



GIROADS

GNSS Introduction in
the ROAD Sector

GNSS APPLICATIONS IN THE ROAD SECTOR

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ROAD APPLICATIONS DEVELOPMENT

- **APPLICATIONS SURVEY.**
 - Identification of GNSS applications in the road domain.
 - Analysis of cohesion criteria and application grouping.
- **SERVICE ENABLER ANALYSIS.**
 - Technological enablers.
 - Non-technological enablers.
 - Feasibility analysis.
 - Open issues and main risks.
- **ACTION PLAN AND RECOMMENDATIONS.**
 - AG safety-of-life, AG liability-critical, AG non-safety & non-liability-critical.
 - EU perspective.
 - China perspective.



GNSS APPLICATIONS IN THE ROAD DOMAIN – IDENTIFICATION

- Research projects.
 - Gala, Galilei, Advantis,...
- Interviews with key stakeholders.
 - Highway operators, technology producers, disabled associations, specialized lawyers, urban transport Administrations,...
- Partners' contribution.
- Internal discussion.



GNSS APPLICATIONS IN THE ROAD DOMAIN – LIST

Road charging	Accident reconstruction
On-street parking pricing	Traffic management
Legal speed & environmental enforcement	Infrastructure management
Passenger transport management	Fleet management
Management and tracking of special vehicle classes	Emergency services
ADAS	Navigation and in-car information
Traffic information	Recovery after theft
Taxi service pricing	Road lighting management
Pay-per-use insurance pricing	Transport on demand
Tax collection	Car rental pricing
Livestock transport management	Transport and traffic monitoring for planning and research purposes
Information for vulnerable road users	



COHESION CRITERIA FOR APPLICATION GROUPING

- Objective: to find a criteria to group applications with common characteristics.
- Analysis of applications:
 - Existing provision of service for application and sub-applications.
 - Stakeholders.
 - Legal, commercial and safety implications.
 - Critical issues: technological, commercial, financial, institutional-political, social-cultural and legal.
 - GNSS technological requirements; communication requirements.



APPLICATION GROUPS

- AG Safety-of-Life.
 - Any safety implication.

- AG Liability-Critical.
 - Any legal or commercial (pay per use) implication.

- AG non-safety-of-life & non-liability-critical.
 - Non safety, legal or commercial implication.



AG SAFETY-OF-LIFE

- Safety-critical:
 - ADAS.
 - Emergency services.
 - Information for disabled road users (blind).



AG LIABILITY-CRITICAL

- Road charging.
- On-street parking pricing.
- Taxi service pricing.
- Pay-per-use insurance pricing.
- Legal speed enforcement and environmental enforcement.
- Tax collection.
- Car rental pricing.
- Accident reconstruction and identification of responsibilities.
- Management and tracking of special vehicle classes.
- Livestock transport management.
- Recovery after theft.



AG:

AG NON-SAFETY-OF-LIFE & NON-LIABILITY-CRITICAL

- Navigation and in-car information.
- Traffic information:
 - Road lighting management.
 - Infrastructure management.
 - Transport and traffic monitoring for planning and research.
- Information for vulnerable road users (not disabled)
- Traffic management.
- Fleet management.
- Passenger transport management.
 - Transport on demand.



AG SAFETY-OF-LIFE. Example: ADAS

- Collision warning systems, ISA, Lane Keeping, Automatic guidance,...
- Existing technology: GPS, radar sensors, ultrasonic sensors, camera,...
- Possible migration to GNSS due to safety implications (safety critical).
- Some opinions from interviews:
 - “It will probably take a long time to develop some of this applications”



AG LIABILITY-CRITICAL. Example: ROAD CHARGING

- Existing technology: man-made, DSRC, GPS,...
- Migration to GNSS due to commercial implications (liability critical).
- Advanced charging strategies.
- Stringent technological, legal, financial, commercial,... requirements.
- Legal framework partly available.
- Some opinions from interviews:
“In some countries, charging based on DSRC has been recently installed, meaning a great investments which operators wants to recover”



AG NON-SoL & NON-LC. Example: NAVIGATION AND IN-CAR INFORMATION

- Existing technology: GPS, GSM, RDST-TMC,...
- Possible migration to GNSS
 - Better performance for dynamic navigation.
 - As a result of “one OBU-multiple service”.
- Some opinions from interviews:
 - “Navigation already works quite well, although in some countries is not dynamic”
 - “Public-private partnership is not always possible”



MAIN OPEN ISSUES/RISKS

- Lack of certification for Galileo SoL Service.
- OBU capabilities to ensure position integrity.
- Lack of data error detection mechanisms.
- Standardization aspects.
- Possibility of loosing data due to OBU's malfunction.
- Interoperability with existing systems.
- Variability in Administrations support.
- Lack of definition about financial support.
- Lack of coordination between stakeholders.
- Ensure data privacy.
- Acceptance of GNSS position as legal proof.
- Liability scheme under negotiation.
- EU legislation to ensure across border enforcement.
- OBU factory installation.
- Availability of reliable and cost-efficient communication links.
- ...



ACTION PLAN – AG SoL

Technological level	Ensure availability/ integrity/ accuracy.
	Design efficient OBU
	Implementation of data error detection mechanisms.
	Improve availability of communication links.
Institutional – political level	Technical investigation for interoperability
	Provide Administration support
Commercial level	Promote standardization activity and define legal framework
	Coordinate stakeholders activity
	Ensure compatibility with current systems
Legal level	Development of certification legal framework.
Financial level	Set up a financial framework
Socio – cultural level	Ensure privacy guarantees
	Provide a satisfactory quality level



ACTION PLAN – AG LC

Technological level	Definition of EGNOS/Galileo capabilities.
	Promote and develop research to define technological enablers.
	Design OBU in coherence with Directive 2004/52/EC
	Consider insurance companies requirements.
Institutional – political level	Technical investigation for interoperability
	Provide Administration support.
Commercial level	Promote standardization activity and define legal framework
	Coordinate stakeholders activity
	Ensure compatibility with current systems
	Develop market analysis activities
	Establishment of contractual information system to prevent fraudulent use of OBU
	Guarantee of standardization and multi-functionality for insurance pricing applications.
Financial level	Set up a financial framework
Legal level	Promote standardization activities.
	Development of certification legal framework.
Socio – cultural level	Ensure privacy guarantees
	Provide a satisfactory quality level



ACTION PLAN: EU PERSPECTIVE

FIELD	ACTION PLAN
Technological	Definition of EGNOS / Galileo technical capabilities.
	Consolidate Galileo products.
	Consolidate regional integrity concept.
	Establish a technical solution to get a satisfactory service availability and accuracy.
	Ensure GNSS interoperability.
	Promote and develop research to improve the availability of communication links.
Institutional - political	Guarantee EGNOS qualification for liability-critical and safety-of-life services.
	Promote technical investigation to identify interoperability requirements.
	Promote acceptance of GNSS technology.
Commercial	Provide administration support for the development of gnss based services.
	Promote integration of GNSS technology in vehicles.
	Coordinate stakeholders activities.
	Ensure compatibility with current systems.
	Standardisation and certification.
Legal - regulatory	Establishment of a European contractual information system to prevent fraudulent use of OBU.
	Development of legal framework for data privacy and reliability
	Define EU enforcement criteria.
	Development of legal framework that recognises data as evidence in courts of law and against fraudulent claims.
Financial	Undertake regulatory actions required for specif applications.
	Secure funding for Galileo and EGNOS.
	Set up a financial framework, considering public and private support
	Enable distribution of infrastructure costs.
Socio - cultural	Promote the advantages of the single device / multiple services concept.
	Consider users' demands in the definition of services.
	Ensure the provision of a satisfactory quality level for services.



CHINESE PERSPECTIVE

- Interviews with relevant stakeholders in Beijing.
- Road and legal framework available.
- Applications map in China.
 - Many services already provided.
 - Others almost inexistent (insurance,...).
- Feasibility analysis: some differences (banks, private property, external companies,...)
- Recommendations:
 - Enhance cooperation Europe-China.
 - Support research, development and application.
 - Establish standards.
 - ...



CONCLUSIONS

- Improvement of existing applications; new applications, in many cases not possible with the existing technologies.
- Enablers are more stringent for AG SoL & AG LC.
- Similarities in recommendations and action plans.
- Consider users' demands (users packages) for market analysis.
- Similarities in China (technology); differences in institutional and legal framework.



Thank You for Your Attention!

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