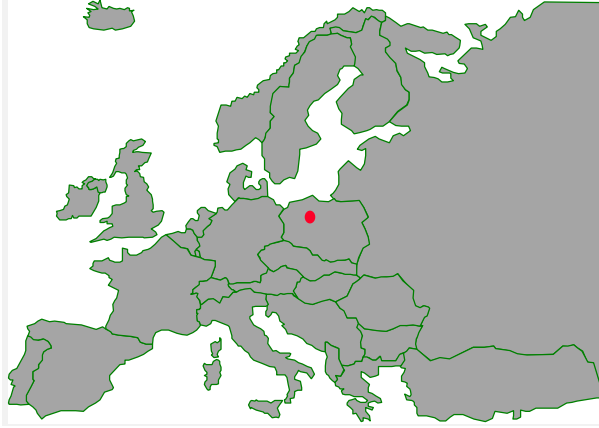


DEMONSTRATION SITE:	POZNAN/POLAND
	
NAME OF THE DEMONSTRATION PROJECT (CASE STUDY):	CITYMAN POZNAN PILOT PROJECT – TRAFFIC MANAGEMENT AND CONTROL SYSTEM
DURATION OF THE PROJECT:	1996 – SUPPORT GAINED 1998 – PILOT COMPLETED
NAME OF THE PROJECT:	EUREKA TRANSPORT PROJECT

URBAN PROFILE

Poznan - the capital and largest city of the Poznan province, lies on the Warta River in west-central Poland with around 700 thousand inhabitants. The city is a major cultural, industrial, commercial and literary centre. Industries including metallurgical works, chemical and furniture factories, textile mills, and food-processing plants. The city is located at the intersection of the busy highways between Berlin - Warsaw and Gdansk - Wroclaw which run through the heart of the city leading to particularly high levels of traffic in general and heavy goods vehicles in particular.

ABSTRACT

Traffic in Poznan has been growing rapidly since the move to a market economy. Current infrastructure was designed for a lower level of traffic and in the absence of large investment funds, power to better regulate traffic and optimise flow is now essential to prevent chronic congestion and pollution problems in the centre of the city. With the aim to help solve this problem, a consortium including a leading Dutch supplier and the Polish consultancy firm PolTraffic in 1996 applied for and gained 1 million EUR of support for a traffic management project from the Dutch Government through the international EUREKA programme.

Within the project, the consortium defined and developed a signal controller upgrade plan for a pilot area of Poznan including the main artery road. This included the development of a generic (single board computer) black box device, which locks on to and takes over the control function of the existing controller, enabling traffic responsive control, central control and network optimisation. A high level library of control functions was also adapted to local conditions and regulations, thus enabling the fast creation of easily adaptable controller software with advanced dynamic functionality.

3 main installations were tested and implemented in a pilot setting including the upgrading of 10 Polish legacy controllers on the main Remonta artery road, a new traffic responsive controller with complex tram priority system at the Most Teatralny intersection, and a new traffic responsive controller using Autoscope video detection for the Roando Kaponiera intersection.

The resulting network of upgraded and new controllers was optimised for flow on the main artery using a window scheme, which limits the flexibility of the individual dynamic controllers in such a way as to maintain co-ordination on the main artery. Preliminary measurements show a 30% increase in capacity on the artery.

The result of the project was the fulfilling of the stated objectives, satisfaction on all sides and commercial continuation of the project, Poznan has ordered over 40 more black boxes. The project is a good example of public-private co-operation, where challenges were met through a combination of professionally and commercially motivated commitment.

The project has shown that transferability of such technology does not necessarily have to be an insurmountable technical or financial obstacle. The success of the project and commercial continuation speaks for itself. Other cities in Poland have been convinced by the approach.

BACKGROUND AND OBJECTIVES

As in many larger cities in Central Europe, traffic in Poznan has been growing rapidly since the move to a market economy. Current infrastructure, both road networks and traffic control elements were designed for a different level of traffic flows. In the face of low investment funds available to build a necessary ring-road, the power to regulate traffic and optimise flow is essential to prevent chronic congestion and pollution problems in the centre of the city. The CITYMAN Poznan project arose against this background.

The engineering consultancy firm PolTraffic Ltd., with close links to both the university and the city, as early as 1994 submitted a plan to the City Road Authority describing the basis for an integrated urban traffic control system that would increase the traffic capacity and improve the traffic circulation in Poznan substantially by taking maximum advantage of the existing infrastructure. The system would simultaneously enhance the functional and economical conditions for public transport and public services and reduce fuel consumption and the impact on the environment.

Working on behalf of the City, PolTraffic chose the Dutch firm Nederland Haarlem from a number of leading foreign companies as the best equipped commercial partner for the City to develop such a system for the Poznan and Polish environment.

The consortium in 1996 then applied for and gained support from the Dutch Government through the EUREKA programme¹.

The research and development aims of the project were defined thus:

- Upgrade and integrate the installed base of “legacy” intersection controllers (for a section of the City). The aim was to change existing controllers from rigid non-traffic responsive into traffic responsive controllers with a capability to become integrated into a traffic management and control network.
- Adapt a generic control programme, which is universally applicable in order to avoid dedicated development for each specific intersection.
- Introduce a central management system on the basis of the proven Nederland Haarlem CityMan concept.
- Introduce alternative detection methods (such as camera based) where it proved expensive or ineffective to install classical loop hole detection.
- Achieve optimisation both at a central network and a local intersection level (2 tier optimisation).

¹ EUREKA is not a funding organisation, but a decentralised European funding source for research and development of marketable products and services. EUREKA works on a bottom-up principle, whereby the project is proposed and directed by the partners who are committed by business agreements

PRESENT STAGE OF IMPLEMENTATION

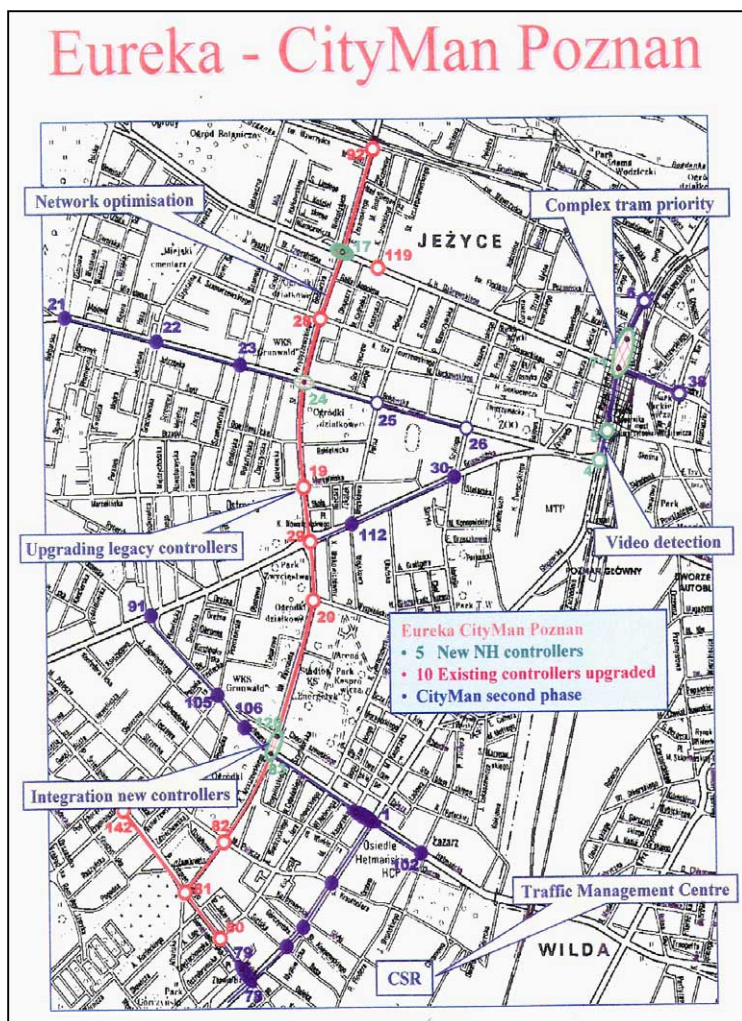
The pilot project was implemented for the upgrade of 10 existing controllers and 5 new controllers were applied on one of the main arteries of Poznan. The above targets were met and the project is moving forward on a commercial basis. The city has ordered over 40 controllers to be upgraded and the fruitful relationship between the Dutch supplier, PolTraffic and the City of Poznan continues to grow healthily.

Financing and Resources Used

Costs are broken down in the following table :

Item	Cost in EUR
Definition phase	210 000
Full exploitation	150 000
Implementation phase	650 000
Total costs	1 010 000

Costs were fully covered by a Dutch Government grant awarded in the framework of the international EUREKA industrial R&D co-operation programme (with the expectation of attractive follow up projects for the Dutch commercial partner).



TECHNICAL PROFILE OF PROJECT

3 main installations were tested and implemented in a pilot setting;

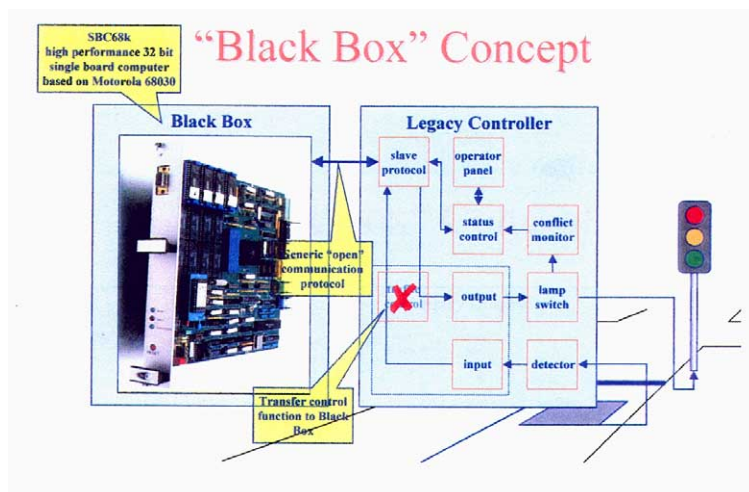
- 10 Polish legacy controllers were upgraded into intelligent traffic responsive and network integrated controllers and 3 new traffic responsive controllers were installed on the main Remonta artery road.
- At the Most Teatralny intersection, a new traffic responsive controller with complex tram priority system.
- A new traffic responsive controller using Autoscope video detection for the Roando Kaponiera intersection

Project area

The following research and development tasks were accomplished :

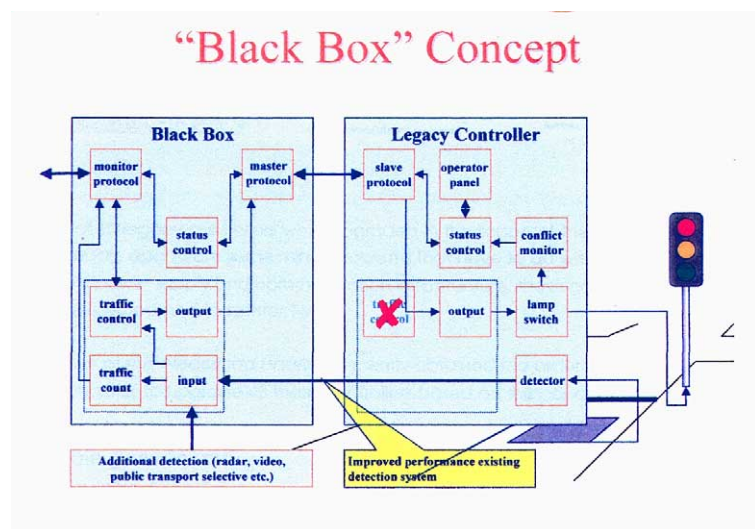
Upgrading and integrating the

installed base of “legacy” intersection controllers



This upgrade was made by creating a generic black box single-board computer for each legacy controller, which took over the traffic control function while leaving intact the original shell (although allowing for other inputs such as video detector data). Ensuring a reliable communication between the black box and the legacy controller was crucial to the success of this upgrade. It was achieved by :

- a) creating a generic “master” protocol in the black box which should be able to communicate *in principle* with any type of legacy controller.
- b) persuading the manufacturer of the legacy controller to develop a “slave” protocol adaptation of his controller conforming to the “master” protocol specification and therefore connecting his device with the black box.



Adaption of a generic control system which is universally applicable

This involved the application and adaptation of a library of high level generic routines, which are used to “build” controller software for the black box device. The library has over 150 functions and enables very fast construction and adaptation of advanced controller logic. The routines were adapted here for Polish peculiarities such as special tram signals and PT priority and static right turn green arrows.

Introducing an integrated control management system

Once the black boxes were installed, this proved a relatively simple task as the central management system installed was compatible with the chosen NH UNIC system. The system was designed to make optimum use of the existing communication infrastructures.

Introducing alternative detection methods

Autoscope video detectors were installed at the Rondo Kaponiera junction. The image processing unit was programmed to place virtual loops over the video image. Vehicles passing the loop were then recognised and input to the traffic controller. 7 cameras installed made it the largest application of *Autoscope* at a single intersection in the world.

Network optimisation at a central and local level

Within the framework of the project, local intersection optimisation was achieved through programming the installed black boxes with the generic control functions for traffic responsive flow. Network optimisation (maximising flow on main arteries through co-ordinated green times for vehicle platoons) has proved a more difficult task. A window scheme was developed which defines (not on-line) times where green must be given at junctions to ensure compliance of the dynamic plan with the network optimisation requirements. The controllers then work within this restriction to maximise overall benefits including possible green time on the artery routes for vehicles, which are not in the main platoon. Dynamic central setting of the window restrictions is a long-term aim and not within the scope of the project.

RESULTS & IMPACTS

All parties concerned in the project are satisfied with the results of the project and all technical objectives have been met. The proof of the success, given the objectives of the EUREKA programme in promoting industrial R&D co-operation which leads to commercial follow-ups, lies in the response of the city, which has ordered a further 43 black box devices to be integrated into the central control system.

Preliminary measurements show a 30% increase in capacity on the main artery of Poznan. It is not clear what the impact of optimisation of this main artery had on the capacity of conflicting flows.

BARRIERS & CONFLICTS

The main technical obstacles were met in adapting state of the art technology to existing hardware and local conditions. Traffic conditions and traffic in Poland differ widely from the conditions generally met in countries of the EU. The biggest challenge was to build a truly open system, which could *in principal* communicate with any existing controllers in the country. The team, however, succeeded in overcoming the majority of challenges that they met.

The biggest implementation problems were met with the *Autoscope* video detection system. Although the system proved to be a reliable and acceptable substitute for buried loop detectors in dry testing, when installed *in situ* in June 1998 it was prevented from working reliably by the movement of the poles to which the cameras were attached (the poles support the overhead power supply for trams). Video detectors are extremely sensitive to movement and changes of lighting etc. and therefore special and delicate system tuning are often necessary. The supplier of the video detection technology is working on the problem.

TRANSFERABILITY

The project was practically all about transferring state of the art signal control technology at minimum cost into an environment with basic but not complete detection and control infrastructure. The products were made generic and therefore transferable in the first instance to the rest of Poznan, in the second instance to the rest of Poland and then to other cities anywhere of similar scale and with similar needs.

The project shows quite clearly that transferability is a big issue from both a technical and financial viewpoint. Without the development of a black box device, it is unlikely that Poznan could have made such quick progress in upgrading to a traffic responsive, centrally connected and fully mutually compatible network of controllers.

A critical point for transferability is the co-operation of the legacy controller manufacturer. If they are unwilling or as in some cities there are in place a range of different controllers of various ages, origin and functionality then immediately there may arise political problems of competition and protectiveness. Clearly the technical and political complexity rises when a number of legacy controller suppliers are each approached to create a “slave” protocol which complies with the “master”.

Different countries have their own peculiarities of traffic regulations, public transport priority and flow, which would necessitate adaptation of the generic function library. Once these adaptations have been made, however, the library presents a very powerful and time efficient way of creating controller software.

It becomes clear from this pilot that transferability of such technology does not necessarily have to be a technical or financial obstacle as the success of the project and commercial continuation speaks for itself.

Transfer is not just about transfer of technology and in this project intensive know-how transfer went on between the Dutch and Polish partner. This was essential to ensure smooth cooperation and to make long-term continuation of co-operation a realistic option.

Other cities in Poland have been visiting the project and have been convinced by the approach.

LESSONS LEARNED

A number of important lessons come out of the project.

At an organisational level there are a number of interesting points to be drawn. The local consultancy firm PolTraffic Ltd forms an interface between the supplier, city and the university. This relationship allows for the overcoming of the know-how, commercial, linguistic and cultural obstacles which inevitably arise in such situations. The project represents a good example of a cross-cultural private-public co-operation. Recognising and to some extent satisfying the interests of all players is essential to such an approach. Everybody gains something, the Dutch Government supports its industry, the supplier gets an advert and a foot in the market, the City gains a better solution than it could have reached otherwise and the local consultancy and university gain knowledge and experience of advanced technology. Such an approach sounds ideal but it must be perceived positively by all parties to make it work.

At a procedural level it is wise to look at the budget allocation between phases. 20 % of the project budget was dedicated to the definition phase. Much time and attention was paid to objectively researching and defining needs and developing a well considered implementation plan which defined a fit-to purpose and minimal cost solution. It would have been very easy to dismiss adaptation of existing controllers as infeasible and instead to throw away the old and impose a completely new system (this is not to say that this is never a good solution). The definition phase included an extensive survey of Polish traffic characteristics and desk research on local traffic forecasts. Given the R&D nature of the work, all adaptations were first computer simulated before being put into practice and thus saving wasted resources on unnecessary failures.

At a technical level as mentioned already, it has been learnt that in this case at least, state of the art signal control products are transferable and adaptable at acceptable cost to the environment of Poznan, Poland and probably the wider region.

ADDITIONAL INFORMATION

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Bibliography and pictures :

“CITYMAN Poznan : The preparation and execution of a significant intersection control pilot project in Poland” - Nederland Haarlem 1998