Customer case study
Transportation Infrastructure

Intelligent transportation stations as part of the automated payment initiative

Summary

- A transit agency needed to automate its fare collection system for better efficiency
- As part of the automation project, the agency also wanted to monitor other station events to simplify the job for booth personnel
- Phoenix Contact’s Control and Industry Solutions (CIS) team provided a complete solution that was easy to maintain

Customer profile

A major transit agency in the mid-Atlantic had used a manual cashier system on its subway lines for 50 years and decided to upgrade the system as part of an overall automated payment project.

Background

Ridership on mass transit systems is increasing at a fast pace across America. To keep up with this demand, transit agencies need to streamline fare collection and payment handling. This means taking advantage of high-tech systems, such as easy-to-use smart cards, credit cards, and other electronic means for fare collections.

Transit agencies around the country are upgrading their fare collection systems with new and better technology to meet customer expectations for a higher level of service. Older methods are rapidly becoming obsolete, costly, inefficient, and unaccountable.

Challenge: Much more than just an automated payment system

A major transit authority in the mid-Atlantic has used a manual cashier system on its subway lines for 50 years and decided to upgrade the system as part of its overall automated payment project. The current system relies on cashiers stationed in booths.

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The cashiers activate manual controls on the integrated control consoles (ICCs) to allow riders access to the boarding platforms through turnstiles. These consoles contain pushbuttons and pilot lights to show the operator what is activated. The cashier performs other important duties and will remain in the booth for a time to come. However, cashiers may have to perform an emergency train stop in the case of a passenger falling onto the rails or other emergency situation. They also have the responsibility to notify maintenance with a call bell if someone spills something or leaves something behind, or if a light is out or something is broken on the platform. The cashiers also monitor
elevators and escalators, so they can notify the zone office of emergencies, such as an elevator that has stopped running or needs maintenance. Cashiers also need to monitor wheelchair-bound passengers and others with disabilities, to ensure that these customers have safe access to the system or to provide necessary assistance. The cashier manages all of this locally in the booth. All inputs and outputs are hardwired from the ICC to the end devices.

From outside the cashier’s booth, it is currently not possible to observe the status of lights or the position of pushbuttons, or to note if the cashier is in or out of the booth. Additionally, the cashier is solely responsible for the access systems described above. The agency wanted to change all that.

In addition to streamlining the fare collection process, the agency wanted to have the ability to monitor and control entries remotely, monitor and control elevators and escalators, and, if someone falls into the track area, to activate alarm systems with lights and/or sound devices and to activate the emergency train stop system. Numerous new cameras will monitor for wheelchair-bound passengers, and station agents will also patrol the stations. The agency wanted to enhance this system with devices that allow remote monitoring and control. This will give the agency “eyes” on an integrated system, so supervisors receive a notification (an alarm or indication activated) if and when a cashier leaves the booth.

The agency’s goal was to have six zone offices open 24 hours a day, seven days a week, communicating to 80 cashier booth sites. This would greatly improve awareness of the booth status and allow remote monitoring, so action can be taken whether or not the cashier is present in the booth. The project also required hardware, software, and engineering expertise in a simple enclosure, so that agency employees could easily install the system with minimal use of scarce resources.

Solution
Phoenix Contact’s Control and Industry Solutions (CIS) team worked with the transit agency and a local engineering firm responsible for developing the HMI component of this project. The design included all connectivity designs, from software down to the wire type and sizes that would fit the conduits.

Phoenix Contact provided the ILC 131 with Ethernet communication on Modbus TCP over the existing Ethernet system. Other components in the system included MINI power supplies, PLC-PT relays, Varioface (VIP) power distribution block, and push-in (PT) terminal blocks, all in an enclosure with appropriate holes for conduit and cabling. A local engineering firm programmed Wonderware for the HMI software, and Phoenix Contact created custom WebVisit screens to aid in commissioning so the transit agency did not have to do any programming. Each substation also received security appliances to protect Ethernet communications. The transit agency installed the boxes.

A parallel system would also be wired into the existing ICC, communicating the status of each circuit via Modbus TCP. This was achieved by the use of an ILC and wired I/O. The ILC communicated through an unmanaged switch that had one fiber and four copper ports. The Modbus TCP signals were integrated into the Wonderware HMI that was programmed by the engineering firm. The existing hardwired points were rewired to terminal blocks for integration in parallel with the new I/O system.

Results: Easy maintenance and troubleshooting
The transit agency is very pleased with the units that have been installed so far. Benefits include the following:

- Ease of maintenance: The ILC uses SD cards that make replacement simple.
- Improved troubleshooting: The ILC has easy-to-use troubleshooting tools, plug-and-play replacement, and monitoring ability.

The transit agency has also developed a strong working relationship with Phoenix Contact as a trusted partner for future opportunities. The relationship has since led to the development of a pump monitoring system.