RESOURCE ALLOCATION IN DANGEROUS GOODS TRANSPORTATION ENVIRONMENTS

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Geneva, 5-7 March 2008

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Safety as a key priority

- Improving safety is an EC priority
  - (2003-2010 European Road Safety Action Programme).
- 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.

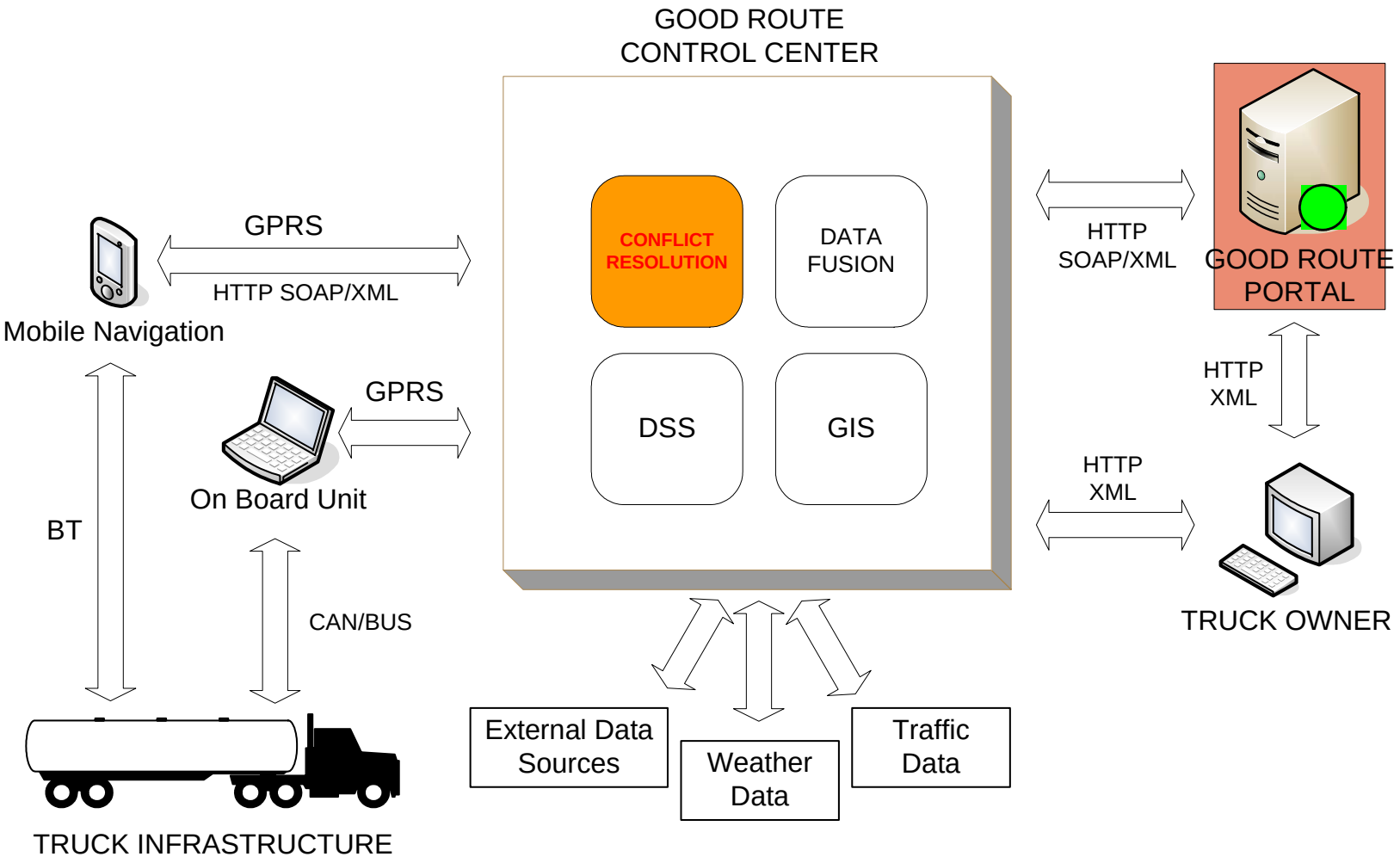
GoodRoute Project

- STREP Project FP6-2004-IST 4

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



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

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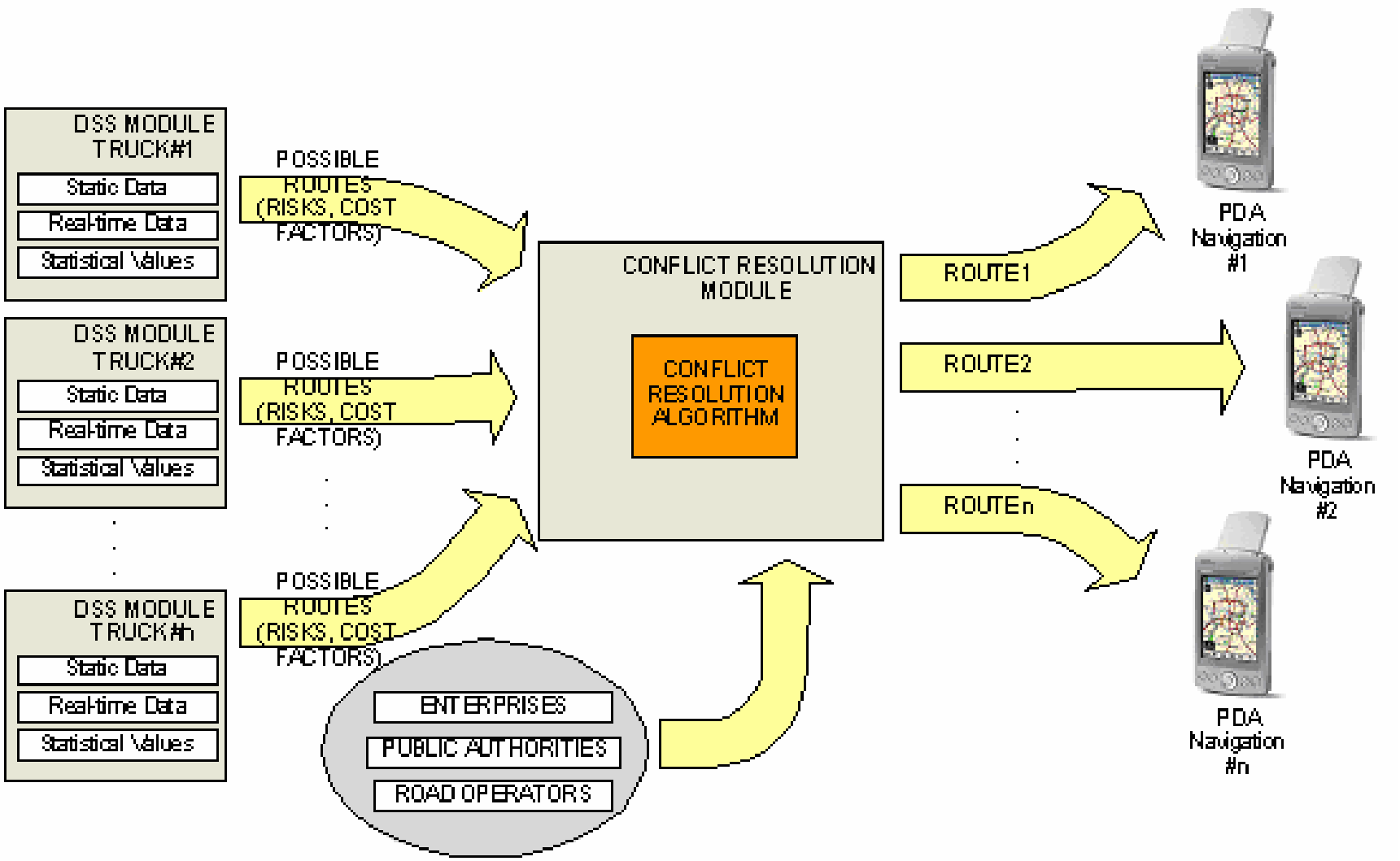
Conflicts involving DGV's

- 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

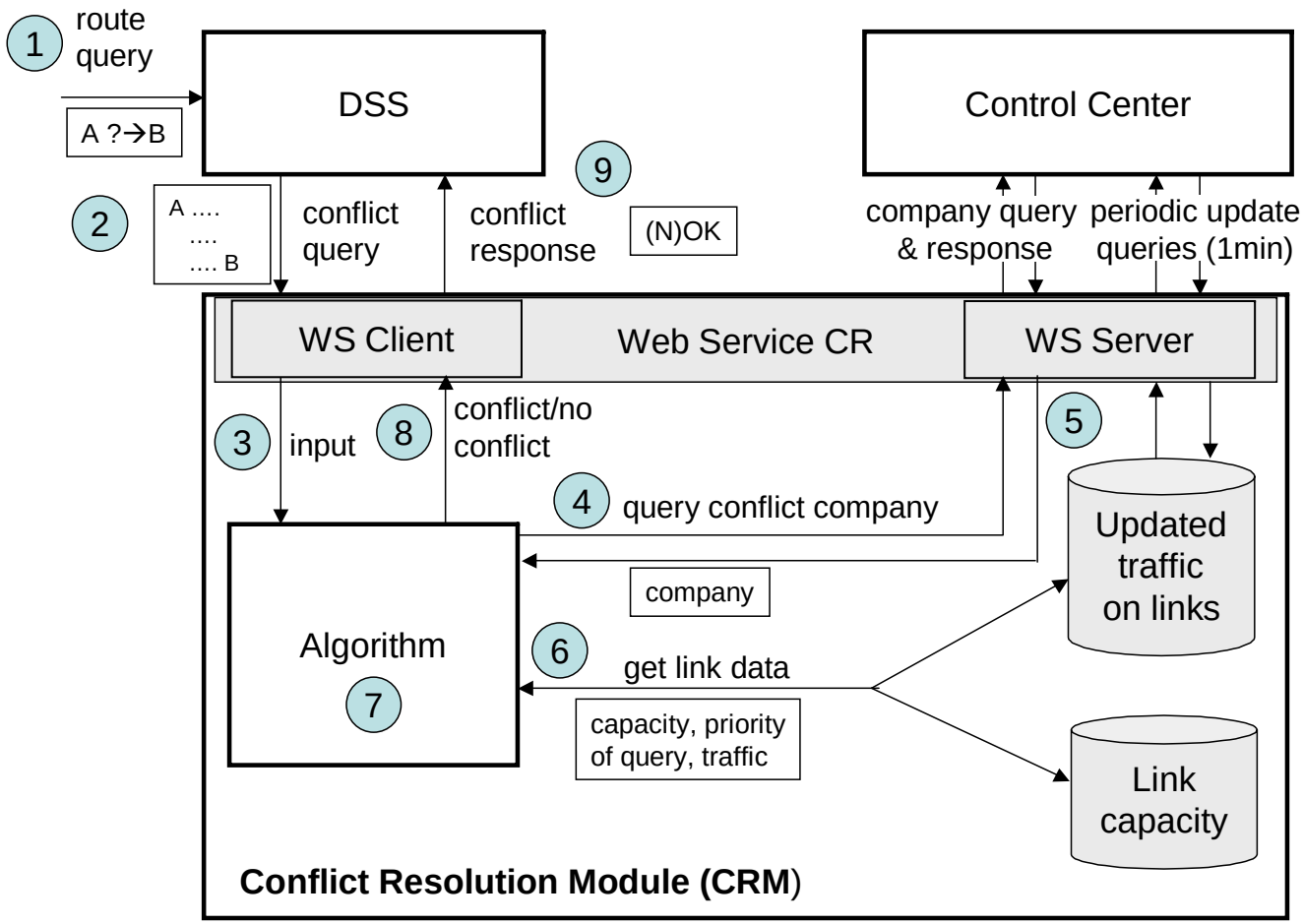
CRM approach (I)

- 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



Implementation

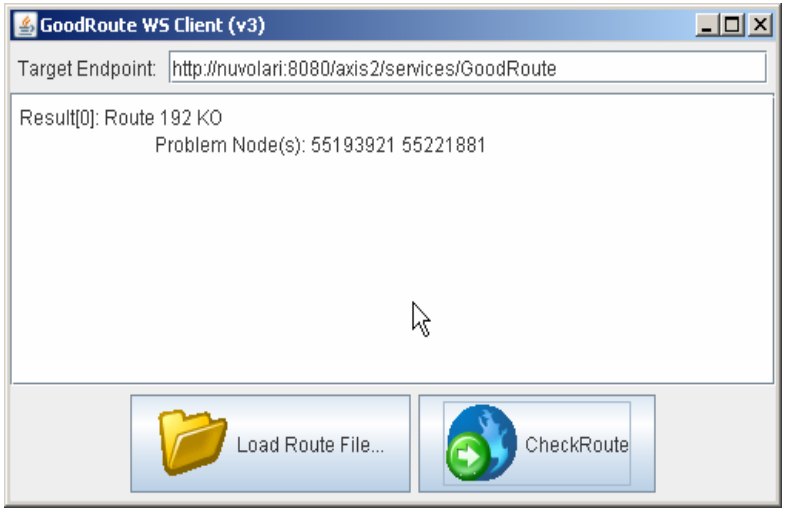
- CRM module is implemented in C language with external interfaces by Web Services built using Tomcat, Axis2 and Java.
- It has been implemented in computers using Windows XP and Ubuntu Linux O.S.

Route Query Example

- Example of a route query to the CRM (with real data)

```
222
192
15 nodes
   0: 01/01/2007 00:00:00   336     55199750
   1: 01/01/2007 00:02:47   337     55214682
   2: 01/01/2007 00:04:39   344     55193921
   3: 01/01/2007 00:07:33   325     55221617
   4: 01/01/2007 00:08:40   327     55221616
   5: 01/01/2007 00:13:16   263     55193879
   6: 01/01/2007 00:13:33   264     55221644
   7: 01/01/2007 00:15:06   265     55221645
   8: 01/01/2007 00:15:13   266     55221828
   9: 01/01/2007 00:15:47   267     55221829
  10: 01/01/2007 00:16:01   268     55221830
  11: 01/01/2007 00:21:19    26     55221880
  12: 01/01/2007 00:21:56    29     55221881
  13: 01/01/2007 00:22:05    30     55221882
  14: 01/01/2007 00:22:17    31
```

- Output from the CRM:
  - There are links with problems-> re-routing



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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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