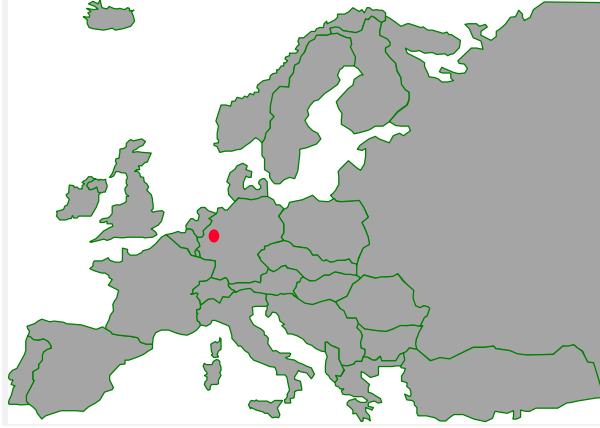


DEMONSTRATION SITE:	COLOGNE/GERMANY
	
NAME OF THE DEMONSTRATION PROJECT (CASE STUDY):	ON-TRIP TRAVELLER INFORMATION USING VMS - INCIDENT DETECTION AND VMS AT KÖLN - ZOO BRIDGE
DURATION OF THE PROJECT:	1996-1999
NAME OF THE TAP PROJECT:	EUROSCOPE

## URBAN PROFILE

Cologne is the major industrial, commercial and cultural centre in the German state Nordrhein-Westfalen with more than 1.000.000 inhabitants. The car-ownership-rate is over 50%. The city represents a major motorway and railway crossing and has an average daily commuter traffic of 320.000 persons in 190.000 vehicles.

## ABSTRACT

Within the overall urban traffic management concept, the city of Cologne had the objective to improve the efficiency, safety and environmental aspects of urban and regional transport by influencing travel behaviour. One possibility of doing this was improving the availability of traveller information, both pre-trip and on-trip through Variable Message Signs (VMS).

The key objective of the installation of VMS in the city of Cologne is to enable travellers or car drivers to make informed choices and to encourage them to use public transport more often.

VMS in Cologne are used for showing alert and incident messages, informing about environmental situations, giving the timing to commute into the city by PT and city events and providing suggestions for usage of park and ride. In future VMS will also be used for suggested speed by car.

The existing VMS infrastructure consists of 19 freely programmable VMS in the urban area and at the boundary. Moreover 85 parking guidance signs can be found in the city of Cologne. This infrastructure has been complemented by the Urban Traffic Management concept.

Within the EU Project SCOPE<sup>1</sup> a strategy module for the dynamic traffic information and control of VMS has been developed and installed on the "Zoo Bridge" ahead of the P+R site "Zoo Station".

<sup>1</sup> The SCOPE project, funded in the Transport Telematics programme EU DRIVE II of the European Commission (1992-95), tested and implemented Advanced Transport Telematics products in the cities of Southampton, Cologne and Piraeus.

Based on evaluation results, VMS are considered to be a useful tool for changing travel behaviour with consequences on the traffic situation due to mainly three factors:

- Information/ guidance provided by the VMS for Park and Ride
- The improved user quality of the parking lot
- The improved public transport services from the “Zoo station”

Within the EUROSCOPE project<sup>2</sup>, which is the follow-up project of the SCOPE project, an incident detection module “Köln-Zoo Bridge” has been integrated in the VMS “Zoo-Bridge”. By detecting traffic incidents and informing travellers about these incidents via VMS, this system can help to improve traffic control or influence the traffic at the very critical section of the “Zoo Bridge”, and increase the traffic flow as well as traffic safety.

## BACKGROUND AND OBJECTIVES

As a result of an increasing number of traffic breakdowns in the city centre during the main shopping weekends and daily on the main roads to the city during the peak hours, the city of Cologne has started to implement an overall urban traffic management concept supported by a big investment programme for infrastructure.

Transport policies and traffic engineering requirements of the city of Cologne are reflected by the main objectives:

- To environmentally and compatibly use the traffic infrastructure and to reduce pollution
- To improve the economic efficiency of the traffic system and to increase traffic safety
- To influence the choice of transport mode
- To strengthen the co-operation of traffic operators

With the Cologne Traffic Engineering Program (1991), the City of Cologne wanted to realise an integrated approach of collective and individual traffic information and influencing measures to optimise the traffic situation in the centre of Cologne. Within the Traffic Engineering Program a Traffic System Management has been set up with a Traffic Operation Centre as its core. There, a Traffic System Management computer collects all relevant data and controls all collective and individual traffic control and information systems and services for on-trip and pre-trip information. The Traffic Management Computer serves as the integrating component for several subsystems, such as:

- Parking and traffic guidance computers
- Traffic engineering planning system
- Management system for route signing
- Traffic Information System
- Road-works co-ordination

One key objective of the city of Cologne was to improve the efficiency, safety and environmental aspects of urban and regional transport through the provision of both pre-trip and on-trip information. The information should serve to encourage increased usage of both non-car

---

<sup>2</sup> EUROSCOPE is funded in the Telematics Applications Programme (TAP) of the 4<sup>th</sup> Framework Programme of Community, Research, Technological Development and Demonstration (1994-98), builds on the infrastructure and results of the SCOPE project. Partner cities of EUROSCOPE are Cologne, Hampshire County, Piraeus, Rotterdam, Strasbourg, Genoa, and Hamburg, followed by Cork and Brandenburg. EUROSCOPE was active in the following work areas: Traveller Information, logistic information and communication systems and network management.

modes and PT, influence trip timing/substitution, reduce destination search time, as well as leading to better route choice.

The use of VMS in the city of Cologne offers the possibility of better traffic management since information is supplied at the right time and is suitable for various situations. Variable Message Signs have been installed enabling passing of information to drivers according to the traffic situation in the inner city of Cologne, guidance to P+R sites, and information about public transport services.

## **PRESENT STAGE OF IMPLEMENTATION**

A major component of the urban traffic management concept is the parking guidance system, which has already been installed between 1986 and 1989 with an extension in Cologne-Deutz in 1998. The city centre is divided into four areas with 35 car parks. Drivers are guided directly to the nearest free parking lot by 98 dynamic and 170 passive signposts.

In 1989, the city of Cologne started a pilot project where large Variable Message Signs have been provided at the outskirts of the city. They informed drivers on the current traffic situation in the city centre, the nearest P+R sites and public transport services.

The telematics infrastructure in Cologne consists of 19 new route guidance VMS, funded by the Cologne Traffic Engineering Program.

Within the EU Project SCOPE, the software for one of two existing VMS for the dynamic traffic information and control was partly developed and installed at two P+R sites. The first Variable Message Sign (dimension: 3.00m x 8.00m) installed was the "P+R Zoo" sign at the junction "Buchforst" of the motorway A4. The P+R Bocklemünd sign is next to the stop "Bocklemünd" which is connecting two rail rapid transit lines and several bus lines.

The "P+R Zoo" sign indicates guidance to the P+R site Zoo and gives information on the environmental and parking situation in the city centre as well as alternative methods of travel by public transport service provided from the P+R site Zoo. At certain relevant periods of the day, the drivers can obtain information on the nearest available parking lots to the trade fair as well as the connections to the shuttle busses, which are offered there.

Within the EUROSCOPE project, which is the follow-up of the SCOPE project, an incident detection module "Köln-Zoo Bridge" has been integrated in the VMS-sign "Zoo-bridge", as part of the traffic management system.

The incident detector module has been integrated into the traffic system management and is working with low failure rate since late 1996. Traffic data gathered by inductive loop detectors is assessed in the Traffic System Management Computer and triggers different traffic strategies such as specific messages on VMS.

## **Financing and Resources used**

The Cologne Traffic Engineering Programme is subsidised mainly by local, federal, state and national funds. Several applications were also supported by EU programmes in the context of the projects SCOPE (DRIVE II/ ATT) and EUROSCOPE (4<sup>th</sup> FP).

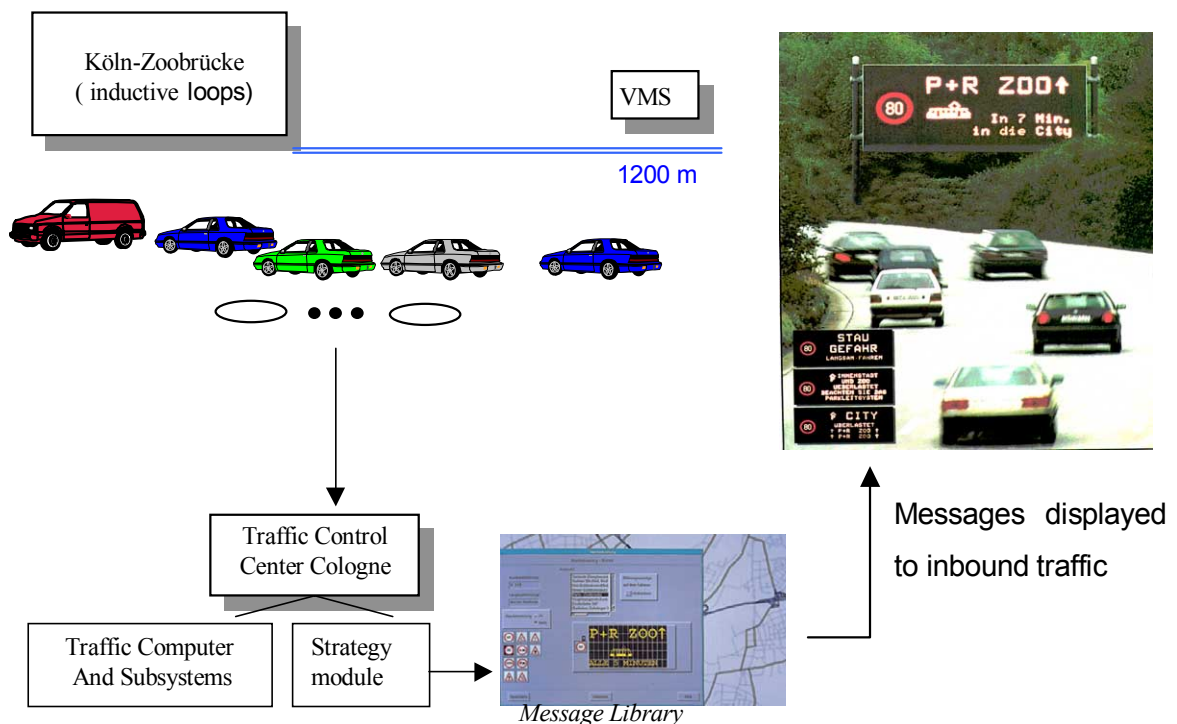
The infrastructure costs of the VMS used in the city of Cologne are dependent on the size and vary from 75.000 EURO for a 1m x 2m VMS to 90.000 EURO for a 2m x 4m VMS, including manufacture and installation costs. The figures do not include roadside works and the electric network, since these costs vary greatly. The costs for the VMS of 3m x 8m, which is a prototype, were approximately 130.000 EURO.

## **TECHNICAL PROFILE OF PROJECT**

The VMS sign „Zoo Bridge“ consists of a message text of 5 lines with scaleable sign dimensions and pictograms, such as symbols and traffic signs. The list of messages generated includes: alert and incident messages, suggestions for usage of park and ride, the timing to commute into the city by PT, environmental conditions and city events.

For operator convenience, all messages generated can be checked on each sign individually. An editing system allows interaction, so the text can be programmed manually to match actual arising needs. The database of messages follows the geographical needs of the location of each sign.

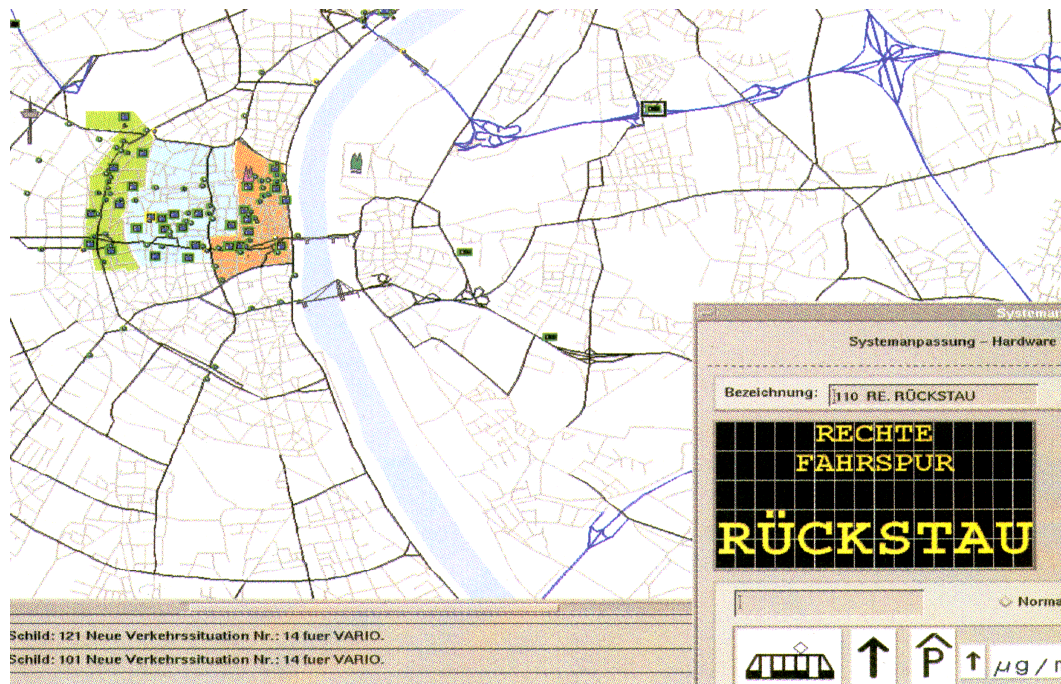
The VMS at “Zoo Bridge” is linked to the urban traffic management computer in Cologne. All sensor inputs, derived from inductive loops are processed by a strategy module. Incidents are detected and appropriate messages are generated as follows: The traffic strategy module in the Urban Traffic System Management (UTSM) computer identifies the varying number of passing vehicles on each of the detectors and assigns them to a decision scale. Depending on the details in the decision scale (165 possibilities), a text which matches the current situation is taken from the text library and displayed on the respective VMS. The last picture displayed alert messages to resolve an incident causing a traffic jam at the right lane.



*Description of Incident Detection System*

The VMS in Cologne, called VARIO displays, are completely free programmable. The VARIO system has been developed with the particular aim to display a wide range of text messages using letters, figures and pictographs.

In the VARIO system constant alphanumeric messages and pictures are being displayed over a longer period of time (as a rule > 5 minutes). The system is based on conventional glass fibre optic technology.



*Digitised City Map of Cologne and Alter Message generated by a Strategy Module*

## RESULTS AND IMPACTS

### VMS for Park+Ride

One of the key objectives of the installation of the VMS was to enable travellers / car drivers to make informed choices and to encourage them to use public transport more often. For evaluating the effects of the VMS a survey has been realised in 1993 within the SCOPE project.

The major purpose of the survey was to gain empirically secure knowledge on the user-frequency and trip purpose of the P+R users, the reasons for and duration of use as well as origin and destination of the trip. This survey was carried out for the Vario panel at the ramp section "Zoo Bridge"/A3/A4/B55a in the area of the access point Buchforst guiding to the P+R facility "Zoo".

In summary, two thirds of the questioned people were familiar with the VARIO panel in the area of Buchforst. Of those people who normally pass the panel when entering the parking garage, up to 91% are familiar with the variable information panel. Mostly, the Vario panel is positively evaluated. 54% of the P+R users refer to the panel as their information source, 29% of the frequent P+R users refer to the panel and more than 40% of the users who go shopping or to a training/ educational institution consider the panel as most important.

### Incident detection

The overall traffic situation on the city motorway A4, one of the most important feeder roads from the eastern outlying area of Cologne, is marked by a very high traffic level on all four lanes, in particular during the rush hour peak in the morning, with a tendency towards traffic jams and danger of accidents.

The incident detector module plus the strategy module have been developed and applied to specifically improve this situation. As expected, the results of all evaluated surveys show a positive development with regard to traffic flow, frequency and seriousness of accidents and environmental effects.

The main criterion for the evaluation of the incident detector application at the “Zoo Bridge” is the increase of traffic safety. Although no statistics with comparable data on the situation before and after the introduction are available (minor accidents are no longer registered), it is generally known that the number of serious accidents has decreased considerably. Since the strategy module has been introduced there have been no fatal accidents in the relevant section.

A second criterion is the traffic flow. Also here, a clearly increasing flow and a decrease of traffic jams as well as a decrease of the harmful environmental effects can be noted.

## **BARRIERS AND CONFLICTS**

There were no real technical or political problems before implementing the systems. Since the development and demonstration of the systems was strongly financially supported by the Federal State and the Land “Nordrhein-Westfalen”, no economic problems during operation appeared.

## **TRANSFERABILITY**

For implementing an urban incident management, three elements are of major importance:

- data collection,
- data analysis
- information delivery and traffic management strategy implementation.

For data collection, cities need CCTV or other standard data collection methods (inductive loops or above ground detectors, etc.) that can measure traffic flow. The comparison of data of the current road conditions and those of “normal traffic conditions” has to be done by a traffic data analysis system. Information delivery can be done by local broadcast media, VMS or by RDS-TMC, GSM cellular telephony and beacon based systems.

For those cities interested in seeing how the systems work in reality, the City of Cologne offers the possibility of presenting their operating systems.

## **LESSONS LEARNED**

The example of the city of Cologne has shown that the use of VMS for real-time information at the roadside in the course of their journeys (Park and Ride information and route guidance in the case of incidents or events which are disrupting traffic) can have a considerable effect on the drivers’ awareness of traffic conditions and alternative possibilities and behaviour. This example gives an overview as to how a VMS system might contribute to increase network efficiency and the quantity and quality of information available for drivers and journey comfort as well as to improve driver safety and environmental conditions. VMS can also support the objective of influencing the modal split in favour of PT.

Moreover the Cologne example makes clear, that VMS can be used for different purposes with high flexibility. In addition to indicating alert and incident messages and park and ride facilities, the VMS in Cologne are also used for giving information about city events, and in future the timing to commute into the city by PT, as well as suggested speed by car. In Cologne, the existing VMS system has been enhanced through the addition of an extra component (e.g. linking of incident detection to existing VMS system in Cologne).

**ADDITIONAL INFORMATION**

City of Cologne, Department for Roads and Traffic Engineering

Hartmut Sorich

Willy-Brandt-Platz 2

50679 Köln

Tel: +49-221-221-27173 Fax: +49-221-221-27091

E-mail: hartmut.sorich@stadt-koeln.de

European Project Office of the City of Cologne

Dr.-Ing. Jürgen Grotepaß

Athener Ring 4

D-50765 Köln

Tel: +49-221-221-21485 Fax: +49-221-221-21900

E-mail: eurocologne@compuserve.com

**Bibliography:**

Cologne Traffic Engineering Program – Urban Traffic Management: The approach towards solving the traffic problems of today? The Cologne approach. Issued by the City of Cologne (Road and Traffic Engineering Office) and Siemens AG (Traffic Control Systems Division), Munich

PVT – Cologne Intelligent Urban Traffic Management. Issued by the City of Cologne (Road and Traffic Engineering Office) and Siemens AG (Traffic Control Systems Division), Munich

SCOPE project: Deliverable No 30: SCOPE book: Contribution of SCOPE to the DRIVE programme, July 1995

SCOPE project: Deliverable No 17: Field Trial and Assessment Coordination – Final Report, July 1995

EUROSCOPE project: Deliverable No 15: Evaluation Results and Comparative Assessment, Issue 03, April 1999

EUROSCOPE project: Deliverable No 19: Evaluation Results and Comparative Assessment, June 1999

EUROSCOPE project: Forming the Mobile Society within the Information Society (CD-ROM), Office of European Affairs, City of Cologne, Cologne 1999