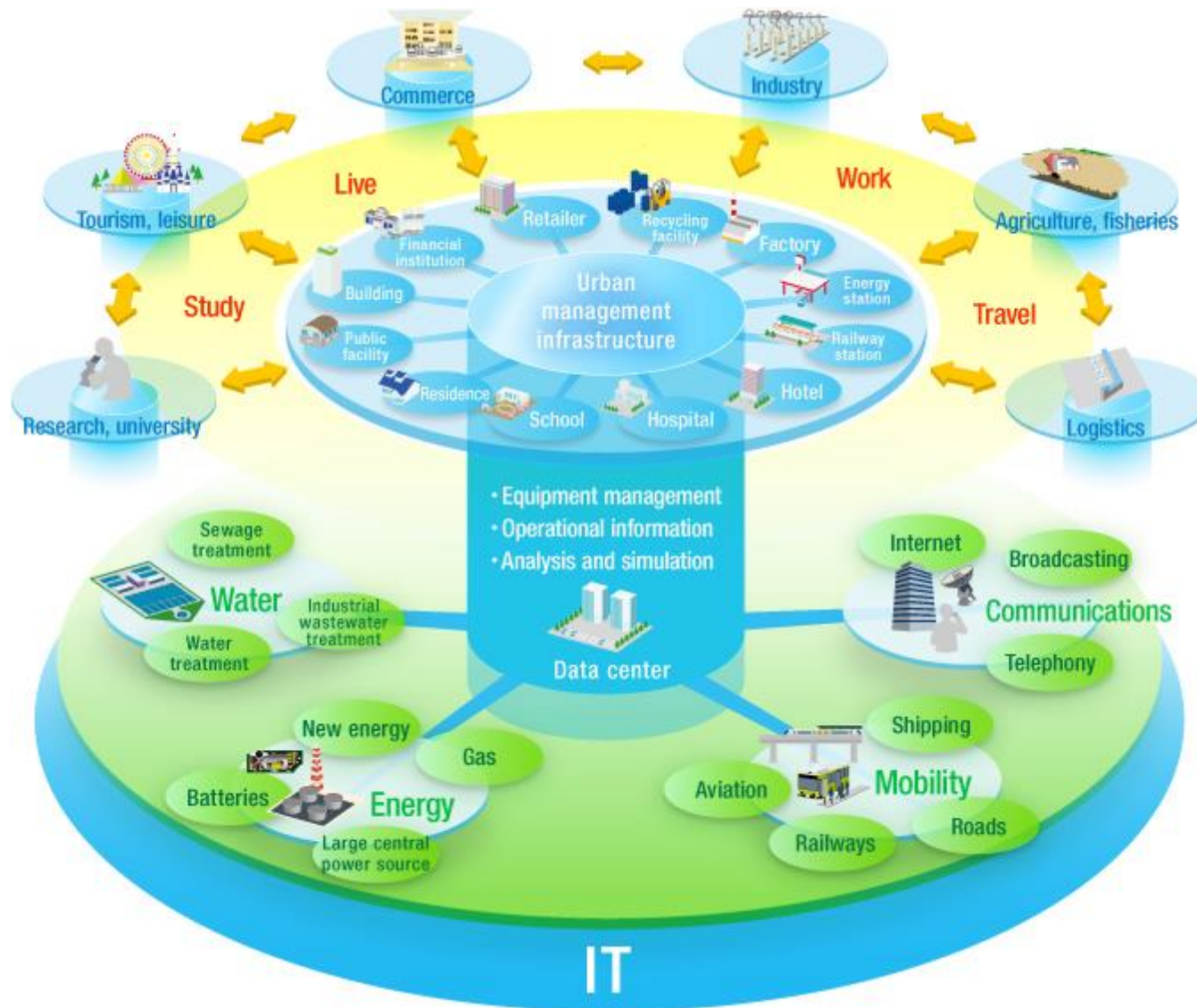


Many views: institutional in Europe

- Eleven priority areas defined in the Strategic Implementation Plan of the European Innovation Partnership on Smart Cities and Communities:
 - Sustainable Urban Mobility
 - Sustainable Districts and Built Environment
 - Integrated Infrastructures and processes across Energy, ICT and Transport
 - Citizen focus
 - Policy and Regulation
 - Integrated Planning & management
 - Knowledge Sharing
 - Baselines, Performance Indicators & Metrics
 - Open data governance
 - Standards
 - Business Models, Procurement and Funding
- For the time being, 8 of the 11 priority areas are covered by the **Action Clusters**



Many views: IT and intelligence



Smart cities: challenges



Unique **features** mean unique **challenges**:

- **Large scale**, every is really big
- **Time** consuming and real time
- **Dynamic**, everything changes in time
- **Uncertainty** in all tasks and phases
- **Complex** relations, interdependences
- Several **goals** at the same time
- **Human** preferences and interfaces
- Lots of **restrictions** (legal, technical...)
- **Mobile** plus **desktop** applications



Bioinspired techniques and more

- Research in **biologically inspired** techniques applied to complex problems
- Focus on **any technique** helping to get efficient and accurate results
- **Even advanced** methods cannot deal with **complex** instances of **real** problems: high dimension, constraints, epistasis, uncertain data, real time, ...
- Traditional methods put so many **constraints** and **simplifications** to the problem (in order to solve it) that the found solution is no longer valid

METAHEURISTIC

- **Heuristic**: information or procedure used to guide the search of algorithms
- **Meta**: high level structure containing operators later tailored to problems
- **Many scientific fields** involved: computer science, and also mathematics, operations research, industrial engineering, physics, ...

Metaheuristic versus the rest of solvers

How they work



Exhaustive



Advanced



Metaheuristics



What this means



Others cannot...



MetaH CAN!



Classic Techniques



Metaheuristics



Advanced



efficiency

Efficient, accurate, and even Nature-inspired!

Evolutionary Algorithms

Survival of the fittest

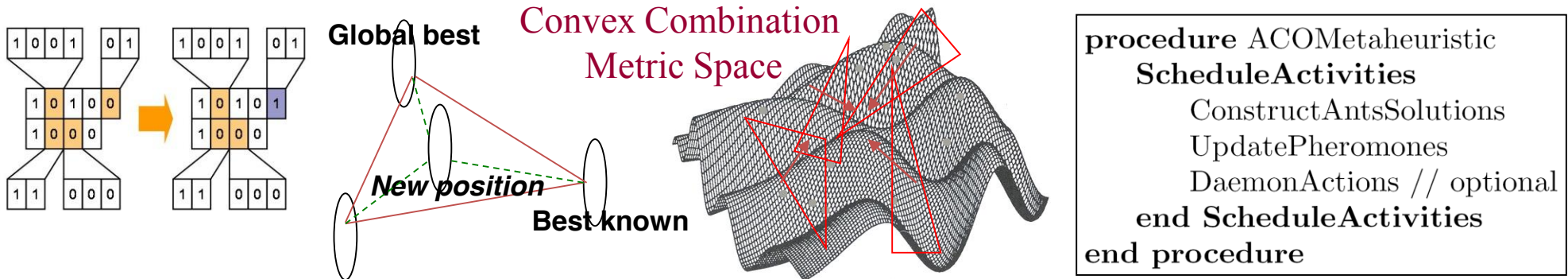


Bio-inspired Computing

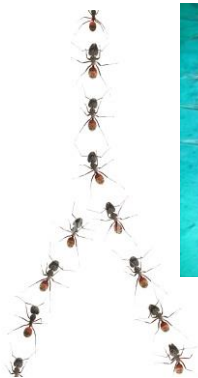


Inspiration

...but all of them run in a computer as programs



Inspiration



(0,2; -1,4; 3,5)

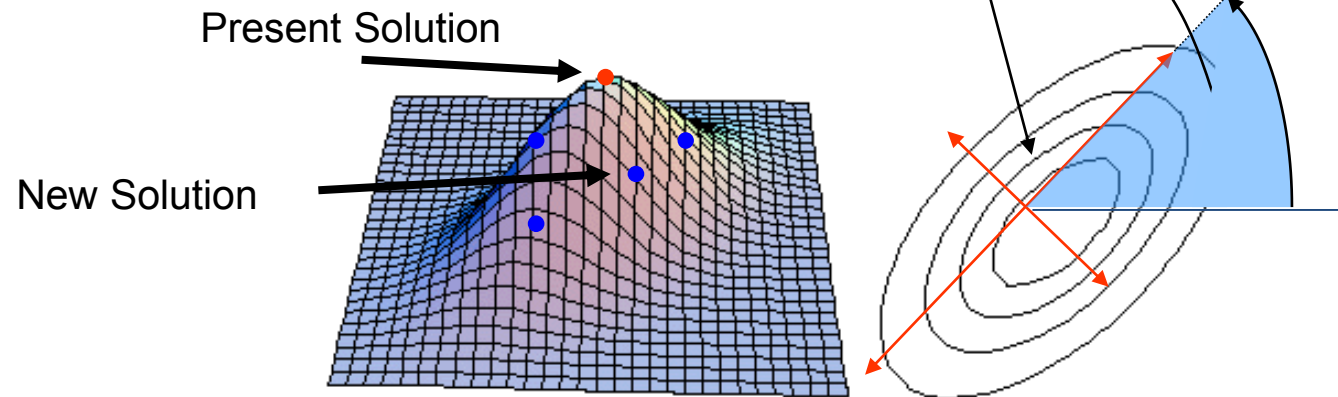
→ Solution Vector

(1,0; 10,3; 7,2)

→ Standard Deviation

(1,7; 0,3; 2,1)

→ Search Angles



Advanced techniques needed

- Four main ways of upgrading in **efficiency** and **accuracy**:

- **Parallelism:**

Clusters, Cloud computing, multicores, FPGAs, GPUs...

- **Hybridization:**

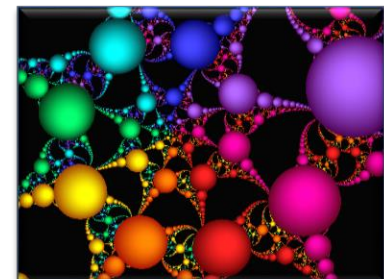
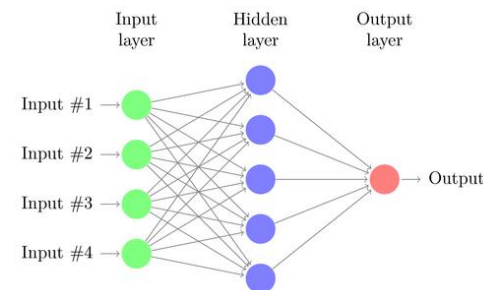
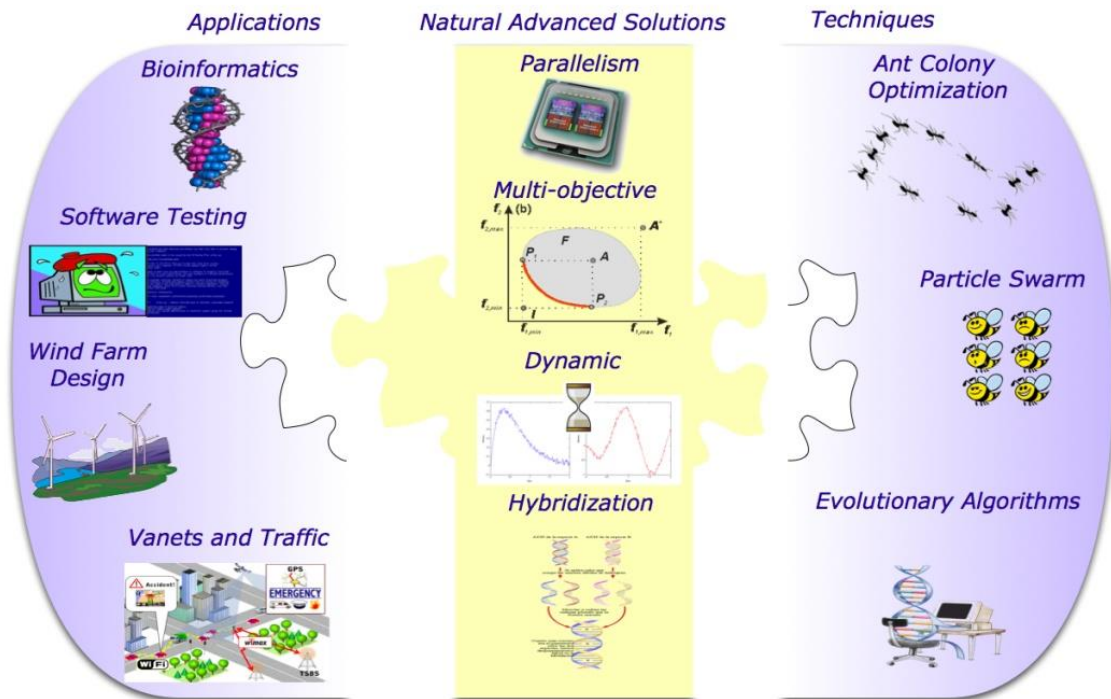
Combining algorithms, operators, representations: problem knowledge

- **Multiobjective:**

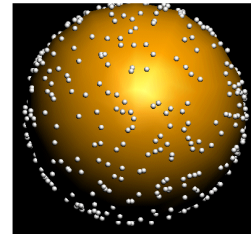
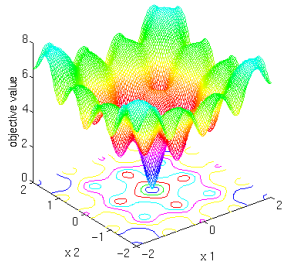
Modelling explicitly several conflicting objective functions with Pareto's concept of dominance

- **Dynamism:**

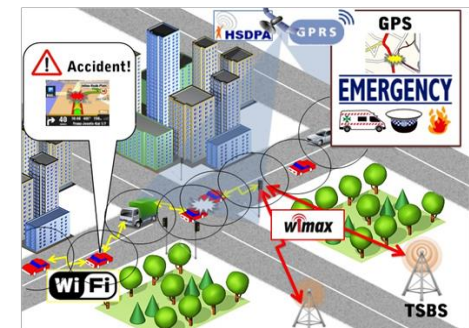
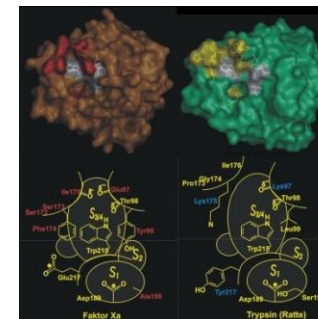
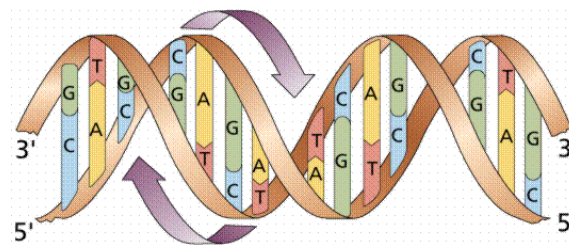
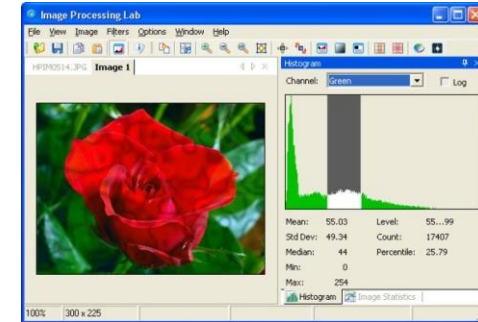
Solve a problem that changes in time and adapt previous solutions to the new scenarios



Multidisciplinary experience is common here



Distribute "n" electrons
on a sphere



Scientific success reported in journals...



Companies and city administrations are deeply involved

 **EUREKA**
A Network for Market Oriented R&D

Municipalities, University & Industry



Applications (I)

Smart Mobility



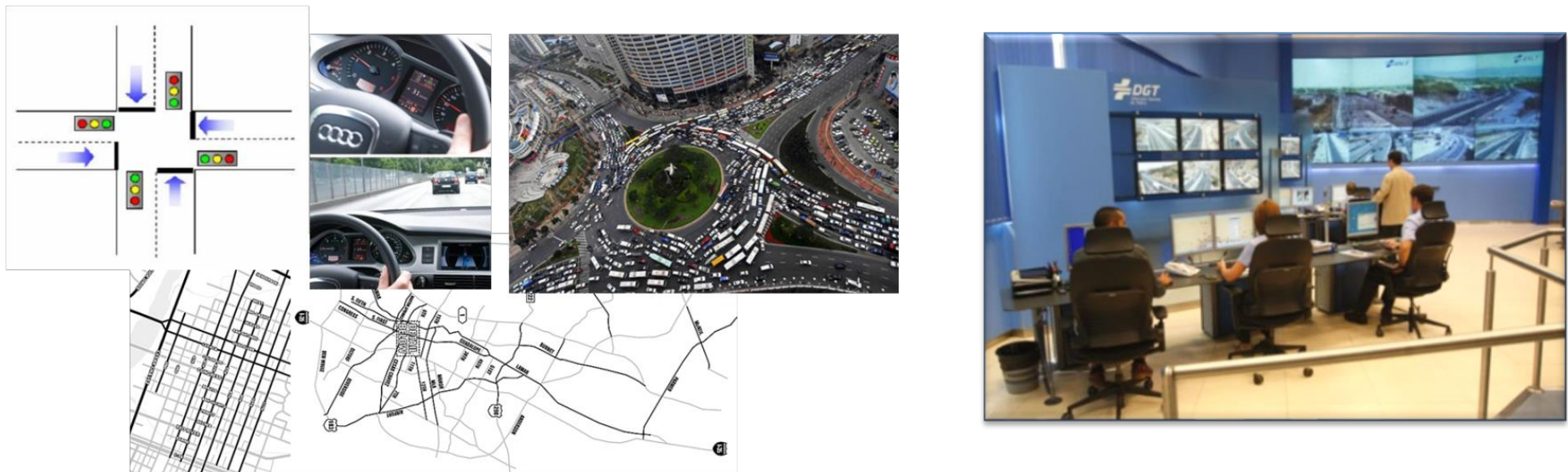
<http://roadME.lcc.uma.es>



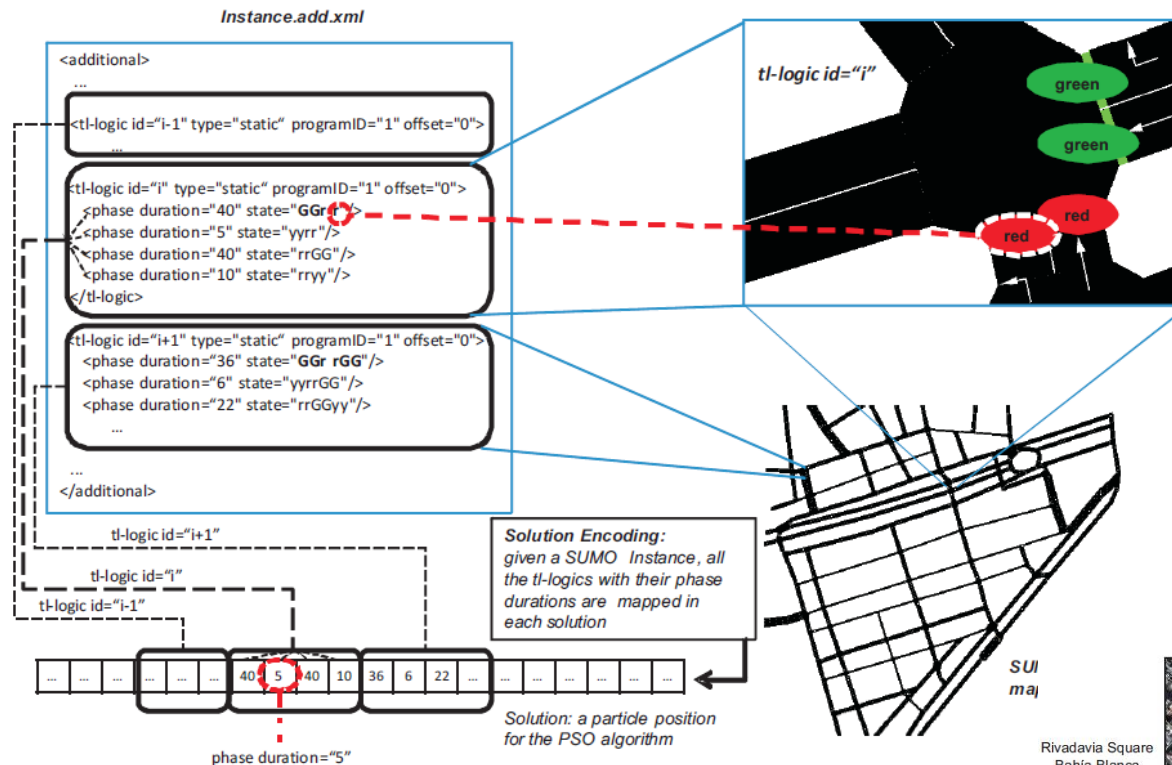
<http://moveON.lcc.uma.es>

Smart semaphores control: approach

- A software tool for the control center, using a bio-inspired engine, to assist the experts on the **semaphore scheduling**, for a given urban area or the whole city
- By means of **simulation** and other software facilities used in the Traffic Control Center of the city, we can generate optimized traffic schedules and efficient strategies of smart mobility for semaphores
- Optimized schedules can then be later applied to **real traffic management**, after verification tests with such a simulated program (off-line plus on-line)



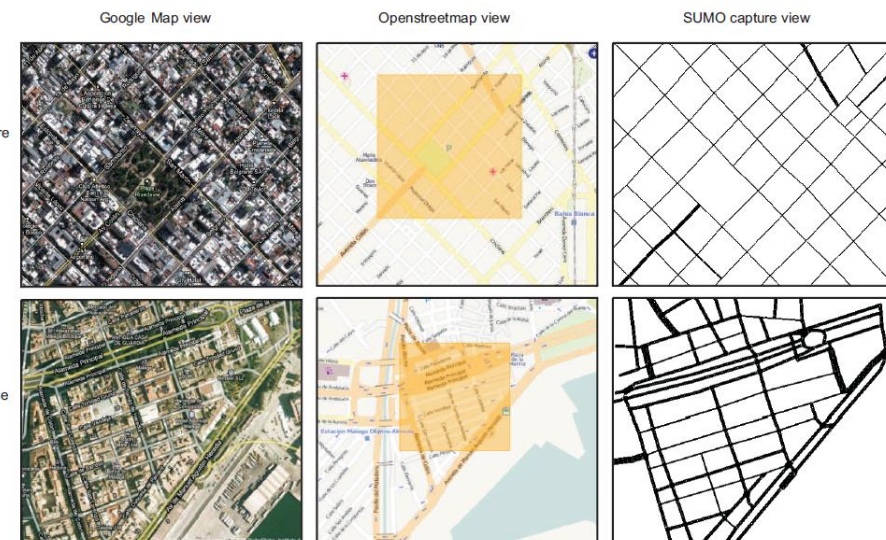
Smart semaphore control: technologies



- High dimension problem
- Considering the whole city details
- Maps, locations, driving rules, vehicles...
- Comprehensive simulations with real data
- Long processing times

SUI
may
Rivadavia Square
Bahía Blanca
Argentina

Alameda Avenue
Málaga
Spain



Smart semaphore control: results

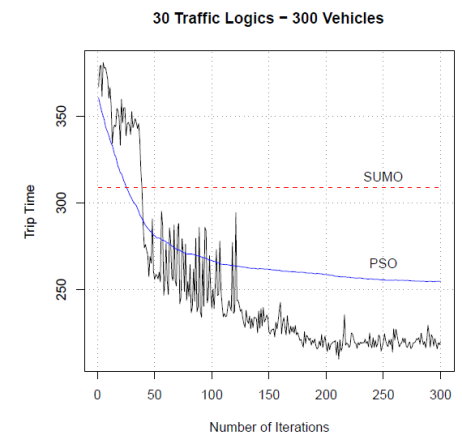
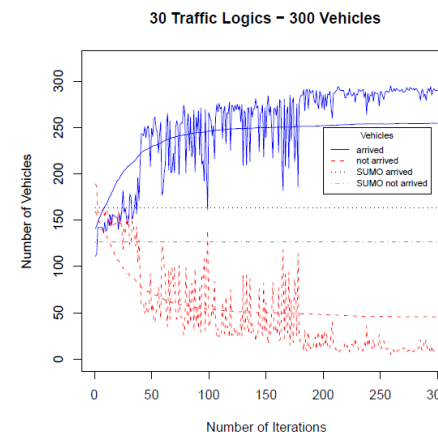
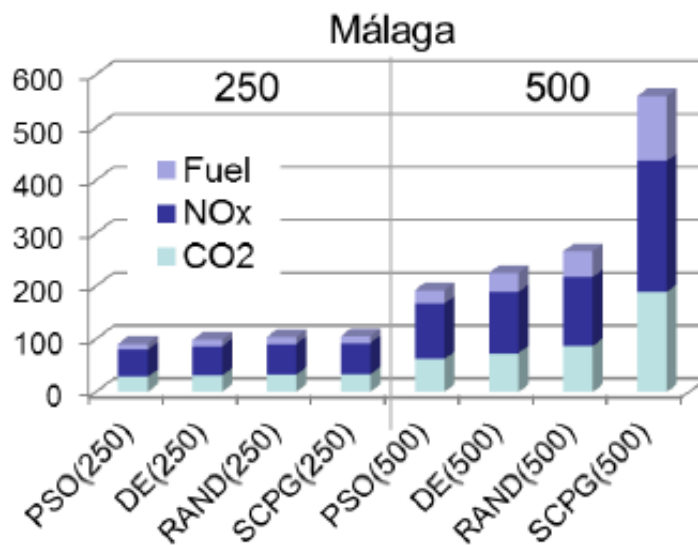
- Optimized semaphore schedules have **benefits** in terms of:
 - Traffic congestion control
 - Prevention of severe traffic jams
 - Reduction of CO₂ emissions and fuel consumption
 - Driver/pedestrian safety
- A tech/tech combination
- Successful scientific results



PSO



SCPG

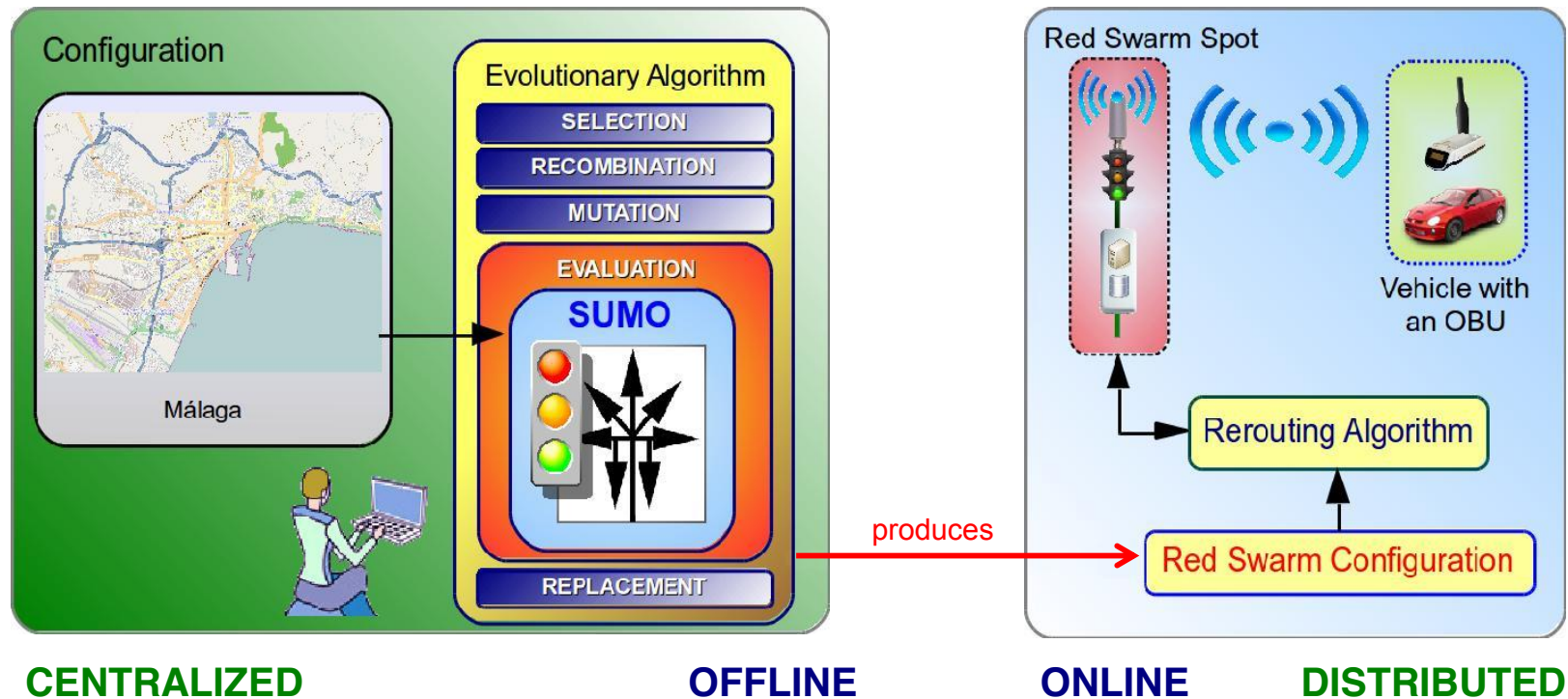


Smart Red Swarm: approach

- Smart road traffic optimization to **avoid traffic jams and manage the city**
- Red Swarm Spots have computation and comm. abilities (infrastructure)
- Vehicles use onboard units, smartphones or tablets
- It **distributes traffic** based on the probability of congestion: citizen-city balance
- **Customized** service for every driver
- First design, then use in real time
- **Routes** is just one use
- Other uses involve **big data** apps:
 - collecting info from passing vehicles
 - create math models of the city
 - off plus on line merged management



Smart Red Swarm: architecture



An evolutionary algorithm searches for a configuration for the Red Swarm spots

The configured Red Swarm spots are deployed in junctions of the city

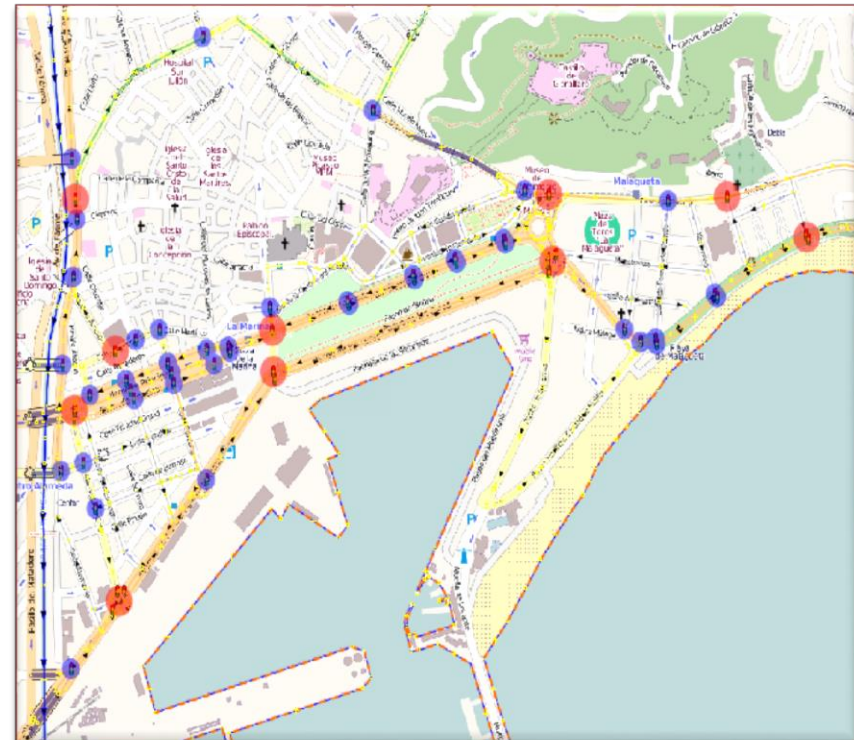
GOAL: smart mobility

Reduce travel times, gas consumption, and pollution

Smart Red Swarm: technical details

MÁLAGA (SPAIN)

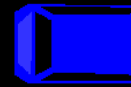
- Real Scenario
 - 261 traffic lights
 - 10 Red Swarm spots
 - 800 vehicles
 - 4 vehicle types
 - 3 different traffic patterns (*Scen1, Scen2 & Scen3*)



Sedan



Van



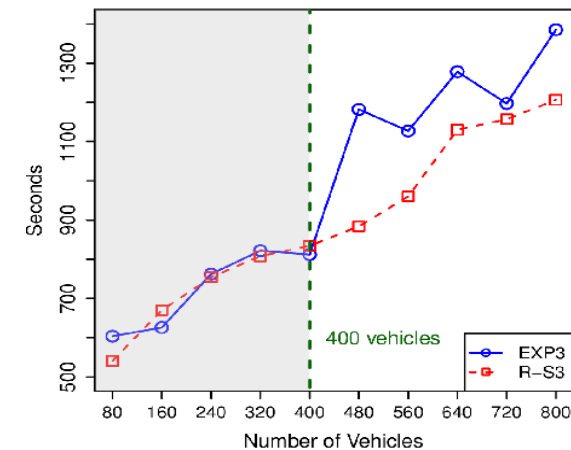
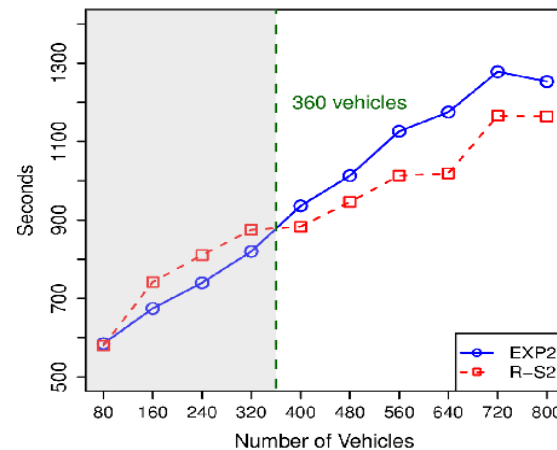
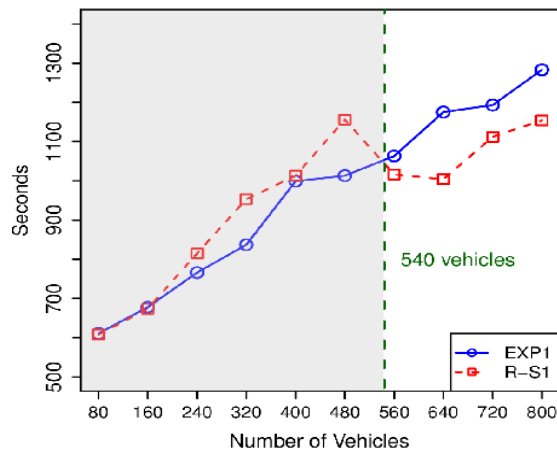
Wagon



Transport

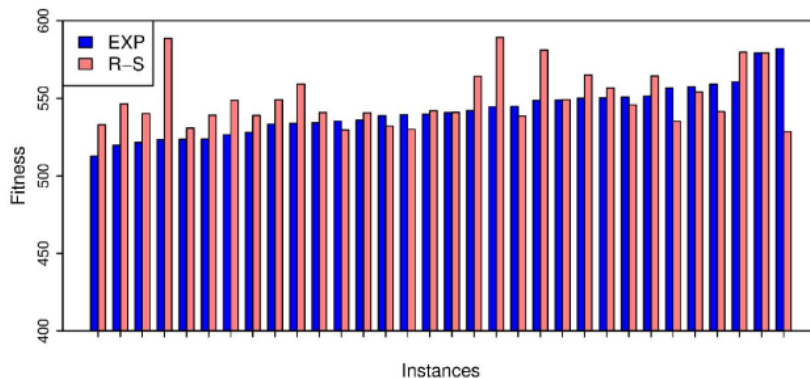
Our goal is to reduce the travel time of the vehicles
in high density conditions, and then pollution

Smart Red Swarm: some results on travel times

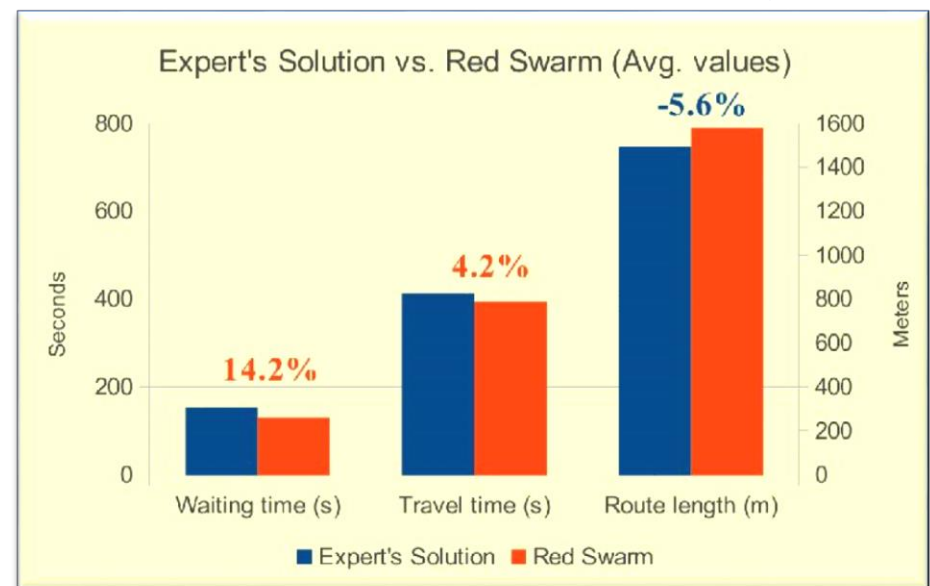


Show videos...

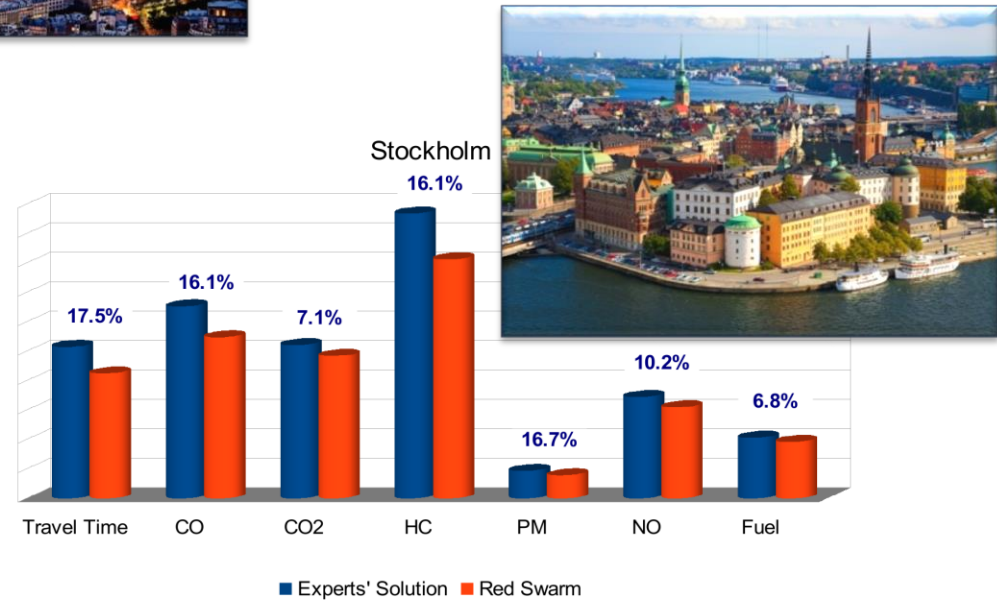
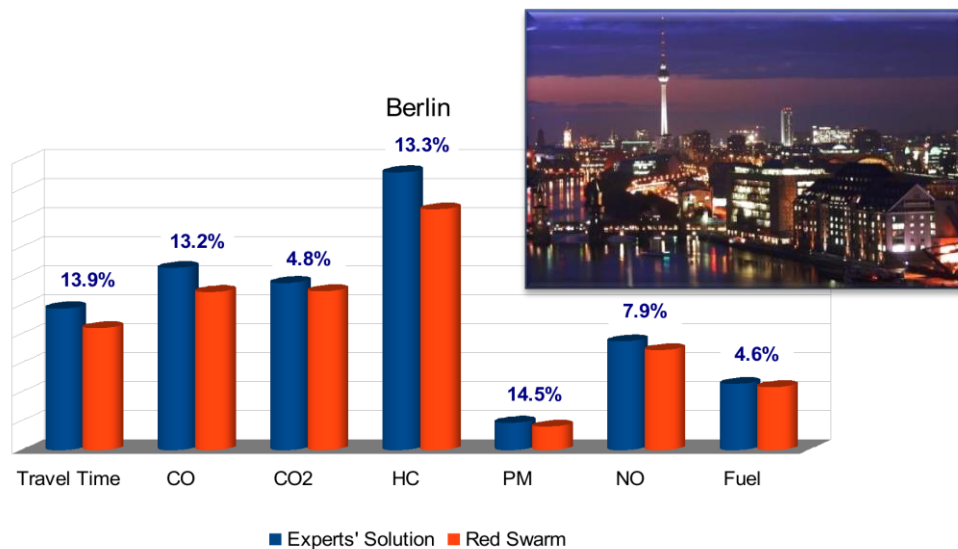
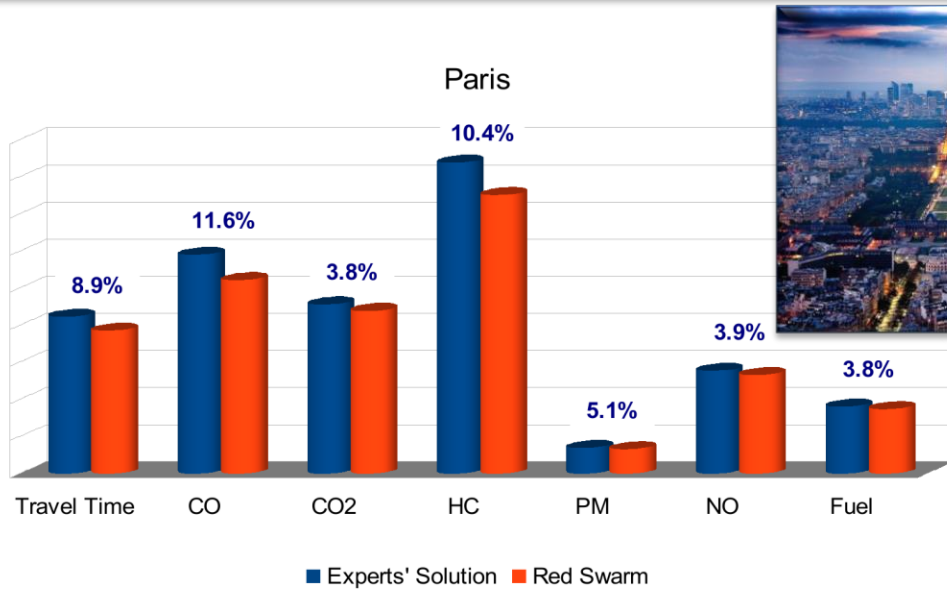
It works in unseen scenarios



Red Swarm reduces travel and waiting times

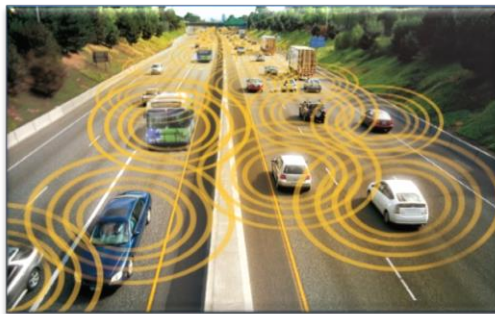


Smart Red Swarm: ecofriendly results



Vehicular Ad-hoc Networks: how to comm in cities?

- Communication and computation are the bases for smart cities
- Wireless communications are preferred (flexible, ubiquitous...)
- All communications rely on broadcasting and routing protocols
- Existing protocols do not work in VANETS: new and tuned ones are needed
 - (i) **V2V: vehicle to vehicle**
 - (ii) **V2I: vehicle to infrastructure**



Optimizing communication protocols in cities

• VANET Protocol Optimization:

- VANET communications imply: highly dynamic topology, limitations in coverage, bandwidth, and energy consumption, network congestion, frequent disconnections, and others...
- An optimal configuration of the communication protocols can improve the quality-of-service (QoS) of the network: a must in this domain
- Using intelligent automatic techniques to face the huge number of possible protocol configurations

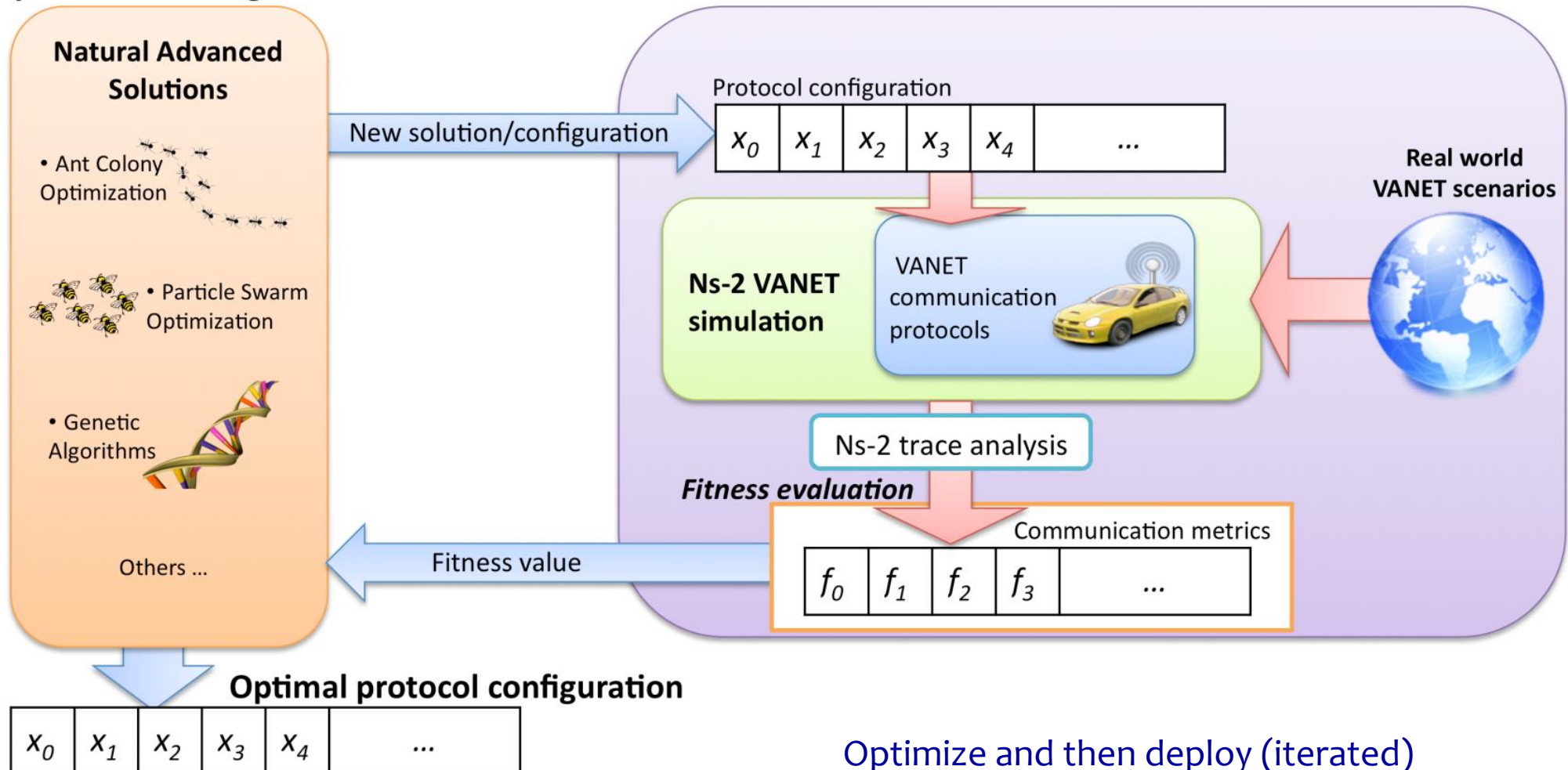
AODV
RFC 3561

Parameter	Default Values	Range
ACTIVE_ROUTE_TIMEOUT	3.0 s	1.0 ... 10.0
ALLOWED_HELLO_LOSS	2 HELLO packets	1 ... 10
MY_ROUTE_TIMEOUT	2.0×ACTIVE_ROUTE_TIMEOUT	1.0 ... 10.0
NET_DIAMETER	35 nodes	1 ... 50
NODE_TRAVERSAL_TIME	0.04 s	0.01 ... 1.0
NET_TRAVERSAL_TIME	2.0×NODE_TRAVERSAL_TIME ×NET_DIAMETER	1.0 ... 10.0
RREQ_RETRIES	2 tries	1 ... 10
RREQ_RATELIMIT	10.0 kbps	1.0 ... 10.0
TTL_START	1.0 s	1.0 ... 10.0
TTL_INCREMENT	2.0 s	1.0 ... 10.0
TTL_THRESHOLD	7.0 s	1.0 ... 20.0

Optimization by using simulators fed with real data

Optimization Algorithms

Solution Evaluation



Broadcasting optimization: QoS in VANETs

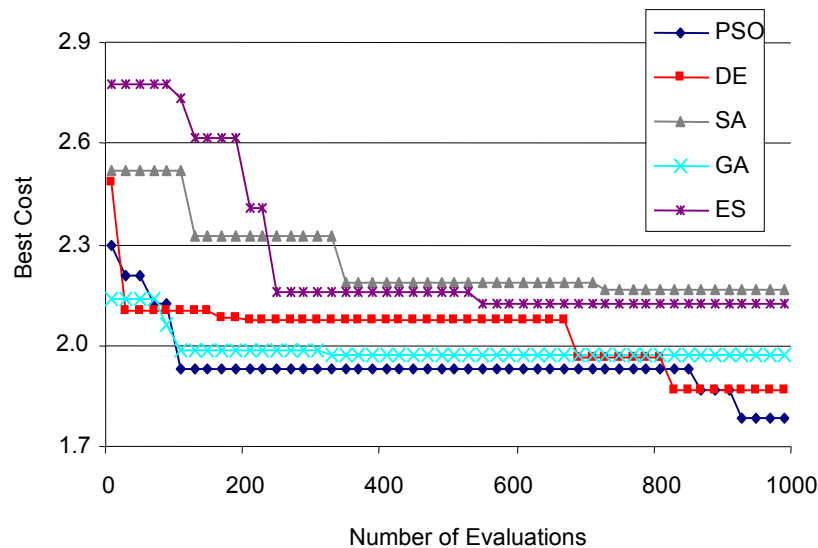
$$fitness = w_1 \cdot (-PDR) + w_2 \cdot NRL + w_3 \cdot AEED \cdot C$$

Packet Delivery Ratio

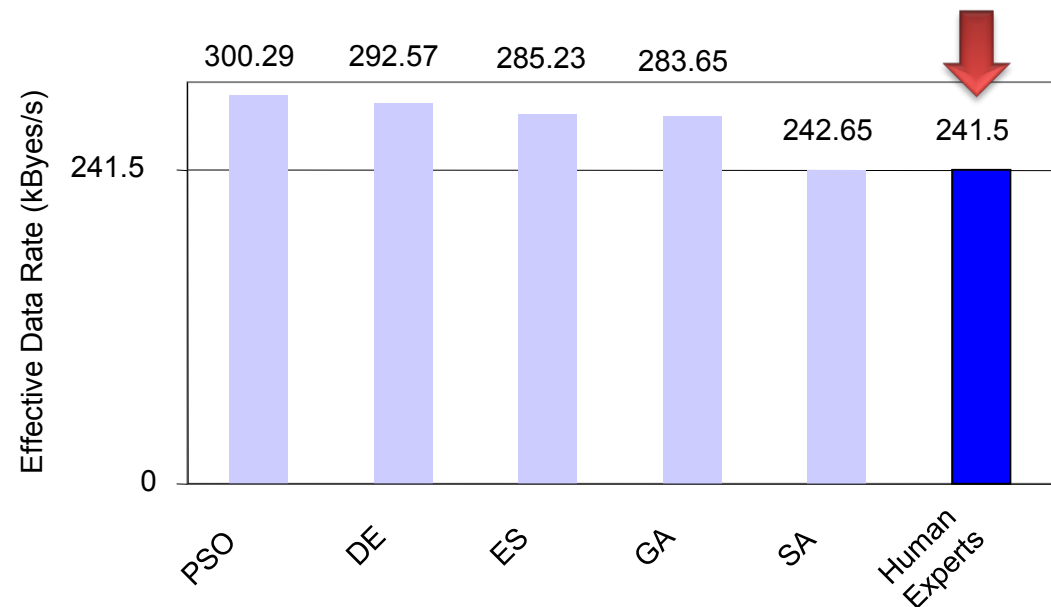
Network Routing Load

Average End-to-End Delay

Median Performance - Urban Scenario

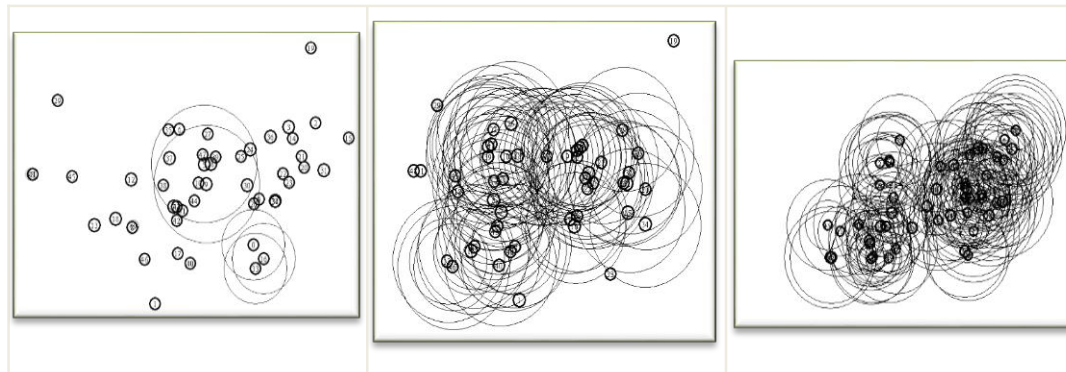
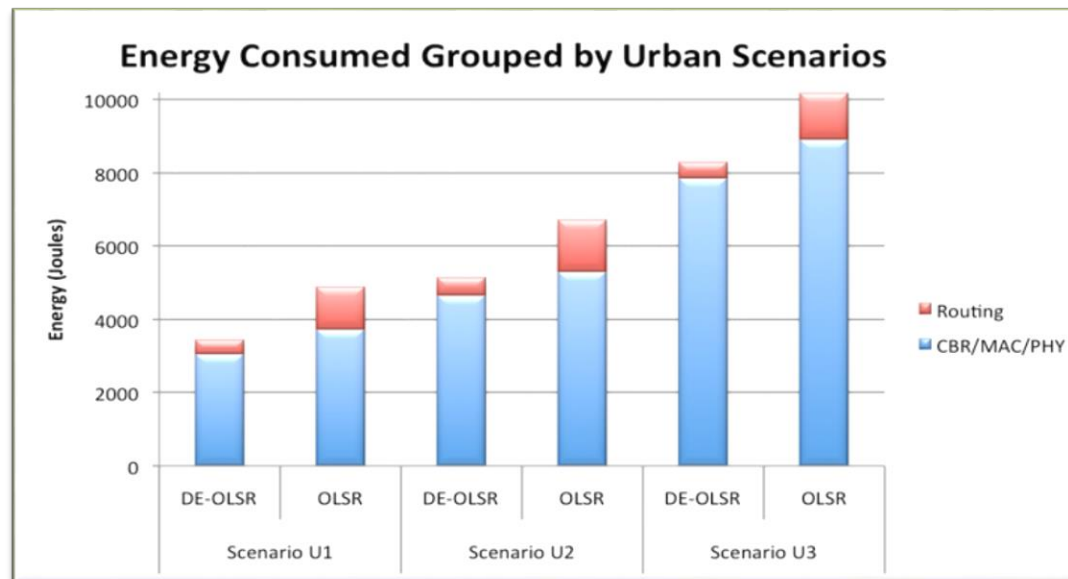


Urban Scenario



Green communications: optimizing energy

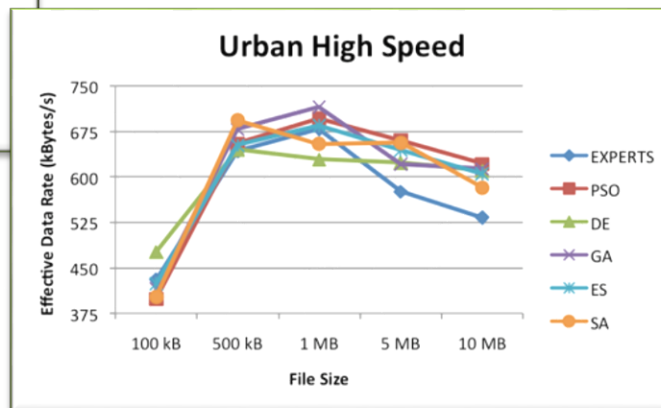
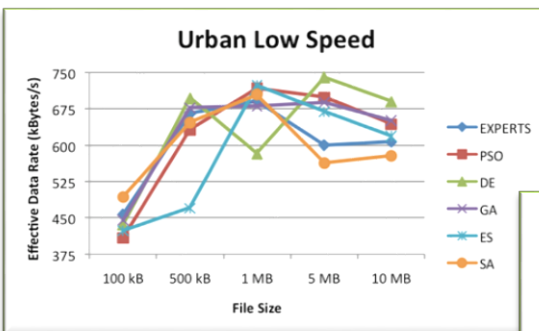
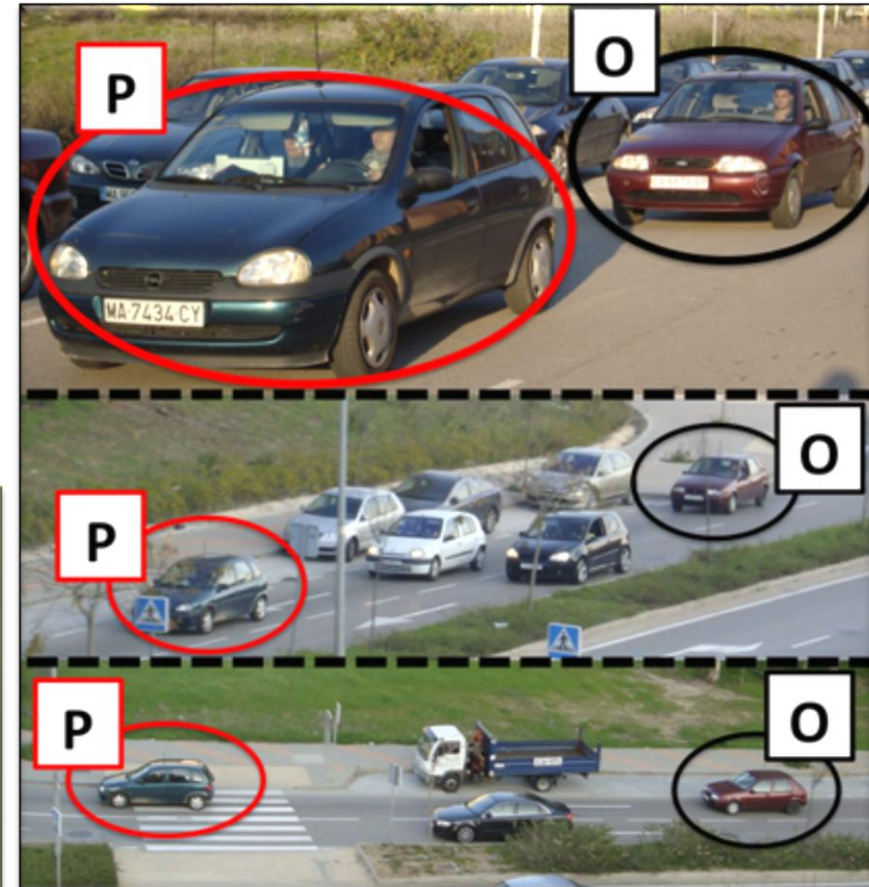
fitness = energy_consumption



Real world tests

• From simulation to real world results:

- The real world test results confirm the (ns-3) simulated ones



Smart panels (I)

- Smart panel services are needed to advise users on the path to reach major places in town, minimizing **travel time, fuel consumption, and noise**
- The advises are available in **information panels** at strategic points in the city: **traffic lights, parking lots, stop signals, etc.**
- The system takes into account traffic state and future predictions, CO₂ levels and noise level



Smart panels (II)

- Benefits for the citizen:

- Save driving time
- Avoid traffic jams
- Saves fuel



- Benefits for the city:

- Reduce traffic jams
- Reduce CO₂ emissions
- Save energy (fuel)
- Reduce noise pollution



Smart bus scheduling (I)

- The generalized utilization of the **smart cards** in city buses and new services of free transfer between buses allow to gather a lot of **interesting data**: more common transfers, rush hour per line, ...
- Applications could allow to **use** all those **data** to generate a **better flexible scheduling** of buses lines, doing an optimal utilization of the available fleet of buses



	ORIGEN	HORARIO
LABORABLES	MÁLAGA CENTRO	6.25 - 7.00 - 7.20 - 7.40 - 8.00 - 8.30 - 9.00 - 9.35 - 10.10 - 10.45 - 11.25 - 12.00 - 12.35 - 13.15 - 13.50 - 14.25 - 15.00 - 15.35 - 16.10 - 16.45 - 17.20 - 17.55 - 18.30 - 19.10 - 19.45 - 20.20 - 20.45 - 21.20 - 21.45 - 22.15 - 23.00 - 23.30
	AEROPUERTO	7.00 - 7.40 - 8.10 - 8.30 - 8.55 - 9.25 - 10.00 - 10.30 - 11.10 - 11.45 - 12.25 - 13.00 - 13.35 - 14.10 - 14.45 - 15.20 - 15.55 - 16.30 - 17.05 - 17.40 - 18.20 - 18.55 - 19.30 - 20.00 - 20.35 - 21.00 - 21.35 - 22.05 - 22.25 - 23.00 - 24.00
SABADOS	MÁLAGA CENTRO	6.30 - 7.00 - 7.40 - 8.20 - 8.50 - 9.25 - 10.00 - 10.40 - 11.15 - 11.50 - 12.30 - 13.05 - 13.40 - 14.20 - 14.55 - 15.30 - 16.05 - 16.40 - 17.15 - 17.50 - 18.25 - 19.00 - 19.35 - 20.05 - 20.30 - 20.50 - 21.30 - 22.20 - 23.00 - 23.30
	AEROPUERTO	7.05 - 7.35 - 8.05 - 8.35 - 9.10 - 9.45 - 10.20 - 11.00 - 11.35 - 12.10 - 12.45 - 13.25 - 14.00 - 14.40 - 15.15 - 15.50 - 16.25 - 17.00 - 17.35 - 18.10 - 18.45 - 19.20 - 19.55 - 20.25 - 20.55 - 21.20 - 21.50 - 22.20 - 23.00 - 24.00
FESTIVOS	MÁLAGA CENTRO	6.30 - 7.00 - 7.40 - 8.15 - 8.40 - 9.05 - 9.35 - 10.05 - 10.35 - 11.05 - 11.35 - 12.05 - 12.40 - 13.10 - 13.40 - 14.15 - 14.45 - 15.15 - 15.50 - 16.20 - 16.55 - 17.30 - 18.00 - 18.30 - 19.00 - 19.30 - 20.00 - 20.30 - 21.00 - 21.25 - 21.55 - 22.25 - 23.30
	AEROPUERTO	7.05 - 7.40 - 8.20 - 8.55 - 9.20 - 9.50 - 10.20 - 10.50 - 11.25 - 11.55 - 12.25 - 12.55 - 13.30 - 14.00 - 14.30 - 15.05 - 15.35 - 16.10 - 16.40 - 17.10 - 17.45 - 18.20 - 18.50 - 19.20 - 19.50 - 20.20 - 20.45 - 21.15 - 21.45 - 22.10 - 22.35 - 23.00 - 24.00



Smart bus scheduling (II)

- The scheduling generated by the proposed application is **flexible** and it also allows to **small changes** (few minutes) in the departures of the buses to **adjust** their scheduling to the **current situation**. For example:
 - Quite a number of passengers (mainly students) of lines 20 and 22 do a transfer to line 5. The scheduling of line 5 can be online tuned (only a few minutes) if a delay is detected in lines 20 or 22



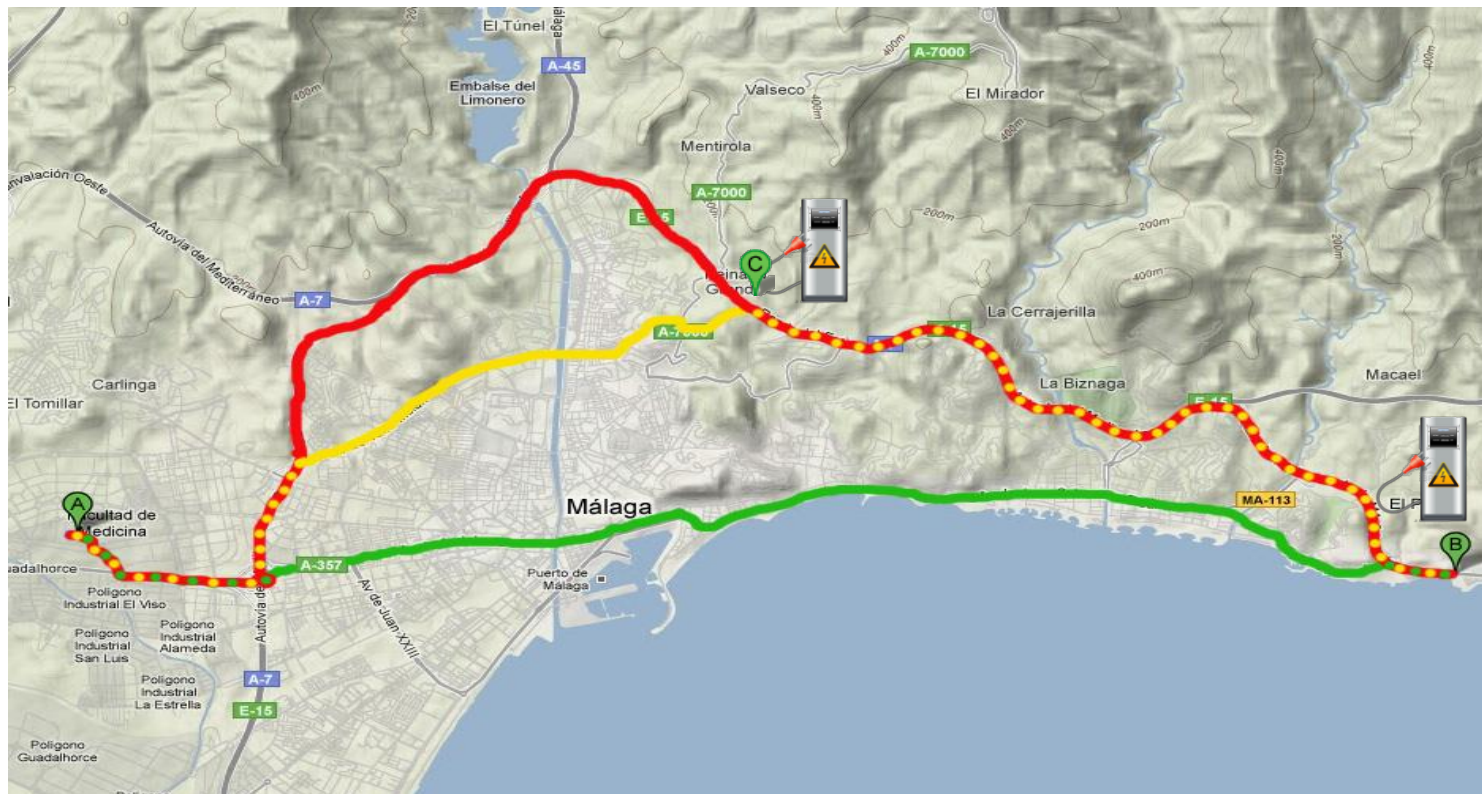
A small delay in line 20 will ask for a small delay in the departure of buses in line 5 and help bus transit



- Customized **new services** for sharing vehicles or for getting on the fly demands for home pick up and delivery

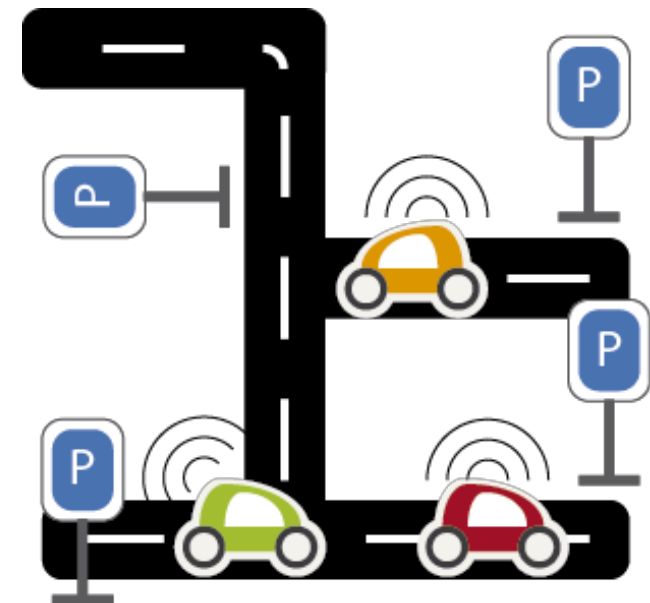
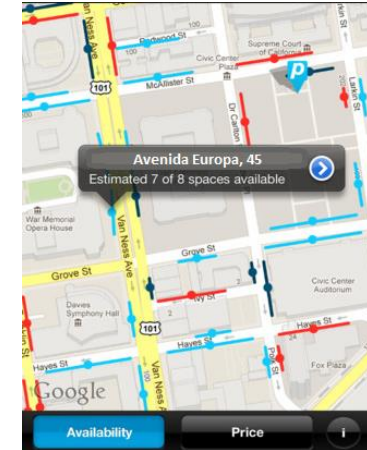
Smart EV management

- Electrical vehicles (EVs) have a **reduced autonomy and battery**. Tools for quick reaching/location a station are needed (traffic jams, unexpected events)
- **Smart phone applications** are needed to locate nearest charging stations considering time, prices, queues of early clients and citizen's preferences



Smart surface parking (I)

- Smart parking services provides drivers with real-time information about **parking availability** according to a given destination
- Parking **rates are adjusted** according to the parking availability (flexible pricing)
 - Reducing the prices in the areas with more free parking places
- Allows **mobile payment**



Smart surface parking (II)

- Benefits for the citizen:

- Make finding and paying for parking faster and easier
- Find the parking place anywhere with smartphones
- Save driving time, and therefore, transport time
- Avoid dangerous traffic situations

- Benefits for the city:

- Distribute road users through different parking areas
- Improve business by easing the parking
- Reduce traffic jams
- Reduce CO₂ emissions and noise pollution



Parking request

Mobile payment

SmartParkingFlow

Parking availability



Parking sensor

Smart signs



● Everything is better with WiFi !

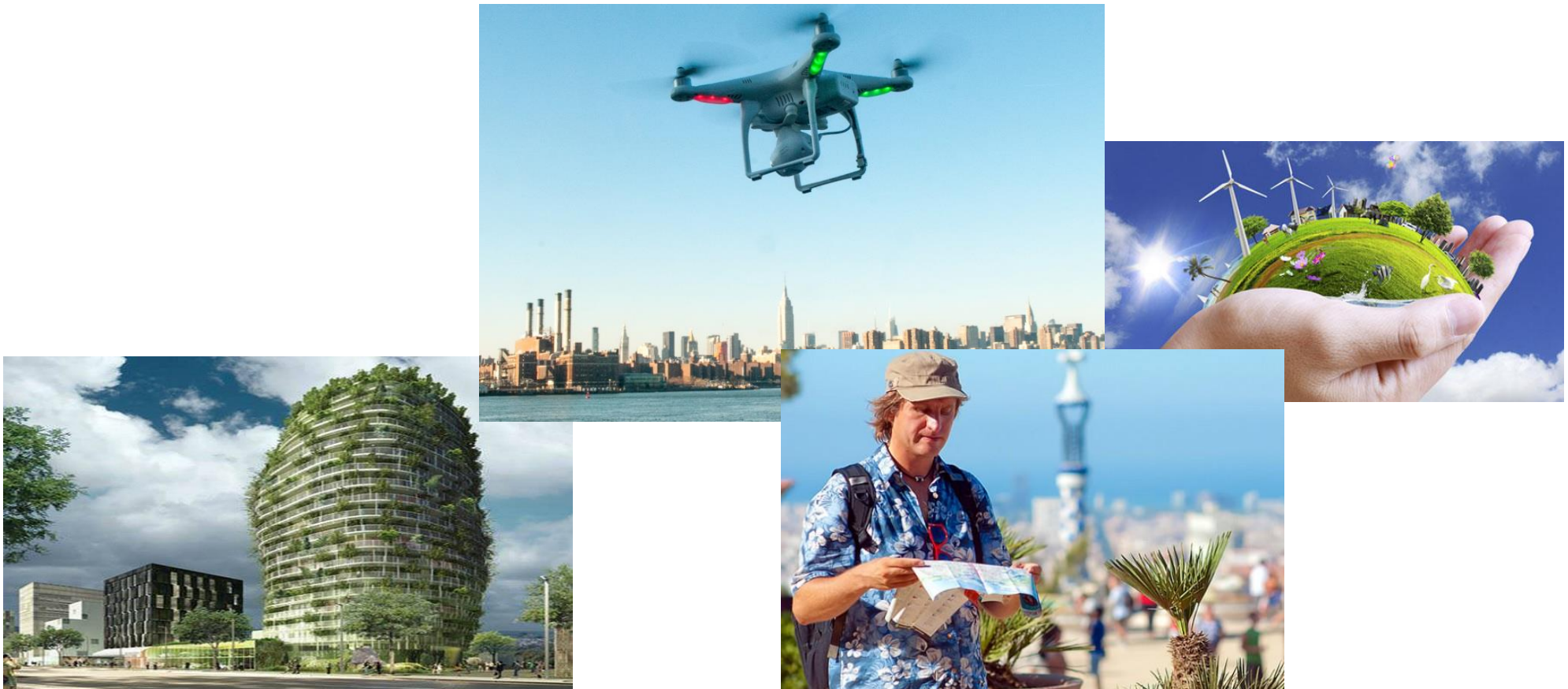


● “Policemen **near** to you, ask for help”



Applications (II)

Energy, buildings and much more



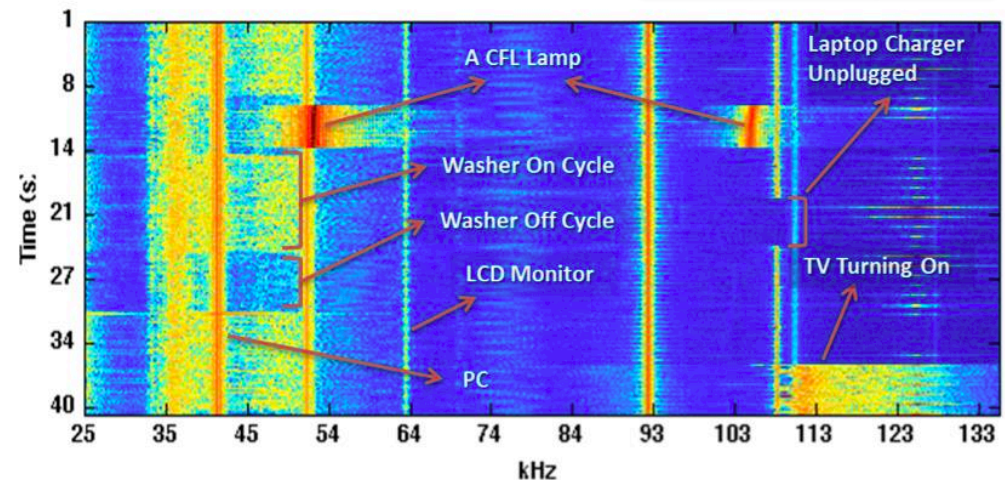
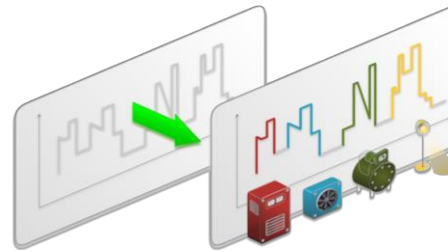
Smart energy systems

- **Energy** applications: generation, transportation, forecasting, and consumption
- Tremendous **importance** for companies, cities, and users!

Wind Farm Design



Disaggregation and Savings



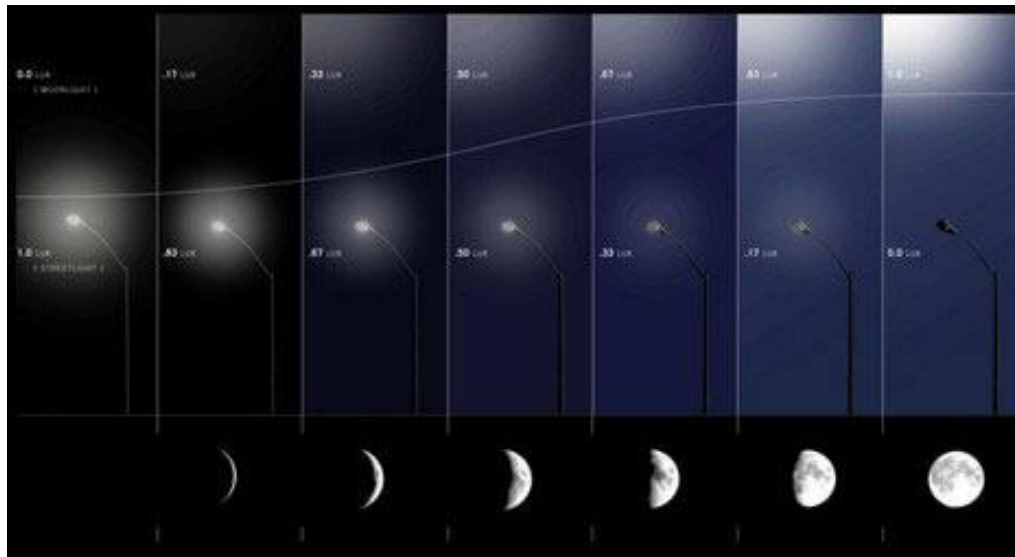
Smart lighting (I)

- Smart Lighting manages the city lights in order to **reduce the energy consumption**. It gives the correct illumination intensity for the city in an adaptive, collective, and intelligent way
- Benefits:
 - Reduce **energy consumption**
 - public lighting represents between 40% and 70% of the electricity bill of municipalities
 - Increase **lifetime of city lights**
 - a 5% reduction in operating voltage will more than double the life of a traditional bulb
 - **Minimizes light pollution**
 - **Join the green revolution!**
 - the least polluting energy is the one that is not used
- Requirements: few sensors and connectivity to city lighting



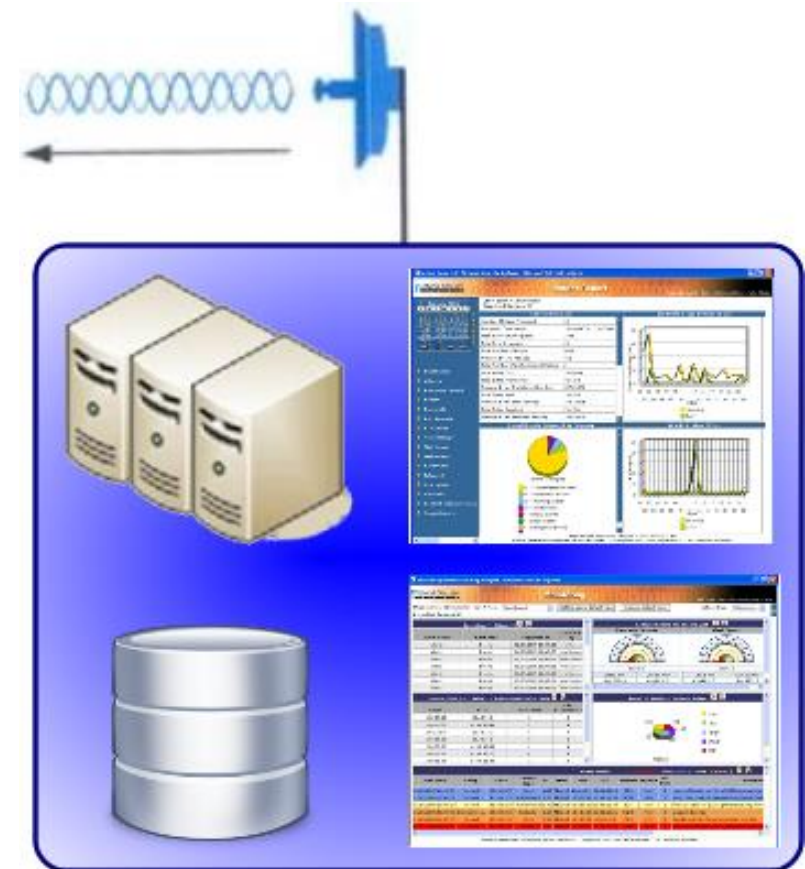
Smart lighting (II)

- Sensors detect the ambient lighting in different areas of the city. Public lighting **adapt its intensity as needed**
- Intelligent management of public lighting has a huge impact in energy consumption, **saving a lot of money**
- **Málaga has 239 LED street lamps**, with seven different technologies. The challenge is to **fine tune their parameters to improve efficiency**



Smart water jet systems (I)

- This smart garden watering system improves gardening activities in the city by minimizing the waste of water



Smart water jet systems (II)

- It **saves water** by sensing the humidity of gardens
- It chooses **the best moment of the day** depending on the water pressure, temperature, etc.
- The optimizations of resources is based on **swarm intelligence technologies**
- It keeps a **record** of the activities to **report** the amount of water saved
- It can be **easily integrated** in the existent facilities of the city




Smart residuals gathering (I)

- New services for the **optimal planning route** to collect all trash containers in a city. You will know whether the **trash containers** are full and **when** they should be gathered
- Benefits:
 - Clean city (many millions of euros savings)
 - Save in unnecessary collection visit
 - Less noise in our streets
 - Less bad smells
 - Avoid traffic jams (use of traffic information)
 - Service: “Pay as you throw”
- Only Need: GPS, RFID, and sensors
- Recycling **creates four jobs** for every one job created in the waste management and disposal industries

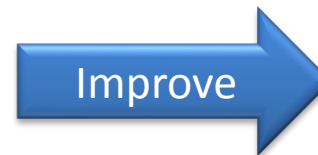


Smart residuals gathering (II)

- With WSN and RFID tags you **can monitor the trash**. The central system receives petitions when the on-site gather is required ()
- With Optimal Routes you will **save money**, time and avoid contamination. Avoid the collection of 2 trash containers means 3.3 km less in this route

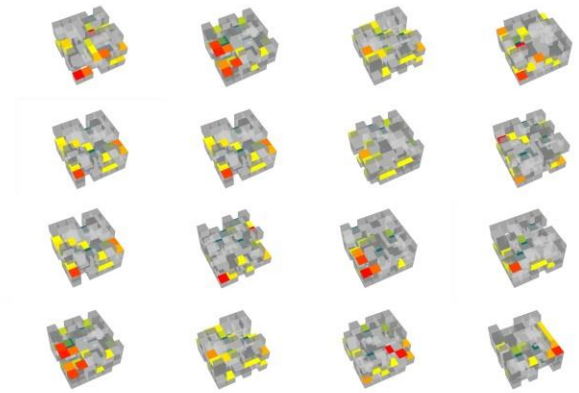


Traditional Route: 5.3km

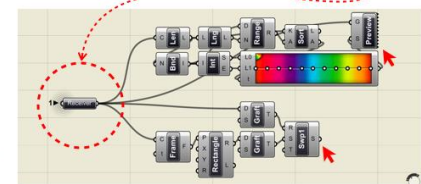
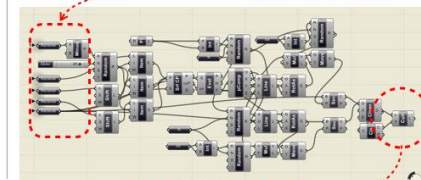
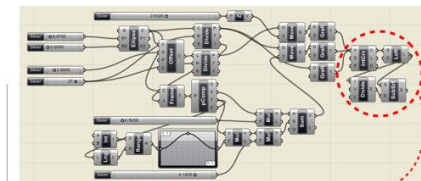
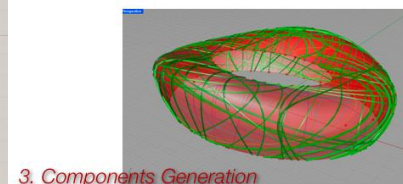
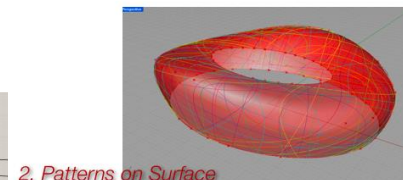
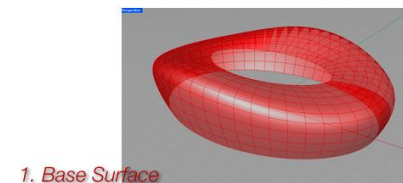
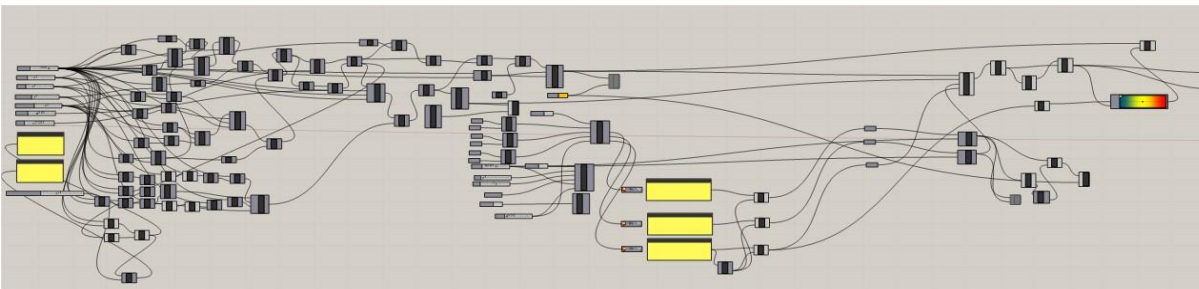


Optimal Route: 2km

Smart building construction: the approach



- Safer, sustainable, modern design principles
- Complex simulations needed
- Optimization and machine learning needed

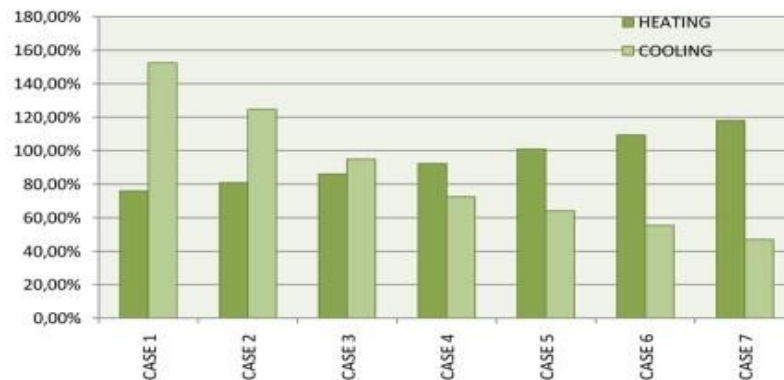


Smart building construction: techniques and technologies

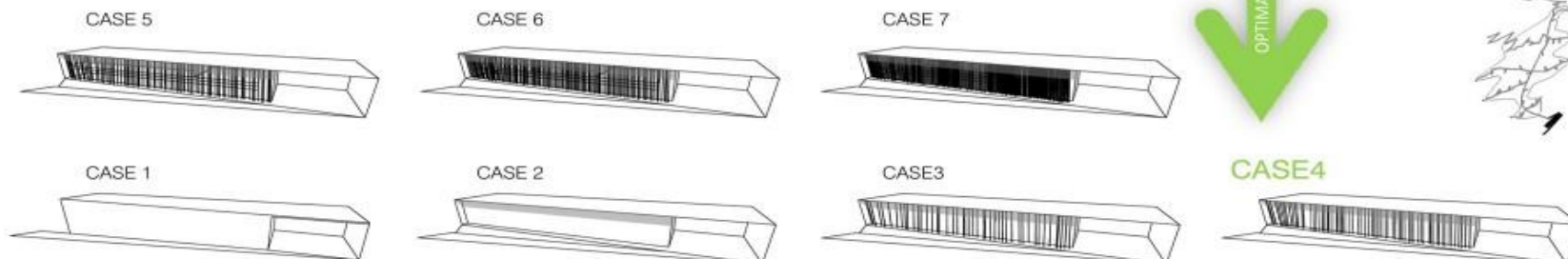
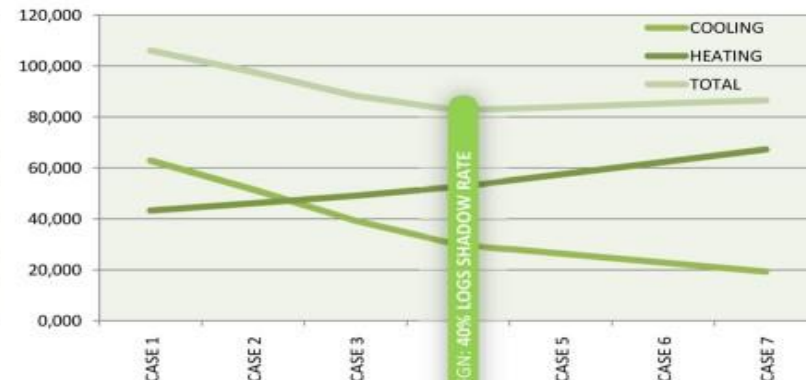
ENERGY DEMAND ANALYSIS (kWh/sqm)

		PROJECT			REFERENCE			%		LIMIT
		HEATING	COOLING	TOTAL	HEATING	COOLING	TOTAL	HEATING	COOLING	TOTAL
CASE 1	NO SHADOWS	43,290	62,920	106,210	57,006	41,282	98,288	75,94%	152,42%	100,00%
CASE 2	NO LOGS JUST PROJECTINGS	46,129	51,458	97,587	57,006	41,282	98,288	80,92%	124,65%	100,00%
CASE 3	25% LOGS SHADOW RATE	49,110	39,164	88,274	57,006	41,282	98,288	86,15%	94,87%	100,00%
CASE 4	40% LOGS SHADOW RATE	52,634	29,917	82,551	57,006	41,282	98,288	92,33%	72,47%	100,00%
CASE 5	50% LOGS SHADOW RATE	57,493	26,406	83,899	57,006	41,282	98,288	100,85%	63,97%	100,00%
CASE 6	75% LOGS SHADOW RATE	62,352	22,896	85,248	57,006	41,282	98,288	109,38%	55,46%	100,00%
CASE 7	100% LOGS SHADOW RATE	67,211	19,385	86,596	57,006	41,282	98,288	117,90%	46,96%	100,00%

% PROJECT VS REFERENCE BUILDING



ENERGY DEMAND Wh/(sqm-year)



Smart tourism (I)

- Smart Visit offers to city visitors a **self-adaptive city trip planner** that improves tourist experience
- The recommender system considers the **users profile** and **up-to-minute sights information** (queue timeouts, remaining capacity, ...) in order to compute the travel itinerary that best fits the visitors at that precise moment
- The traveler can select the **most convenient tour** from the ones proposed by the application. This tour will be rated by the user in order to update and improve the recommender system



Smart tourism (II)

- Benefits for the city:

- City sights are **not overflowing** with people
- Authorities gather **real-time visitors satisfaction** information
- Increasing **tourist's satisfaction**



- Benefits for the city visitors:

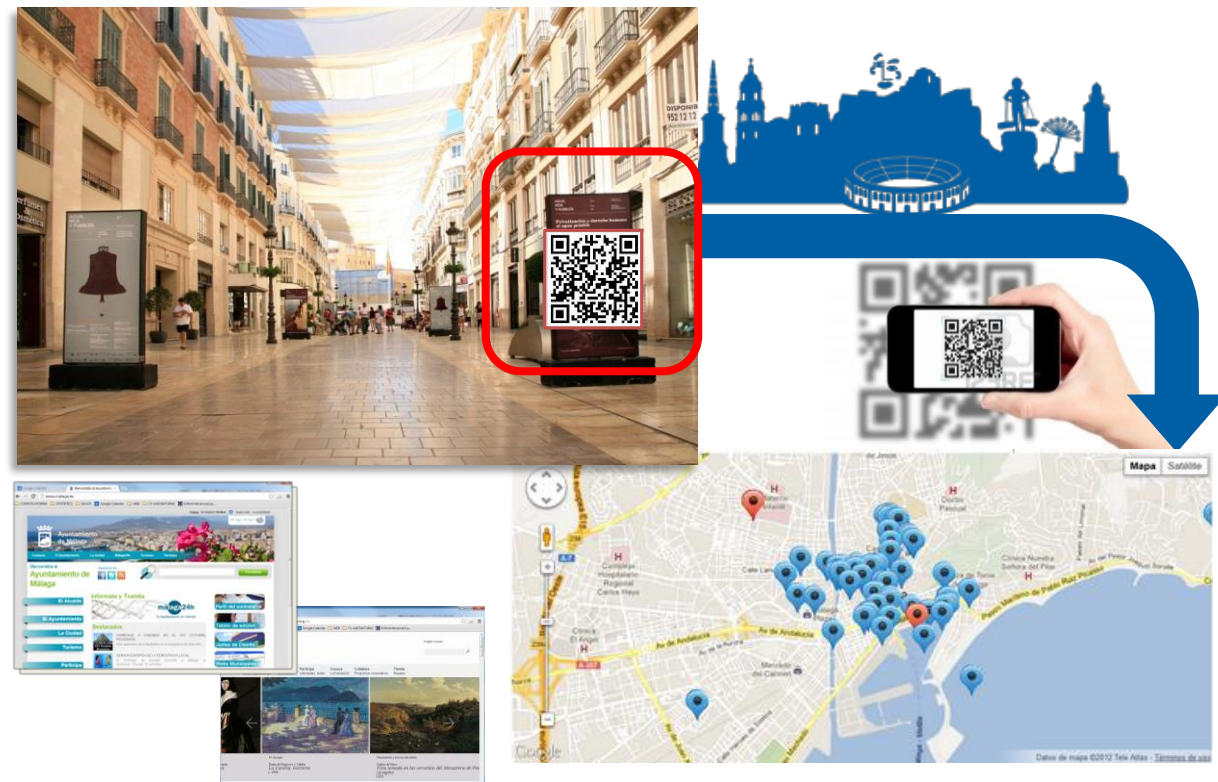
- Save tour times avoiding **long queues**
- **Never get lost** thanks to the GPS
- Multilingual and multimedia **sights description and events information**
- Increasing **safety** avoiding tourist traps



Smart QRinfo (I)

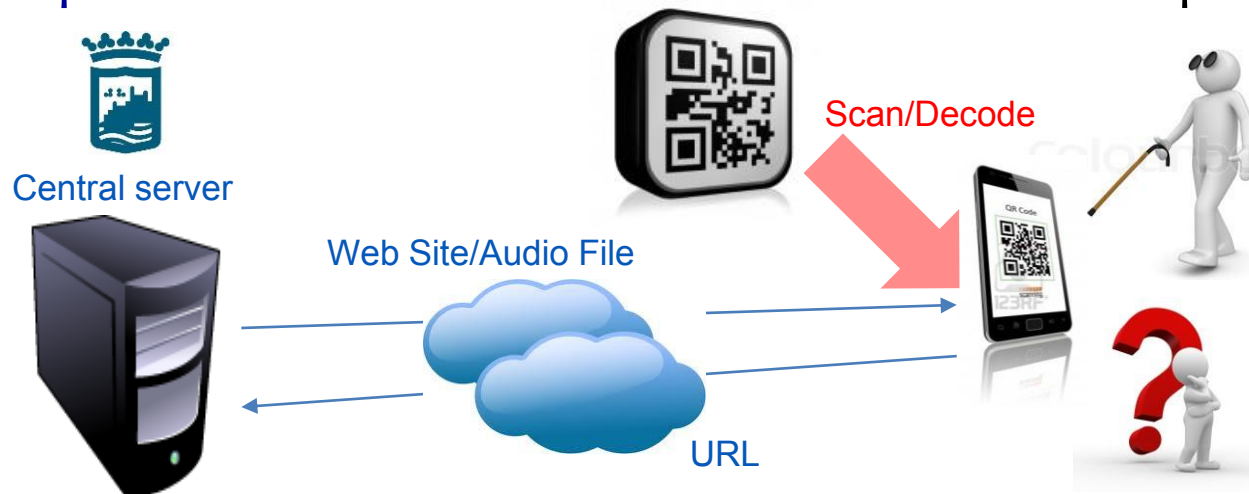
- Smart QRinfo allows new visitors to easily access to detailed city information in the context of where they are located
- QR-Code panels distributed in interesting points throughout the city can be captured by smartphones to directly serve information to the user with just one “click”
- A central web service will redirect dedicated links to real time information:

touristic places, events, welcome messages, administrative procedures, voice info-links, recommendations, activities, video-streaming, etc.



Smart QRinfo (II)

- With **Smart QRinfo** it is possible to redirect **visitors' smartphones** to official web sites, applications, and voice messages in a straightforward way
- The **central service** will gather and generate **statistic information** for a decision making process, such as: most visited links, sequence of captured QR-Codes in the city, the nature of demanded information...
- Voice messages delivering to **blind people**
- **Low cost implementation**: a minimum infrastructure is required



Smart monitoring (I)

- Smart measuring and surveillance of city spots



- Drones equipped with sensors can take images or capture **data** to be processed in a control center and then take actions

Smart monitoring (II)

- **Benefits:**

- Support to decisions by taking data from the city
- Precise information of weather and environmental conditions
- Better weather forecast in the city
- Garbage in streets, beach...



Smart hawkeye (I)

- Smart building hawkeye allows the **remote damage analysis** of buildings and large structures
- Drones equipped with cameras can **help detecting any cracks in the wall**
- Different sensors can take additional accurate measures at precise points (**temperature, humidity, ...**)
- Proprioception, **swarm intelligence**, autonomous control...



Different
measurements



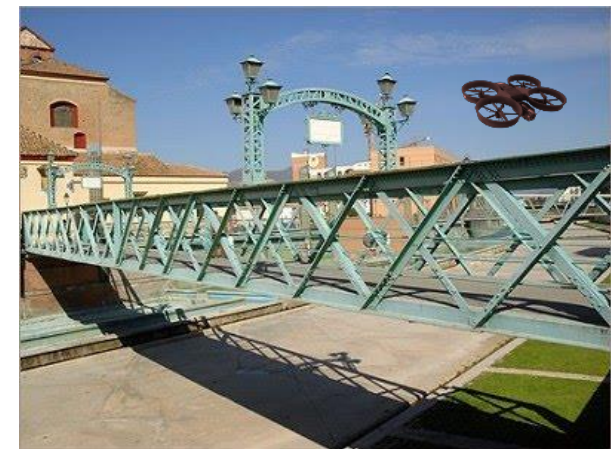
Building and structures
analysis by authorities



Smart hawkeye (II)

- Benefits:

- Precise information of the building status
- Working safer for technicians responsible for civil assessment
- Avoiding traffic jams caused by the use of large crane trucks

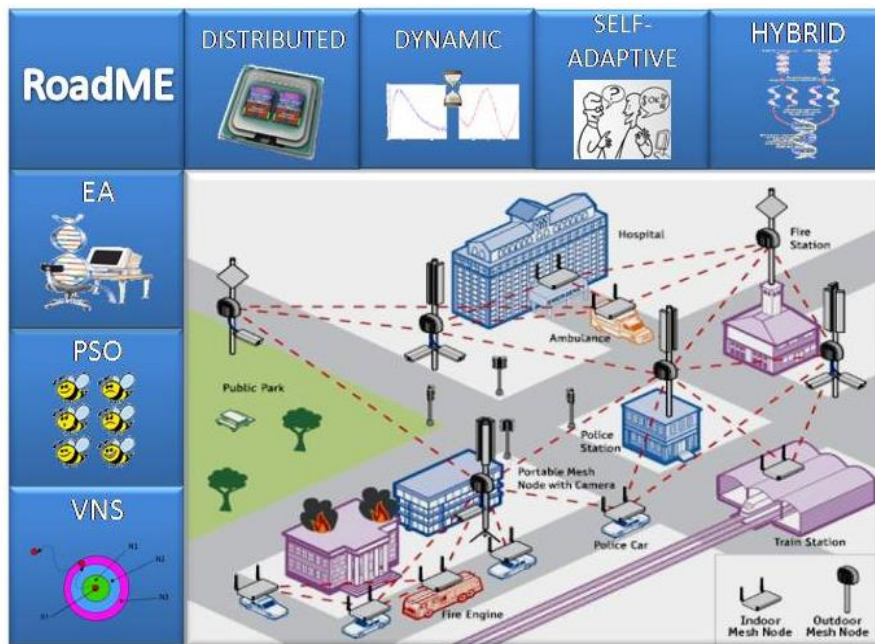


Some projects: vehicular communication networks

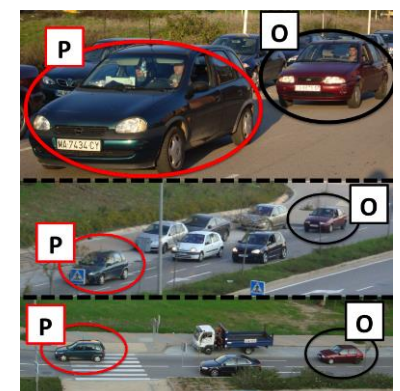
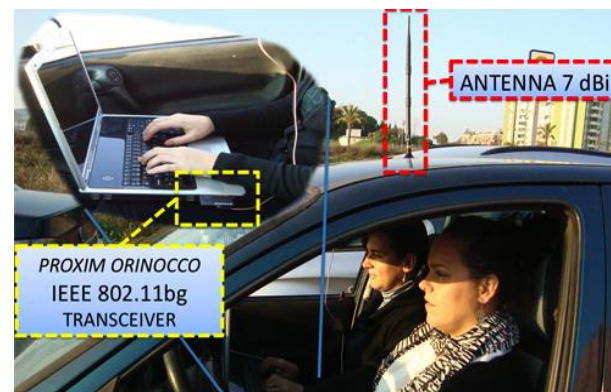
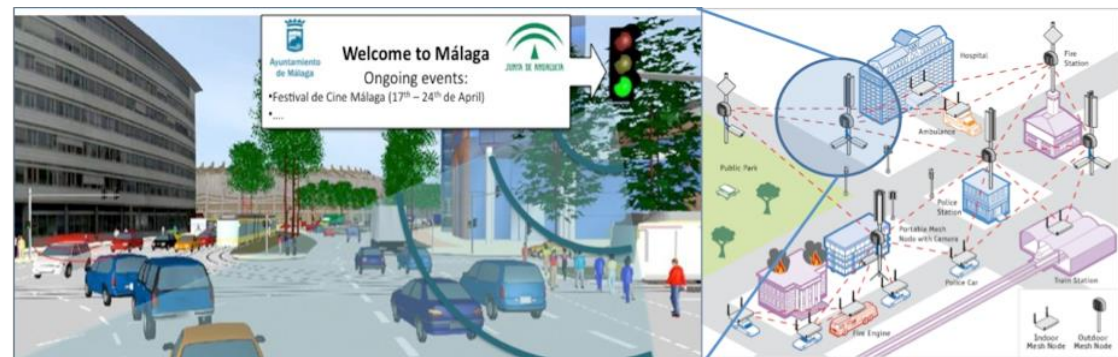


<http://roadme.lcc.uma.es>

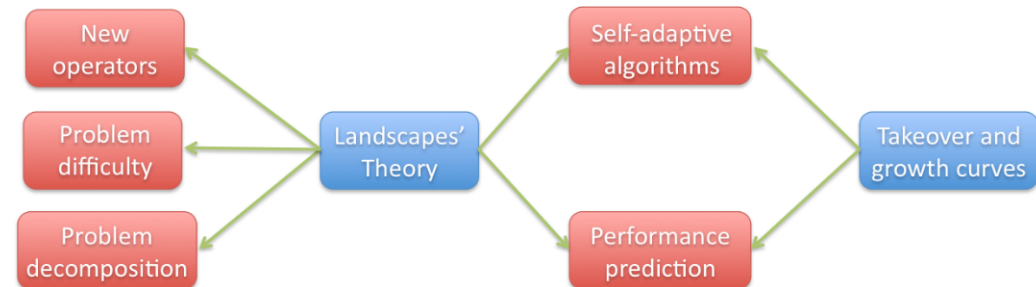
At a glance



Real life testing



New techniques: from theory to practice



Some projects: intelligent applications

<http://maxct.lcc.uma.es>



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- App for drivers (Android & iOS)
- Central server + apps by 3G
- Central server + open data (FIWARE)
- Complete route vs. step-by-step
- Pure gathering of information (GINF)
- Interactive maps + open data
- Profiles of drivers (clustering)
- Hardware search and installation



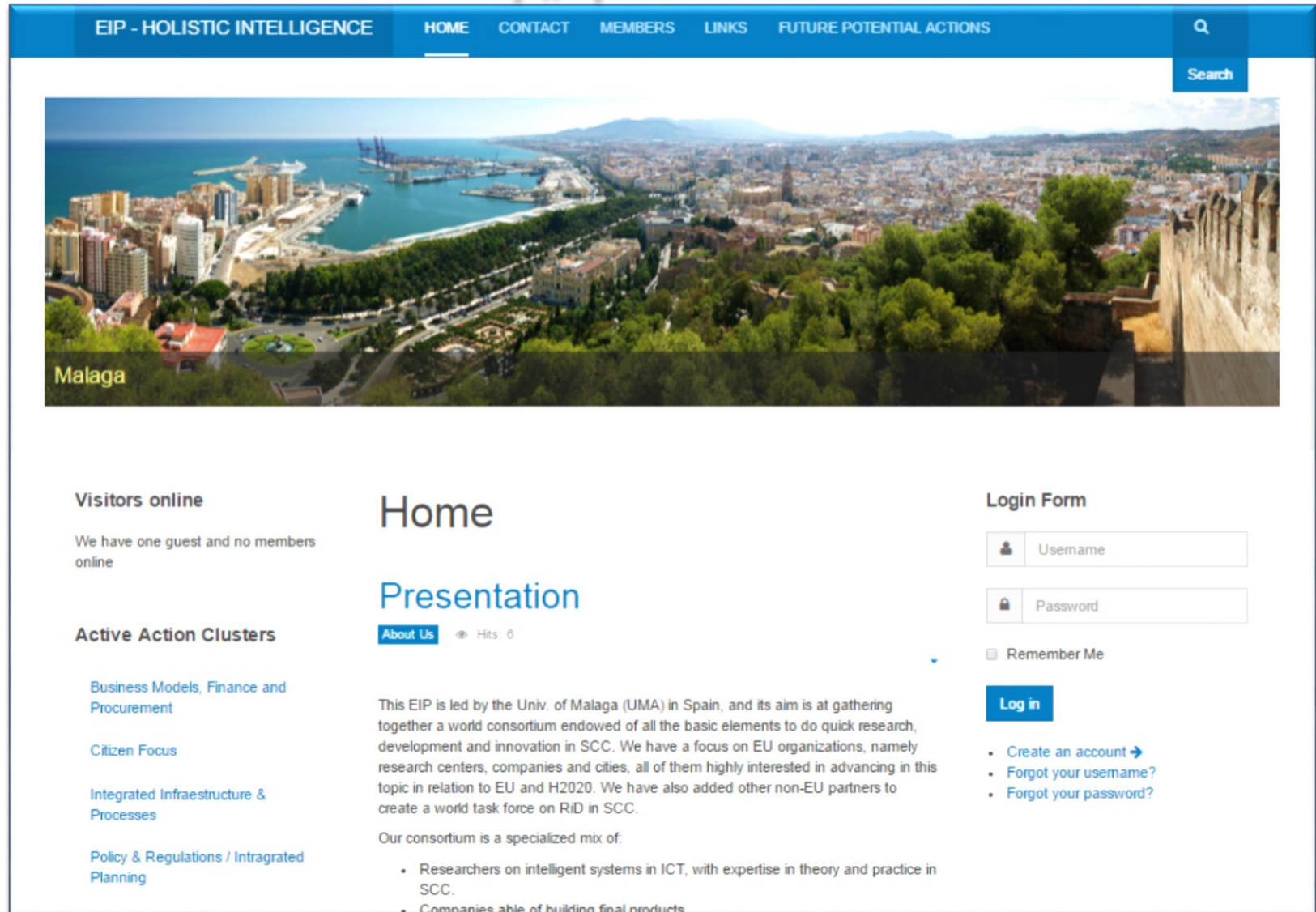
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- Desktop application
- Know and describe present policies
- Simulate Málaga and other cities
- Weekly and peak hours analyses
- Use of available open data
- Tests with the traffic control center
- Comparisons with existing tools
- Interactive maps of TRL

Some projects: holistic Intelligence

<http://eip.lcc.uma.es>

European
Innovation
Partnership
2014-2016



The screenshot shows the homepage of the EIP - HOLISTIC INTELLIGENCE website. The header is blue with navigation links: EIP - HOLISTIC INTELLIGENCE, HOME, CONTACT, MEMBERS, LINKS, and FUTURE POTENTIAL ACTIONS. A search bar is on the right. Below the header is a large banner image of Malaga, Spain, with the word "Malaga" in the bottom left corner. The main content area is divided into three columns. The left column contains "Visitors online" (1 guest, 0 members), "Active Action Clusters" (Business Models, Finance and Procurement; Citizen Focus; Integrated Infrastructure & Processes; Policy & Regulations / Intragrated Planning), and a "Login Form" with fields for Username, Password, and Remember Me, along with a "Log in" button and links for "Create an account", "Forgot your username?", and "Forgot your password?". The middle column features a "Home" section with a "Presentation" link and a description of the EIP's mission, followed by a list of consortium members. The right column contains a "Login Form" with fields for Username, Password, and Remember Me, along with a "Log in" button and links for "Create an account", "Forgot your username?", and "Forgot your password?".

EIP - HOLISTIC INTELLIGENCE

HOME CONTACT MEMBERS LINKS FUTURE POTENTIAL ACTIONS

Search

Malaga

Visitors online

We have one guest and no members online

Active Action Clusters

- Business Models, Finance and Procurement
- Citizen Focus
- Integrated Infrastructure & Processes
- Policy & Regulations / Intragrated Planning

Home

Presentation

About Us Hits: 6

This EIP is led by the Univ. of Malaga (UMA) in Spain, and its aim is at gathering together a world consortium endowed of all the basic elements to do quick research, development and innovation in SCC. We have a focus on EU organizations, namely research centers, companies and cities, all of them highly interested in advancing in this topic in relation to EU and H2020. We have also added other non-EU partners to create a world task force on RiD in SCC.

Our consortium is a specialized mix of:

- Researchers on intelligent systems in ICT, with expertise in theory and practice in SCC.
- Companies able of building final products.

Login Form

Username

Password

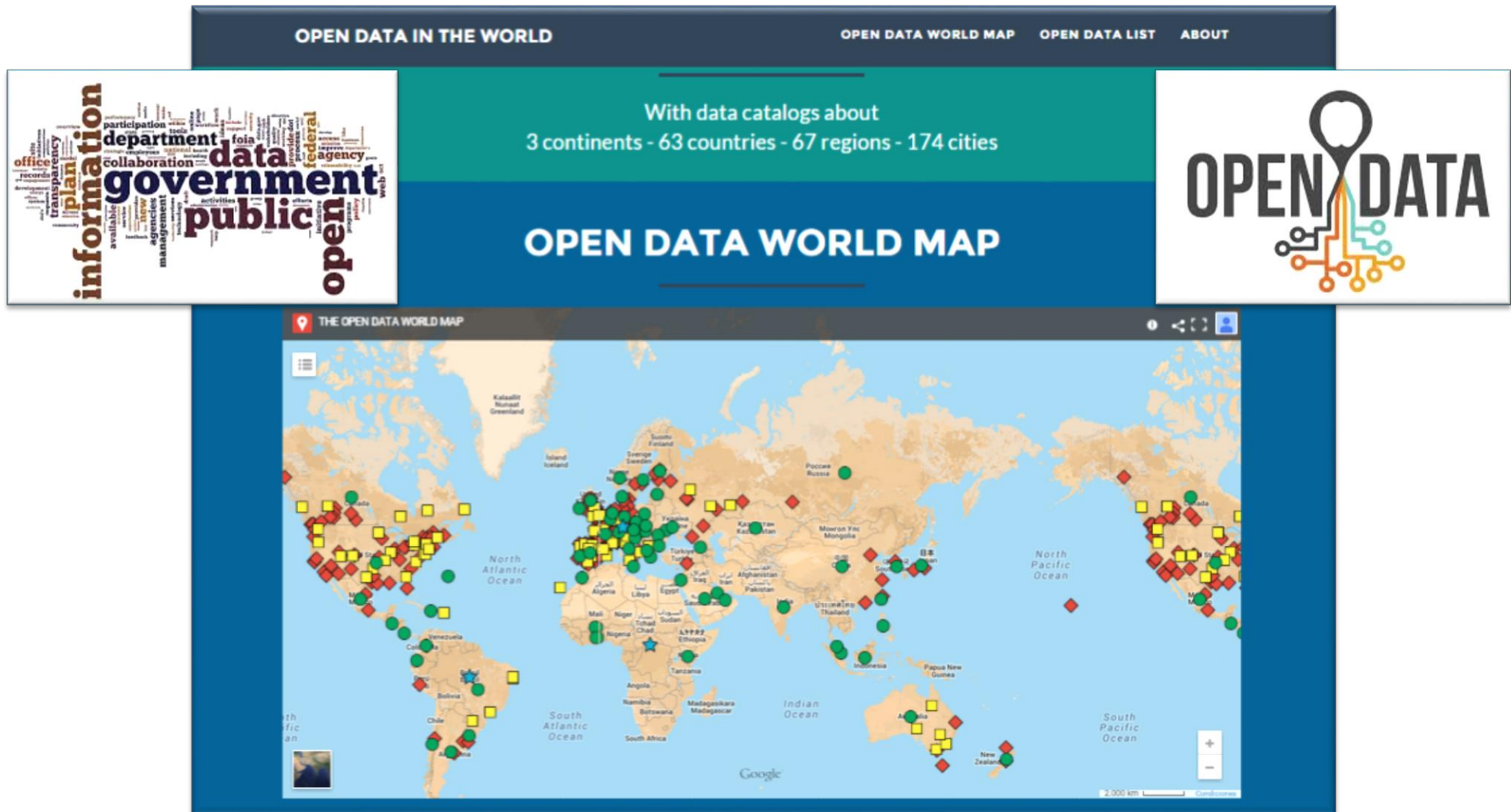
☐ Remember Me

Log in

- Create an account →
- Forgot your username?
- Forgot your password?

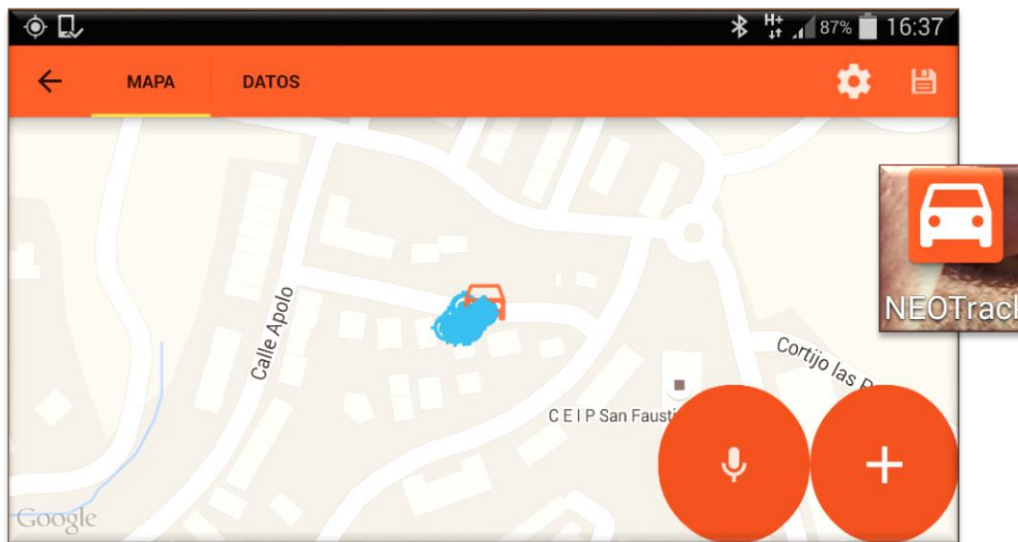
Open data in the world

<http://eip.lcc.uma.es/opendata/>



Many new services...and apps!

NEO apps for Android



A **floating car** rides the city with a given plan, collecting information and events



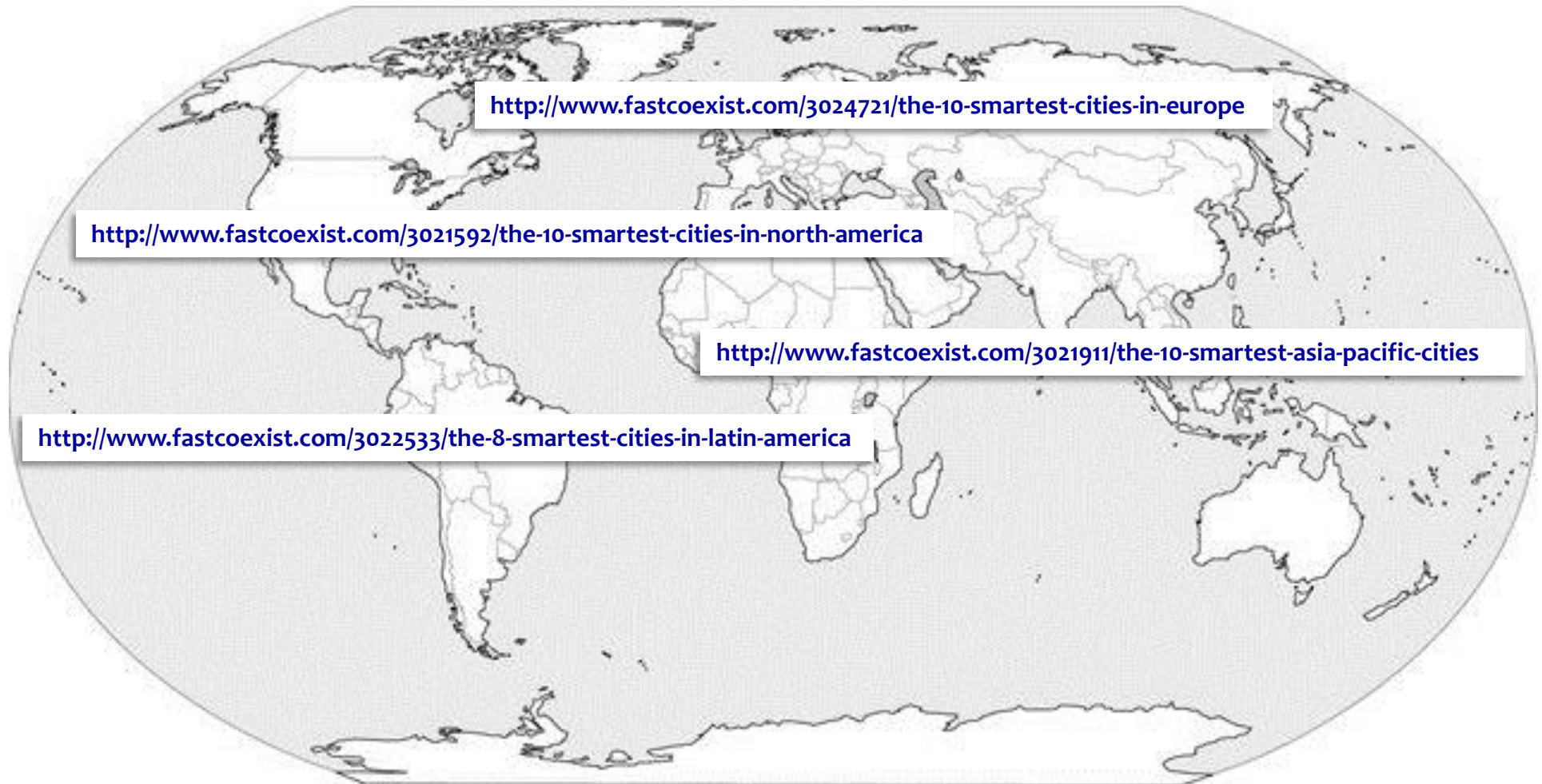
Pedestrians can have the route of **lower temperature** to their destination

The place for smart cities in Europe

<https://eu-smartcities.eu>

The screenshot shows the homepage of the 'Market Place of the European Innovation Partnership on Smart Cities and Communities'. The header includes a navigation menu with links to Home, About, FAQs, Help, Important Legal Notice, and Contact. Below the header is a search bar with the placeholder text 'Search for commitments, solution proposals, EU projects, publications...' and a 'Search' button. The main content area features a breadcrumb trail 'Home » News » Towards a Market Place for Smart Cities' and a large title 'Towards a Market Place for Smart Cities'. To the left of the title is a large photograph of a group of people sitting in a modern, brightly lit room, engaged in a discussion. To the right of the title is a section titled 'Latest Blog Posts' which lists three articles: 'STIR HUB innovation network' (dated 06.03.2015), 'Addressing both Urbanisation and Population Ageing in Smart Cities' (dated 27.01.2015), and 'European Innovation Partnership on Smart Cities: Launch of the European...'. Each article is accompanied by a small icon.

Rankings on Smart cities



<http://eponline.com/articles/2015/02/18/the-top-5-global-smart-cities-of-2015.aspx>

Summary

- Smart cities need **efficient** and **effective** modern problem solvers
- We can use existing **information and procedures** to improve them (a must!)
- We can build small/large, context-aware and adaptive **applications**
- Here, solutions are both **vertical** (specialized) and **horizontal** (integral)
- We must face **multiple levels** at smart cities: citizens, districts, city, routes, infrastructure, city council, public/private companies...
- We can exploit **open/big data** to build unseen new services
- Incorporating a **business model** is mandatory: so how to make **research**?
- An amazing domain for new **ideas and collaborations** !!!

ACKNOWLEDGEMENTS

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¡Gracias!

Málaga (España)



<http://neo.lcc.uma.es>

<http://neo.lcc.uma.es>