



**SOFIA, BULGARIA**

## GPS based fleet management system

### Background/context

The Municipality of Sofia has signed gross cost contracts with operators of public transport services based on a fixed price for vehicle-kilometres. The trams and trolleybuses are operated by Sofia City Electrotransport (100% owned by the municipality), which runs 190 trams on 17 lines and 100 trolleybuses on 10 lines every day. The buses are operated by Sofia City Autotransport (also 100% owned by the municipality) which runs 76 of the city bus lines. Both operators have contracts with the Municipality which are revised every year.

The remaining 16 bus lines are operated by five firms selected through an open tender procedure and contracted for five-year terms by the municipality.

In all contracts the Public Transport Company of Sofia ("SKGT") acts as a third party (an organising authority) which controls the performance of the operators (regularity, covered mileage, quality of the transport service, etc.) SKGT also collects the revenues passengers (issuing and selling tickets and passes) which are subsequently distributed among the public transport operators every month based on their vehicle kilometres covered.

Certain penalties are imposed on operators, e.g. for deviations of more than two minutes from the timetable or other related issues. There are also certain bonuses for improving the quality of the service.

Based on all this SKGT has to fulfil its obligations for supervising the performance of the operators. Before 2001 SKGT monitored vehicles by means of an outdated system based on certain "marking points" along vehicle routes. This allowed drivers to cheat the system, especially in places where the distances between marking points were too great. All this resulted in decreased quality and increased costs of the service.

### Case description

In 2000 SKGT began investigating ways to replace this system with a modern one based on new technological developments, such as GPS. In 2001 the City and its daughter company SKGT selected the company MUSAT to develop the modern fleet management system.

MUSAT has origins in the Technical University of Sofia, and takes advantage of the experience of its teachers and the innovative thinking of its students.

As the new system improved the performance of SKGT it was 100% funded by the company's own resources.

Milestones:

- 2000 – research
- 2001 – pilot implementation in some electrical vehicles (trams and trolleybuses)
- 2004 – completion of the central system (dispatching centre)

- 2005 – the project was named “IT Project of the Year”
- 2007 – the last bus in Sofia was equipped with GPS (total number of vehicles equipped – over 1,000)

With the help of 24 satellites, the system is able to locate each GPS-equipped vehicle within the range of 10 metres.

The system, patented by MUSAT, consists of:

- Central system:
  - 2 servers;
  - 40 workstations;
  - dedicated software, developed by MUSAT, that can visualise each vehicle on the city map. It has a large number of tools for filtering, reporting, recording, etc.
- On-board equipment:
  - board computer – via GPS module and antenna it transmit the actual location of the vehicle every 30 seconds.
  - Dashboard with interface for operating the system. It also displays the timetable, helping the driver to stick to schedule;
  - Panic button for emergency cases (for accidents, vandalism);
  - Radio station for 2-way voice communication with central dispatchers.

### Legislation and policy issues

During 2000–2001, Bulgaria's Public Procurement Act was not yet in force. Therefore MUSAT was selected based on an inquiry for offers and internal selection procedure. The benefit of this was that the selection procedure was carried out very quickly and smoothly.

### Cost and financing

Cost for implementation of the system (including installation):

- EUR 1 million – on-board equipment (EUR 1,000 per vehicle)
- EUR 430,000 – central system hardware
- EUR 70,000 – software
- EUR 1.5 million TOTAL

Due to the relatively small investment, it was directly paid from SKGT's own sources.

### Results

Cost savings – due to improved dispatching the operational costs (for fuel, oil and tyres) were reduced by approx. 30%

More efficient use of the labour of the drivers reduced labour costs by approx. 20%

Other results: Decreased internal fraud (stealing of fuel, etc.).

### Problems

In its current configuration the system cannot solve problems connected to increased car traffic and traffic congestion. It cannot influence the traffic-light system and there is no connection with the traffic police yet.

### Transferability and success factors

Smaller, less sophisticated systems have been implemented in two other Bulgarian cities – Varna (the country's second biggest city, 400,000 inhabitants) and Vratsa (100,000 inhabitants).

The conditions of the success are the low price of the system and the fact that the supplier is local which facilitates the implementation.

The system was further extended with the installation of more than 100 real-time electronic passenger information boards at bus and tram stops. Each board receives information from the dispatching centre about the exact location of vehicles via GPS and calculates the estimated time for arrival on that stop.

The City of Sofia and SKGT are continuously working on the technological renewal and extension of the system – for better control of mobility. In the final phase the system will be able to control traffic lights, giving priority to public transport vehicles) as well as to interact with the traffic police.

### Lessons learnt

The implementation was very well-organised because it was the responsibility of just one stakeholder, SKGT. The practice in other cases always has shown that the involvement of more players means more time for implementation, partly due to the necessity of coordination.

With no public-procurement law in effect in 2001, SKGT used internal selection procedures. After the adoption of the law, due to increased procedural requirements, all projects were significantly slowed down.

The selection of a supplier rooted in a local university significantly decreased the cost of the project and was a key to its success.

### Conclusions

The implementation of this system is considered a great success due to its low cost, short time for implementation and excellent results:

- The system objectively registers the mileage of every vehicle and records it. This is later on the base for objective payment to the operators.
- Allows quick and effective intervention in the traffic of the PT vehicles if necessary.

### References and contacts

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