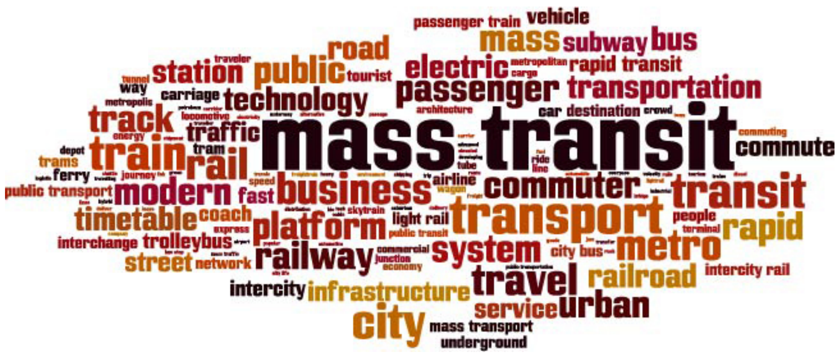
The Changing Face of Video Surveillance and Security in Mass Transit Systems

AXIOMTEK



Video surveillance is a key ingredient of security systems, and it's quickly transitioning from dumb camera systems to cloud-centric smart machines to fulfill safety requirements of vast metro systems.

A passenger is standing too close to the subway platform when the train approaches. The station's "brains" jump into action. The object detection software inside the transportation hub's embedded system allows smart cameras to detect this, prompting an immediate alert. Likewise, a mass transit system can also recognize when a package is left unattended and issue a corresponding security alert.

Video surveillance technology is changing rapidly and, unfortunately, one of the key drivers behind its massive growth each year is the growing terrorism threat. However, while video surveillance is crucial to making mass transit more secure, system integrators face several challenges when deploying security solutions capable of handling the rugged travel environments.

For instance, in a mass transit system, it's critical that embedded designs effectively handle changing weather conditions, vibrations and atmospheric pressure differences. A major consideration for a video surveillance design is the ability to monitor and capture clear images effectively and thus reinforce public safety within the metro system. Combined with the software solutions for camera management features, we can expect a new generation of data-driven, intelligent video surveillance systems.

This white paper will take a closer look at the changing face of the transportation surveillance and security industry. And it will chronicle the transition from traditional surveillance systems comprising of cameras and antiquated tape backups to smart camera systems employing media servers and GPS trackers for processing real-time passenger information.

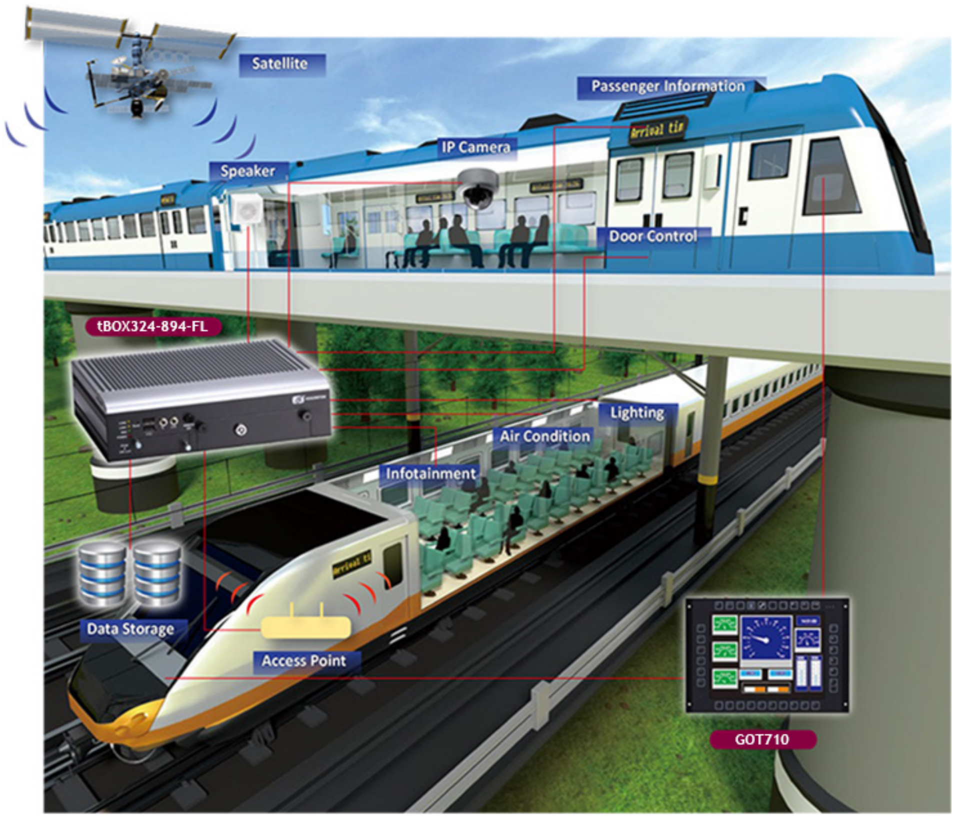
The paper will also unravel the hardware and software building blocks in an advanced video surveillance system and how they facilitate cost-effective development and deployment while simplifying and shortening the complex integration cycles. Moreover, you will see how these open computing architectures can counter the market fragmentation that increases cost and stifles design innovation.

Transitioning from dumb to smart surveillance

The world's most complicated transit network with the highest passenger volume simply can't rely on metal detectors, full-body scanners and plain clothes officers. It's settings like these where video surveillance technology improvements are allowing mass transit authorities to better control and track suspicious activities and people. In other words, the days of a passive approach to transport security are nearing their end.

So what's new in the ever-changing needs of the transportation industry? What are the features and capabilities that mass transit system engineers are eyeing to create newer and more advanced transportation embedded systems? It starts with the migration from dumb camera systems simply taking images of a location to smart machines that can be remotely controlled. These smart camera systems can also store data into a cloud over encrypted wireless connections.

It's worth noting that video surveillance systems can even use a data plan to wirelessly connect and allow law enforcement professionals to spot a suspect or incident quickly. A 4G wireless connection can also help locate a bus, plane or train using a precise GPS tracking system.



1. Mass transit systems can now seamlessly interface with surveillance and law enforcement crews.

However, when it comes to gigabit transfers to backend servers for storage, live views and analytics, wireless links haven't yet attained those gigabit speeds. Video surveillance files can consume multi-gigabytes of storage capacity; at the same time, the quality of the images and video is crucial when transferred across the network for real-time recording and analytics.

Enter Cat5e and Cat6 cables with 100-Gbit/s transfer speeds: they reduce the time needed to download a large video file from hours down to minutes. And that brings us to a crucial technological improvement in mass transit security systems — cloud computing.

Public transportation systems at large and mass transit authorities in particular have been using internal systems to locally store imaging and video data and transfer them to government and law enforcement agencies across private networks. However, mass transit authorities can stream, store and analyze the image and video data while using data center and cloud services and share them with police and other government agencies in real time at a much lower cost and lower operational expenses.

When you bundle it all together, a modern video surveillance system for public transport applications mandates the latest in CPU technology, enhanced memory, proper power management and larger internal storage. In the next section, we'll provide a sneak peek into those key building blocks of a transportation surveillance platform. It inevitably starts with the microprocessor that drives real-time video transcoding and multi-channel analytics.

Transportation security building blocks

A new breed of transportation embedded platforms now acts as the brains behind the smart camera systems that can monitor multiple locations in a mass transit system. These transportation embedded systems can incorporate single-core processors for lower-end systems as well as multi-core processors for higher performance requirements.

A new crop of x86 processors now supports HD-level intensive video graphic applications and H.264/H.265 encoding for surveillance tasks while maintaining a high level of power efficiency. These processors support multiple high-resolution cameras and a variety of network video encoding and streaming protocols.

The processors also complement industrial computers for surveillance and security designs by offering different system combinations to fulfill complex requirements in transportation embedded systems. Take, for instance, the diversity of I/O ports that these processors offer to broaden the scope of a video surveillance system.

The type of processing platform is also crucial in managing other key design considerations, including video capture, vibration management, EMI shielding and climatic temperature controls. It establishes standards for surveillance systems operating under specific environments.

2. The embedded computers in a transportation hub can serve a variety of transportation environments.

Then there are software building blocks that complement an open computing architecture for enabling new video surveillance technologies. Take the example of video management software (VMS) that provide camera management and remote monitoring functionalities. The VMS packages offer video capture SDKs and protocol stacks, and they support global standards for IP-based video surveillance and security systems.

Here, at this technology intersection, the strategic partnerships between hardware suppliers and software companies can play a vital role in automating smart camera features and thus boost operational efficiencies in a mass transit system. That combination is crucial in creating transportation solutions with flexible design configurations.

The building blocks approach allows system integrators to easily customize and configure smart camera systems operating in a mass transit setting. First and foremost, it enables the mass transit system integrators to choose embedded systems with favorable processing, memory, storage and I/O features.

System integration support

The building blocks approach also complements the open computing architectures while facilitating designs with software Application Programming Interfaces (APIs). And that helps system integrators in developing their own value-added software more efficiently. It's worth mentioning that embedded system suppliers like Axiomtek are teaming up with software providers to complement their hardware solutions and to test and verify the advanced camera features. Axiomtek is also a member of the Intel® Internet of Things Solutions Alliance.

The symbiotic relationship between the hardware and software worlds is allowing transportation embedded system suppliers to address major surveillance design concerns. The suppliers of embedded systems can also complement system integrators for mass transit surveillance applications with engineering services for integration and customization features.

3. Mass transit systems are incorporating a multitude of technologies, mandating a greater system-integration expertise.

While the software partnerships boost industrial computer solutions, in the hardware realm, compact and solid embedded computers allow system integrators boost design flexibility, easy installation and minimize cabling. And that's where long-established experience in ODM design and services can be a differentiator for the suppliers of embedded systems for video surveillance and security systems.

Design case studies

Below are a few examples of embedded designs aimed at low-end, mid-range and high-end transportation surveillance and security applications. First, take the case of a compact vehicle PC for DVR-based surveillance applications.

4. The tBOX100-838-FL embedded computer supports DIN-rail and wall-mount installations and can be integrated into various locations.

The tBOX100-838-FL transportation controller is based on a low power quad-core Intel Atom® processor (the E3845), and it comes with up to 4 Gbytes of onboard DDR3L memory. It features five BNC connectors for one audio-in and four video-in data streams. This fanless transportation computer is also accompanied by a capture SDK to allow system developers to speed up the embedded system development for transportation applications.

The tBOX324-894-FL multi-functional fanless embedded computer offers a more powerful computing platform with the 7th generation Intel® Core™ or Celeron® processors. To facilitate extensive storage, this embedded box PC provides two swappable 2.5-in. SATA3 hard disk drives (HDDs) and one CFast card slot.

The **tBOX324-894-FL** is also equipped with two DDR4-1866/2133 SO-DIMM slots for up to 32 Gbytes of system memory. It offers a modular I/O design for integration into a variety of transportation applications. That includes security surveillance, transportation controller, truck fleet management, train management and onboard infotainment controller in vehicle, railway and marine designs.

Moving up to the high end of transportation embedded PC box solutions, the tBOX500-510-FL features two I/O module slots and a wide selection of value-added modules (VAM) to meet different user requirements and customizations. It's powered by the 7th generation Intel® Core™ or Celeron® processors, and it comes with two DDR4-1866/2133 SO-DIMM slots for up to 32 Gbytes of memory.

This fanless embedded box PC, featuring Intelligent Power Management (IPM) capabilities, facilitates ACC on/off delay, shutdown delay and over/under voltage protection. That leads to broad voltage support, ranging from 9V to 36V DC for automotive applications, 14V to 32V DC for railway and marine application and 16.8V to 137.5V DC for railway applications.

The open computer architectures are reshaping the otherwise fragmented video surveillance systems for mass transit networks. That, in turn, allows system integrators to quickly migrate to newer camera and video-capture technologies while quickly adapting to the changing needs of metro systems.

Therefore, industrial computer suppliers like Axiomtek are teaming up with software companies to incorporate remote management and reporting features in newer and more advanced transportation embedded systems. That also allows them to take away a lot of deployment headaches from system integration projects.