RESOURCE ALLOCATION IN DANGEROUS GOODS TRANSPORTATION ENVIRONMENTS

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Safety as a key priority

- Improving safety is an EC priority
- Thousands of trucks circulate every day within European roads.
  - The transportation of dangerous goods involves risks and potential harm to trucks’ driver and population.
- Any action aiming to reduce accidents is considered of great importance.
Intelligent transport systems (ITS)

- ITS improves transportation safety and mobility through the integration of advanced communications into the transportation infrastructure/vehicles.
- ITS are multi-agent systems using diverse factors (traffic, weather, road conditions, driver behaviour, etc.)
- ITS are being developed to help the driver to avoid or reduce accidents.
GOOD ROUTE aims to develop a cooperative system for dangerous goods vehicles routing monitoring, re-routing (in case of need), enforcement and driver support, based upon dynamic, real time data, in order to minimise the Societal Risks related to their movements, whereas still generating the most cost efficient solution for all actors involved in their logistic chain.

- 13 participants: CERTH (coord.), CRF, IVECO, PTV, UPM, TID, GST, SITAF, COAT, USTUTT, ICCS, ELPA, FINRE
- Duration 2006-2008
GoodRoute Architecture

Mobile Navigation

On Board Unit

TRUCK INFRASTRUCTURE

GOOD ROUTE CONTROL CENTER

CONFLICT RESOLUTION

DATA FUSION

DSS

GIS

External Data Sources

Weather Data

Traffic Data

HTTP SOAP/XML

GPRS

BT

CAN/BUS

GOOD ROUTE PORTAL

HTTP XML

GOOD ROUTE PORTAL

HTTP XML

TRUCK INFRASTRUCTURE
Conflicts in general

- In a perfect world there are not any conflict. The road is ours!
- But we are living in a real world with limited resources
Conflicts involving DGV’s

- Conflicts are produced when some DGV’s require simultaneously routing through infrastructure, exceeding maximum capacity.
  - Route planning level

- Also when some road segments are temporally blocked or closed.
  - Real time monitoring level
Snapshot of the problem
Data Inputs to the module

- **Historical**
  - From public or private sources (traffic density, segments capacity, etc).

- **Real time data**
  - Traffic incidents & weather information

- **Information coming from enterprises, authorities and user groups.**
  - Trigger decision rules motor and influence on the output of the module
CRM approach (I)

- An heuristic approach is used to solve the problem of accumulative traffic and the fixed capacity of some parts of the system.
- CR Module tries to reduce problem complexity using a step by step methodology:
  - Detection of possible conflicts, classification, and resolution.
CRM Subtasks

- Checking link incidents in the infrastructure
- 1st classification: Routes with & without capacity problems.
- Clustering routes according to links with problems & arrival time.
- 2nd Classification: Using link capacity
- 3rd classification: Using arrival time and DGV company.
CRM Architecture

1. Route query: A → B
2. Conflict query:
   A...
   ....
   ... B
3. Input
4. Query conflict company
5. Get link data:
   - Company
   - Link capacity
   - Updated traffic on links
6. Periodic update queries (1 min)
7. Algorithm
8. Conflict/no conflict
9. Conflict response
   (N)OK

Control Center:
- Company query & response
- Periodic update queries (1 min)

Web Service CR:
- Conflict query
- Conflict resolution module (CRM)

WS Client:
- Company query
- Route query

WS Server:
- Updated traffic on links
- Link capacity
Implementation

- CRM module is implemented in C language with external interfaces by Web Services built using Tomcat, Axis2 and Java.
- It has been implemented in computers using Windows XP and Ubuntu Linux O.S.
Route Query Example

- Example of a route query to the CRM (with real data)
  
- Output from the CRM:
  - There are links with problems -> re-routing
Conclusions

- In this paper the Conflict Resolution Module has been shown.
- CRM is part of GoodRoute project System Architecture.
- The main goal of GoodRoute project is reducing the societal risks caused by DGV’s in Europe generating the most cost efficient solution.
THANK YOU!

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