



Dangerous Goods
Transportation Routing,
Monitoring and
Enforcement



European Inter-
Disciplinary Research
on Intelligent Cargo for
Efficient, Safe and
Environment-friendly
Logistics

With the support of:



Smart Freight Transport in
Urban Areas



Road Map for Radical
Innovations in European
Transport Services

ICT in Transport Logistics Workshop

GOOD ROUTE project

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Information Society
Technologies

The need (1/2)



2.4 meters even a limit for LCVs



- Large quantities of DG are being transported in an uncontrolled environment (transportation network) on a daily basis.
- Accident consequences of simple collisions can lead to further undesirable scenarios like:
 1. Fires (jet fire, pool fire, flash fire)
 2. Explosions (Boiling Liquid Expanding Vapour Explosion – BLEVE, Vapour Cloud Explosion – VCE)
 3. Gas Cloud Formation (toxic release)
- Such catastrophes may happen at any moment, anywhere in Europe and pro-active action is required to guarantee citizens safety and security throughout Europe (see PRESTIGE accident).
- The accident of an articulated DG truck (driven to the ditch) costs approximately 600.000 Keuros (including all types of costs).
 - If a traffic/weather information system can prevent such accidents or increase the awareness of the driver, the reduction of the expenses is obvious.

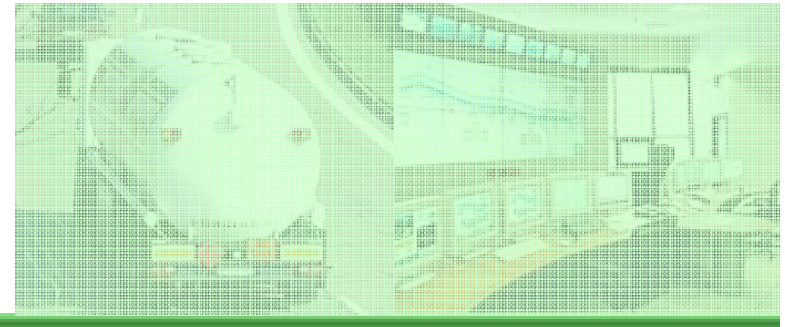
The need (2/2)



- Emergency services are not always as efficient as they should be due to the lack of the relevant know-how of the personnel with regard to the DG accidents mitigation.
- There are often restrictions for DG transportation concerning specific regions and roads, especially in densely populated areas (i.e. in Greece).
- DG trucks may be used also for other purposes, like terrorism; so the company needs to know exactly where they are during their whole travel and, of course, which is the route with the minimum cost.
- Societal risk seems to be of great importance, also for the companies' profile. Companies need to convince on security provision and social sensitization. Thus, are, in general, keen in avoiding sensitive areas and vulnerable populations.
- Obvious need for less vehicles, less mileage and low cost trips.



Current Situation



- The estimated average time that needs to be allocated for the check of each vehicle in tunnels is about 2 hours (1,16 € corresponds to each working hour of the enforcement personnel in Italy). Current vehicles control leads to interruptions of the traffic flow and thus big delays in the DG vehicles routes.
 - On the other hand, the followed methods do not guarantee 100% safety, since the check of all vehicles passing through special infrastructures is not feasible.
- Incidents mitigation is rather slow and long, road traffic is interrupted, creating delays and congestion in the traffic environment.
- In case of an incident occurrence, adverse weather conditions (e.g. snow, ice, etc.) or road works that lead to traffic interruption, and in absence of prior notification, the driver has no other option than to stay all night long or too many hours and wait to leave after the traffic recovery.
- Even if the vehicle is able to continue its travel, there are not specific instructions for re-routing cases; the driver does not know what is the next most preferable route; some of the drivers have purchased an on-board navigation system to assist them with route planning, which is often hard and time consuming.

GOOD ROUTE: Dangerous Goods Transportation Routing, Monitoring and Enforcement



GOOD ROUTE aims to develop a cooperative system for dangerous goods vehicle routing, monitoring, re-routing (in case of need), enforcement and driver support, based upon dynamic, real time data, aiming to minimise the Societal Risks related to their movements, while still generating the most cost efficient solution for all actors involved.

Project acronym	GOOD ROUTE
Contract Number	IST-4-027873-STREP
Programme	FP6-2004-IST-4
Strategic Objective	2.4.12 <i>eSafety – Cooperative Systems for Road Transport.</i>
Date of start	01 January 2006
Duration	36 months
Total Cost	4.887.402,00 €
EC Project Funding	2.800.000,00 €



14 Partners from 6 countries

Developers: CERTH (ITI + HIT), USTUTT, ICCS, UPM/LST, COAT.

OEM's: CRF, IVECO.

Suppliers: PTV, SIEMENS, TID.

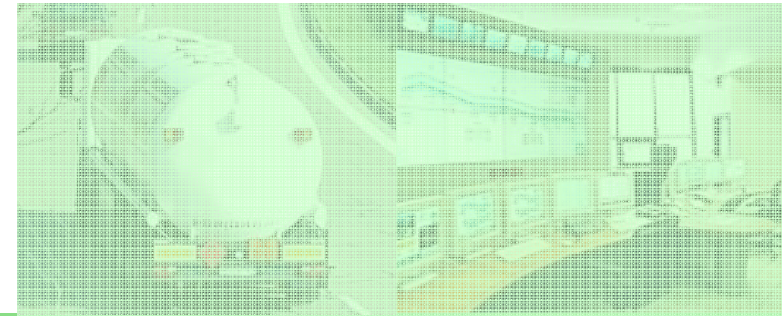
Road operators: SITAF, FINRE, GST, ELPA.

Main targets



- To meet social demand for acceptable risk levels and safety maximisation in the transportation of DG.
- To create a decision support and routing procedure commonly concerted by the very large and very small enterprises, taking into account equity schemes.
- To provide real time and dynamic data to the DG logistic chain, thus maximising the efficiency of transportation and reducing its cost.
- To establish a low-cost and high-reliability monitoring and enforcement system for DG vehicles.
- To establish pan-European cooperation in monitoring and controlling DG movements.
- To reduce congestion and other problems due to DG vehicles by controlling their numbers and types at any given part of the network at any moment.
- To enhance public awareness and acceptance regarding safe and secure transportation of DG.
- To create a standardised ontological framework for DG classification, monitoring and control, that will optimise the use of the network by such goods carrying vehicles, while always, protecting public safety.
- To develop application guidelines and training schemes that will rationalise and optimise DG transportation.

Main project objectives



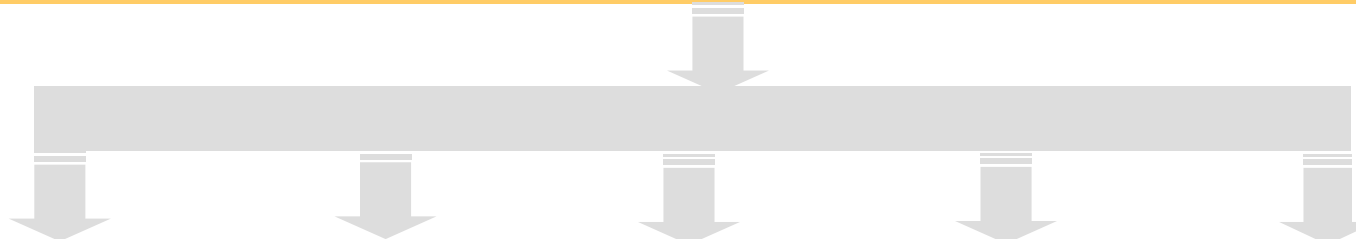
Analysis of DG accidents and needs of all involved actors



Use Cases & specifications



Ontological classification framework on the driver, the vehicle, the cargo, the environmental conditions, logistics chain nodes, etc.



Collaborative platform, able to gather and process in real time vehicle, cargo and environmental data.



Minimum risk guidance system for routing and re-routing of DG vehicles, taking into account individual and societal risks & conflict resolution and equity schemes.

Control Centre algorithms dealing with movements of all participating DG vehicles, which will provide traffic and environmental data to drivers and inform in real time the logistic chain for any unscheduled re-routing required.



On-board automatic data retrieval and storage system, to monitor key dangerous goods vehicle parameters and supply them to local nodes for enforcement purposes.

Optimal user interfaces for the DG vehicles drivers and the control centre operators, without adversely affecting their workload or causing unnecessary behavioural adaptations.

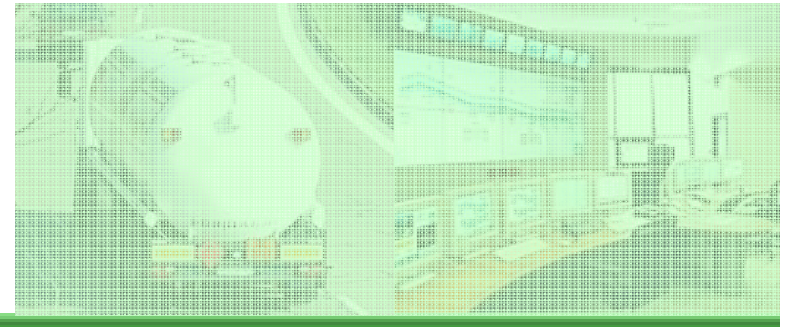
Integration in a prototype vehicle and evaluation in three Pilot sites across Europe, to evaluate their reliability, usability, successfulness, cost efficiency and thus estimate their potential safety impact and viability.

Involvement of all key actors in the DG transportation chain.



Viable business strategy for wide and quick diffusion of the system.

Main Use Cases



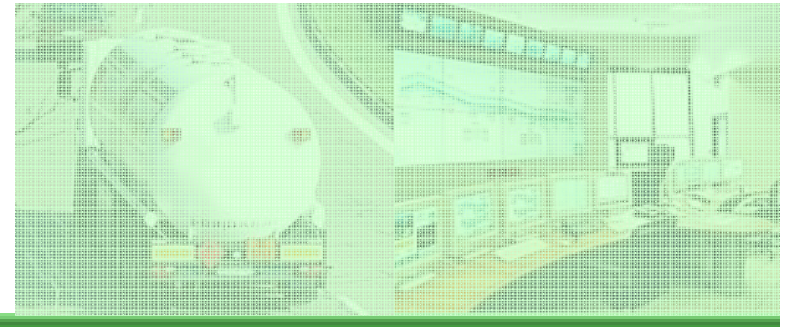
- UC1: "Passport"
- UC2: "Route guidance"
- UC3: "Environmental-related re-routing"
- UC4: "Business-related re-routing"
- UC5: "Enforcement"
- UC6: "Logistics"
- UC7: "Emergency"
- UC8: "C2C communication"
- UC9: "Critical info"

Priority types of infrastructure



- Tunnels (both urban and highway)
- Bridges
- Ferry lines and harbors
- Peri-urban motorways of big cities
- New roads of high speed
- Entry points to a state and especially to the EC (i.e. borders with Albania, Bulgaria, Turkey, etc.). *Albania and Turkey do not apply ADR systematically and Bulgaria applies it non-optimally. However, Yugoslavia and its former countries seem to apply it successfully.*

GOOD ROUTE stakeholders



End users: Safety advisors/trainers, drivers, driver's unions, fleet owners/managers, road operators, special infrastructure operators (tunnel, bridge, etc.)

Citizens representatives: Automotive clubs, journalists

Automotive industry: OEM's, ADAS/IVICS, sensors and communication devices developers, digital maps providers and middleware service providers

Research community: Universities, research institutes

Public administrations organisations & networks: National transport authorities, municipalities, EC directorates and working Groups (e.g. eSafety WGs)

Standardisation bodies: ISO, CEN, UN-ECE , EU Action Group for DG tracking/tracing

Other related European projects: I.e. CVIS, SAFETUNNEL, SMARTFREIGHT, ROADIDEA, EURIDICE, ...

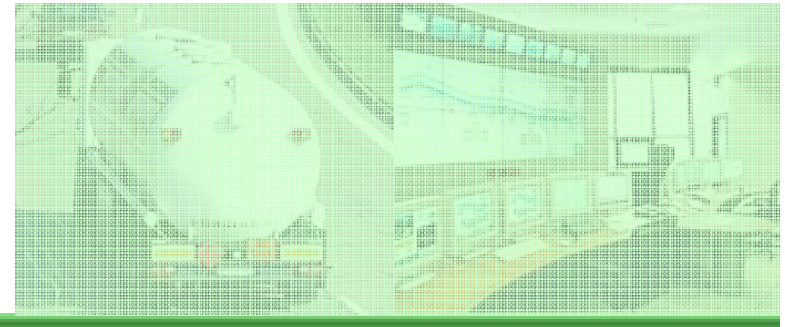
Innovation



- **New Navigation and Route Guidance technology:** “Safest route”
- **TMC Services:** “New, common ontology for DG, involving real time all actors”
- **Enforcement systems:** “Local/central node based system eliminating the need for stop and control”
- **Cooperative system for DG transportation:** “V2I, I2V, V2V and autonomous systems integration”
- **Risk Analyses methodologies and DSS:**

Characteristic	GOOD ROUTE	Quantitative Risk Analysis Software	Route Guidance Systems
GIS back-end	✓	✓	✓
Quantitative Risk Assessment	✓	✓	x
Evaluation of Risk measures (Individual & societal risks, F/N curves etc.)	✓	✓	x
Vehicle Routing Optimization	✓	x	x
Minimum Risk Routing	✓	-	x
Use of real time traffic data	✓	x	x
Use of local road characteristics	✓	x	x
Use of local weather statistical	✓	✓	x
Use of real time weather data	✓	x	x
Consideration of broader needs of society	✓	✓	x
Conflict resolution among actors involved	✓	Possible	x

European Added Value

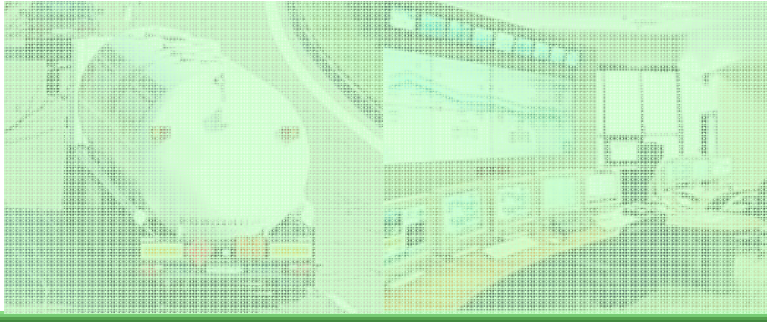


The problem of Dangerous Goods safe transportation is not a local one, but one that goes beyond national boundaries and requires pan-European actions, since:

- Only through pan-European common ontologies can the movement and cargo of such vehicles be monitored and enforced.
- OEM's and sensor/telecom suppliers may provide viably the necessary solutions only within the range of the European Market.

The major innovation and impact of GOOD ROUTE is that it will make European infrastructure (roads, tunnels, bridges, etc.) safer by minimum risk, supported and enforced routing / rerouting of dangerous goods vehicles instead of the arbitrary and unguided practices of today.

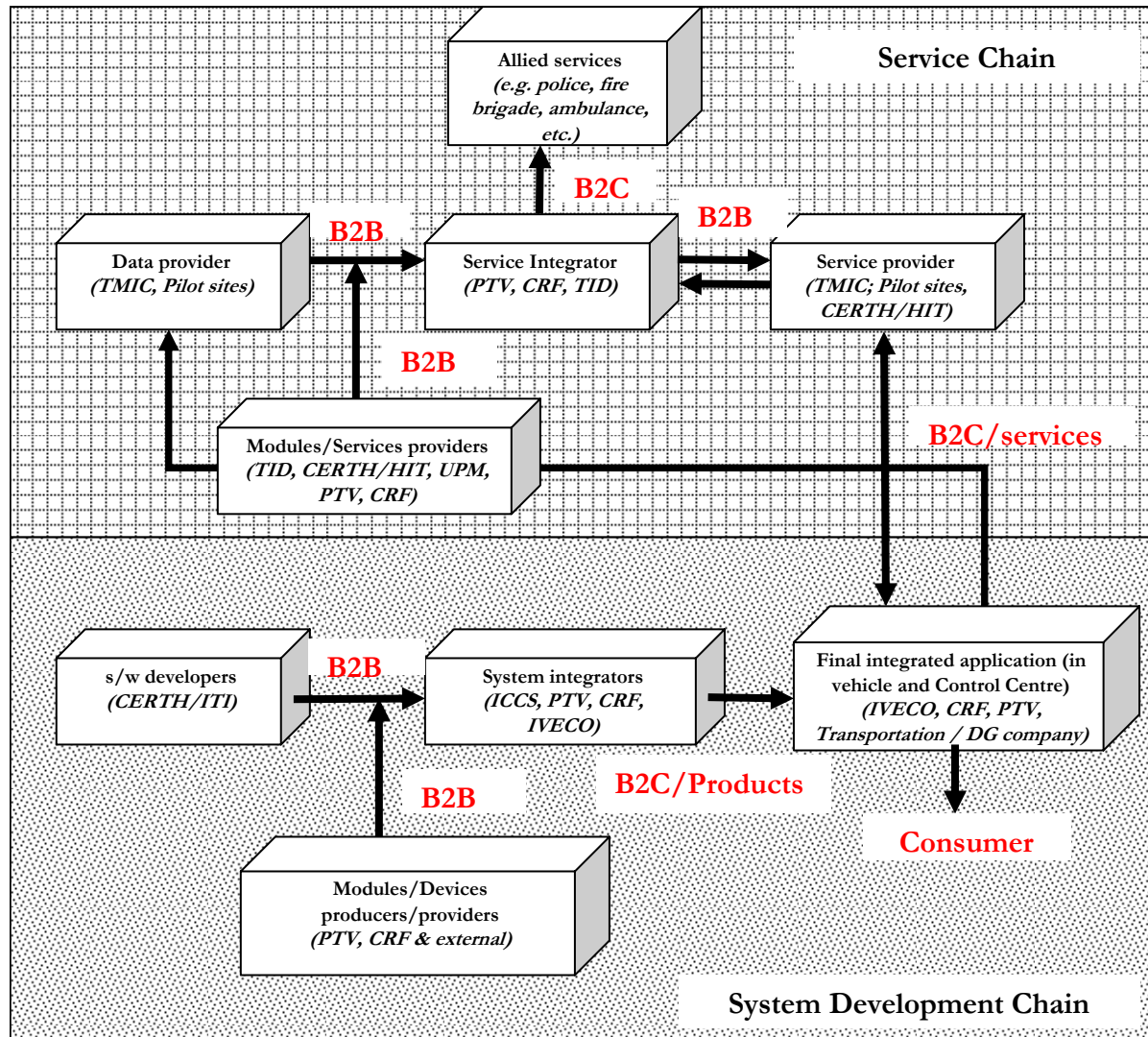
Benefits for the industry & Vision in truck transport



		Truck Navigation	Strategic Optimisation	Routing/ Dispatching
Cost saving	→ avoid damage and detours increase average truck size	✓	✓	✓
Safety	→ avoid severe incidents at regular bridges and railway bridges	✓		
Planning efficiency	→ as detours can be planned in advance, vehicle routing is optimized		✓	✓
Customer service	→ delivery time slots can be more precise		✓	✓
Environmental issues	→ hazardous goods can be kept away from potential accident sites and water contamination	✓		✓



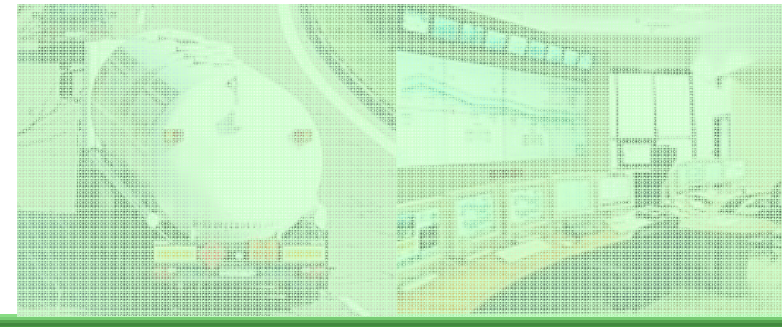
GOOD ROUTE value chain



3 business cases are proposed for the exploitation of the GOOD ROUTE system:

- **Business Case 1:** Voluntary use for internal purposes.
- **Business Case 2:** Voluntary use with additional benefits.
- **Business Case 3:** Mandatory use.

GOOD ROUTE Exploitation Roadmap



GOOD ROUTE Product	Year 1 (January 2006-December 2006)	Year 2 (January 2007-December 2007)	Year 3 (January 2008-December 2008)	1 st Year after the end of the project (January 2009-December 2009)	2 nd Year after the end of the project (January 2010-December 2010)
Minimum Risk Route Guidance System	Prototype phase		Product phase	Product phase	Product phase
QBU	Prototype phase		Product phase	Product phase	Product phase
Semantic Service Network and Control Centre data Fusion algorithms	Prototype phase		Product phase	Product phase	Product phase
Control Centre and Logistic chain support modules	Prototype phase		Product phase	Product phase	Product phase
Enforcement System	Prototype phase		Product phase	Product phase	Product phase
QR vehicle demonstrator	Prototype phase		Product phase	Product phase	Product phase
QR integrated system and service	Prototype phase		Product phase	Product phase	Product phase

