A brief supplement to the INVENT brochure describing the project
Traffic Management in Transport and Logistics VMTL
INVENT

Driver Assistance
Active Safety

Traffic Management
2010

Traffic Management in Transport and Logistics

Detection and Interpretation of the Driving Environment

Anticipatory Active Safety

Congestion Assistant

Driver Behavior and Human Machine Interaction

Traffic Impact, Legal Issues, and Acceptance

Traffic Performance Assistance

Network Traffic Equalizer

Traffic Management in Transport and Logistics
Traffic Management in the Context of INVENT

Traffic and transport continue to be key economic factors. They provide the basis for prosperity and progress and ensure our competitive ability. Mobility is also an important ingredient of quality of life, self-fulfillment, and personal freedom. However, in recent decades the increase in traffic has been accompanied by negative consequences such as accidents and congestion.

Only by using innovative technologies can we find sustainable solutions to these problems and, in the face of ever expanding demands, make traffic safer and more efficient in the future.

As a contribution toward achieving this goal, twenty-three companies and institutions are cooperating within the research initiative INVENT (intelligent traffic and user-oriented technology) comprising the three projects Driver Assistance Active Safety, Traffic Management 2010 and Traffic Management in Transport and Logistics.

The project Traffic Management in Transport and Logistics is pursuing a vision of improved transport efficiency in delivery of goods. The idea is to dynamically optimize the utilization of transport routes, delivery vehicles, as well as delivery period, mobile communication and computing resources. In addition, the customer will benefit from new opportunities for monitoring and controlling the transport of his goods.
Motivation

The growing economic impact of services in our society is leading to increased efforts to improve flexibility and adapt services to match individual customer needs. For example, customers awaiting goods want precise information on the time of delivery; i.e., the time range should be as short as possible.

At the same time, a steadily increasing number of small-package deliveries and returns is projected due to the growth of e-commerce. However, improvements in prompt pick-up and delivery of goods have been hindered by demographic developments such as the increase of single-person households and the growing mobility of the populace. These issues have prompted the search for more efficient ways of managing the transport of goods.

There is considerable potential for optimization by employing dynamic rather than static planning of tours, as has been the case up to now. In this way, deliveries could be arranged within a much more precise time window. A reduction of routes and traffic could be achieved for example by cooperation among the services.
Goals

The goal of the project Traffic Management in Transport and Logistics is to investigate how existing and emerging information and communication technologies can be used to manage the flux of transported goods more efficiently and thus to reduce traffic demand. The focus of the project is on local and regional traffic flows. Pick-up and delivery traffic, particularly in urban areas, the so-called “last mile”, offer a substantial potential for implementation of new concepts in logistics. Planning and management capabilities should be designed and optimized with a precision extending to the exact street address. To this end, recent developments and opportunities for utilization of public mobile communication networks and intelligent delivery route planning tools are to be investigated.

Solution Approach

In classical static delivery route planning, the only aspect of the three key factors (customer, vehicle, and roadway network) taken into account is the set of transport orders. The vehicles execute their delivery route plan without the slightest feedback, and the only available attributes of the traffic network are heuristics based on experience and historical data. Any attempt to make this process dynamic constitutes an intervention in the optimization of this fixed logistic procedure. Achieving the desired flexibility by dynamic processing poses rather severe technical challenges for planning, communication and vehicle systems. The VMTL partners are determined to meet these challenges.

In general, the project distinguishes two planning horizons: The first scenario – Scenario 2005 – takes existing technologies into account that could be available within a short time for a product solution. In contrast, the second scenario – Scenario 2010 – pursues more visionary ideas and incorporates technical options that are expected to be available within a few years.
Process Modeling

In distribution systems, there are a large number of actors, including the sender, the recipient, the logistics company, and the fleet operator, whose various requirements must be taken into account. The evolution of the current traffic state also plays an important role in optimizing dynamical delivery route planning. For these reasons, the project will adapt known tools for process model creation to the special requirements of the logistics sector. Using the process model, interactions and information flows between the actors can be represented and visualized. In addition, it will be possible to simulate individual processes, and improve comparison of alternative solutions with respect to various criteria such as costs or efficiency of resource utilization.
Providing Information

For dynamic goods and delivery management, the various transport and logistic systems to be used require continuously updated information and forecasts concerning, e.g., traffic congestion, road construction, status of tour, or the availability of the recipient. The project partners will investigate which data needs to be provided and how best to provide it, and they will design and develop an appropriate information architecture for this purpose.

In order for users to accept these new services, they must have confidence in the security of the system. For this reason, another important focus of the project concerns security of personal data, protection against unauthorized access and hacker attacks, and other security issues. A series of logistic solutions and software tools are being designed and implemented to support the planned services.
VMTL – Solution Approaches

Order notice

Status of delivery

Traffic information

Tour information

Customer information

Delivery vehicle

Deliverer

Transport management center

Order data and goods

Address information

Point(s) of delivery

Delivery time window

10.30 11.00 11.30 12.00 12.45 1.15 p.m.
Improved recipient accessibility according to his needs

- Delivery profile of recipient
- Delivery time guarantees
- Current traffic information
- Ad hoc pick-up orders
Mobile Communication

In mobile communication systems, radio transmission is the most costly and technologically limited resource. Restrictions can arise both on transmission capacity and on availability and quality of the network that is used. Such restrictions apply to second- (GSM) and third-generation mobile telecommunication systems (GPRS, UMTS) and also to communication via alternative transmission systems.

These constraints need to be included in the design of services for mobile users or in the application of mobile fleet devices to problems such as obtaining information. For this reason, the project will investigate how to design extended communication via third-generation telecommunication systems so as to provide the information required for improved transport management effectively, reliably, and inexpensively. The investigations will also consider hybrid communication solutions (GSM and WLAN).

User Acceptance and Introductory Strategy

In addition to the key question of customer acceptance, a decisive aspect in the practical implementation of VMTL concepts is the degree of positive impact that the processes and services developed in the project will have on traffic. A key goal is to reduce pick-up and delivery traffic demand in urban areas by optimized tour and route planning as well as by intelligent notification services and hence improved delivery rates. Synergies resulting from the combination of different services and functions will also be taken into account. Although for the purpose of acceptance and demonstration a stand-alone implementation of certain components is feasible, it is the combination of different concepts developed by the VMTL partners that will provide the main potential for developing successful business models.
Demonstration of Results

A first evaluation of the innovative solutions in transport and logistics developed in the project will be performed using simulations and mathematical analysis. Particular aspects will then be implemented in field trials and empirically tested for feasibility and utility.

Among the prototypes will be services involving recipient controlled delivery as well as new logistic concepts. The concepts may be subdivided into services and applications for the sender or supplier, for the recipient, for the driver of the delivery vehicle as well as for the fleet manager. The required software infrastructure will be developed.

Implementation of the solutions developed in the project and practical integration into real demonstrators will be closely coordinated with the Hermes Versand Service (HVS). The hubs and fleets of HVS cover the entire country, with structures differing somewhat from one city to another. These differences – including aspects such as fleet size, vehicle and fleet center equipment, delivery percentages, local infrastructure, traffic density, and seasonal influences – need to be taken into account in designing an appropriate demonstration environment (within financial constraints) to maximize the quality and breadth of the test results.

In order to test and evaluate different alternatives, a number of field tests lasting a few weeks and involving two to four depots are planned. These field tests will include both Scenario 2005 and Scenario 2010.
Summary and Outlook

The goal of the project Traffic Management in Transport and Logistics is to obtain technologically and organizationally innovative solutions contributing to a more efficient recipient-friendly, and demand-responsive management of transport and delivery of goods in urban areas. This is to be accomplished by intelligent utilization and deployment of existing traffic, logistics, and information infrastructures.

To this end, leading industrial partners have joined forces in an interdisciplinary investigation of current and emerging issues concerning the most sensible and efficient use of available resources. The partners have agreed to a two-stage approach with two time horizons (2005 and 2010), so that developments arising within the course of the project can be integrated.

To ensure successful transfer of new concepts into practice, intensive evaluation and analysis of the solutions will be performed, including implementation of selected solutions in prototypes. In this way, it will be possible to evaluate the benefit both for customers and for the logistic branch as a whole.

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IBM Deutschland GmbH
PTV Planung Transport Verkehr AG

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<thead>
<tr>
<th>Acronym</th>
<th>Description</th>
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<tr>
<td>GPRS</td>
<td>General Packet Radio Service: overlay of packet based data services on 2nd-generation mobile communication systems (GSM)</td>
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<tr>
<td>GSM</td>
<td>Global System for Mobile Communication: leading worldwide 2nd-generation mobile communication standard for speech and data transmission international telecommunication standard, used in Germany in the D and E networks</td>
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<td>UMTS</td>
<td>Universal Mobile Telecommunication System: The so-called 3rd-generation of mobile communication provides higher data speed and optimal transmission</td>
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<td>VMTL</td>
<td>INVENT-Project Traffic Management in Transport and Logistics</td>
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<td>WLAN</td>
<td>Wireless Local Area Network: local radio data transmission network</td>
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