PROJECT

OMNI

Open model for network-wide heterogeneous intersection-based transport management

Funding: European (5th RTD Framework Programme)
Duration: Mar 2000 - Feb 2003
Status: Complete with results

Background & policy context:

Traffic managers in Europe face the problem of protecting their investments in telematics infrastructure. Using new applications or even introducing new features to existing systems very frequently forces traffic authorities to make -once more - new investments and replace legacy infrastructure, in many cases while it is still fully operational. OMNI addresses this problem by facilitating the re-use of legacy infrastructure by new transport telematics applications.

To that end, the project develops a network-wide, intersection-driven transport management model. The model acts as an intermediate layer that isolates the actual network infrastructure from the applications that are using it. The project models the existing components in the network considering both their physical characteristics and their functionality. The model presents standard interfaces to the objects of the network, allowing the integration of advanced telematics applications or new devices in a pre-existing network infrastructure. The model is implemented in the form of two prototypes composed by a set of technical specifications and a software product for exploitation.

Objectives:

The objectives were to develop a network-wide, intersection driven model: this will act as an intermediate layer which isolates the actual network infrastructure. OMNI models the components existing in the network (e.g. sensors, lanes, local controllers) considering both their physical characteristics and their functionality. The building blocks of this model are individual heterogeneous intersections.

Demonstrating this model in two prototypes, which will be composed by a set of technical specifications and a software product for exploitation.

OMNI builds a consistent view of all the diverse intersections forming the network and their related traffic components and a smart integration of different applications and devices in pre-existing network infrastructures. It also addresses testing the flexibility of the model by the integration within a number of traffic networks using advanced video-based sensors for surveillance and traffic control. There will be a set of transport telematics applications, namely surveillance, advanced traffic control systems, and end-user transport information on the web.

The openness of the model is tested with respect to diverse user requirements and traffic infrastructures in four test sites: Alicante, Milano, Chania and a virtual test site in Paris.

Methodology:

The work begins with a review of the state-of-the-art. Relevant users are identified and classified and a questionnaire distributed among them in order to extract relevant information about their main needs and requirements. Local authorities, traffic system manufacturers, traffic operators and end users (drivers) are contacted, when possible meetings with these users will be conducted in order to get a more complete appreciation of their needs.

The main system requirements and socio-economic constraints are extracted as conclusions from both user requirements and current system capabilities. The task also includes defining preliminary methods and indicators for the evaluation of the system. User requirements are then translated into technical
specifications of the system as a whole and of the individual modules. An accurate analysis of the
evidenced user needs and system requirements is the next step.

The final result is a system architecture design that uses the UML Methodology. The development of the
project's first prototype is done on the basis of the previous analysis and design work. This comprises
the implementation and integration of all project modules.

An evaluation plan defines the evaluation methodology to be used in the project. The development of
the first prototype is tested in a laboratory. Issues such as the integration of modules, the compliance of
the operation of the system with the technical specifications, the reliability, communications, etc., are
assessed.

On the basis of the first prototype, the project's final prototype is implemented: specific developments
are made in each evaluation site, in order to adapt the system to the site characteristics and to enable
its further installation and evaluation.

The Final Prototype is evaluated in four pilot sites: Alicante (ES), Milano (IT), Chania (GR) and a virtual
site representing the city of Paris (FR). The different traffic infrastructures and user requirements of
these sites validate the openness of the model, and the use of different traffic management
architectures (centralised, distributed) validates its flexibility.

**Parent Programmes:**
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**Partners:**
Co-ordinator: ETRA Investigation y Desarrollo S.A. (Spain)

Partners:
- France: CITILOG; IFSTTAR  
- Greece: Technical University of Crete; Municipality of Chania;  
- Italy: Project Automation SpA; Mizar Automazione SpA; Comune di Milano;  
- Poland: Towarzystwo Przetwarzania Obrazow;  
- Spain: Ayuntamiento de Alicante;  
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**Key Results:**
OMNI has demonstrated the feasibility of integrated deployment of advanced Intelligent Transportation
Systems and Applications, overcoming the legacy constraints imposed by existing infrastructure, and
developed a network-wide intersection-driven model which is generic, open and flexible.

Based on COM technologies, the technological approach followed for the implementation of the OMNI
model facilitates the adoption of standard communication protocols, independence from operating
systems; high level of scalability; and a distributed architecture.

The OMNI model is therefore able to carry out the following functions:
- managing information exchange among all the components of the model,
- monitoring of the physical status of the different devices (local controllers, sensors, subsystems)
  constituting the road infrastructure,
- defining a complete model of the network,
- creating a traffic control model,
• real-time updating the dynamic status of the entities present in the urban network,
• reporting in real-time the events produced and detected by the applications.

These functionalities allow OMNI to model the topology and management infrastructures of any European city.

Technical Implications

Based on COM technologies, the technological approach followed for the implementation of the OMNI model facilitates the adoption of standard communication protocols, independence from operating systems; high level of scalability; and a distributed architecture.

The central layer of OMNI is the "Model Of Urban Network" (MOUN). MOUN provides methods for monitoring and control at two levels: physical and application. MOUN has 5 packages with specific purposes:

1. Information Exchange Package: process manager to monitor the control and information flows in the OMNI architecture.
2. Physical layout: includes classes which model the static layout of the urban network.
3. Logical Status Package: includes classes modelling the dynamics of the traffic system.
4. Traffic control: includes classes and associations modelling basic concepts of traffic control
5. Physical Status package: includes classes related to system administration.

Policy implications

None

Documents:

- OMNI project Final Report (April 2003) (Final report)

STRIA Roadmaps: Network and traffic management systems, Infrastructure
Transport mode: Road transport
Transport sectors: Passenger transport, Freight transport
Geo-spatial type: Other