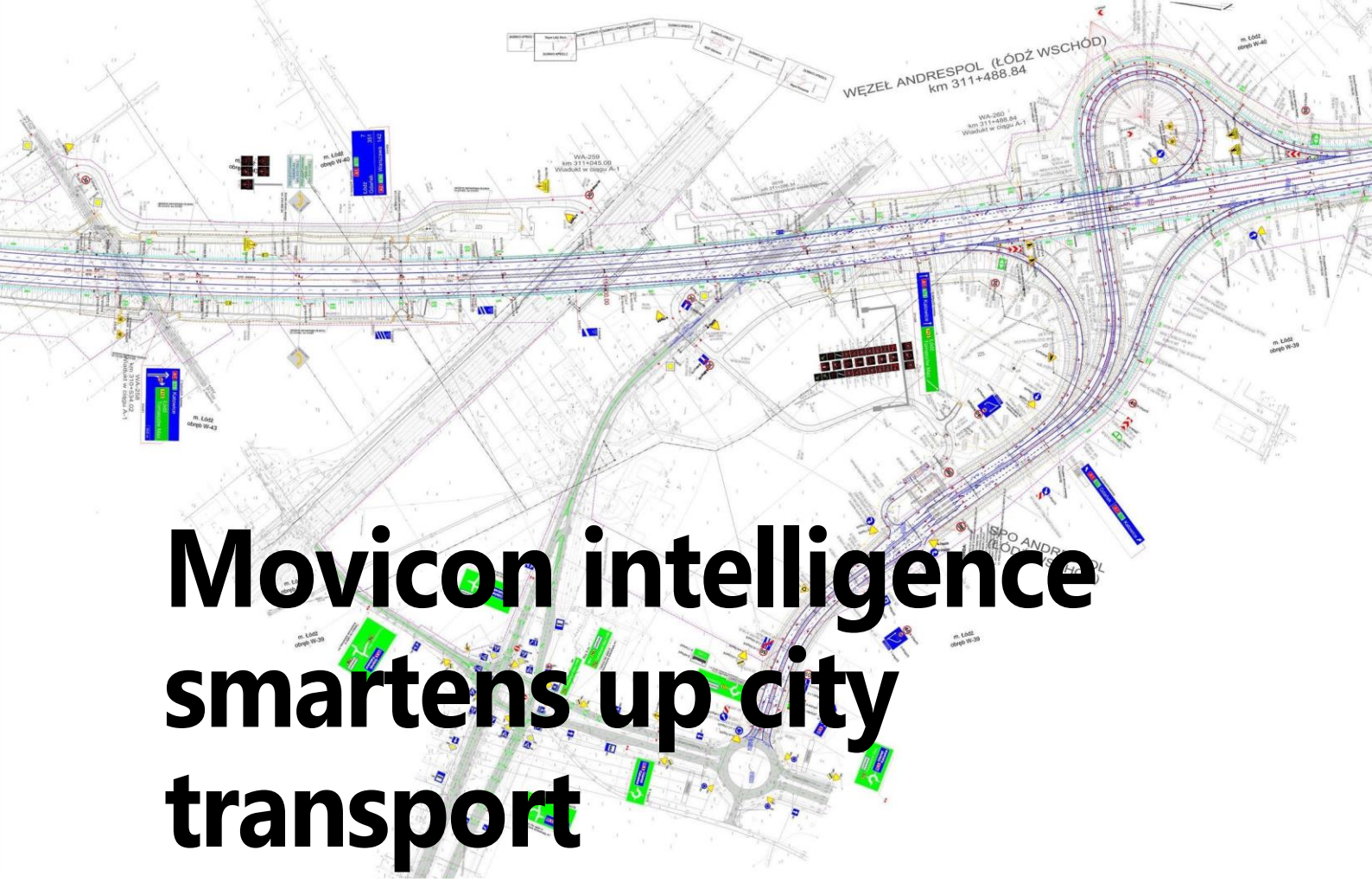


Movicon intelligence smartens up city transport management

The Movicon SCADA technology is used to intelligently control traffic flow through the tunnel in the City of Lodz, Poland.

Lodz is one of the most important cities in Poland. With over 700,000 inhabitants, it is the third important city in Poland. It is also an important communication and transportation hub due to its location in central Poland and its highways and freeways that lead to the other main cities of Poland.
Over the last few years, the city's economical focus has shifted from the textile sector to investing in new technologies and infrastructure by attracting investors operating in the industrial, infrastructure services, logistics and energy supply sectors.
Due to its location and the importance of its mobility and transport infrastructure, two mobility infrastructure projects have recently been put into operation as part of a big European Union investment plan for an intelligent road traffic management system.

The most important project is based on the city of Lodz, which represents the biggest Intelligent Transport System in the whole of Poland. This transport system is comprised of 236 intersections, 700 public transport vehicles, 130 traffic information display panels which total an estimated investment of 185 million euros.

The Lodz city tunnel (Poland) is fundamental for transport travelling across a city of 700,000 inhabitants.

Automation is the key component in this project to manage system intelligence. One such system has been installed in the monitoring and control system to manage traffic flows in the Lodz tunnel.
The Lodz City Council's core mission is to manage the important infrastructure by assigning work and surveying its implementation according to the terms of the project and under the jurisdiction of the law,. The Lodz City Council is an organizational unit of the city of Lodz, whose main objective is to provide assistance to the city's Mayor, in order to ensure that provisions are properly implemented and that all the tasks and objectives undertaken by the city are carried out in accordance with the law.

The players

The project was assigned to Sprint S.A., leading Polish system integrators who have been in operation since 1988. Due to their vast experience in advanced infrastructure technologies and professional services, Sprint S.A. are able to offer clients maximum end-to-end IT security solutions at application and infrastructure level.
Sprint S.A. engineers and installs systems based on different types of media (optic fibre, wireless and conventional): structured cabling, guaranteed power supply systems, alarm systems, fire alarm systems, smoke ventilation, access control, video surveillance and public address systems. The supervision system was assigned to AB-Micro sp. z o.o, who are Progea partners in Poland. They have been operating in the Polish market for more than 32 years offering industrial automation solutions that provide their clients with advanced product and system content.
Their great Movicon skills and experience have allowed them to deliver direct and highly qualified technical support, consultancy and training.
The company HQ resides in Varsavia with another three offices in the north, south and west of Poland. It also has four sales offices and an engineering department with several employees.

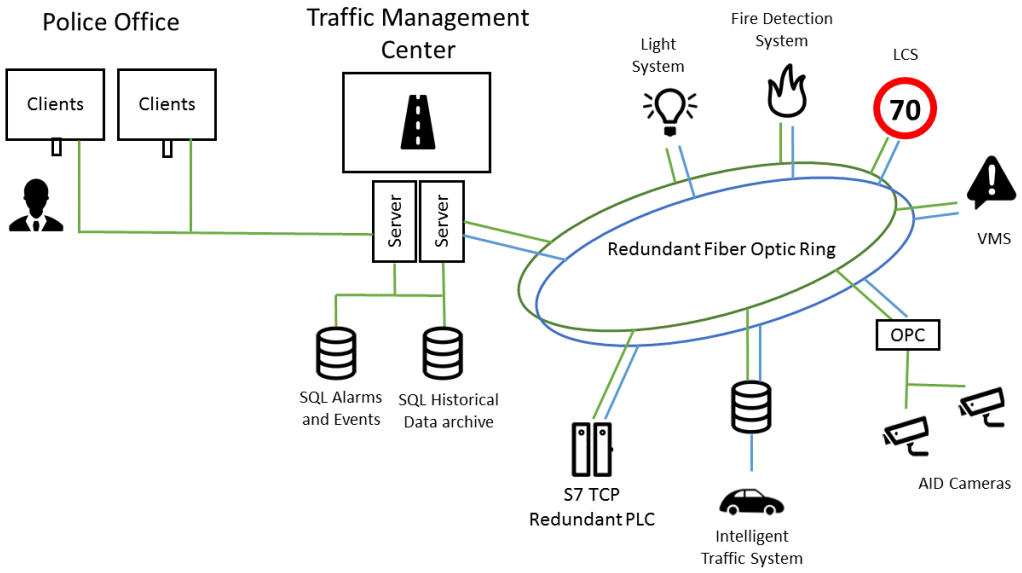
The project's automation solution

The tunnel is situated in the city centre of Lodz and has a dual carriageway heading toward the north and south to reroute heavy traffic passing through the city centre. The 250 meter long tunnel and the entire road and intersections covering 2.5 km are fully controlled and monitored using the Movicon supervision system.
The project's key objective was to manage and improve traffic conditions both for private and public transport in the city center. The monitoring and control system needed to satisfy the following requirement:

- Optimize traffic flow giving priority to public transport;
- Reduce travelling times both for public and private transport users;
- Provide online traffic information in real-time to road users;
- Ensure maximum safety throughout the entire tunnel;
- Manage traffic control, detect and send accident and traffic congestion alerts;
- Control and manage the tunnel's operating conditions in real-time.

The automation project design is based on architecture within which different subsystems, such as PLCs, intelligent video cameras, illumination systems, ventilation systems, fire alarm systems, and traffic information control panels, are used. All of these systems are connected to the main supervisor system with redundant servers collocated in the offices of the Lodz Traffic Control Center, and Client workstations collocated in the various Municipal Police offices.

The Lodz tunnel monitoring and control is based on the Movicon 11.5 supervision platform which includes redundant architecture with two servers and five client workstations. Various subsystem peripherals are connected to the supervisor using a communication network based on two fibre optic rings, one for transmitting data from the video cameras and one for communication between the PLC and peripheral devices.



The Lodz tunnel control system architecture

The monitoring and control system connects and manages the following devices:

- 57 AID system cameras
- 11 sets of Variable Message Sign (VMS) and Lane Control Signs (LCS) panels
- An autonomous illumination regulation system connected to the Movicon control system
- Autonomous ventilation and fire alarm systems integrated with the Movicon supervision system by using electrical signals.

On the whole, the supervision system manages and controls over 3000 I/O real-time variables.

The monitoring and control system collocated in the Head Traffic Control Centre is used by operators to monitor and control ongoing traffic situations 24/7. The Municipal Police offices are also connected to this center using Movicon Client workstations. This allows the police to run control checks on any emergency that may occur in the tunnel so that they can intervene immediately if required. The monitoring and control system also provides the control room with a videowall. The main screen on the videowall displays the complete layout of the tunnel and provides all significant and dynamic information in real-time. A menu permits operators to access the various pages showing mapped out area graphics that report detailed information on the various substations.

An example of a Movicon screen page displayed in the Traffic Control Centre in Lodz.

All the controlled parts can be operated in manual or automatic mode using remote control. When a problem is alerted (such as an accident or increased level of air pollution), the relative intervention procedure is automatically activated with the option for operators to intervene manually when necessary. For example, if an alarm procedure is activated for a road accident within the tunnel, the operator can observe the accident scene closely using the video camera system (a system which is composed of 57 cameras) and intervene to regulate fans and use the variable message panels to warn road users and lighten the traffic flow within the tunnel prior to blocking access to it altogether.

A highly reliable integrated system

Openness is a key feature and one of the reasons why the client chose Movicon. Its architecture provides more than 70 communication protocols allowing the Movcion SCADA to communicate with most of the software products and hardware devices currently available on today's market. Moreover, the use of the most common technology standards offers clients greater freedom to integrate a diverse range of subsystems within one unique integrated management system. A system that offers the use of accident identification, ventilation systems, variable message sign panels and close circuit video cameras. This genre of integration offers users the advantage of management simplification, reduced reaction time and increased safety.

AB-Micro's ambitious project has made it possible to deliver an integrated monitor and control system that ensures maximum server availability and performance. Features that are

top priority considering the mission criticality of such operation system. Two redundant fibre optic rings are use as the basis of the network infrastructure to provide maximum server availability using redundant Siemens S7 PLCs connected to redundant Movicon servers. This kind of redundant configuration delivers the greatest guarantee of reliability which is one of the project's specified key requirements.
It is paramount that the monitor and control system function 24/7 to automatically detect events of accidents and anomaly. As a consequence, quick and appropriate response can be made to activate safety systems using the warning signal panels to avoid road congestion and danger to road users by diverting traffic to alternative routes.
Constant data acquisition from sensors used to detect movement, vibration and smoke for instance, along with AID Cameras permit the system to process and update data continuously. In the event of danger the system is able to alert operators and transmit field signals to inform road users. Lane control signs and variable message sign panels are also managed in unison to divert traffic accordingly.

The operators in the Traffic Control Centre's control room are kept updated with real-time information reporting ongoing situations at all times. They can also manually intervene to modify the viability manged by the system automatically when thought appropriate. The accident alerts and information on hazardous conditions are also made available to Client stations in the Municipal Police Offices to allow quick police intervention when needed.

The following details summarise the system's key management features:

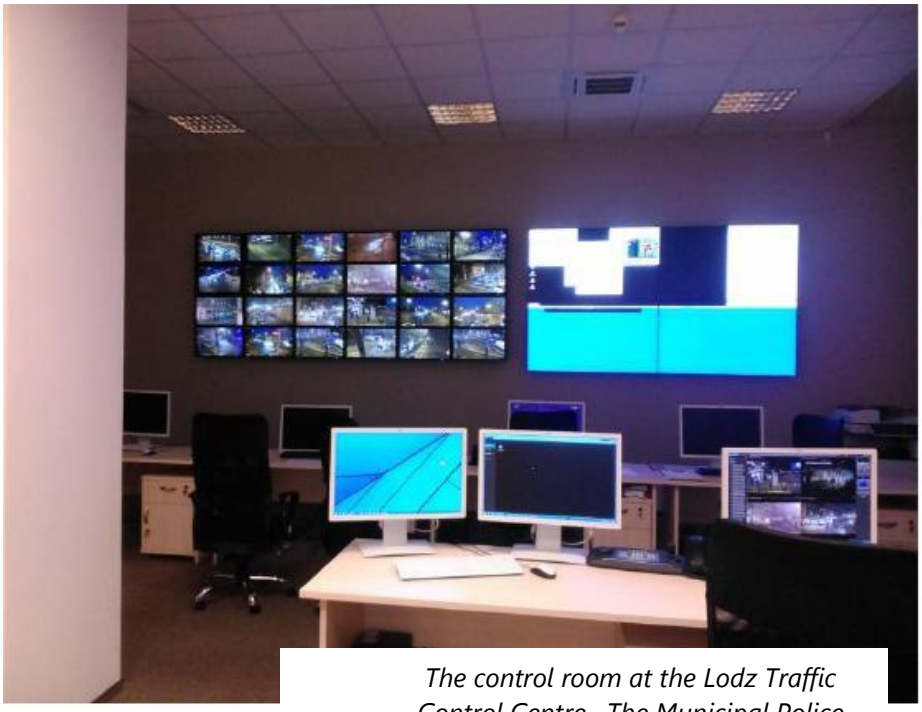
- Monitoring and control of tunnel status in real-time;
- Advanced connectivity with sensors, PLCs, AID cameras, variable messaging Panels, Lane Control Signs.
- Lighting controller system connectivity
- Smoke sensors and fire alarm system connectivity
- Advanced communication gateway and tunnel substation diagnostics;
- Automatic and manual operativity modes (automatic accident detection with operator verification);
- Data sharing with databases of different control systems using the Movicon OBDC Real Time IO Link technology;
- Movicon gateway from AID system (OPC UA) to the Simatic PLC control system.

Project requirements

The tunnel monitoring and control system had to satisfy the following demands according to the client's specifications:

- Highly reliable redundant architecutre;
- Automatic accident detection with AID camera sensors;

- Integration with all the tunnel subsystems: electricity, lighting, ventilation, variable message sign panels, Lane Control Signs and fire detection;
- Integration with the automatic area traffic control systems;
- Remote control;
- Historical logging of data and alarm events in SQL database;
- Implementation of OPC UA standard to access automatic accident detection servers.



The control room at the Lodz Traffic Control Centre. The Municipal Police offices are also connected to the system.

The project completed with satisfactory results by fully complying to the client's demands both in terms of safety and efficiency. Thanks to the automatic controller logic, automatic traffic deviation control scenarios can be easily activated in real-time to provide road users with information by means of using VMS panels and Lane Control Signs to reduce the risk of serious accidents and traffic congestion.
The Instantaneous and automatic detection of accidents or hazardous conditions using AID cameras and sensors enable the system to detect the presence of pedestrians, stationary vehicles, traffic jams, road obstructions, smoke and fire. In the event of any one of these conditions, automatic traffic control scenarios are activated to reroute traffic in order to obtain:

- Major safety
- Reduced in traffic congestion
- Reduced travel times
- Less air pollution caused by car exhaust emissions

This project began in March 2015 and terminated in October of the same year. System tuning lasted until January 31st 2016 after which it was put into operation with the full satisfaction of the client and city residents.

A special thank you to Mr. Zbigniew Betkier
AB-Micro sp. z o.o. - Poland