AAEON — Always Agile, Always Ahead.

NVIDIA Elite Partner

Drive In-Vehicle Deployments
**BOXER-8658AI**

‣ NVIDIA® Jetson Orin™ NX
‣ PoE LAN x 8
‣ Serial Communication Options

## Introduction

Be it ensuring the safety of personnel, law enforcement vehicle fleets, or the delivery of high-value cargo, security has always been paramount in the logistics sector. The need for safety measures on the road has increased across industries, with examples ranging from public figures with dedicated staff to corporate asset transportation, such as financial institutions transporting high-value cargo like cash for ATMs.

The consistent theme that all of these examples share is that the choice of vehicle is crucial. Armored vehicles have long been associated with the military and law enforcement, but such vehicles are easily identifiable, for obvious reasons. In contrast, public officials, celebrities, and those transporting high-value cargo require a similar level of security but in a more discreet form.

Due to these advancements, resilient in-vehicle security systems that anticipate threats, rather than merely withstand them have evolved into a specialized sector within the security industry. These systems are crucial in guaranteeing the safety and security of assets and personnel, especially in high-risk environments.

One of AAEON's clients, a company that creates comprehensive integrated security solutions for various individuals and organizations, wanted to enhance their in-vehicle security offerings. With AAEON's BOXER-8658AI, they successfully created a user-friendly, AI-supported, durable security solution to address their client's varied security requirements.

## The Journey to Deployment

For their application, AAEON's customer utilized an embedded PC as part of a broader security ecosystem which included multiple cameras, threat detection software, and remote monitoring hardware, in the case of commercial fleet management. Therefore, it was crucial for the chosen embedded solution to be easily deployable across various vehicle types, and robust enough to withstand the diverse operating environments it would encounter.

The client's end product aimed to proactively mitigate security risks through the use of AI inferencing while on the road, enabling real-time decision-making in response to threats. This required the system to have significant processing and inferencing capabilities for instant threat detection, as well as versatile interfaces to support secure communication via both wired and wireless connections.

Considering the installation environment for the embedded PC, the most critical requirement was its ability to maintain reliable operation under harsh environmental conditions.

# The BOXER-8658AI: Navigating Any Environment



The BOXER-8658AI's unique selection of interfaces was a major factor in its selection for the project. With the PC able to support eight PoE cameras via RJ-45 ports, the client's security system could maintain comprehensive surveillance of the vehicle's surroundings.

This multiple PoE interface allowed for simultaneous power and data transmission, simplifying deployment and eliminating the need for a separate power source when installing cameras for the application. Additionally, the inclusion of multiple USB 3.2 Gen 2 ports and serial ports (DB-9 and DB-15) facilitated communication with various vehicle systems, sensors, and industrial equipment, enhancing operational versatility and integration capabilities.

It was not just the BOXER-8658AI's wired interfaces that had an impact; its extensive expansion and positioning, navigation, and timing (PNT) options were also crucial to the project. The system's M.2 slots accommodated Wi-Fi and LTE wireless connectivity, while providing scalability to suit AAEON's customer should they require a multi-vehicle fleet management solution.

Onboard Global Navigation Satellite System (GNSS) granted accurate real-time positioning data, essential for tracking the precise location of vehicles, or even setting up geofencing and route optimization protocols for dynamic navigation and monitoring.

The PC's 9-axis sensor support offered a 3-axis accelerometer, 3-axis gyroscope, and 3-axis magnetometer, allowing for automated alerts to be transmitted to control rooms based on predefined thresholds or anomalies detected by the sensors.

For example, in the event of a collision, the gyroscope sensor would note a change and be able to send a warning message to the central control unit via the system's LTE function.



Given the project's narrow specifications, the BOXER-8658AI was the obvious choice for the client's in-vehicle security system. As the factor without which the project would be a non-starter, the product's environmental resilience was a key factor.

Designed to meet MIL-STD-810G standards for shock and vibration resistance, the BOXER-8658AI was guaranteed to work in harsh environments on the road. Furthermore, the solution's broad -15°C to 60°C temperature range guaranteed consistent performance across varying climates.

Efficient power management was also a factor, given the initial power spikes caused by a vehicle's ignition being turned on and the sudden shutdown process seen by vehicle power systems when turned off.

The BOXER-8658AI's Accessory (ACC) Ignition Delay On/Off feature ensured that its power transitions aligned with the vehicle's ignition cycle, optimizing power consumption, protecting mission-critical data, and ensuring continuous operation without unnecessary taxation on the vehicle's battery.

This protection against power supply volatility was further enhanced by the system's 9V ~ 36V power input range, giving AAEON's customer a broader deployment range of vehicles the BOXER-8658AI could be installed in.

While the BOXER-8658AI's peripheral support and advanced data acquisition channels were useful, the key differentiator is how the data they collected was used. Powered by the NVIDIA® Jetson Orin™ NX, the BOXER-8658AI had the processing power to take the data received by the device's PoE cameras, sensors, and other peripherals and perform real-time analysis.

With up to 100 TOPS of inferencing performance, and the assistance of the module's 1024-core NVIDIA Ampere architecture GPU, the BOXER-8658AI could detect anomalies, recognize threats, and trigger alerts in milliseconds using advanced inferencing models, increasing operational efficiency and response times, both crucial factors for preemptive security measures to be actioned.

# The Impact of AAEON's AI Capabilities on Mobile In-Vehicle Security



By selecting the BOXER-8658AI, AAEON's customer was able to create a comprehensive in-vehicle security system that excelled in performing real-time mobile surveillance through the use of its eight PoE camera support.

The BOXER-8658AI could be easily installed using just two wall mount brackets, which was especially beneficial due to its compatibility with a variety of vehicles. This allowed AAEON's customer to customize the solution to meet their individual client's needs without the need for extensive retrofitting or vehicle customization.

On a fundamental level, the BOXER-8658AI met and exceeded the rigorous requirements for processing power, environmental durability, and connectivity. It harnesses the power of AI to accurately and efficiently identify potential threats. Whether it is for personal security, transporting valuable cargo, or managing entire vehicle fleets, the BOXER-8658AI's strong performance and reliability demonstrate that AI can be a highly versatile tool for mobile security solutions. AAEON has solidified its position as a leader in developing and delivering these benefits.

# 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.