# Eyes on the Road

## Smart City Co. Enhances Road Safety with

## AAEON's BOXER-8645AI

## Introduction

Smart city applications serve myriad purposes across different sectors, from enhancing public safety to environmental monitoring. However, the biggest impact the deployment of smart city applications has had in recent years is the way they have helped cities streamline transport architecture to reduce congestion and make roads safer.

Based in Taipei, Smart City Co. is a major presence in smart transport infrastructure, with projects that span from traffic violation detection to vehicle flow analysis. Seeking a platform to help scale their already impressive deployment portfolio, Smart City Co. worked with AAEON to leverage new, more advanced technologies for traffic law enforcement systems.

They did this by using AAEON's BOXER-8645AI, a Fanless Embedded AI System, as a core component of their application architecture.

# Getting up to Speed

The project's objective was to create an AI-driven system that could detect and report traffic violations in real time. This would serve a broader ambition to improve road safety, reduce traffic incidents, and ensure compliance with traffic laws. To achieve this, Smart City Co. designed and deployed a network of AI-powered roadside units with AAEON's BOXER-8645AI as the edge device responsible for the application's inferencing and compute tasks.

As this was not their first large-scale smart city project, Smart City Co. was aware of the challenges that needed to be overcome. The first of these was identifying an embedded system with enough computing power to handle huge datasets and the inferencing capabilities to run AI algorithms on the edge. On a related note, the device chosen would be deployed 'on the ground' where traffic was being monitored, and so making sure it could cope with the outdoor environment was another requirement.
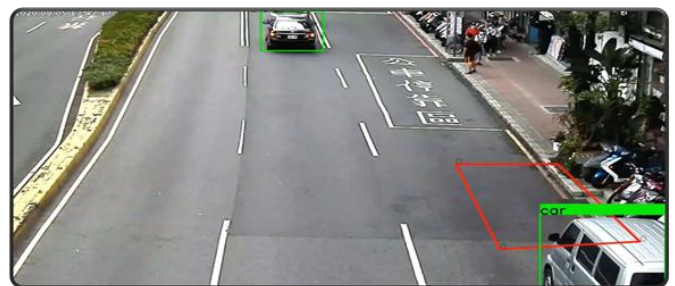


Where communication was concerned, the main issues that Smart City Co. needed to address were the accuracy of the edge device's analysis and how reliably it could securely communicate its findings to a central server. The former point focused on the methods used to obtain image data, and the impact that different types of camera would have on the quality of images the device received, while the latter point focused on the ability of the device to act as a node within the broader application ecosystem.

For example, even if they had deployed a device with exceptional processing and inferencing capabilities, the accuracy of its findings would be inaccurate if the image data analyzed was not of sufficient clarity.

## The Smart Choice: AAEON's BOXER-8645AI



Having used other products from AAEON's NVIDIA-accelerated embedded AI systems for projects in the past, and also recently demonstrated their AI algorithms as part of a live demonstration with AAEON at Embedded World 2025, Smart City Co. had an existing relationship with AAEON. As such, they were already aware of which models from AAEON's Smart Platform Division would be suitable for their project needs.

Given the targeted and specific purpose of the application, Smart City Co. saw AAEON's BOXER-8645AI as the right fit for the project given the system's exceptional computing power, environmentally resilient design, and unmatched peripheral support.

Addressing the customer's requirement for a device with high computing power, the BOXER-8645AI offered 275 TOPS of AI performance via its NVIDIA® Jetson AGX Orin™ module and 2048-core NVIDIA Ampere architecture GPU. With this level of speed and computational sophistication, the application benefitted from the BOXER-8645AI's ability to provide massive parallelism to facilitate the simultaneous analysis of multiple video streams.

In addition to this, the system could run complex Convolutional Neural Networks (CNNs) for object detection and lightweight Transformer models for OCR, as well as executing multiple classification tasks at once – e.g. identifying traffic violation type, license plate details, and vehicle type.

A key factor in the accuracy of the BOXER-8645AI's analysis was Smart City Co.'s choice of peripheral cameras. Through the BOXER-8645AI's eight FAKRA connectors, they installed GMSL2 cameras to obtain the image data necessary for analysis. This provided high quality video stream with ultra-low latency, given the GMSL2 interface's substantial increase in bandwidth speed compared to USB cameras.

Another benefit was the multi-camera synchronization offered, which allowed for data to be captured from multiple angles with synchronized frames, achieving extraordinary levels of clarity. The high quality of the images obtained and used by the BOXER-8645AI served to increase the accuracy of the system's decision-making, reducing false positives by allowing the engine to make use of more reliable data without affecting the speed of operation.



A more practical benefit was also noted in the longer cabling supported by the GSML2 interface, which allowing multiple cameras to be installed on a single edge device and subsequently mounted across locations ranging up to 10 meters.

Such a feature added huge value by allowing Smart City Co. to install more cameras on objects such as traffic light frames, poles, and other existing physical infrastructure.

The environmental specifications of the BOXER-8645AI made it more than capable of operating in the conditions required, given its -25°C to 65°C temperature range. Moreover, the PC was easily deployed via wall mount and offered a 9V to 36V power input range so as to maintain operationality even with unstable power supplies.

Addressing the final prerequisite for the application, the BOXER-8645AI's RJ-45 port was connected to a 4G router, which in turn used a VPN to securely access the internet and assign a secure internal IP address from which it could send details of traffic violations that had been detected to a central server over MQTT for review by law enforcement.

## Application Architecture
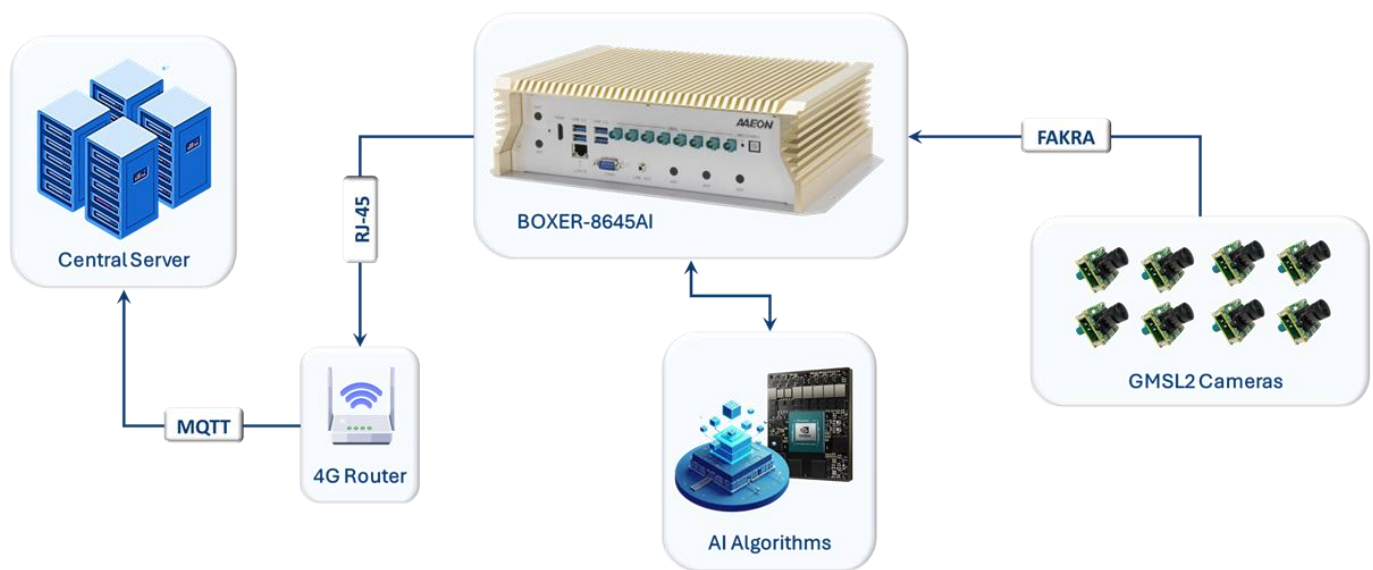


## The Impact of Scalable, Real-Time Traffic Enforcement

By choosing AAEON's BOXER-8645AI as the brains on the edge of their application ecosystem, Smart City Co. successfully deployed a scalable, real-time traffic management system that improved road safety and automated the enforcement of traffic laws.

While the broad range of scenarios the system encountered make it difficult to quantify its impact on reducing traffic violations, the combination of the BOXER-8645AI with GSML2 cameras and Smart City Co.'s proprietary AI models resulted in the system achieving 99.99% accuracy when it came to license plate recognition.

It should be noted that the system also granted a variety of intangible benefits, such as reducing the manpower required to monitor and enforce traffic laws in the areas covered. This is compounded when considering the greater level of consistent enforcement offered by an automated system capable of continuous operation.

# About AAEON

Established in 1992, AAEON is one of the leading designers and manufacturers of industrial IoT and AI Edge solutions. With continual innovation as a core value, AAEON provides reliable, high-quality computing platforms including industrial motherboards and systems, rugged tablets, embedded AI Edge systems, uCPE network appliances, and LoRaWAN/WWAN solutions. AAEON also provides industry-leading experience and knowledge to provide OEM/ODM services worldwide. AAEON works closely with premier chip designers to deliver stable, reliable platforms. For an introduction to AAEON's expansive line of products and services, visit www.aaeon.com.