

First Call for Proposals-Galileo

THE REAL-LIFE EXPERIENCE OF AN ACTIVE PARTICIPANT

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Miguel. M. Romay Merino – GMV Director of GNSS



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Framework Programme

GMV

**PARTICIPATION
IN NAVIGATION
PROJECTS**



GMV Participation in FP Navigation Projects (I)

- GMV group has a relevant experience in participating in FP Navigation projects, GMV has participated in more than 20 projects till now.
- In the frame of the V Framework Programme GMV collaborated in the following projects:
 - **GAUSS**, Galileo and UMTS Synergetic System
 - **AIDER**, Accident Information and Driver Emergency Rescue
 - **GALILEI**, Galileo Definition Study from the User perspective
 - **POLARIS**, Galileo Detailed Service Analysis User Tool
 - **GALLANT**, Galileo for Safety of Life Applications of Driver Assistance in Road Transport
 - **GADEROS**, Galileo Demonstrator for Railway Operating Systems



FIFTH FRAMEWORK PROGRAMME

GMV Participation in FP Navigation Projects (II)

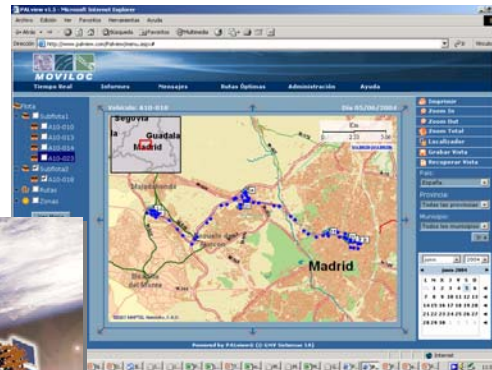


- In the frame of the VI Framework Programme GMV collaborates in the following projects:
 - **REPOSIT**, Relative Positioning for Collision Avoidance Systems
 - **MORYNE**, Enhancement of public transport efficiency through use of mobile sensor networks
 - **ADVANTIS**, A Centralised Guaranteed Integrity Localisation Service. A key for the EGNOS and Galileo Business Model
 - **GIROADS**, GNSS Introduction in the Road Sector
 - **M-TRADE**, Multimodal Transportation Supported by EGNOS
 - **HARMLESS**, Humanitarian Aid, Emergency Management & Law Enforcement Support Applications
 - **MENTORE**, Implementation of GNSS Tracking&Tracing Technologies for Regulated Domains
 - **MAGES**, Mature Applications of Galileo for Emergency Scenarios
 - **GEM**, Galileo Mission Implementation

GMV Participation in FP Navigation Projects (III)



- **GARMIS**, Galileo Reference Mission Support Project
- **SWIRLS**, New Receiver Technologies for GPS/Galileo Receiver Applications in a Professional Market
- **SCORE**, Service of Coordinated Operational Emergency and Rescue using EGNOS
- **HELICITY**, Precision Helicopter Guidance for Cities and Emergency Support



POLARIS

RAPID PERFORMANCE ASSESSMENT



WHAT IS POLARIS?

polaris computes navigation performances - accuracy, availability, DOP, NSVS, PL - given:

- Target systems and sensors
- User location(s) and environment(s) of the application

The first tool to link the Galileo design with the users and service providers

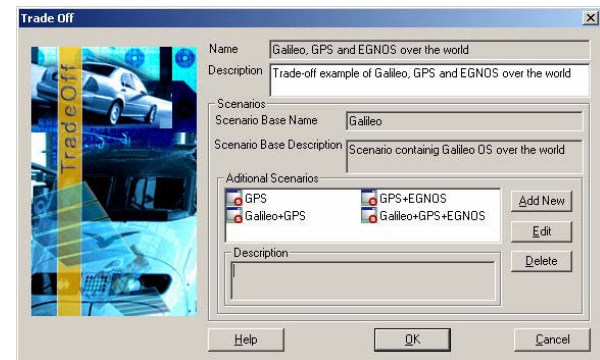
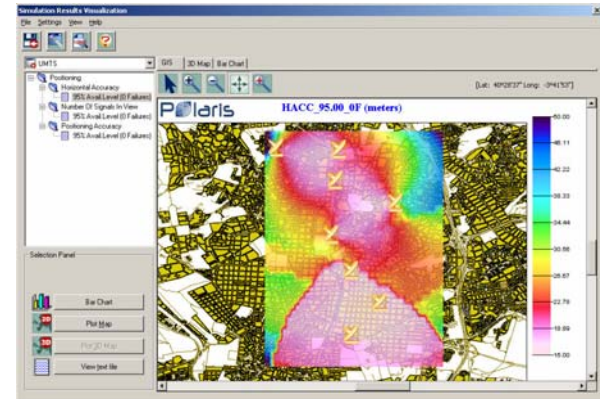
A platform for

- Rapid performance assessment
 - Of navigation systems and sensors,
 - For low-cost, portable platforms,
 - To support application and system design.
- ■ Optimised for execution time
 - ■ GNSS/SBAS, Local Elements, Heading and Distance Sensors,
 - ■ Laptop
 - ■ Mass-market application domains (road, pedestrian, railway, maritime)



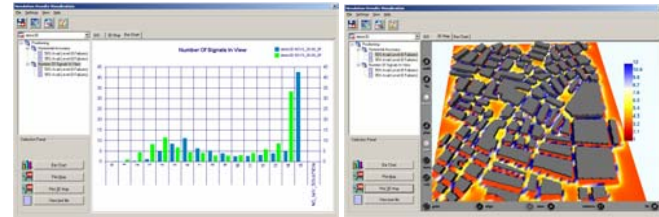
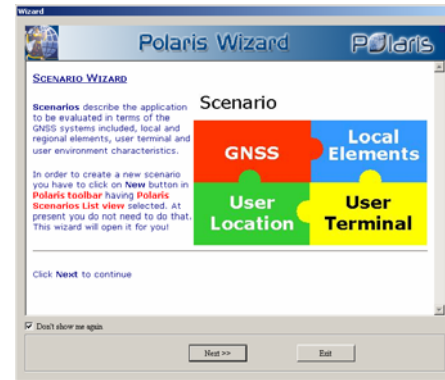
FIND THE OPTIMUM GNSS SOLUTION

- Evaluate performances of scenarios that combine sensors, augmentation systems, different environments, and GNSS services.
- Performances can be evaluated over wide coverage areas or along specific trajectories.
- Use the trade-off function to compare combination system and stand-alone performances.



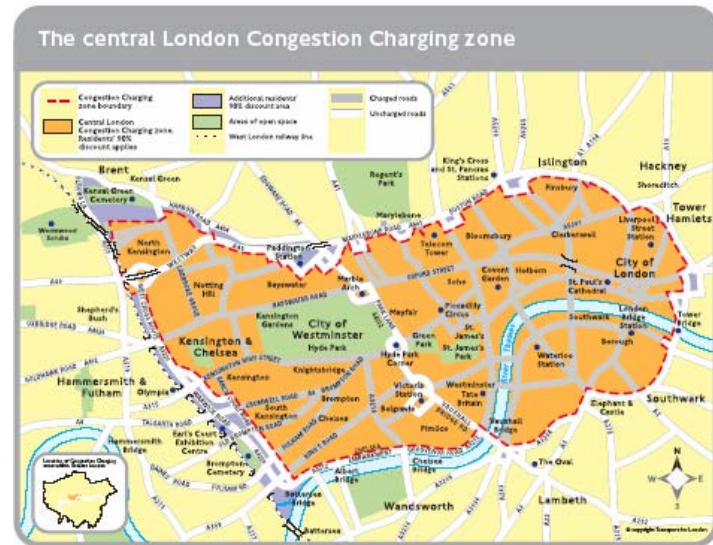
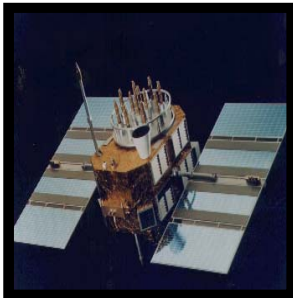
INSTANT ANSWERS

- User-friendly GUI
- Scenario and simulation building wizards.
- Default scenario components: constellations, receivers, user locations, local elements, sensors
- Characterise your own
- Output formats for both system designers and market analysts:
 - Charts
 - x-y plots
 - 2D and 3D maps
 - Export to file



USE CASE: TRANSPORT FOR LONDON

- TfL, the London transportation authority, is using **polaris** to assess the feasibility of a London Congestion Charging scheme using GNSS technology.



ADVANTIS

GNSS ENABLED LIABILITY CRITICAL APPLICATIONS



WHAT IS ADVANTIS?

Objective

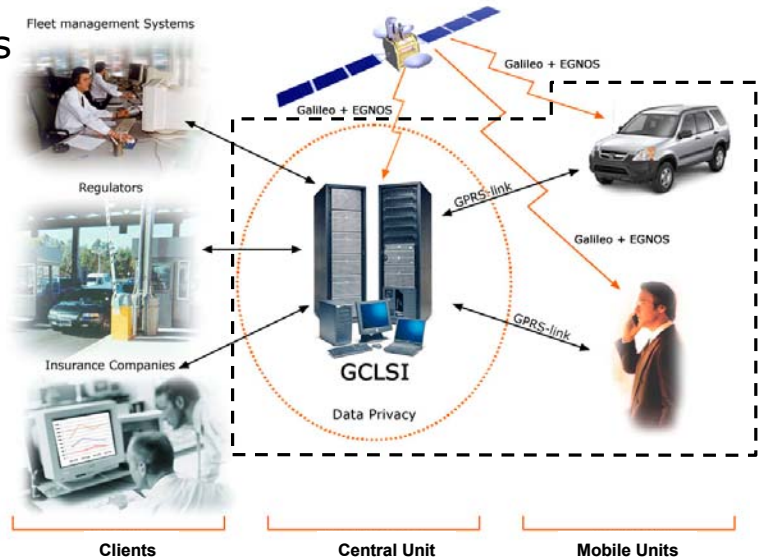
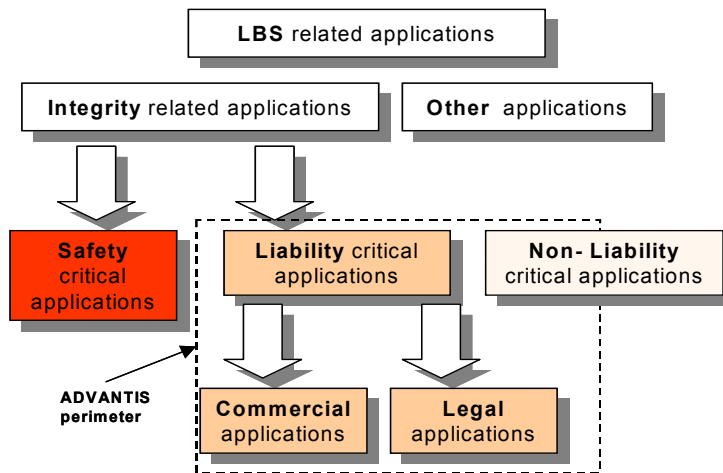
- To define a system and business model supporting a variety of applications
 - to provide position, velocity, and time (PVT) with integrity
 - under a Service Level Agreement (SLA)
 - using EGNOS and Galileo
- Project Phases
 - Concept & System definition
 - Prototype development & Trials definition
 - Trials execution, analysis and results dissemination



ADVANTIS CONCEPT

A centralised system + associated business model

- Linking Users with Service Providers
 - Through a single On-Board Unit
- Providing guaranteed position information
- Through GNSS

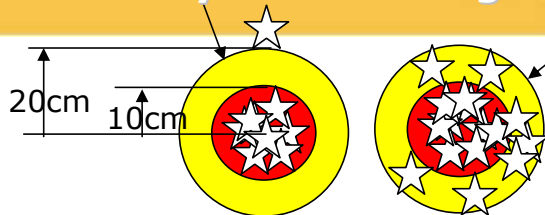
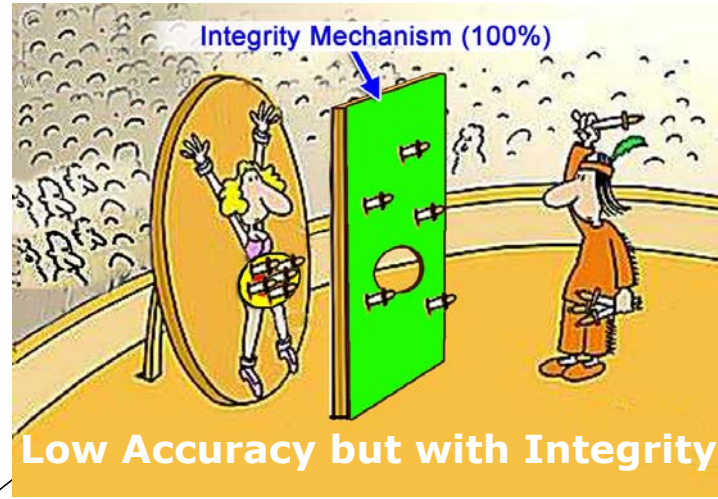


Liability Critical Application

- Integrity linked to a legal truth
- Undetected mis-performances can generate significant consequences.

IMPORTANCE OF INTEGRITY

Integrity: a measure of trust which can be placed in the correctness of the information supplied by the total system.

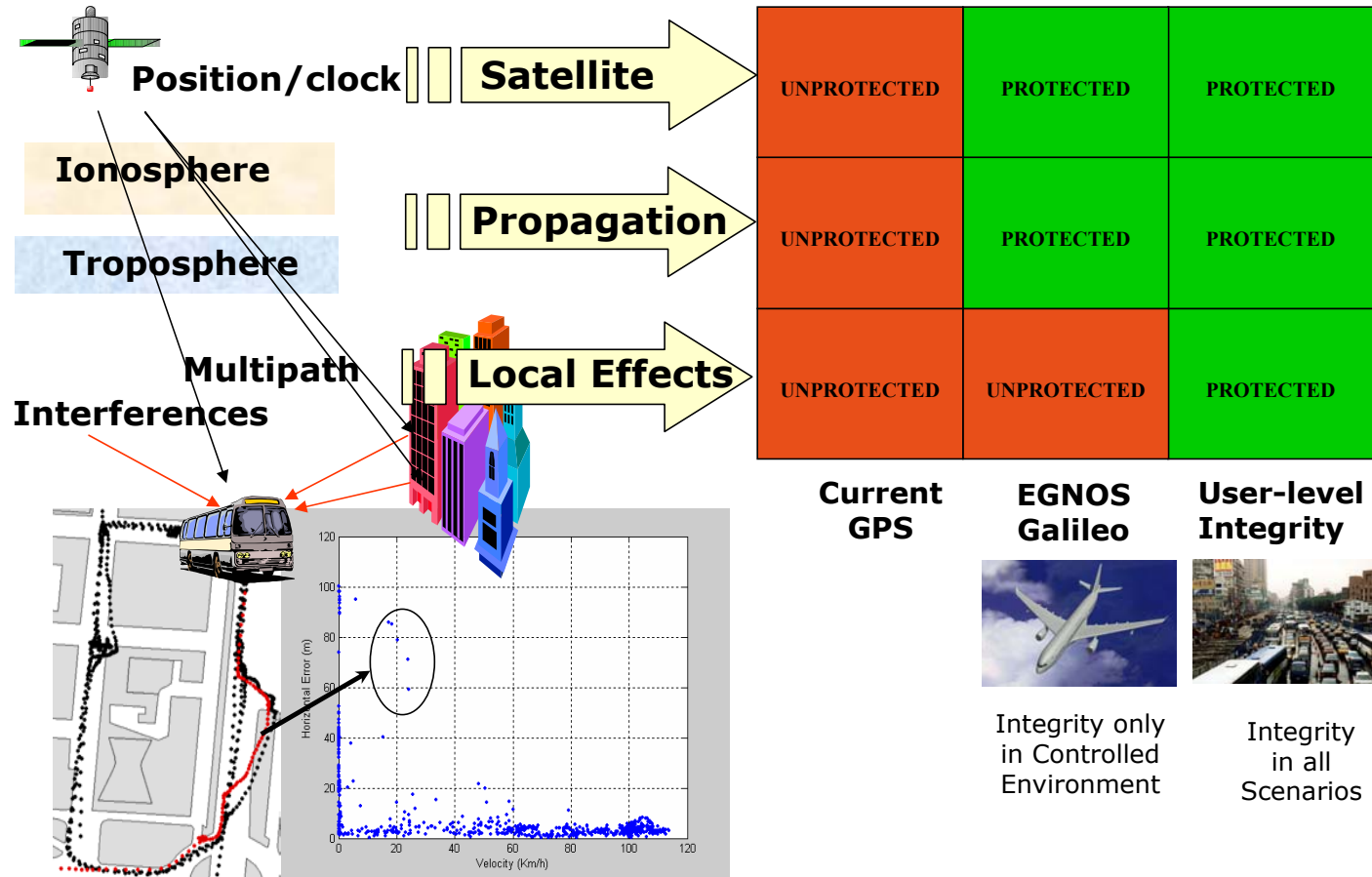


8 cm	18 cm
99%	100%

Accuracy (e.g. error at 95%)

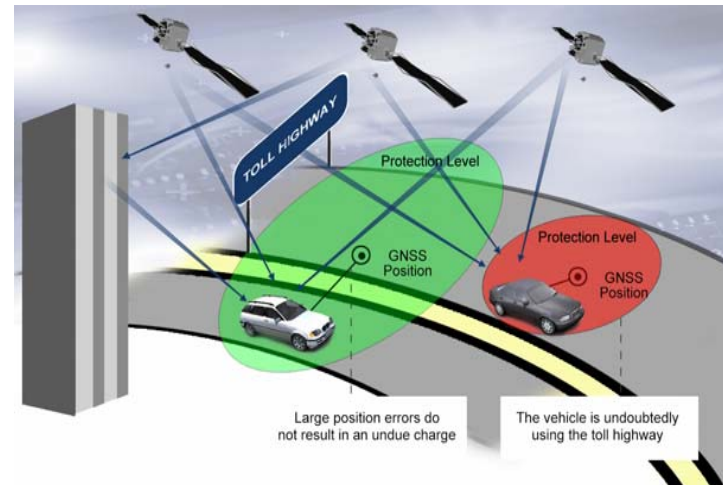
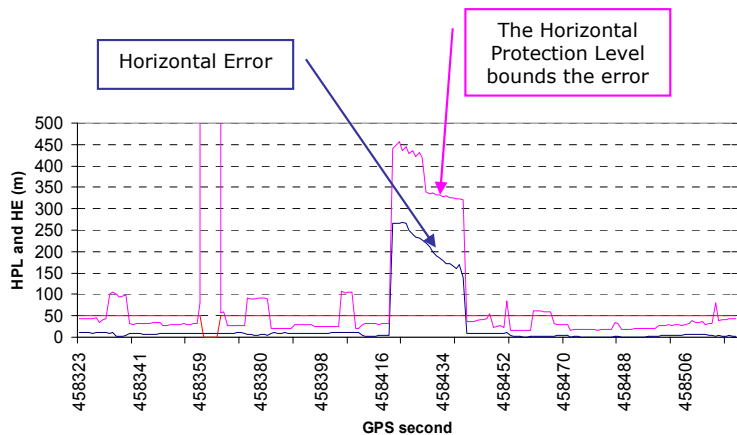
Integrity (percentage inside the yellow circle)

INTEGRITY IN URBAN ENVIRONMENTS



ADVANTIS TRIALS

- Legal Zone Restriction for Individuals
 - High social impact
 - Integrated Urban Traffic Management
 - European Transport Policy on a smaller scale
- Horizontal Protection Level bounds the Horizontal Error.
 - Provides guaranteed positions
 - Supplies the foundation for liability critical applications



TRAFFIC MANAGEMENT

Road Charging Application

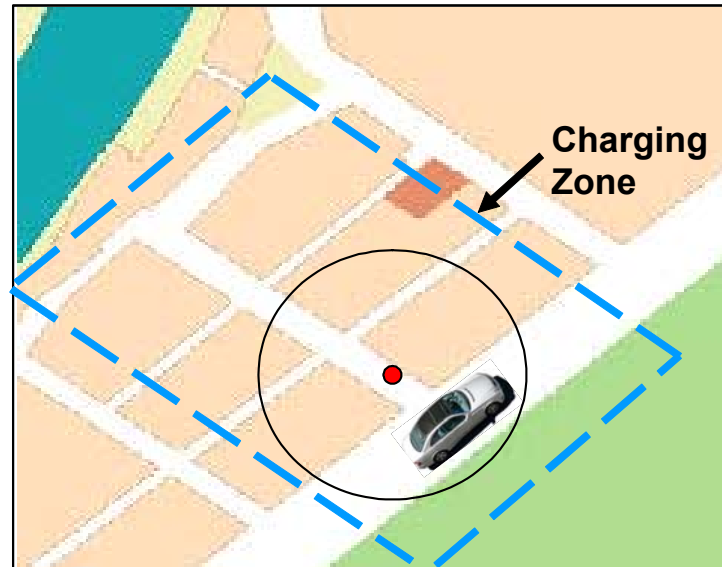
Road Charging is characterized by requirements on the correctness (integrity) of the user position, velocity and time to:

- Validate the application's correct performance in order to avoid loss of the provided service and revenues.
- To ensure that charging is computed correctly and in particular, that users are not charged if they have not used the service/infrastructure.
- Avoid spurious claims against the service provider by ensuring that the PVT data is recognized as a legal proof of application use.

CHARGING INTEGRITY

Horizontal Protection Levels

- Vehicle is detected to be in a zone (or street segment), and charged only when 2 (uncorrelated) PLs are inside this zone.
- This ensures charging integrity: probability of charging incorrectly $< 1 \times 10^{-7}$



ADVANTAGES OF CONGESTION CHARGING

- Reduce volume (congestion) of central roads
- Reduce traffic (time lost)
- Encourage use of alternative transport:
 - Public transportation
 - Walking
 - Bicycle, etc.
- Reduce accidents
- Reduce Contamination
- Without affecting local business (Use case: TfL)
- Generate revenue
 - E.g., to improve public services

ADVANTAGES OF USING GNSS

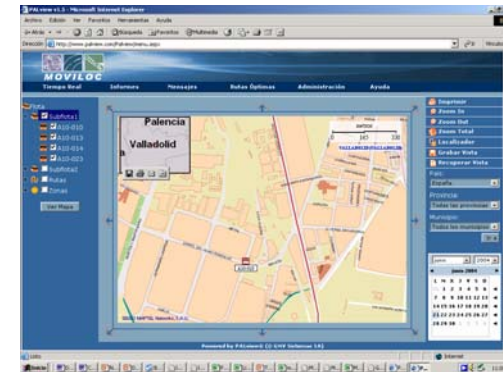
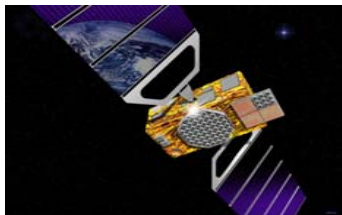
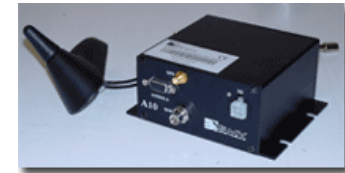
- Flexible: supports any mode of tariff
 - Variable in time and date
 - Based on time spent or distance travelled
 - Valid for cordon (congestion) or motorway schemes
- Supports instant changes to zone definition or tariff scheme
- Minimal ground infrastructure needed
- No visual impact
- Supports other value added services:
 - Insurance pricing (pay per use)
 - Driver assistance
 - Fleet management
 - Traffic information



**...Even so,
challenges still
exist...**

CHALLENGES FOR GNSS

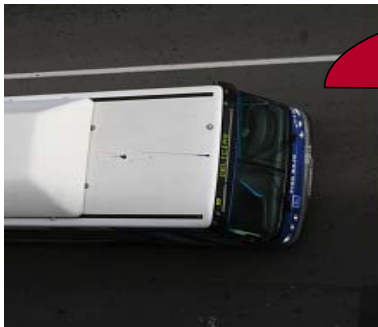
- On-Board Unit cost high
- Mechanisms for the occasional user
- Roaming (Interoperability)
- Availability: guarantee a high probability that a vehicle will be detected and charged
- Guarantee that a non-user will not be charged incorrectly ("Overcharging problem")
- Legal acceptance of the GNSS position as sufficient proof for a toll to be charged



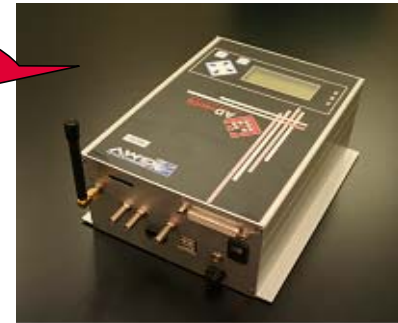
ADVANTIS URBAN CHARGING

Charging trial objective

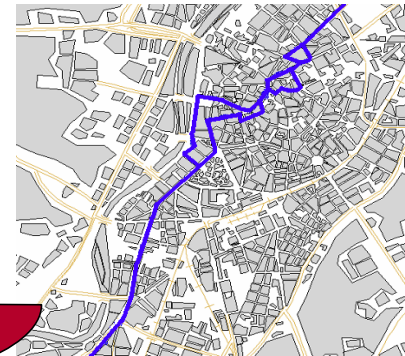
- Demonstrate charging performances for different Charging Areas and Environments.



Two ADvantis On Board Units



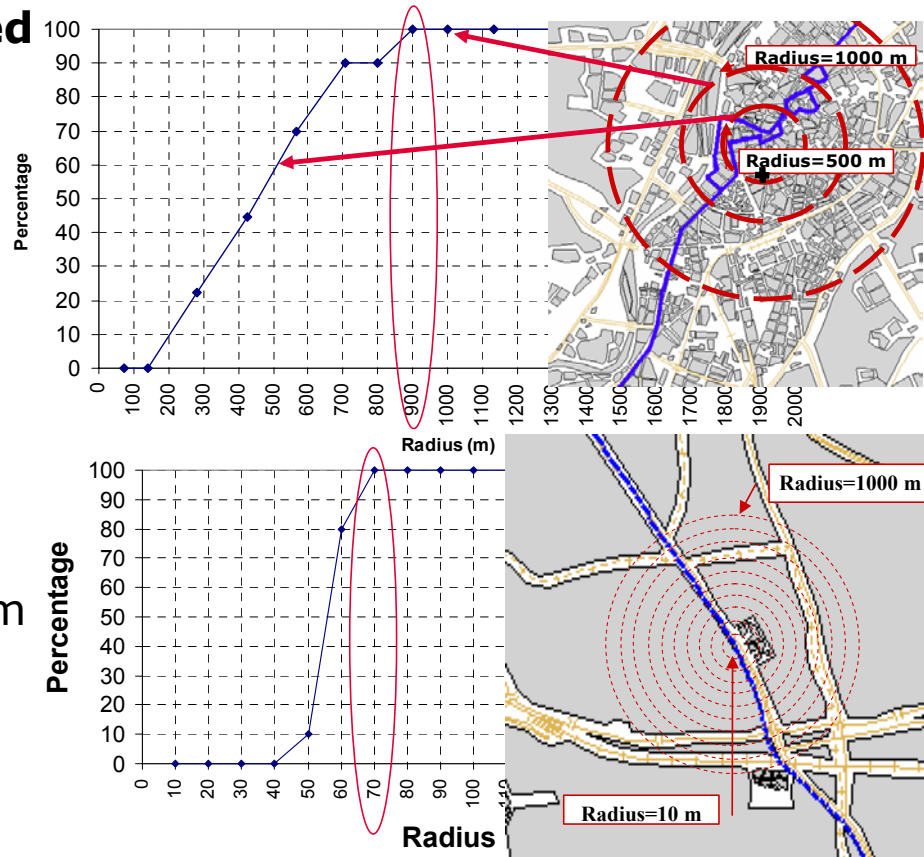
10 days of sample data, more than 17000 data points in urban environments



URBAN vs. OPEN-SKY RESULTS

No Mischarges Observed

- Urban Canyon Charging Availability 100% @ 900m
 - No false alarms
 - Position availability: 79,38%
 - Accuracy 95%: 18,56 m
 - Integrity availability (for HAL 300): 45,40%
- Open-Sky Charging Availability 100% @ 70m



ADVANTIS DEMONSTRATED

- Guaranteed Local Integrity a must for Liability Critical Applications
 - The key for the correct and successful implementation of road charging applications
- The integrity algorithms developed provide HPLs that satisfy both urban and highway road charging application requirements.
- More charging mechanisms/granularity will be enabled by the reduction in HPLs/combination with other integrity-based techniques
- Use of GNSS positioning data hinges on creation and enforcement of national and international legal and regulatory frameworks

CONCLUSIONS

CONCLUSIONS (I)

- Both projects met their initial objectives
 - Polaris is a handy platform for quick and flexible performance analyses being used by clients in Europe, USA and Asia that has evolved internally at GMV
 - ADvantis shows that integrity is the key to liability critical GNSS applications
- FP projects are co financed, therefore it is important to align the participation with the company research activities
- It is important to link the projects with the user community, ADVANTIS and POLARIS are clear examples of projects with a clear user orientation

CONCLUSIONS (II)

- From our perspective the main benefits of the FP mechanism are:
 - To improve the level of cooperation between European Industries
 - To support and promote research activities in many different fields
- Areas for improvement:
 - Too big projects, valuable research and development capable to produce IPRs is usually better handle in small well focused projects
 - The need to form large consortiums where the company with good ideas to start with new R&D risks to spread them and loose any chance to produce IPRs
 - Low support to potential users to incorporate new technologies, many developments end with the project end



Thank you

Miguel Romay Merino
GNSS Business Unit Director
Email: mromay@gmv.es
www.gmv.com



HARMLESS

Applications of the Satellite navigation within:

- . Emergency Management**
- . Humanitarian Aid**
- . Law Enforcement**

HARMLESS Overview

Objective:

Definition and promotion of GNSS based applications (with a focus on EGNOS & GALILEO) to these User Communities:

- Emergency Management (EM)
- Humanitarian Aid (HA)
- Law Enforcement (LE)

Harmless Consortium



HARMLESS is a 6th FP project handled by the European GNSS Supervisory Authority (GSA)



Development Status



- **Analysis phase finished**
Critical Analysis: Technical and regulatory framework;
User Communities analysis; priority applications selection
- **Implementation phase started July 2007**
Analysis of the priority applications
Demonstrations

Priority Applications

Humanitarian Aid:

Damage Assessment

IDP/refugees Camp Management

Security of Personnel

Urban SAR and SAR coordination

Global monitoring and tracking of aid shipments

Epidemiological Mapping



Emergency Management and Law Enforcement

General survey

Tracking and monitoring of dangerous cargoes

Team location during trials

Emergency resources management and route guidance

Increased safety

Improved Search and Rescue

Tracking in parole and probation

Suspect tracking

Bait activation system.



Implementation Phase

- Analysis of the priority applications (“mini Phase A”):
 - User consultation and Application requirements
 - Preliminary architecture
 - Market, cost/benefits and social benefits assessment
 - Regulations and standards
 - Demonstrations
- Strong focus on the implication of the user communities:
 - Consultation with the users to confirm interest and requirements
 - Demonstrations and HARMLESS Workshop
 - Dissemination of the results in workshops, congresses
- If some applications are identified as very beneficial, strong recommendations will be made to the EC for specific R&D projects.

HARMLESS Demonstrations

Law Enforcement

- GNSS for suspect and vehicle tracking

Emergency Management

- Resources management
- Flood Emergency Management
- Fire Emergency Management

Humanitarian Aid

- Damage Assessment

