

MASS TRANSIT

Harness the Power of AI to Enhance Passenger Safety and Maximize Operational Efficiency

Improve security and increase ridership with video analytics

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Rail and transit passenger expectations for safety and security are higher than ever. Transit agencies that have regained their pre-pandemic ridership levels have made significant investments in vehicle cleanliness, platform and route security patrols, in-vehicle surveillance systems, and rolling stock maintenance, to name just a few. But are these investments enough to meet the expectations of the modern transit passenger?

THE CHALLENGE: PASSENGERS DEMAND — AND DESERVE — INCREASED SAFETY AND SECURITY

The urgency for the public transit industry is to respond with some haste to the needs of passengers regarding safety and security on their transportation systems. The traveling public has been well-educated on what technologies and capabilities exist to make all public places safer and more secure, most notably the vast capabilities of artificial intelligence (AI) and surveillance. Most transit operators, however, are not well-equipped to expeditiously identify solutions and the resources needed to make these solutions a reality. If safety and security solutions are not accomplished, regaining and growing ridership will be delayed or never occur.

To regain and grow ridership while simultaneously managing risk, transit authorities need to leverage emerging technologies to gain visibility into real-time passenger behavior and movement on their systems. Previously, these technologies have primarily included the widespread adoption of video surveillance. However, transit agencies now require additional time and resources to take full advantage of AI's capabilities and what their transit security systems are surveilling.

How important is safety and security surveillance technology to public transit passengers?



AI POWERS THE NEXT GENERATION OF TRANSIT SAFETY AND SECURITY

For many, the jury may still be out regarding how effective and safe the use of AI is in their daily lives. But in public transportation, AI is already proving to be a vital tool in leveling up safety and security systems. Transportation agencies can harness the power of AI-driven video analytics (VA) to improve video surveillance and security assessments, gain real-time insight into passenger activity and trends, and assure passengers of a safe and secure journey.

The specific benefits to public transit safety and security include the real-time detection of weapons or threats to safety, unattended packages or other objects, and even when passengers or pedestrians may have fallen into the path of an oncoming vehicle.



WHAT ARE AI-DRIVEN VIDEO ANALYTICS?

Modern, automated video analytics use AI technologies in real time to process surveillance video and the corresponding information to assess passenger behavior and onboard activity. In some cases, the AI-driven VA technology can even receive and process data from previously installed rail and bus surveillance systems, depending upon their age and configuration.

The VA solution processes the data in real time from what is collected inside the transit vehicle and at transit platforms and facilities to offer “as-it-is-happening” insight into:

- Passenger safety;
- Security threats and potential criminal activity; and
- Ridership and passenger flow trends.

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The data processing is typically completed using what is referred to as edge computing or “edge AI.” Edge AI is the use of artificial intelligence in edge computing, enabling computations close to where data is collected — such as on transit vehicles that are in motion — rather than at a centralized cloud computing facility or an off-site data center. Unlike cloud AI, edge AI is real-time, leveraging 5G/LTE network independence. Edge AI enables devices to make smarter decisions faster without connecting to the cloud or off-site data centers. With edge AI, the system tracks multiple scenarios continuously, resulting in a determination known as “AI inference.” ([Click here](#) for more information about Edge AI’s use in public transportation.)

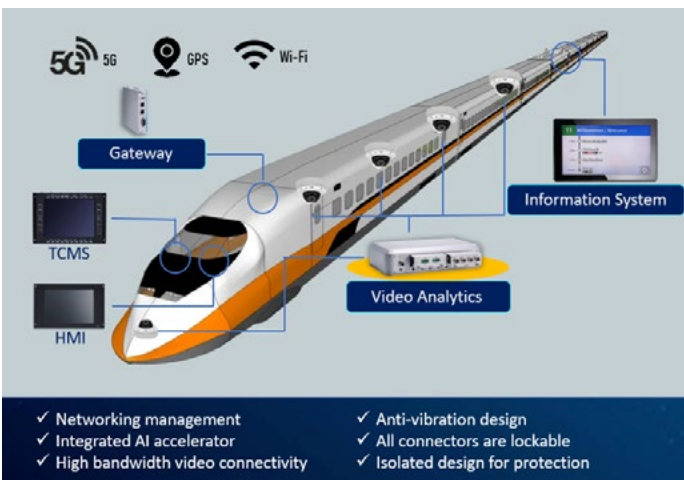
exponentially. The agency can even make service and rolling stock adjustments to convenience the passengers and improve the passenger experience.

VIDEO ANALYTICS ARE MULTI-MODAL

Video analytics are just as useful for bus transit operations as they are for rail systems. Much like the hardware and equipment used for the industry’s onboard video surveillance systems, the hardware required to provide VA has been designed to withstand vibration and all the rigors endured by rolling stock of all types. From the smoothest light-rail cars to the transit buses that experience every kind of challenging terrain, the systems have become quite rugged and reliable.

The systems can also be readily installed at platforms and transit transfer centers. All system surveillance can be linked to provide a complete view of the passenger’s journey, from the wait at the platform or stop to initial boarding, the journey itself, any transfers that may occur along the itinerary, and the passenger’s final deboarding.

When it comes to procurement, VA solutions can be acquired in a variety of ways. These methods include stand-alone procurements — which may be most effective for well-established fleets with lower average fleet age and better condition — or the solutions can be included as part of a larger rolling-stock procurement. Like windshield wipers, mobility device securement systems, and passenger seating, all the equipment needed for surveillance and VA can be included as another component of the overall vehicle specifications.



When you layer AI-driven intelligence over traditional surveillance systems, the transit agency’s ability to adjust service, respond to threats, and reduce risk to the agency and passengers increases

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IT'S ALL ABOUT THE PASSENGER

Implementing AI-driven VA clearly has multiple direct benefits to passengers, making it significantly more likely that they will not only ride but also become loyal, frequent passengers. These passenger benefits include:

- **Safety First and Foremost:** As mentioned, a safe transit system is a system that will more quickly return to (and exceed) pre-pandemic ridership levels. Passengers want to know they will be safe when riding, including vehicle cleanliness, timely preventive maintenance, well-trained conductors and operators, etc. As with everything a transit agency does, safety is the cornerstone of VA.
- **Increased Security:** With the unfortunate occurrences and subsequent media and social media proliferation of criminal activities on our mass transit systems, passengers across all modes are more aware of potential threats. This awareness brings enhanced sensitivity to systems and activities they perceive as potential security threats. While video surveillance systems are not new, how transit agencies and the relevant authorities respond to the information collected via these systems has become greatly enhanced, thanks to VA. When a passenger is aware that an agency has real-time VA capability to detect, observe, and — most importantly — respond to potential threats, the passenger is more likely to feel a sense of security and deterrence. This sense of security enhances the possibility they will continue to ride the system.
- **Optimized Passenger Flow:** As transit managers start to utilize the information collected through their VA solutions, they enhance the ability to optimize passenger flow. For example, the agency's management team can quickly observe train cars or buses that may be underutilized, so they can adjust their operations in real time to encourage passengers to board these vehicles with more available seating. Rail operators can even adjust how trains might arrive and stop at platforms so that the less utilized cars are more likely to be boarded than those that may be near or at capacity.
- **Comfort, Convenience, and Privacy:** Transit passengers can ride comfortably knowing that their transit provider is enhancing their experience with VA. Commuters can return to the "good old days" when they could take full advantage of their commute times to catch up on the news, respond to emails, and even place their latest online shopping orders. While all passengers need to be fully aware of their surroundings (and report anything suspicious to authorities),



knowing that VA solutions are working hard to protect them and their fellow passengers makes for a much better, more comfortable ride. Additionally, all VA systems are programmed with the appropriate privacy measures to protect passenger identities and focus more on the passenger's activities and less on who the passenger may be. "AI Anonymization" is built into VA solutions to protect passenger identities. Passenger information is accessed only when threats are detected and only by authorized personnel and law enforcement professionals.

BENEFITS FOR THE TRANSIT AGENCY

Perhaps increased ridership is the primary way that VA helps transit agencies, but there are also several other direct and indirect benefits:

- **Reduced Costs and Equipment Downtime:** Operational efficiencies gained from VA can save operational and maintenance costs when used to their fullest potential. Maintenance and repair issues are identified more expeditiously, avoiding the occurrence of deferred maintenance or larger problems to overcome. VA can be a significant support for optimized asset management.
- **Higher Passenger Satisfaction:** Now that passenger ridership is fully rebounding, the focus again shifts more toward how satisfied the passengers are with their transit service. With enhanced passenger flows, reduced vehicle crowding, and an increased sense of safety and security, passenger satisfaction scores will undoubtedly go up.
- **Streamlined Incident Reviews:** One of the most tedious processes our transit teams face is the complete and thorough review of incidents and accidents. Agencies

and law-enforcement officials invest tens of thousands of personnel hours each year to review passenger complaints, potential criminal activity, safety risks, operator behavior, etc. With the benefit of real-time video analytics, agency staff can more quickly and efficiently achieve a more thorough and accurate assessment of incidents — in a fraction of the time it currently requires. This not only resolves the situation more quickly, but it could also lead to more risk containment and the subsequent reduction in insurance costs.

- **Operational Improvements:** The ability to identify areas for operator and driver improvement is another key benefit. Area for improvement can quickly be identified by observing team member behaviors, expediting training opportunities and making the system operations safer and more efficient.
- **Enhanced Advertising Revenue Opportunities:** While not a direct result, a transit agency with higher ridership and passenger satisfaction can increasingly persuade advertising and promotional partners to support its efforts by purchasing transit advertising and partnering with the agency to accomplish its mission. An agency’s partners will have increased confidence that their advertising investments are well spent, reaching a growing and receptive target audience.



tBOX520

AXIOMTEK’S tBOX520: THE NEWEST VA SOLUTION FOR TRANSIT

Industry partner Axiomtek has developed one of the most recently introduced AI-driven VA solutions designed specifically to meet the needs of the public transportation industry.

The company’s tBOX520 is a new EN 50155, EN 45545-2 certified modular embedded system for railway and transit applications. The fan-less, transportation-embedded system is powered by a state-of-the-art 12th generation Intel® Core™ i7/i5/i3 or Celeron® processor. Its adaptability to transit applications is enhanced by the support of versatile VA modules, allowing transit agencies to employ a single configuration for environments that are frequently in motion (such as transit vehicles).

To accommodate the varying power designs of individual train car models and conditions that occur in mass transit such as voltage fluctuations or interruptions from power outages, the Axiomtek tBOX520 is equipped with 24V to 110V wide-range direct current (DC) input with ignition power control. The tBOX520 is also constructed to withstand extreme temperatures (from -40°C to +70°C, or -56°F to +158°F), meeting the operating

temperature class specified by the EN 50155 certification for in-vehicle industrial computers that are utilized in mass transit applications. ([Click here](#) for more details on intelligent power management and EN 50155 certification.)

Axiomtek’s tBOX520 includes the following technical capabilities:

- Up to eight IP cameras can be directly connected to tBOX520 (utilizing M12 lockable connectors), and more IP cameras can be connected through mobile network switches.
- The Intel i7 CPU handles an object detection model of up to 16 video streams at 30 frames per second (FPS) and precision at FP32-INT8 (floating point 32-bits at INT8 quantization) with OpenVINO AI optimization.
- Additional inference power can be achieved through additional AI acceleration modules.
- To contain costs and leverage previous investments made by the agency, the tBOX520 allows the agency to use installed regular IP cameras and deliver full AI functionalities (eliminating the high cost of installing or upgrading to new AI-powered cameras).
- In addition, custom AI models are available from Axiomtek’s software partners.

Transit agencies are choosing tBOX520 to serve as their video analytics solution for the following features and benefits:

- The solution is fully verified and pre-certified for rugged transit use, which means it is ready to be implemented immediately upon selection.



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Surveillance Recording

Smart Surveillance

Passenger Flow Mgt

AI Video Analytic

24V~110V DC Power-In

EN50155 Certified

tBOX52
Railway Embedded System

- It has the ability to immediately interface with a wide range of peripherals and connections, resulting in enhanced adaptability.
- Value-added modules are available for a variety of input and output requirements, so the solution is customizable to the agency's specific technology needs.
- Intelligent and effective power management (referred to as smart ignition) minimizes unnecessary power consumption after the transit vehicle stops running, reducing fuel and electrical costs.

MAKE AI A REALITY FOR YOUR TRANSIT SYSTEM

With the increased need to satisfy passenger demands for safety and security — and the ongoing need to optimize transit operations — public transportation operators need to evolve from simply employing legacy video surveillance tools and processes to full-scale implementation of AI-driven VA solutions. With the latest products and support systems, AI can be readily implemented throughout the transit industry, keeping pace with other leading industries where AI is being adopted to expedite product development, reduce costs, predict consumer behaviors, and protect the public at large.



tBOX52
PRODUCT PAGE

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