

ASSECO

Smart bus stops in Rzeszów
City Monitoring and Control System.



Customer Benefits.

The City Transport Authority in Rzeszów is the institution responsible for the functioning of public transport within the city. In the capital of the Podkarpacie region there is a very well-developed private bus communication system, which is used by the residents of the city and surrounding communes. However, a number of private transport providers use bus bays stops belonging to the City Transport Authority in an unauthorized manner. The City Transport Authority, as the infrastructure manager, bears the costs related to bus stop maintenance and is also obliged to ensure the safety of passengers using them. Bus stops can be used by transport providers other than the City Transport Authority only after sign-

ing appropriate agreements related to, among others, payment of fees and other obligations. Cases of using bus stops without having signed such agreement and thus not paying the appropriate fees and not following guidelines such as stopping times have become an increasing problem in the city. The City Transport Authority therefore needed a solution that would allow monitoring and control of the situation at the most heavily used bus bays in the city. The City Transport Authority in Rzeszów has defined its needs by specifying the details of the project entitled "Smart Bus Stop Monitoring System [ISMP]". Following a tendering procedure, Asseco Data Systems was selected as the contractor.

"By implementing another innovative project with Asseco, Rzeszów strengthens its leading position in the Smart City solutions market and we are very proud of that. The new project will contribute to greater comfort for the residents of Rzeszów who use public transport." – Marek Ustrobiński, Deputy Mayor of the City of Rzeszów.

Project in figures.

9 months
project implementation
time

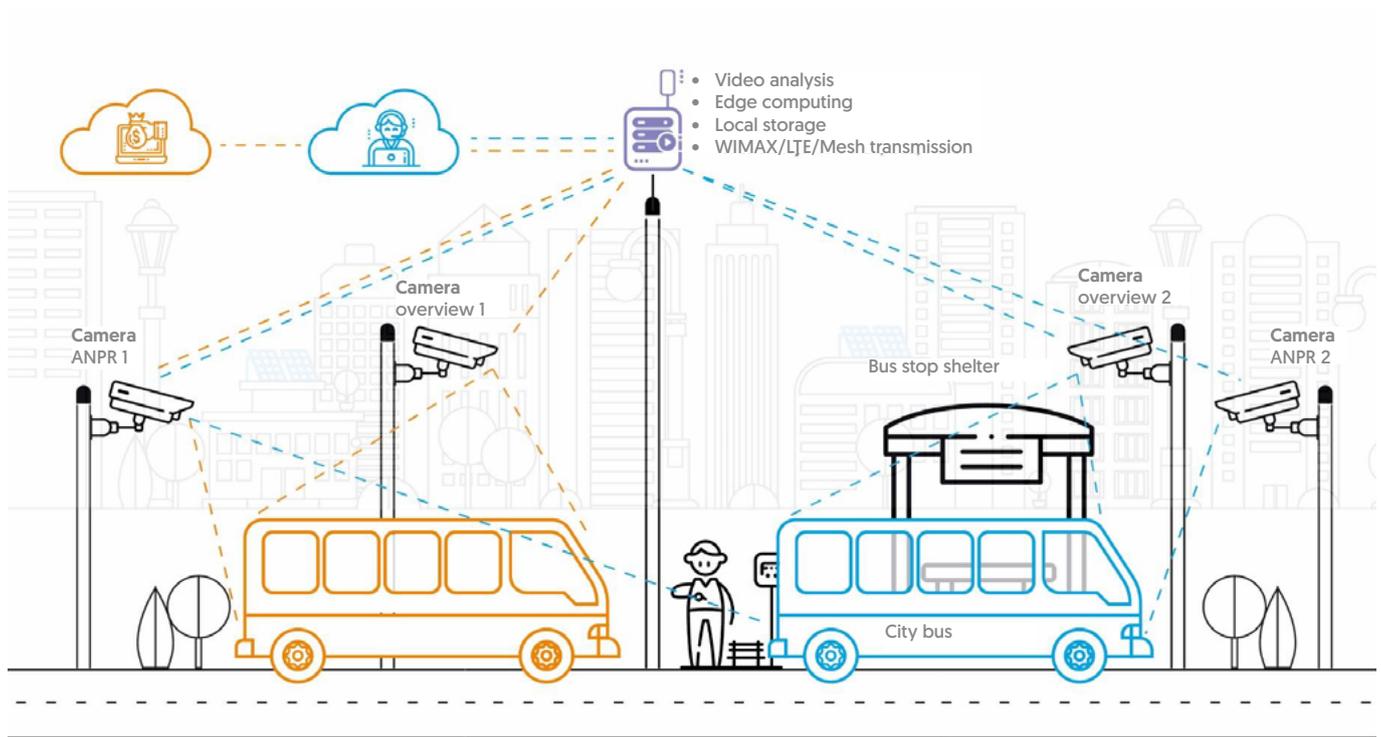
12
number of persons involved
on the Asseco side

8
number of persons involved on
the City Transport Authority side

200
number of installed
cameras

Over 2 million
the number of identified vehicles
within 6 months' time

4000
number of detected cases of
unauthorized use of a bus stop



System functionalities.

The ISMP, which has been installed at 47 bus stops in Rzeszów, is integrated with the city's electronic passenger information system, which has been used since 2015. Smart video surveillance allows, with the help of ANPR cameras among others, the automatic recognition of license plates, as well as the monitoring of parking time, the size and type of vehicle, and the area the bus occupies. The data from the local servers is then filtered in the central system and a finished report on the vehicles stopping at the bus stops is generated.

The City Transport Authority, on the basis of this report, may demand payment from transport providers who have used city infrastructure in an unauthorized manner. As vehicles unauthorized to stop at the bus stops are considered to be buses and other vehicles that do not have the manager's permission to use this infrastructure [for example, buses of external transport providers who have not concluded the required agreement or other large vehicles blocking the City Transport Authority buses from serving passengers].

"It is the first such system in Poland, because Rzeszów was the first city to diagnose the problem and its negative impact on the functioning of transport within the city. We are glad that it was our team that implemented this pioneering project. Currently, based on the inquiries from other customers, we see a great potential of this solution in the Smart City market." – Paweł Sokołowski, Director of the Digital Urban Infrastructure Division, Asseco Data Systems.

System Architecture.

License plate recognition is carried out continuously on local servers. Continuous analysis makes it possible to accurately determine when a vehicle enters a bus bay. Recognition of the make, model and color of the vehicle is done using ANPR cameras and analysis of images of the front of the recognized vehicle taken. The analysis of the vehicle image is done by measuring the front end of the particular vehicle, the grille and headlight layout, and then the analysis data is compared with the vehicle template in the system. Linking of tracked vehicle information between analysis data coming from different cameras is done using the vehicle registration number. The system takes a picture of the vehicle each time an arrival/departure is detected for the purpose of calculating the time spent in the bay and annotates the picture with metadata, in particular the identified registration number and the time stamp of the arrival/departure. Vehicle images are stored locally and transmitted to a

central server on demand. The storage period for images on local servers is approximately 30 days. The vehicle length is measured when the vehicle is first recorded entering the bay. The measurement is performed using overview cameras that are associated with corresponding cameras for vehicle license plate recognition. The vehicle length measurement in a specially modeled camera frame scene is based on video analysis, which aims to detect the object in the camera's view (bus, minibus, etc.) and determine its approximate length. Object analysis is performed by modeling the scene based on integrated video analytics algorithms in the camera and on the local server. Review of analysis results and real-time operation is possible via the camera's dedicated interface. The performance of overview camera analytics can vary depending on the scene modeled, as well as camera placement and manner of installation.

Key benefits.

- The system allows for monitoring and identification of all transport providers using the city's bus stop infrastructure;
- The recordings allow for effective debt collection from transport providers who fail to pay fees resulting from the use of city infrastructure, as well as for controlling whether the terms of the signed agreement are observed, e.g., in terms of the time a vehicle occupies a bus bay;
- The system provides precise and reliable evidence in the form of photographs and video recordings which are necessary in the event that the bus stop infrastructure manager decides to use them in administrative and judicial proceedings in order to enforce claims;
- Improve the flow of vehicles in bus stop bays, reducing passenger boarding times and the process of selling tickets by the driver.

In 2019, the "Expansion of ITS Bus Stop Infrastructure" project was awarded the Smart City Award in the "Smart City Solution" category at the Smart City Forum gala.