



PLAatform for the deployment and operation of
heterogeneous NETworked cooperating objects

7th Framework Programme

FP7-257649

PLAatform for the deployment and operation of heterogeneous NETworked cooperating objects (PLANET)

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Avoid Shower Caps

- “Shower caps” are solutions in search of a problem
- Available in many hotels but...
 - Is anybody using them?



PLANET Metadata

- Integrated Project with number INFSO-ICT- 257649
- **Start:** October 1st, 2010, **End:** September 31st, 2014, **Duration:** 48 months
- EC approved funding: 4.9 Mio. €
- Total Budget: 6.95 Mio. €
- Partners:
 - University of Duisburg-Essen (Germany)
 - Andalusia Foundation for Aerospace Development (Spain)
 - SELEX Galileo (UK)
 - Deutsche Luft- und Raumfahrt (Germany)
 - Boeing Research and Technology Europe (Spain)
 - University of Edinburgh (UK)
 - University of Pisa (Italy)
 - Consejo Superior De Investigaciones Cientificas (Spain)
 - Flying-Cam S.A. (Belgium)
 - ETRA Research and Development (Spain)
 - ELSAG Datamat S.P.A. (Italy)
 - Association for Research and Industrial Cooperation of Andalusia (Spain)



PLANET Scenarios

Environment:

Doñana Biological Reserve



Declared World Heritage Site in 1994. Part of the EU Large Scale Facilities. Singular Scientific and Technological Infrastructure (ICTS) of the Spanish Government.

http://icts.ebd.csic.es/StaticVer.do?id=descripcion_red

Critical infrastructures and vehicles:

Airfield Scenario



New UAV airfield facility (4.1 M euros) for Air Traffic Management and UAV experimentation. Aerial segregated space for the project.

Other case study Scenarios



Saturn Scenario, Grand Challenge , UK (Enabling successful asymmetric security operations in complex urban environments)

Other scenarios can also be drawn on such as the DLR alpine rescue and Bavarian forest monitoring



More than €10 Mio. in UAVs, UGVs and networks provided by partners



**EXPLOITING SYNERGIES, FOCUSING RESOURCES,
MAXIMIZING IMPACTS**



Scenario: Doñana Biological Reserve (DBR) Declared Humanity patrimony in 1994

- Located in the SW of the Atlantic Coast of the Iberian Peninsula
 - 10,000 hectares, included in the 50,000 hectares of Doñana National Park
- 4 large ecosystems: beaches, dunes, scrubland, and marshland
- 21 different biotypes
- The flora includes 803 species of vascular plants
- The fauna includes 41 species of ants, 7 of freshwater fish, 30 of estuary fish, 11 of amphibians, 19 of reptiles and 20 of mammals
- 700,000 aquatic birds can be found at the same time on the marshlands
- One of the most important biological reserves in the world



Currently Available Sensor Infrastructure

- Created and funded by the Spanish Government
- Goal:
 - Monitoring of natural processes
- Available data:
 - Audio information from the field
 - Live images and video information
 - Temperature, humidity, etc.
 - Position of animals, tracking, etc.
 - Pollution based on metals, pesticide, etc.
 - More than 90 different types of information



Computer Science Challenges

- System integration
 - With the available infrastructure
- Deployment of sensors in a cooperative way
 - As based on a previous analysis / simulation by a biologist
 - In inaccessible areas that grad students cannot reach
- Non-intrusive health monitoring of the network
 - Detect “holes” regarding communication
 - Coverage of all 90 types of available information
- Real-time tracking of “nodes”
 - Animals are tagged and can be monitored
- Processing and forwarding of “complex” data
 - Audio and video information
- Data analysis and visualization
 - Improving on the already available web interface

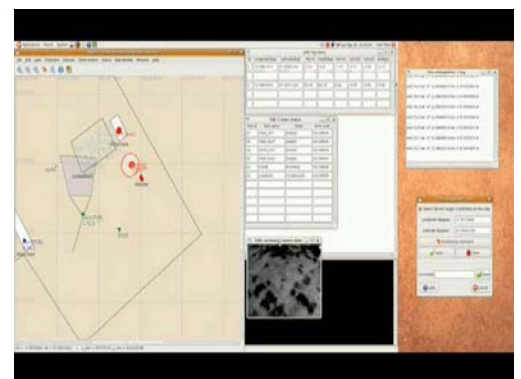


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Deployment and Redeployment of Sensors using UAVs

- Deployment using as a base the technologies developed in other EU projects



- New ideas for deployment and redeployment

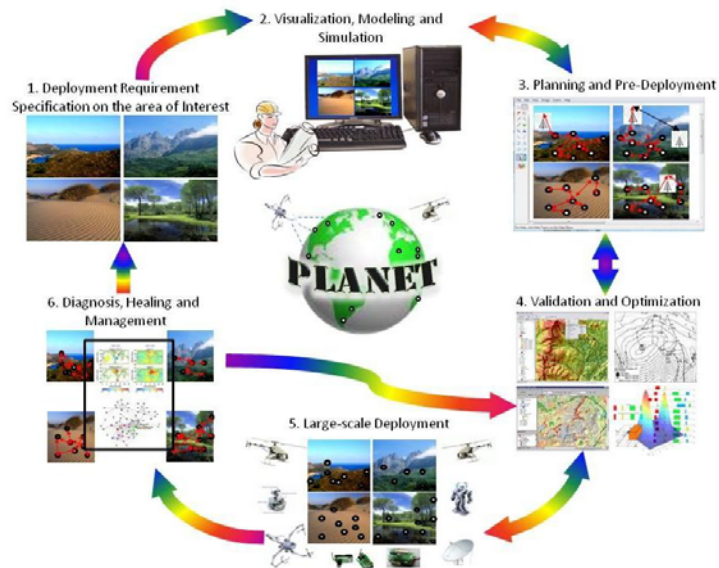
- Mounting devices on UGVs
- Transportation and deployment of small UGVs



PLANET Objectives and Approach

The design, development and validation of an **integrated platform** to enable the **smarter deployment, cost effective operation and maintenance** of large scale complex systems of heterogeneous networked Cooperating Objects, including Wireless Sensor and Actuator Networks and mobile objects.

Objectives
O1: Design and development of the PLANET platform
O2: Methods for adaptive network deployment
O3: Autonomous systems for deployment
O4: Distributed network-centric computing
O5: Security methods
O6: Validation DBR
O7: Validation Airfield



PLANET builds on successful previous research projects and experience gained from real deployments for first generations systems

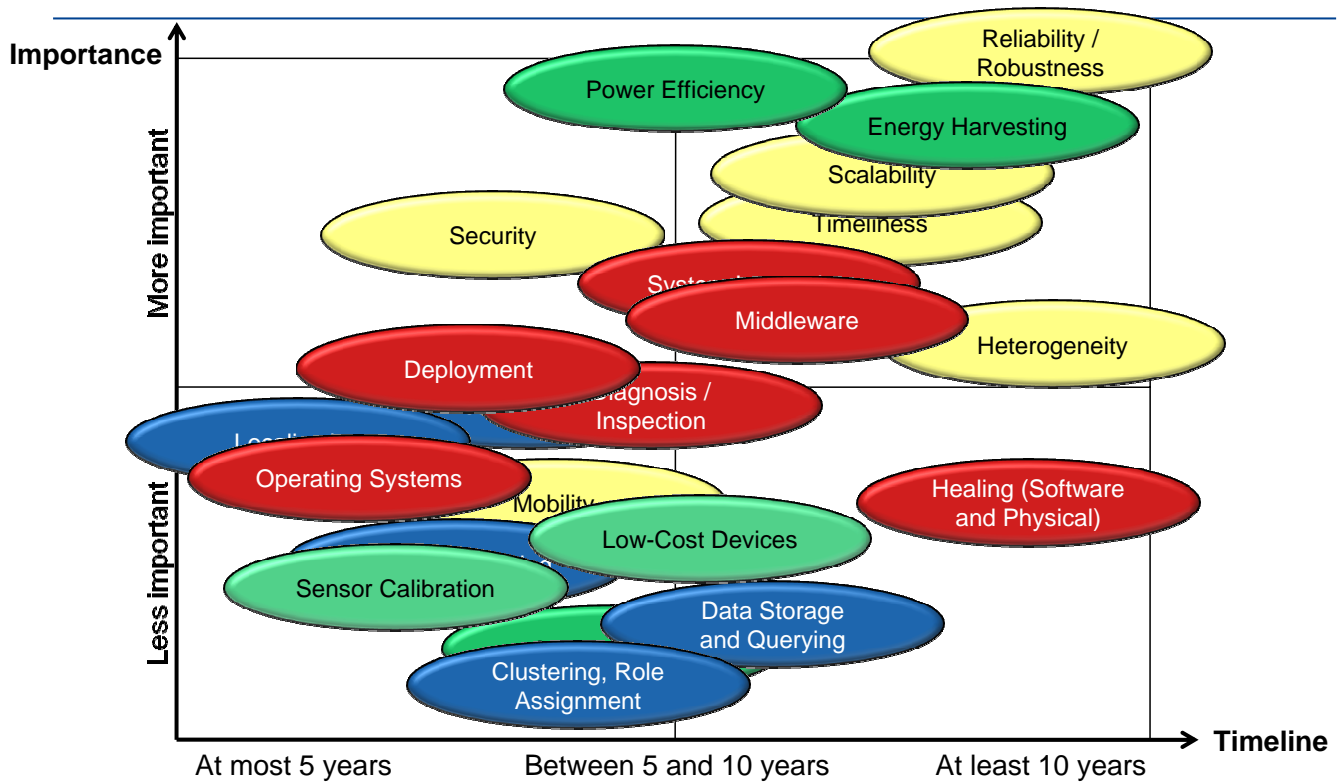


Research Roadmap on Cooperating Objects

- First edition published by the European Commission
 - Updated every year
- State of the art for Cooperating Objects
- Current gaps and trends
- Main research topics and predominant work areas



Predominant Work Areas



Key Issues

- Planning and Pre-deployment of heterogeneous devices at large
- Cooperative sensing techniques with mobile autonomous vehicles
- Secure deployment of heterogeneous devices
- Deployment of the network by autonomous vehicles
- Experimental validation at the Doñana Biological Reserve



Balance of Simulated and Real Nodes

- Planned experiments include the following nodes and sensors
 - Unmanned Aerial Vehicles (UAVs) both fixed and rotary wing
 - Unmanned Ground Vehicles (UGVs)
 - Motion / range sensors
 - Scan lasers (raster)
 - Intelligent camera nodes for video processing
 - Environmental sensors (wind, others)

- Typical numbers for scenarios
 - Numbers might vary during project
 - DBR sensors not included

Type of Node / Sensor	Real	Simulated
UAVs	3	100
UGV and ground vehicles	2	8
Motion / range sensors	10	50
Camera nodes (video)	4	20-30
Scan lasers (raster)	3	15-20
Environmental sensors	10	50



Level of Field Tests for the Two Scenarios

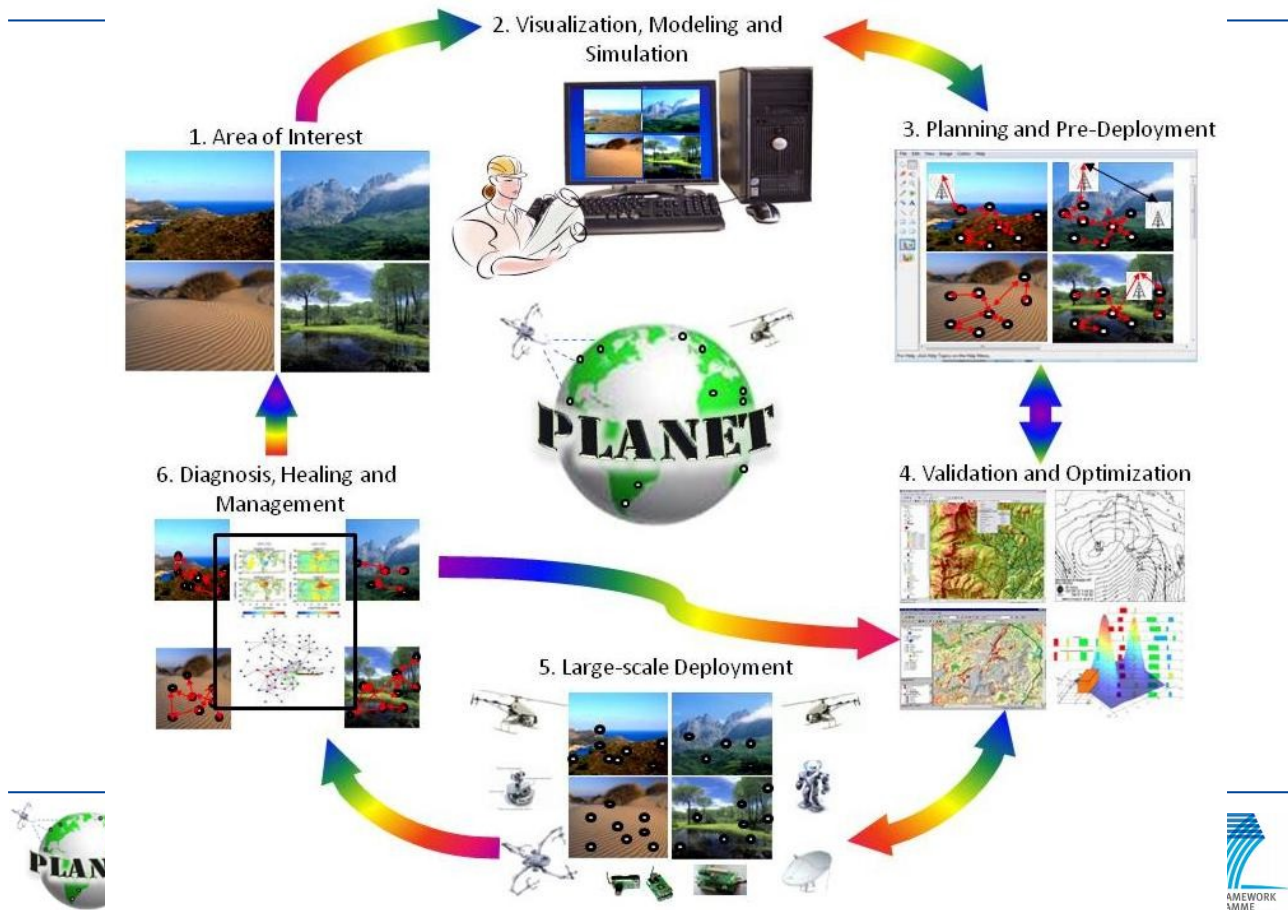
Experiments planned at M18, M32 and M46 for several consecutive days
 Deployment and redeployment experiments performed at DBR in real-life settings



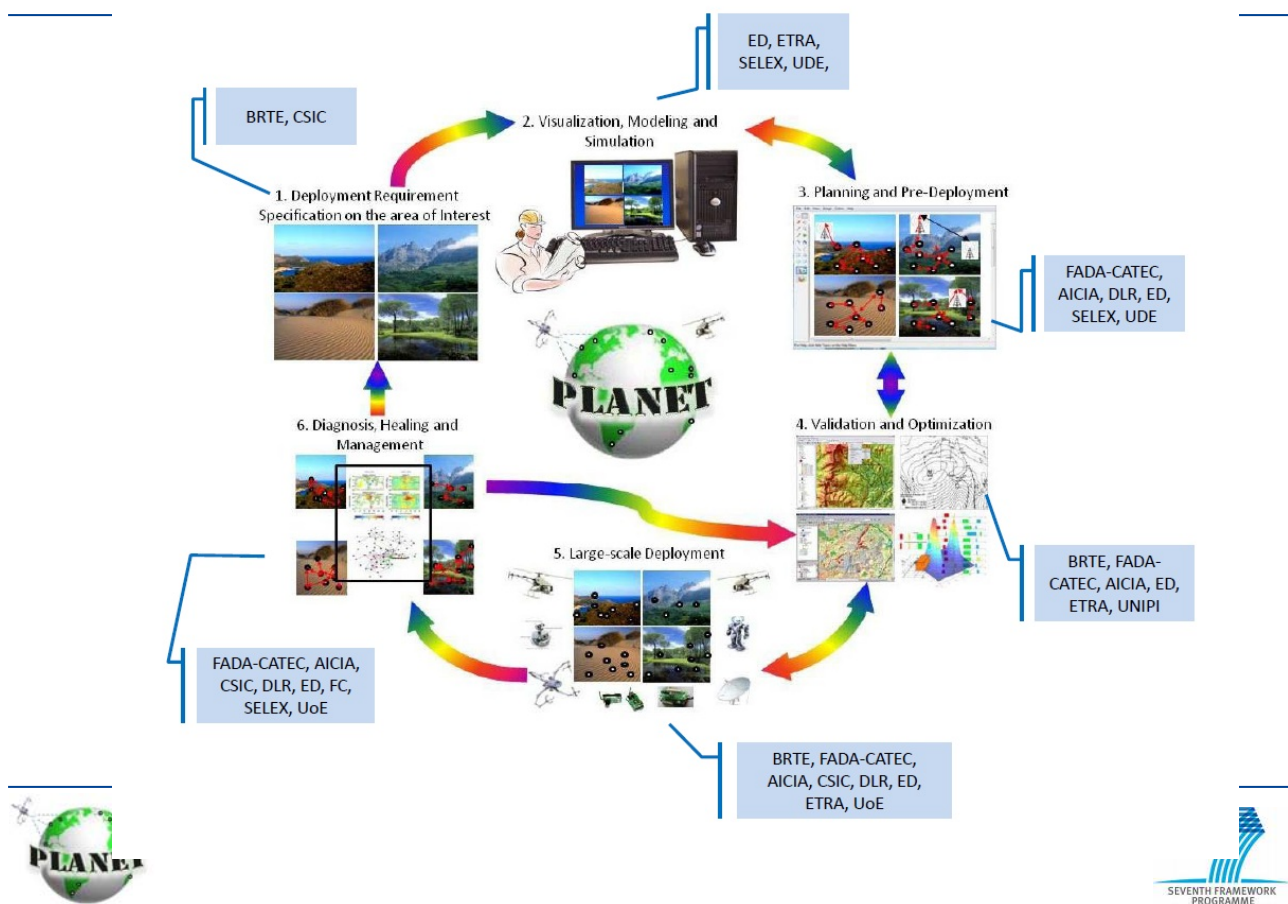
Highly Automated Airfield scenario using integrated simulation combined with deployed real nodes and systems. Field tests for this case will be based on one runway scenario.



The PLANET Solution



Distribution of Tasks



But hopefully not like this...



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Thank you for your Attention

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