

ASSECO

Metropolis

Fare Collection System in Tychy.



The Client.

Metropolis GZM (orig.: Górnośląsko-Zagłębiowska Metropolia) — Metropolitan Association formed in the area of the Upper Silesian conurbation on 1 July 2017, unites 41 cities and communes with a total area of 2.5 thousand square kilometers with 2.3 million residents. The association commenced operations at the beginning of 2018.

Well-organized public transport is the basis for the functioning of Metropolis GZM. Each day, more than 1,600 public transport vehicles hit the streets of the Metropolis, providing transport services to passengers at approximately 6,700 stops. They travel more than 100 million kilometers per year.

Until 2018, there were three different public transport companies in the present-day Metropolis GZM: KZK GOP,

MZKP Tarnowskie Góry and MZK Tychy. The first two used the Silesian Public Services Card System (ŚKUP) and the same ticket fare, while the third had a different one. This generated additional travel cost and was inconvenient for both residents and visitors to the Metropolis. The integration of public transport became an obvious need, culminating in the merger of transport companies into a single entity, the Metropolitan Transport Authority (ZTM). The Silesian Public Services Card (ŚKUP) system is one of Europe's largest comprehensive fee collection system implementations, as part of which over 600,000 electronic ŚKUP Cards have been issued. It supports continuous sales and payments and enables the use of several hundred products of various types for several hundred entities of Metropolis GZM.

Project objectives and assumptions.

The main objective of the project was to extend the ŚKUP system to the area of operation of the former MZK Tychy serving the City of Tychy and 16 communes from the so-called Tychy Agreement, i.e, Mikołów, Łaziska Górne, Orzesze, Ornontowice, Wiry, Kobiór, Łędziny, Bojszowy, Bieruń, Chełm Śląski, Imielin, the City of Oświęcim, the Oświęcim Commune, Miedźna, Pszczyna and Mysłowice. An important new requirement was the implementation of support for contactless payments with EMV payment cards in vehicles and the launch of functionality for the

handling and settlement of transactions made with payment cards in ticket machines and inspectors, as well as the collection of additional fees in ticket inspector devices also using a payment card.

In response to the customer needs, Asseco Data Systems implemented its proprietary Metropolis Fee Collection System (SPO) and integrated it with the Silesian Public Services Card system. The company provided comprehensive support for the ŚKUP cards as well as payment cards in the Mass Transit Transaction/Pay As You Go model.

System Architecture.

Contactless ŚKUP and EMV cards

The solution allows for simultaneous operation of two conceptually different proximity cards: ŚKUP and EMV, taking into account the technologies they use and different formal and legal conditions. Although both cards are contactless cards, they have different concepts of operation at their core. The ŚKUP card is a carrier of electronic money issued by the ŚKUP organization

within the so-called closed loop, and information about purchased services and tickets. EMV cards are primarily a secure identifier that does not require additional information to be stored on the card. The processing of the purchase transaction takes place within the system and the final debiting of the account with the payment takes place within the open loop of electronic money.

Since the handling of each type of card is different, the terminal uses a smart switch that waits for the EMV cards to come close by default. The applied solution allowed to implement support for the same fare using identical user interface for different cards.

Infrastructure

In the delivered solution, the elevated infrastructure performs two primary tasks:

1. Support for transport route completion — on-board computer with necessary vehicle equipment (e.g., GSM or GPS antennas).
2. Support for ŚKUP and EMV cards — ticket machine (validator) and ticket inspector device.

The functionality of the modern on-board computer is based on an x86-64 universal industrial computer running Windows IoT Enterprise edition. The application installed on the on-board computer displays on-screen information about the transport route completion and ongoing information about being ahead of or behind schedule in an easy-to-understand fashion and allows two-way communication between the driver and the management center.



A ticket machine is a device consisting of a Linux-based IoT computer and a certified EMV card payment terminal. It provides full ŚKUP card and payment card support, including the sale of tickets in distance and zone-time fares.



The ticket inspector device is based on a payment terminal — with PayDroid (a specialized version of the Android OS). Thanks to this approach, in addition to functionalities related to validation of tickets, it enables collection of additional payments via payment cards — including contact payments. For charges requiring entering the PIN, innovative PCI PTS 5 compliant on-screen keyboard technology is used.

All devices of the remote infrastructure have been equipped with large, colorful touch screens, and applications feature a rich, modern-looking graphic interfaces. With regard to the Data Processing Center, the Asseco Data Systems implementation team carried out comprehensive work consisting in embedding the newly implemented modules of the central software within a private computing cloud, which was integrated, maintaining high security and performance standards, with the previously implemented private computing cloud of the Open API ŚKUP environment.



The ŚKUP system and the ŚKUP API

Integration with the ŚKUP system was carried out using the ŚKUP Open API Integration Platform, which allows devices and services from different manufacturers to be connected to the system. With the Open API, the ŚKUP system is no longer homogeneous, which reduces the cost of purchasing new devices. This is the first implementation of the Open API platform in Poland in a fare collection system such as ŚKUP.

The components of the Metropolis SPO system

The project involved the use of Metropolis SPO components, a fee collection system developed by Asseco Data Systems:

- **AOZ module.** The purpose of the module is to provide communication between devices and other system modules, in particular with the Open API ŚKUP and MTT. Additionally, the module allows to manage and monitor the operation of the remote infrastructure.
- **MTT module.** The purpose of the module is to process transactions executed via EMV cards. Its role is to collect partial information on payment card usage in the system along with its contexts processing and debit generation, managing debt card processing and providing information to external systems.
- **Payment Gateway and Acquirer services.** The execution of EMV card payments using deferred authorization, and in particular the ŚKUP fare when the transac-

tion amount may not be known when the card is read (tapped), necessitated the use of the Payment Gateway service. Within the framework of the delivered solution, the service has been integrated with the system of the Acquirer — Polskie ePłatności, and the entire solution was granted the certificates required by Visa and MasterCard payment organizations.

- **Modules supporting passenger service.** Modules supporting passenger service are an integral part of the delivered solution. The functionalities related to the presentation of the history of EMV card usage and the handling of complaint processes are particularly worth of mentioning. The functionality listed was provided as part of:
 - Customer portal
 - Application used at Passenger Service Points
 - Complaints module

Key features.

- ŚKUP card support ensuring full compliance with the ŚKUP-related processes.
- EMV card support in vehicles using deferred authorization mechanisms and daily transaction aggregation in accordance with Visa and MasterCard standards guidelines for transport.
- The system is ready to implement daily-optimized fares depending on the card usage history. The idea is that the customer can always be charged the most advantageous fee. This functionality is particularly useful in the case of differentiated fares, of which the fare in the Metropolis is a prime example.
- The all-in-one ticket inspector solution for verifying ŚKUP and payment card holders' entitlements. Ability to pay additional fees (fines) using cash and credit cards.
- Payment card usage history implemented within the ŚKUP portal supporting online tokenization and the ability to link a payment card to an existing ŚKUP account or passenger account.
- Mechanisms related to complaints handling including the ability to report complaints related to the use of a payment card through the portal, POP or mobile application.

Distinguishing aspects of the solution.

- The transaction amount does not need to be known at the time the card is tapped.
- Ability to use distance and zone-time fares in parallel.
- Possibility of applying a daily-optimized fare (choosing the most advantageous fare for the passenger).
- The payment card is a carrier of ticket information equal to the ŚKUP card.
- From the passenger's point of view, ŚKUP and EMV cards are operated in an identical manner. The passenger does not have to learn the nuances of how to use each type of card.
- The system uses a secure card identifier in the form of a token. The same token is always obtained from the card number and expiration date, but the card number and expiration date cannot be determined from the token.
- The card can be tapped without the need for the terminal to remain in constant connection with the central system.

Key benefits.

- For the passenger:
 - Providing full functionality of the ŚKUP, convenient purchase and use of Metropolis GZM tickets in the area covered by the Tychy Agreement using the latest generation of fee collection system devices.
 - Convenient cashless payments via EMV payment cards in accordance with Visa and Mastercard guidelines for transport directly at electronic ticket machines installed in vehicles.
- For the transport provider:
 - A single, integrated Fare Collection System throughout the entire area of the company's operation.
 - Opening the ŚKUP system to a wide variety of device and peripheral service providers.
 - Production-implemented pilot of the new form of payment, allowing to carry out proper tests before its large-scale implementation in all vehicles covered by the ŚKUP system.
 - Providing modern, passenger-friendly solutions, which will translate into an increase in the number of people using public transport.

Project in figures.

13 months

maximum project implementation time

PLN 11 million net

project budget

+ 160

**vehicles (buses and trolleybuses)
equipped with modern
infrastructure**

190

**in-vehicle computers — universal
industrial tablets integrated with the
panel have been installed in vehicles**

560

**ticket machines with a touch screen and
card readers for contactless payments
have been installed in vehicles**

10

**state-of-the-art ticket inspector devices
with payment card support have been
installed in vehicles**

“We have implemented the new method of payment in buses in Tychy in the MTT standard, the international standard for contactless payments in public transport. This is the first such project in Poland. When the payment card is held near the reader, the transaction is identified with a unique, encrypted token. The card then becomes a proof of acquiring the right to travel and in the case of ticket control, you just have to put it close to the control device. Settlement of payment for the travel takes place as a separate process at the end of the day. This gives additional possibilities to use algorithms to select the most advantageous fare for the passenger. The solution has been certified by the international payment organizations — Visa and MasterCard. The implementation in Tychy perfectly shows the potential of the ŚKUP service platform, where the most technologically advanced solution and convenient forms of payment for the travel were made available to passengers. The project itself, which for a number of reasons was quite a challenge, was carried out in an exemplary manner.” – said Paweł Barnaś, Director of the Smart City Division at Asseco Data Systems, the contractor to expand the ŚKUP system.

“Nowadays, contactless card payment is a standard and a major convenience for people who do not carry cash on them and make practically all transactions using a card. Now, this will be possible in buses and trolley buses in Tychy. We want this to become a standard in our transport, therefore we are working on this solution in connection with the planned and global modernization of the ŚKUP system.” – said Jacek Brzezinka, Member of the Management Board of GZM [Contracting Authority].