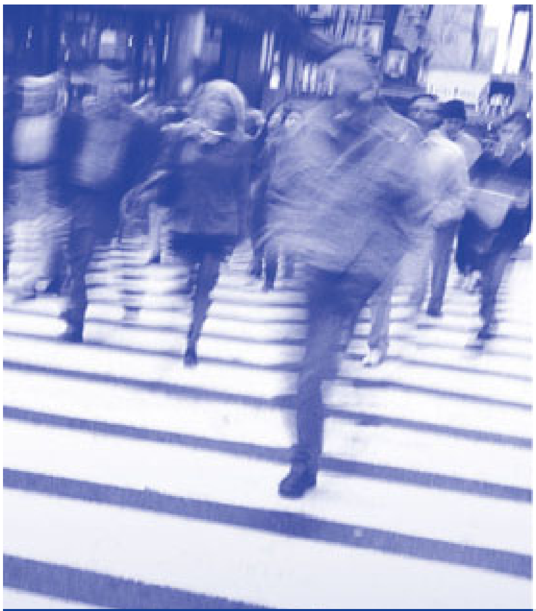

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Implementation status report on operational VMS system

ELAN Deliverable No. 8.6-D1

Project acronym: ELAN
Project full title: Mobilising citizens for vital cities

Grant Agreement No.: ELAN TREN/FP7TR/218954/"ELAN"

Workpackage: WP8 Transport telematics
Measure: 8.6-GEN Sustainable multi-modal traffic management
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IS CO-FINANCED BY THE
EUROPEAN UNION

Revised Final version

12/12/2012

ELAN deliverable no.	8.6-D1
Date / Version	12/12/2012
Dissemination level	public
Work Package	WP 8
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File Name	8.6 - D1 - Implementation status report on operational VMS system_revised.pdf

Keywords

General			Work package links		
x	CIVITAS			WP1 Alternative fuels & clean vehicles		WP7 Energy-efficient freight logistics
x	ELAN Project			WP2 Collective transport & intermodal integration	x	WP8 Transport telematics
				WP3 Demand management		WP9 Project coordination
				WP4 Influencing travel behaviour		WP10 Project management
				WP5 Safety, security & health		WP11 Research and Technological Development
				WP6 Innovative mobility services		WP12 Impact and process evaluation
						WP13 Dissemination, citizens' engagement, training and knowledge transfer

Document history

Date	Person	Action	Status [1]	Circulation [2]
03/07/2012	Jeroen Willems	Preparation of draft version	Draft	SC
24/08/2012	Ann Plas	Revision of draft version	Draft	PM
10/09/2012	Marcel Braun	Proof-reading and commenting	Draft	ML
11/09/2012	Jeroen Willems	Preparation of final version	Final	PM
12/12/2012	Begga van Cauwenberge	Preparation of revised final version	Final	PM

[1] *Status:* Draft, Final, Approved, Submitted

[2] *Circulation*: PC = Project Coordinator; PM = Project Manager; SC = Site Coordinators; EM = Evaluation Manager; DM = Dissemination Manager; SEM = Site Evaluation Managers; SDM = Site Dissemination Managers; SCo = Scientific Coordinator, P = partners, ML = Measure Leaders

CONTENT

1. Introduction

The aim of this document is to provide a summary of the work done within CIVITAS ELAN measure 8.6-GEN – Sustainable multi-modal traffic management since the project start date until the system implementation date. In the interest of a complete understanding of the scope of the measure by the reader chapter 3 is dedicated to the preparatory work which had already been done prior to the start of the ELAN project on 15 September 2008.
This run-up to the actual implementation of the new Traffic Guidance System is included into this report because it explains certain choices made by GCC and gives an insight into the "why, where, what, when and how" questions that will inadvertently arise when browsing through the course of the measure.

2. Outline of the measure

Measure 8.6-GEN – Sustainable multi-modal traffic management aims to reduce the number of cars in the city centre, especially during peak hours. This is to be achieved by setting up a Traffic Guidance System (TGS) consisting of roadside VMS signs which will be used to post traffic-related messages concerning the conditions on the road network ahead. The aforementioned VMS signs will also be used to guide traffic to the city's underground parking garages and to reroute traffic flows in the event of congested access routes.

The objectives of the measure are:

- more efficient use of the road network;
- less congestion in PT corridors, hereby increasing the commercial speed of trams and buses;
- increased use of P+R facilities by issuing recommendations on the VMS signs to use the P+R system;
- less cars in the city centre.

The functional requirements to which the Traffic Guidance System shall have to adhere are:

- parking traffic information and guidance
- P+R recommendation
- Advance warnings pertaining road works and events which will have an impact on traffic flow
- Improvement of PT flow
- Real-time traffic information and guidance based on incident/ congestion detection on the road network
- Exchange of traffic information between TGS and third-party systems (regional road authority, PT authority, etc.)
- Managing and optimising the city's traffic lights

This rather vast list of requirements for the Traffic Guidance System justifies an implementation in three phases:

- Phase 1: commissioning of hard- and software which will provide parking information and -guidance. The pieces of hard- (VMS signs) and software will be made capable of handling phase 2 and 3.
- Phase 2: implementation of traffic information based on known events
- Phase 3: real-time traffic information and re-routing

Phases 1 through 3 are incorporated into CIVITAS ELAN albeit that phase 3 will not be completely implemented by the end of the ELAN project, due to the large amount of work and investments to be done.

3. Work done prior to CIVITAS ELAN

3.1. Background

GCC has had a Parking Guidance System (PGS) in operation since 1997 and as early as 2004, the Municipal Parking Authority – the proprietor and operator of the PGS – started planning its successor. GCC wanted the new Traffic Guidance System to be much more than a mere upgrade of the existing system: the city's vision on sustainable mobility called for a true traffic management system for the local road network which would also be capable of warning motorists of traffic conditions in the city, giving recommendations on routes and alternative transport modes and actively re-routing traffic where necessary. Over the course of the period 2004 - 2008, several preparatory steps have been undertaken which have led to the publication of a tender document and subsequently the implementation of the new TGS within the ELAN timeframe (2008-2012).

A summary of the activities leading up to the tender is given in the following subparagraphs.

3.1.1. Traffic and mobility study

The traffic and mobility study for the TGS was carried out in 2006 and served several purposes:

- to clearly identify and inventory all the needs of GCC and its partners (i.e. Regional Road Authority, local and federal police, public transport authority, other GCC departments, etc.);
- to specify the different types of VMS signs needed, their positions, the capabilities of the software etc.;
- to decide on the type of architecture to be used in order to make the TGS linkable to third party traffic management systems;
- to decide – in conjunction with the partners – which organisation form will be needed in the future to be able to organise a traffic management system which encompasses every road type (primary, secondary and local roads);
- to analyse the pros and cons of several possible technologies for use in the VMS signs (e.g. LED/ LCD/ dot matrix for the signalling units, interior lighting vs. diamond grade reflecting materials, radio/ GPRS/ fixed line for communications between server and VMS signs, etc.)

A survey was conducted to identify best practices with similar systems elsewhere in Europe (e.g. Potsdam (D), Hamm (D)). GCC employees – together with delegates of the partners involved in the study – held a site visit at two traffic management centres in the vicinity of Rotterdam (NL) on the 24 October 2006. Rotterdam seemed to be an interesting example for developing a collaboration between the national road authority, which is in charge of the traffic centre managing the higher order roads and tunnels, and the local authority (city administration of Rotterdam) which has their own traffic centre aimed at local traffic management. At the time of the visit, the city of Rotterdam had also recently installed a new parking guidance system which is capable of a limited re-routing of traffic in the case of major events.

This field survey gave the visiting party useful insights in setting up a modern traffic management centre; a number of technical and practical issues were taken up with Rotterdam city officials (e.g. the choice of a combination of LED modules and rotating prisms).

Besides its tangible outputs, the traffic and mobility study also served a very important step to get all important project partners on board and up to speed from the very beginning. This approach instantly created goodwill and support with these partners, which greatly helped GCC to obtain permits for the installation of signs on roads and property belonging to these third parties.

3.1.2. Graphical and physical design of VMS signs

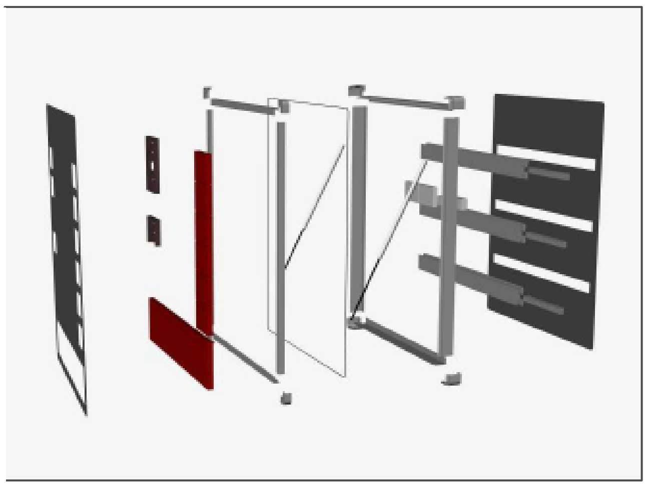
With all the organisational, architectural and technical issues addressed in the traffic and mobility study, work on the tender document could almost commence.

However, given the technical lifespan of the new VMS signs of 10+ years and the great impact of such large and conspicuous objects in a historically rich urban environment, GCC had specific concerns about the aesthetical quality of the VMS signs. This led to a sidestep in the form of an assignment for an industrial design bureau to come up with a fitting physical and graphical design of the outside casing and front plate of the signs.

Through a public procurement procedure, a suitable candidate for the job was found: Enthoven Associates Design Consultants (EADC). Among others, EADC earned its merits in the field of product design with such examples as the design of the interior of the new generation Thalys trains, the next generation buses by Van Hool, total design of Q8 Easy gas stations (including signage) and also the street furniture in use now in the city centre of Gent.

EADC was given a set of conditions to adhere to throughout the design of the VMS signs. These conditions were typically features which had already been decided upon during and in the wake of the traffic and mobility study, such as the typology and general dimensions of the VMS signs, the use and position of LED displays on the sign face, etc.

Within these boundaries, EADC was given liberty to propose a number of design directions for both the VMS sign casing and the graphical layout of the sign face. A jury of representatives from GCC selected the most suitable design, after which EADC went back to the drawing board to further detail the chosen design.



The detail design phase in its turn revealed some practical issues to be resolved such as material choices, strength of the casing and internal structure, visibility of the graphics, access and maintenance, etc. These issues were dealt with by GCC in close cooperation with EADC.

All the design work finally resulted in a concept document portraying the various design features of the VMS signs in detail and was intended to be incorporated into the tender documents as a “hard” requirement for candidate-bidders.

3.1.3. Public procurement

3.1.3.1. Preparation of tender

Preparation of the tender documents began after completion of the design study. The tender documents described in detail all the functional and technical requirements for the TGS – phase 1. In essence, the assignment called for:

- removal of all the existing parking guidance signs (123 in total) and parking data consoles (9 in total);
- production of 118 new VMS signs and 45 static (non-electronic) signs, including their supports;
- installation of aforementioned signs, including ground works and casting of foundations;
- creation of advanced central management software (codename Hermes) to operate the signs;
- production and installation of 9 new parking data consoles.

Implementation of the system was described in the tender to take place in two phases:

- installation of VMS signs at the fairground site "The Loop" and implementation of part of the software to operate these signs (within 220 calendar days from the start of the contract);
- installation of the VMS signs in the city centre, installation of parking data consoles and software and commissioning of the entire system (within 290 calendar days from the start of the contract).

3.1.3.2. Publication of tender

The invitation to bid was announced on 28 June 2008 in the European Journal of Publications. The bid opening date was set at 11 September 2008.

Upon the original bid opening date, GCC had received no valid bids for the assignment described in the tender documents. A short investigation identified the reasons for this as being the high level of penalties imposed on the contractor for exceeding the due dates in the tender and a discrepancy between the technical specifications for the VMS signs as described in the tender.

The original contract was therefore not awarded, the tender documents were modified to eliminate the obstacles which led to there being no valid bids and the revised tender documents were re-launched in a new invitation to bid, with the bid opening date set at 11 September 2008. This time, three valid bids were received.

3.1.3.3. Evaluation of responses and purchase order

The evaluation of the bids commenced on the bid opening date (11 September 2008) and was finalised on 3 November 2008. The conclusions of the evaluation procedure were summarized in the bid evaluation report. Criteria such as price, technical quality, adherence to applicable technical standards, quality of the service contract, etc. were taken into consideration when drawing up the final ranking of the bidding companies. With a total score of 84,47/ 100, Vialis BV in Haarlem (NL) offered the best bid.

Basing itself on the conclusions of the bid evaluation report, the Gent City Council decided to award the contract to Vialis BV on 1 December 2008. The actual practical project management is taken up by the Belgian subsidiary of the company, Vialis Belgium NV.

The official contract start date was set for 11 December 2008.

3.1.3.4. Communications network

The Parking Guidance System which had been operating since 1997 used coaxial cable[3] as a communications medium between parking garages, parking guidance signs and the central server. A further use of this cable network by the new TGS had proven to be impossible, for the owner of the coax

[3] The coax cable network used is actually part of the privately-owned cable tv network, where GCC can use a limited number of reserved frequencies for communications purposes regarding the PGS.

network, Telenet, stated in the course of 2006 that it would need all available capacity on the network for its core business activities. Therefore the use of the cable network by GCC for its PGS/ TGS could not be guaranteed anymore in the foreseeable future.

After weighing all pros and cons concerning the choice of an alternate communications network (fuelled by the research done in the traffic and mobility study), the choice fell upon a self-owned secure channel radio network. The decisive factors which steered GCC towards radio as a medium were:

- independence from privately owned and operated networks (i.e. GSM, other radio networks);
- more flexibility in choosing locations for VMS signs: no need for cable connections (vs. cabled solutions such as coax/ optic fibre/ copper wire);
- data transfer security protocols (i.e. encryption) managed by GCC;
- cost (at the time of purchase, GSM/ GPRS communication was twice as expensive to operate compared to radio).

Having opted for radio as the future means of communication for the TGS's main components, GCC published a tender for the hard- and software of the radio network. This equipment was not included in the main tender for the TGS because it was expected that the traditional manufacturers of traffic systems would have a lack of expertise in the field of radio communications, which would lead to a suboptimal solution.

Thus, the tender documents for the installation of the communications network called for the delivery and installation of four transceiver base stations and 118 radio/ modem/ antenna packs to be built into the VMS signs. GCC chose to locate the base stations on top of the city belfry (95m AGL[4]) to ensure sufficient reach and low transmission power (2W max).

After due evaluation of the responses to the call for bids, the contract was awarded to R.T.S. BVBA from Ieper (B).

3.1.4. Gantries at fairground site „The Loop"

The fairground site "The Loop" is situated at the south end of the ELAN demonstration corridor. At the moment, it accommodates the fairground halls and an IKEA store but over the next 15 to 20 years it will be developed to its maximum capacity, totalling 450.000 m² of leisure, retail, office and other functions. As the building programme proceeds, the available number of parking spaces at the site will be gradually increased from 6.000 to 14.000 spaces. It comes as no surprise that the amount of visitors this site will attract will need an efficient on-site parking management system. As soon as this need was identified, a dedicated subsystem of the TGS for the fairground site was devised and included in the tender. Consisting of 18 VMS signs, this subsystem will be managed from the site itself by remotely accessing the central server (Hermes) of the TGS.

The road infrastructure of the fairground site is such that gantries are needed to mount the VMS signs on to ensure road users can adequately see them.

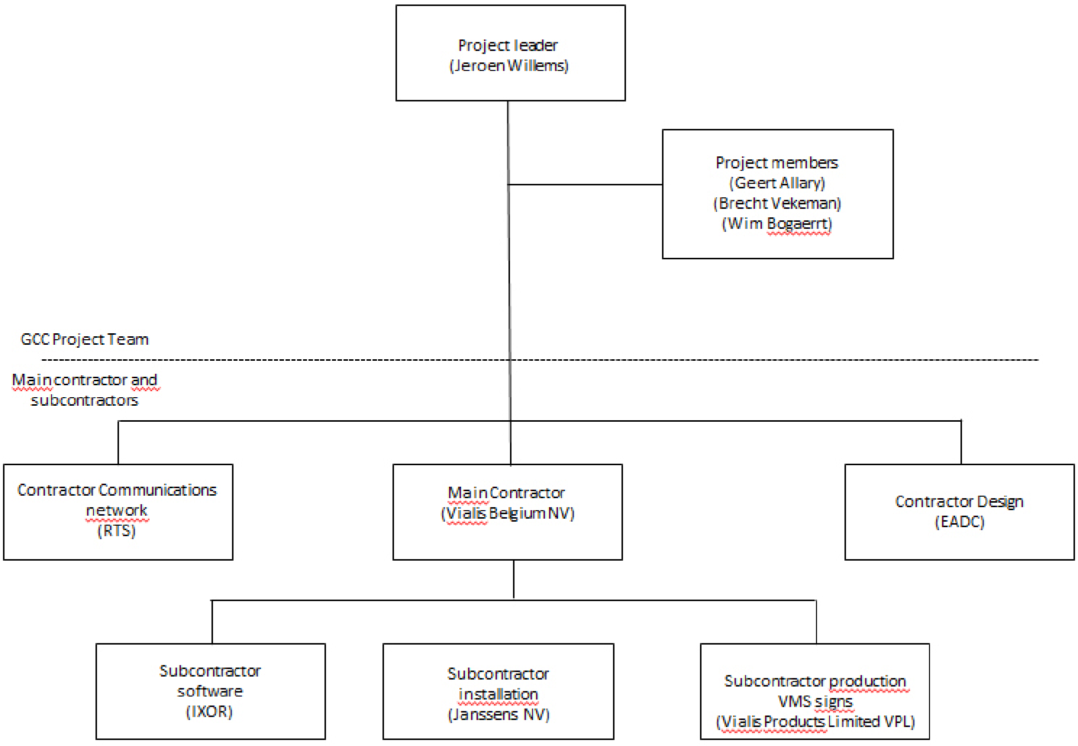
A total of three full gantries (spanning road widths between 19 to 26 metres) and two half-gantries were installed on the site in May 2008.

[4] AGL: Above Ground Level

4. Implementation of the first phase: parking guidance system

4.1. Project start

4.1.1. Composition of project team



4.1.2. Kick-off meeting

The kick-off meeting for the project was held on 11 December 2008 and was attended by the GCC project team, the main contractor and its subcontractors.

A short summary of the work at hand, the available timeframe and the legal obligations the contractor shall have to adhere to were provided by the Measure Leader.

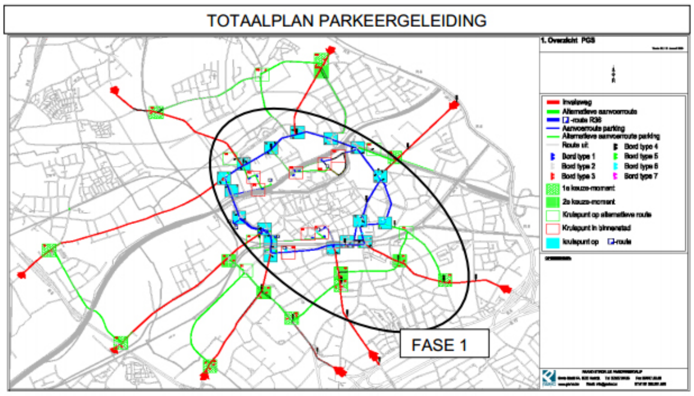
Special attention was given to the coordination between GCC, the main contractor and its subcontractors and Eandis (the authority that manages the electrical power grid). GCC has also emphasized the importance of a swift proceeding of the installation of the supports for and the VMS signs themselves to keep the nuisance for road users and residents to a minimum.

4.1.3. Alterations to implementation plan

The implementation plan drawn up by GCC as part of the tender documents needed to be slightly adjusted due to changes during the call for tender period in the city's road network. This implied that a number of variable traffic signs had to be relocated (planned) and/ or given a slightly different layout. These adjustments were passed on to Vialis Belgium NV at the kick-off meeting.

4.1.4. Early success stories

Evidence emerged that the design concept and functional specifications for the VMS signs and central software of the Traffic Guidance System put forth by the Gent City Council was being embraced by other municipalities in Belgium. The city of Kortrijk has published a tender of its own traffic guidance system which was clearly based on the same design principles and has similar but reduced functional requirements as the TGS that is being implemented in measure 8.6-GEN by GCC.



[5]

4.2. Project implementation progress per subsection until 14 March 2010 [6]

4.2.1. Variable traffic signs

4.2.1.1. 15 December 2009 – 15 March 2009

The design drawings and 3D renderings of the VMS signs put forth by the main contractor (Vialis) in the bid were refined and handed over to the design bureau (EADC). EADC was appointed by the Gent City Council in 2007 to produce a physical and graphical design concept for the new VMS signs which combined functionality, user-friendliness, ease of maintenance and aesthetic features. This design concept was inserted into the tender documents and served as a strict requirement for the contractor to abide to. EADC was also given the task to revise the contractor's designs and to follow-up on the production phase of the signs in order to assure a close match between the design concept and the produced VMS signs.
Upon revision of the detail design drawings provided by the contractor, three minor issues were identified which required alteration. These issues were taken up by the Measure Leader and the contractor and eventually resolved.

4.2.1.2. 16 March 2009 – 14 September 2009

Following the approval of the final design proposals in the previous period, a prototype VMS sign was constructed by the contractor to be subjected to Initial Type Testing according to subsection 2 of the EN12966 norm. Optical type testing was carried out in the contractor's workshops under the supervision of the German Verband der Deutschen Elektrotechnik (VDE). The VMS sign passed the optical test section of EN12966 with the exception of the luminance ratio test. Based on these test results, the LED mask design was slightly altered. An additional luminance ratio test with the new mask demonstrated full compliance with the norm.

[5] Source: http://www.kortrijk.be/files/kortrijk/Dimitri_Maebe/Parkeergeleiding.pdf
[6] The tender contains a number of subsections (e.g. VMS signs, communications network, software, etc.). This division into subsections will serve as a framework for the description of the work done on the measure and will be maintained throughout this document.

The various other lab tests required for a full EN12966 compliance were subsequently carried out in the VDE lab in Germany. VDE stated that all tests have been carried out and the test rig has demonstrated full compliance with the norm.
Following the successful type tests, Vialis commenced factory production of the VMS signs. Delivery of a first batch of signs was expected for 1 October 2009. Additional batches were to arrive in the second and fourth week of October 2009.
The Measure Leader prepared a short document containing a series of acceptance tests which every VMS sign had to pass before and after its installation and activation.

4.2.1.3. 15 September 2009 – 14 March 2010

Major problems occurred when the delivery of the variable signs was seriously delayed. Production of the variable traffic signs commenced in the previous period (June-September 2009) and carried on until the end of this period. 41 signs were confirmed to be delivered, but the remaining batch of 71 signs was not yet confirmed. This delay was caused by serious mismanagement of the subcontractor in Hong Kong and the fact that the products didn't meet the criteria. The possible cancellation of the contract altogether was considered by the GCC.

Upon arrival of the variable traffic signs in the workshop of the contractor in Belgium, some work still had to be carried out on each sign prior to its installation:

- Applying static texts on the front side of the sign in reflective sheeting
- Calibration of the rotating prisms to line them up with the front plate of the sign
- Installation of the radios, antennas and cabling
- A full acceptance test for each sign

The accumulation of these activities meant an additional processing time for each sign of +/- 1,5 weeks between its arrival in Belgium and installation of the sign on the pole.

4.2.2. Communications network

4.2.2.1. 15 December 2009 – 15 March 2009

GCC had decided to have the VMS signs, car parks and central server (HERMES) communicate with each other through radio on three dedicated secure channels.

During a project team meeting on 7 January 2009 with Vialis Belgium NV and RTS it became clear that the response times of the largest types of VMS signs would turn out to be too high if radio were used as the communication medium. During normal operation, the data packets sent to and received from the VMS signs are fairly modest in size, which doesn't pose any problems when using radio (2400 baud). However, when an operator wants to send an image consisting of clear text and pictograms to a large LED matrix VMS sign, the low bandwidth of the radio channel results in transmission times in excess of 30 seconds per sign.

In order to fix this issue, GCC decided to equip only the large LED matrix VMS signs (26 out of the total of 119 signs) with a GPRS modem instead of radio equipment.

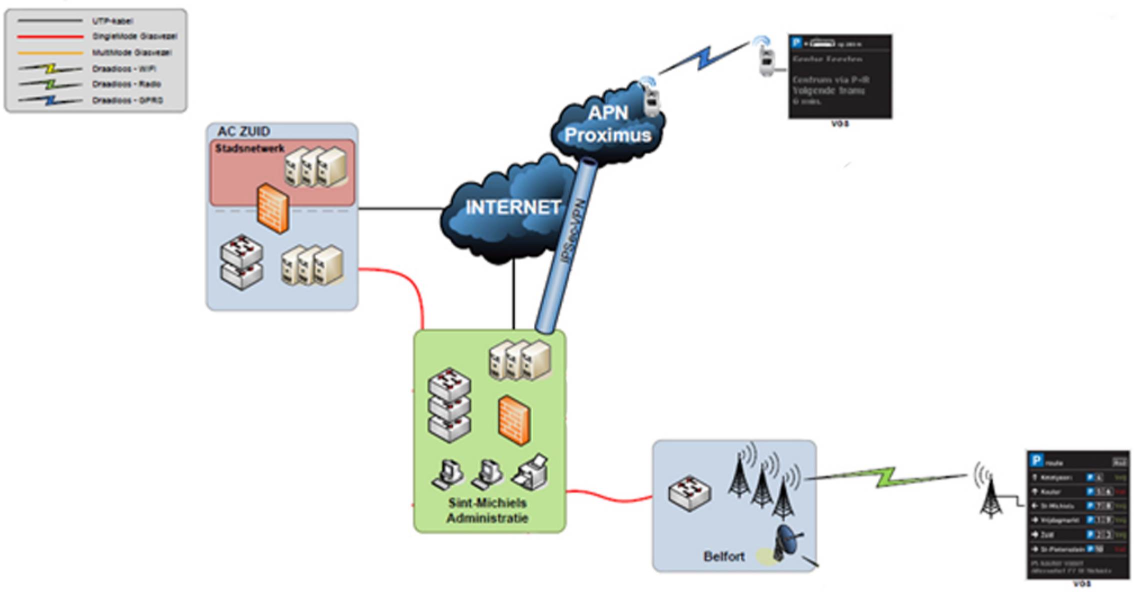
RTS constructed a test rig consisting of a transmitter and a receiver which was used by Vialis to test the communication protocol.

4.2.2.2. 16 March 2009 – 14 September 2009

As mentioned above, the communication medium which interconnects the VMS signs, the car parks and the central server will operate via RF on three secure channels. Three base stations (one for each channel) for the communication medium have been installed at the top of the Gent Belfry tower (+/- 90m ASL). Following this installation, the communication medium has been thoroughly dry-tested and has revealed no major problems.

Besides the private radio network used to operate the parking guidance signs, the preparations for the other communication medium, i.e. the GPRS network, were also taken by the GCC. The setup consisted of a private APN (IPSec-VPN tunnel) with the GCC's provider of mobile telephone and internet, Belgacom Proximus. This secure network connects the HERMES-server directly to the mobile network of the provider and is used to operate the large LED matrices (26).

<u>Visual presentation of the current communication network setup:</u>



4.2.2.3. 15 September 2009 – 14 March 2010

An even more important problem, which was identified after the arrival of the first signs in Belgium, concerned the data transfer through the radio network. Often, data packages were lost or alternatively, when a data package was successfully relayed to a sign there was no “ack” message[7] sent back to Hermes.

Up to the arrival of the first batch of variable signs, the contractor relied on testing the communications medium using a test rig. This rig comprised of a laptop running sign test software, a radio that served as a transmitter (base station), another radio that represented the receiver in the sign and finally (at the end of the chain) a PLC that simulated the internal controller of the sign. This test method was chosen by the contractor because a working sample of a sign controller was not yet provided by the Hong Kong based Vialis Products Limited.

When the newly arrived signs were fitted with radios and tested, there appeared to be discrepancies between the configuration of the test rig and the real-life sign. Phenomenons like the loss of data packages during transfer between Hermes and the sign, scrambling of data during transfer and the frequent absence of an acknowledgement message after a successful data transfer were all unexpected problems which Vialis Belgium had to resolve.

The troubleshooting process had been on-going for the more than 10 weeks. The slow response of Vialis Products Limited to the requests of Vialis Belgium to provide firmware updates for the controller gravely contributed to the overall delay.

The sequence of flagrant errors, the many encountered problems and the apparent inability of the contractor to solve them, drove the GCC into a position where it needed to take decisive action, whether or not to terminate the contract.

[7] Acknowledge message: confirmation of the reception of the data packages.

4.2.3. Software

4.2.3.1. 15 December 2009 – 15 March 2009

The central software application used to drive the Traffic Guidance System (TGS) carries the name "HERMES".[8]

Quite early into the project course, Vialis and Ixor have stated that it would take a greater amount of time to elaborate a viable communication protocol that uses the radios' RS232 standard than first expected (because of the fact that the original communication protocol was based on TCP/IP). A delay in measure implementation was feared because of these problems, but later developments have demonstrated that the delays caused by modifying the software were even subordinate to the delays encountered by Vialis Products Limited with the construction of the VMS signs.

During this period, the beta version of HERMES was capable of handling the data influx from car parks (number of available spaces per car park) and visualising the output on VMS signs, albeit in a simulated environment.

Work begun on a sub-module of HERMES which would handle all the traffic management scenarios such as re-routing of traffic, issuing traffic warnings, etc.

An additional scenario has also been drawn up which consisted of linking the TGS to a ramp metering system that would restrict the influx of motorized traffic into the ELAN corridor. By doing this, the commercial speed of public transport in the corridor is expected to augment, especially at peak traffic hours. The TGS provides support to this ramp metering system by re-routing parking-bound traffic away from the corridor and by issuing traffic warnings emphasizing on possible congestion ahead.

4.2.3.2. 16 March 2009 – 14 September 2009

One parking garage data console has been installed and tested in one of the city's parking garages. This console receives entry and exit barrier information and sends this information through to HERMES.

On-going development of the central software (HERMES) was carried out by Ixor and enveloped:

- The development of a web-based application to use in the car parks. This application runs on a local PC in the car park and will allow the parking guard to correct the number of available parking spaces, to alter the status of the parking (open/ closed) and adjust the opening hours.
- The development of a web-based application for use on the fairground site. This application will run on a laptop with wireless internet capability and will allow the parking manager of the fairground site to control the VMS signs present on the site. A number of pre-defined scenarios were programmed into HERMES pertaining the allocation of the various parking lots on the site to the three major destinations (i.e. exposition halls, IKEA and P+R). These scenarios also dictate the filling sequence of the parking lots per destination.

4.2.3.3. 15 September 2009 – 14 March 2010

In December 2009 and January 2010, the Measure Leader conducted a thorough test of the software and forwarded a three-page list of remarks and desired adjustments. Since the end of January 2010, development of Hermes halted following the problems encountered with the radio communication. The remaining portion of software to be programmed relied on a working communication between Hermes and the signs.

4.2.4. Power supply

4.2.4.1. 15 December 2009 – 15 March 2009

A subsystem of the Traffic Guidance System was to be installed on the fairground site (The Loop) at the south end of the ELAN corridor. This dedicated system was to provide parking guidance for the

[8] programmed and implemented by Ixor, one of Vialis' subcontractors

entire fairground site and attempted to inspire motorists to use the P+R facility on the site through the provision of detailed information on the departure time of the next city-bound tram. Apart from the exposition halls and an IKEA store on the premises, the fairground site itself is quite barren and electric power supply is virtually nonexistent in large parts of the site. Acting on this information, GCC weighed the possible options to overcome this hurdle. One possibility investigated was to make use of the street lighting system on and around the site to supply power to the VMS signs. The viability of this solution depends on the approval of the authority that manages the electric power grid. A second option which has been researched was the use of photovoltaic cells combined with either fuel cells or a windmill to generate the needed electric power.

4.2.4.2. 16 March 2009 – 14 September 2009

Acting upon the choice GCC had made in the previous reporting period to temporarily connect the VMS signs on the fairground site to the fairground halls' own electrical installation an agreement has been signed between both parties. Ground works, cabling and electrical connections have been realized by GCC between 24 August and 10 September 2009. With the exception of two locations, all installation sites for the VMS signs on the fairground site have been provided with electrical connection and are ready for the VMS signs to be installed. The two remaining locations have been approved for electrical connection by the power grid authority, but hooking up the locations is up until today uncertain given the uncertain destination and exploitation of the fairground site.

4.2.5. Implementation

4.2.5.1. 15 December 2009 – 15 March 2009

The entire implementation plan containing the locations where VMS signs are to be installed was finalized and handed over to the main contractor. Recent changes and special requirements pertaining the installation of the signs were pointed out to the contractor's project manager.

4.2.5.2. 16 March 2009 – 14 September 2009

In early July 2009, Janssens NV, Vialis' subcontractor for the ground works and the installation of the VMS signs, has conducted a number of field visits to the various intended installation sites in presence of the Measure Leader. The definitive positions for all VMS signs were marked during these field visits.

The subcontractor started carrying out preparatory ground works from 24 August 2009.

The installation of the VMS signs on the fairground site was expected to be carried out from 1-10 October 2009. Installation of VMS signs in the city centre was planned for the end of October 2009.

4.2.5.3. 15 September 2009 – 14 March 2010

All the poles for the static and variable message signs were installed. However, in-detail inspection revealed that none of the 90 poles destined to carry the variable signs were without fault. All of the poles had areas of chipped and scratched paint on the surface. In some cases the scratches ran deep enough to have damaged the underlying anticorrosive layer. As a result, a number of poles were already showing evidence of rust. Theses damages were attributed to a lack of care in transporting the poles from the production facility in Hong Kong to the installation sites. It was also observed by GCC that the public domain around the poles was poorly restored after the installation of the pole. The contractor was urged to resolve the problem. All the poles were to be repainted with a new anticorrosive layer.

4.3. Project implementation progress from 15 March 2010

Because of all of the above-mentioned problems, the entire schedule of the project was overthrown. With the leave of the Measure Leader at the GCC, the project suffered a new problem and couldn't continue for the next months. Because of this major change in the project the standard planning couldn't be maintained and therefore the structure of this evaluation is also adapted.

4.3.1. Future of the project: with or without Vialis Belgium

Because of the major problems which occurred during the project the GCC had to make a decision whether or not to continue the project with Vialis. The contractor had made grave errors during the implementation and construction of the system. Besides the problems with the hardware, poor project management from the contractor also led to frustrating situations. The option to end the contract was seriously considered but this would also mean that the GCC had to start all over again, with a project that had been started in 2007 with the first call for tender. Nothing was to say, that the above occurred problems or new ones wouldn't occur with another contractor. So it was decided by the GCC to continue the project with Vialis, with an intense follow-up from the side of the GCC. It was demanded of the contractor to prove (with a new series of tests) that they could control every step before they could take another step.

Although the GCC decided to give the contractor this last chance in April 2010, due to the extra time it will cost to start the procedure all over again and the pressing need of replacement of the old system, it still kept the option of cancelling the contract with the current contractor if there was no improvement what so ever.

4.3.2. Work undertaken in the period 15 September 2010 – 14 March 2011

As of September 2010, everything has been set into motion to finalise the first phase of the sustainable multi-modal traffic management project and to realize Milestone 4 of the measure; i.e. having the system operational by March 2011.

4.3.2.1. Testing period at fairground site The Loop successfully ended

This first testing period covered almost 6 months and gave a lot of information for the next step in the implementation process, i.e. the installation of the remaining batch of VMS signs in the city centre of Gent. During this test period the following problems showed and were solved:

- The electrical safety switches inside the dynamic signs weren't installed properly. This resulted in an electrical malfunction at a certain point caused by an electrical peak from the electrical network at the fairground site.
- The programming of the LED modules and the other dynamic compartments were wrong due to a miscommunication between the manufacturer in Hong Kong and the contractor (cultural differences).
- For some of the signs it appeared radio communication seemed impossible. The contractor Vialis had no problems connecting the signs through GPRS though. Troubleshooting showed that the problems with the radio communication were due to an incorrect patching of the modem in the signs.
- The tests showed that not all of the signs had a stable radio connection which was a proximity effect according to the contractor. A solution was to be found with larger antennas in the near future but it led the project team to believe that this couldn't cause a problem for the remaining VMS signs in the city centre (which were only half as far situated from the base station).

4.3.2.2. Installing the remaining batch of variable signs

With the above information, it could be assumed that the system would be installed and put into service without major problems inside the city centre. In December 2010 the City of Gent gave its fiat to start the installation of the Type 3 – full led – signs, situated on the major roads just outside the city centre. This installation proved to be without significant problems and led to the next step of the implementation process.

In January 2011 the GCC gave its approval to install the remaining batch of dynamic signs under strict conditions. The installation had to be executed under a very strict timing and every sign had to be tested and approved before installation by the Measure Leader of the GCC (in the lab of the subcontractor, Janssens NV).

The physical installation hasn't shown great difficulties and didn't lead to any significant delay. The installation of the radio communication though proved to be yet another difficulty. 80% of the signs proved to have had connection with the server through the radio system, but there seemed to be some major problems with the stability of this connection.

As stated before, there are three radio antennas on the Belfry Tower, each pointed to a different direction. Each antenna transmits a signal and polls each variable sign in its sector every 4 minutes. This polling can do two things:

a. If nothing significantly changes in the parking garage, the polling only shows a status update of the VMS signs.
b. If something else changes, for instance when a parking garage is fully occupied, it should change the LED-display on the variable sign. If there is a loss in communication, it takes another 4 minutes to poll the sign again, which can lead to a contradictory situation on the field (for instance, one sign can display Parking Sint-Michiels as free, another can display full). It should be mentioned that this situation occurs really rare.

In order to solve this problem the following actions have been undertaken:

- Adapting the installation on the Belfry Tower. This led to an amelioration of the polling cycle. Most of the signs seem to have a stable connection.
- Adapting the communication time-out module of the controller in the variable sign. If there is a loss of communication of more than 25 minutes, the signs will turn blank, in order not to give wrong information.

The contractor of the communication installation, RTS, still had great concerns with the installation of the antennas on the VMS signs which was carried out by the main contractor. RTS offered to install the antennas differently on the signs to test whether this improved the stability even more. These tests were conducted in November 2011 and proved to be very successful. In August 2012 all of the remaining signs will be adapted with the new antennas.

4.3.3. Finalizing the first phase

By April 2012, the city of Gent finally had an operational traffic guidance system. Although there were some start-up problems, they weren't of this kind that they had a major influence on the car user in Gent. This was the starting point of an evaluation phase, which led to a temporary approval of the first phase in March 2012.

5. Evaluation of the first phase: parking guidance system

5.1. Evaluation approach

Both the functioning of the system was evaluated, as well as the perception by the citizens. Since it is difficult to measure of the impact of this specific measure on the traffic flow and congestion problems in the city centre, this impact has not been measured. Although to have a small insight in the impact, congestion at the entrance of the main parking garages and on the main axes in the corridor (Nederkouter) have been visually measured at the busiest moment on 3 Saturdays.

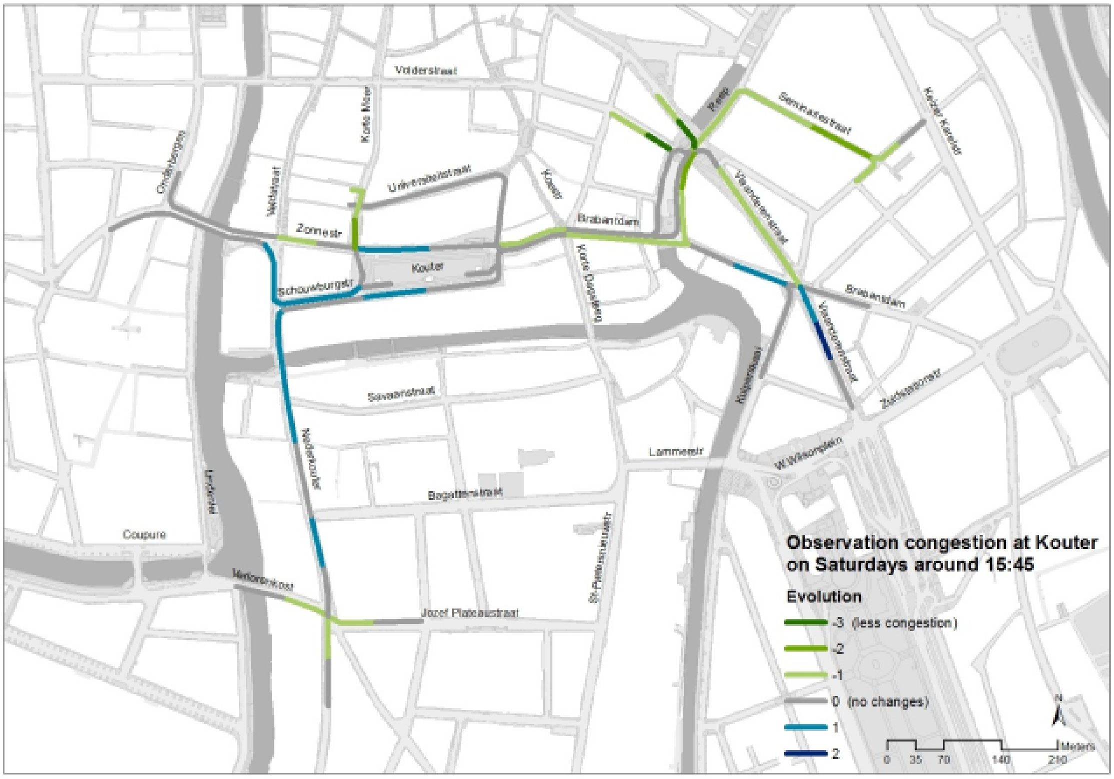
Besides this, the acceptance of traffic guidance system was measured by interviewing car users that were parked at the underground parking facilities about their route choice: did they use the information of the traffic guidance system, is the data clearly presented, etc. The postal questionaire done by inhabitants of the CIVITAS corridor is a second source of information on the appreciation of the traffic guidance system.

5.2. Impact evaluation

Key result 1 - 10% shorter queues around the Kouter parking

In the before situation there was approximately 2.200 m of congested streets sections measured on a busy Saturday. In the after situation 2.000 m of congested streets were found. The target of a reduction of 10% was therefore achieved.

Observation of queues on busy Saturdays (evolution before-after)



Key result 2 – Growing appreciation of new traffic guidance system

The appreciation was measured in a postal survey in the CIVITAS corridor. Citizens' opinions on signposting of parking route stayed stable with 64% positive respondents. On the topic signposting of available parking spaces the number of positive respondents rose from 43% to 84%. The target of an increase of 25% was therefore achieved.

Acceptance on parking and traffic guidance system by citizens living in the CIVITAS corridor

	Parking route is clearly signposted		Available parking spaces are clearly signposted		Digital signs show useful suggestions in heavy traffic		Indicated routes of digital signs are followed	
	2010	2012	2010	2012	2010	2012	2010	2012
Totally agree	12%	9%	9%	32%	0%	2%	-	3%
Agree	52%	55%	34%	52%	15%	18%	-	15%
Neutral	35%	20%	51%	13%	61%	34%	-	40%
Disagree	0%	9%	3%	2%	18%	36%	-	34%
Totally disagree	1%	7%	3%	1%	6%	9%	-	8%
Total	100%	100%	100%	100%	100%	100%	-	100%

5.3. Process evaluation

Barrier 1 - discrepancies between the configuration of the test rig and the real-life sign

The test rig comprised of a laptop running sign test software, a radio that served as a transmitter, another radio that represented the receiver in the sign and a PLC (programmable logic controller) that simulated the internal controller of the sign. This test method was chosen by the contractor because a working sample of a sign controller was not yet provided by the Hong Kong based Vialis Products Limited. When the newly arrived signs were fitted with radios and tested, there appeared to be discrepancies between the configuration of the test rig and the real-life sign. Since software had to be adapted, this resulted in a few months delay.

Barrier 2 - Stability of connection with the signs

A majority of the signs had difficulties to connect with the server. In order to solve the radio connection problem the installation on the Belfry Tower was adapted. Also the position of the antennas on the poles was improved.

Barrier 3 - Controller false programmed

The integrated prisms of the 69 VMS signs on the city ring showed a memory problem. The Vialis controller sends the location of the prisms each time it demands a status report, which means every 4 minutes. The memory of the prisms was built to store 100.000 positions, which should have been enough, if the controller had been programmed differently. Again software had to be adapted, which resulted in a few months delay.

Driver 1 - Satisfactory prototype VMS sign constructed

Vialis proved by Initial Type Testing (EN12966-2:2005), that his VMS fulfils the demands of the required performance classes. The manufacturer could commence factory production of the 123 VMS signs.

Driver 2 - Foundations builded beforehand

Because the poles for the VMS signs will be fitted with a footplate (which will be invisible after installation because burried under the sidewalk), the foundations for the poles can be cast beforehand.

Driver 3 - Successful testing period at The Loop

The testing period at fairground site “The Loop” was successfully ended. The first testing period has covered almost 6 months and gave a lot of information for the next step in the implementation process, i.e. the installation of the remaining batch of VMS signs in the city centre of Gent.

Driver 4 - Successful cooperation with police

During the Lightfestival (200.000 visitors in city centre on Saturday between 18 and 24u), the city council employee that manipulates the VMS signs worked from the police coordination centre. This cooperation was very appreciated by both parties.

Driver 5 – Integration of acces control

The ramp metering system that keeps traffic away from the Nederkouter when quequeing starts, was succesfully integrated in the traffic guidance system. When the ramp metering system is active, traffic to the Kouter is automaticly rerouted. For this application a successful cooperation with De Lijn (public transport company) was needed.