

Putting safety first across transportation networks: the power of real-time video surveillance

What are the key safety concerns for transport operations, and how can reliable real-time video over cellular deliver a cost-effective solution that gives transport operators the upper hand when it comes to prioritising safety?





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Introduction



For transport operators, ensuring the safety of passengers, staff and assets is paramount.

But burgeoning transport networks, escalating safety threats and the costs associated with maintaining extensive transport infrastructure mean achieving consistent, comprehensive visibility is harder than ever.

Many existing surveillance systems leave cameras misconfigured, redundant or offline. As a result, the potential for incidents looms large.

Modern transportation systems require advanced surveillance solutions to address the multifaceted safety concerns they face. Enter real-time video.

Real-time video surveillance has emerged as a powerful tool in addressing safety concerns, providing the enhanced visibility and critical insights transport operators need to respond to incidents and make safety a top priority.

This whitepaper explores the key safety concerns across transportation networks, examining the advantages of real-time video monitoring, the challenges of implementation and the cost-effective solutions offered by re-deployable cameras via cellular networks.



Chapter One

What are the key safety concerns for transport operations?

Transportation networks encompass a vast array of systems, with thousands of people, vehicles and assets to keep track of. The potential for incidents is significant, so tackling safety concerns is a high priority for transport operators.

The number of incidents reported throughout the public transport networks in the US amounted to almost 20,800 incidents in 2022 — with buses accounting for 56% of incidents and heavy rail networks (subway/metro) accounting for nearly 27%.

Statista Research Department

Safety challenges across transport networks cover a variety of issues that can compromise the safety of passengers, staff and the infrastructure itself. These concerns vary depending on the type of transport system, but some common themes include:

- ⚠ **Passenger safety**
E.g. crowding and overcapacity, assaults and harassment or slip, trip and fall hazards
- ⚠ **Staff safety**
E.g. assaults on staff, accidents and injuries or hazards like pollutants or extreme weather
- ⚠ **Infrastructure/tech failures**
E.g. track defects, bridge and tunnel integrity or signalling system failures
- ⚠ **Accidents and collisions**
E.g. road traffic accidents or railway collisions
- ⚠ **Security threats**
E.g. terrorism, cyber security or vandalism and theft
- ⚠ **Emergency situations**
E.g. medical emergencies, fires, explosions or natural disasters like flooding
- ⚠ **Operational safety**
E.g. driver fatigue, maintenance and inspections or training and competency
- ⚠ **Accessibility issues**
E.g. inadequate accessibility features or safety measures to protect elderly passengers and children



The rate of reported major assaults against transport workers rose 47% from 2020 to 2023.

Associated Press analysis of Federal Transit Administration data

Delays in response times can exacerbate the severity of incidents, leading to increased casualties and damage. So, rapid and effective incident response is essential to minimise the impact of accidents and emergencies.

Accurate and objective recording of incidents is also crucial for post-incident analysis and accountability. The absence of reliable data can hinder investigations, affect insurance claims and impede the development of effective safety measures.

But surveillance blind spots and limited communications in remote locations, such as rural highways or isolated rail tracks, often hinder incident management and prolong emergency response. Equally, image break-up and latency render footage of incidents unusable — making consistent visibility a challenge. Without 24/7 video streaming, transport operations teams often also struggle to identify, monitor and repair faults across networks.

All these issues increase the risk of incidents and reduce overall network safety.



Chapter Two

How can real-time video give transport operators the upper hand on safety?

Whether you're in the station, at the depot or on the move, real-time visibility across transport operations is key to predicting, identifying and resolving the key safety concerns discussed in chapter one.

Real-time video surveillance enables transport operators to:

- Remotely monitor activity at stations and on public transport — as well as maintain maximum visibility of fleets.
- Make instant decisions and respond faster to emergency situations, preventing delays and disruptions to emergency services.
- Proactively meet duty-of-care requirements by connecting with workers on the frontline and assisting them directly to ensure the safety of staff and passengers.
- Deter criminal activity, such as illegal trespassing and theft.

The presence of cameras alone acts as a deterrent to potential criminals, creating a safer environment and reducing incidents of theft, vandalism and assaults. When combined with real-time video surveillance, they can be transformational — further decreasing anti-social behaviour and other criminal activities.

Additionally, real-time video can be used to continuously monitor compliance with safety protocols, identify potential hazards and ensure that safety measures are being followed — by both staff and passengers. This is particularly important in high-risk areas, such as railway crossings and busy intersections.

The integration of real-time video surveillance can reduce criminal activities on public transport systems by up to

23%

The Transport Research Laboratory
(TRL)



Real-time video surveillance also offers benefits in terms of fleet visibility and management. Transportation networks involve large fleets, including buses and trains. Surveillance cameras installed in vehicles can provide real-time monitoring of driver behaviour, vehicle conditions and passenger activities — ensuring compliance with safety regulations and identifying any issues that may arise during operations. By integrating real-time video surveillance with fleet management systems, transportation operators can also optimise routes, monitor vehicle performance and enhance overall operational efficiency.

However, perhaps the most significant advantage of real-time video surveillance in transportation is its ability to facilitate faster emergency response.

Real-time video enables transport operators to detect incidents, such as accidents or suspicious activity, immediately and assess situations accurately. At the same time, real-time video provides emergency responders with valuable situational awareness, allowing them to understand the scope and nature of an incident before arriving on the scene. This information is crucial for making informed decisions, deploying appropriate resources and initiating timely emergency response to minimise the impact of incidents.



University of Birmingham

Clearly, real-time video is a major advantage across transport networks. So, why are more operators not implementing it?



Chapter Three

What are the challenges of implementing real-time video across transport networks?

Despite the numerous benefits of real-time video surveillance, several issues can hinder its implementation across transportation networks. These issues largely revolve around one core challenge: the wired versus wireless debate.

Implementing real-time video surveillance has traditionally required a significant investment in wired infrastructure, including the installation of cameras, cabling, power supplies and network connectivity equipment. The costs can be particularly high in large and complex transportation networks, such as railways or highways, where extensive cabling is required to cover long distances and remote areas.

Wired camera systems can quickly become outdated and require costly maintenance. These systems are also more prone to corruption and failure, relying solely on cabling and grid power. And because wired infrastructure is fixed, these systems can't easily scale or adapt to suit changing surveillance needs.

The average cost of installing a single surveillance camera, including cabling and infrastructure, can range from \$1,000 to \$2,500.

International Association of Chiefs of Police (IACP)



Wireless video technology, on the other hand, supports more flexible installations — operating over Wi-Fi or cellular to provide enhanced portability. However, wireless solutions come with their own set of challenges.

Delivering real-time video over wireless networks requires significant bandwidth, which can be costly and unpredictable.

Wireless video capabilities depend on the strength of network connections, prohibiting their use in remote or congested locations. Without the necessary bandwidth, footage will likely suffer from high latency, rendering video streams unreliable and compromising the effectiveness of surveillance systems.

The costs associated with wireless bandwidth can vary based on usage, network congestion and data plans. This unpredictability makes it difficult for transportation operators to budget for ongoing surveillance expenses.

The cost of wireless bandwidth for real-time video surveillance can account for up to 50% of the total operational expenses.

The Mobile Video Surveillance Market

Network congestion and latency can reduce the effectiveness of real-time video surveillance by up to

40%

Institute of Electrical and
Electronics Engineers

All these challenges limit the full potential of using real-time video across mainstream and remote transport networks. Fortunately, there's a way for transport operators to combine the reliability of wired camera infrastructures with the mobility and scalability of wireless video solutions...



Chapter Four

How can re-deployable cameras via cellular deliver a cost-effective solution?

Advancements in video compression technology have made it possible to deliver high-quality real-time video over wireless cellular networks — ensuring reliable video transmission even in challenging environments.

Unlike conventional video codecs unsuitable for transmission over cellular, AI-based network-aware codecs enable truly real-time video over mobile networks by self-optimising compression to deliver accurate, low-latency footage in congested or remote locations.

This technology can support various camera outputs — from body-worn devices to fixed or mobile CCTV. Re-deployable cameras, in particular, have emerged as a cost-effective and versatile solution for the transportation sector.

Re-deployable cameras significantly reduce the estate costs associated with traditional surveillance systems and transport operations by eliminating the need for extensive cabling, infrastructure or maintenance.

These cameras can be installed quickly and moved to different locations as needed for unparalleled scalability and flexibility, making them ideal for transportation networks of all sizes. This scalability allows for cost-effective implementation and easy adaptation to evolving safety requirements. The ability to quickly move cameras to different locations enables transport operators to address emerging safety concerns and optimise surveillance coverage.

With re-deployable cameras via cellular, transport agencies (including government-funded departments) can roll out a reliable real-time video surveillance system across the entire transport network — improving safety while lowering operating costs for a better return on estate investments.

Case Study

TfL

Overview

TfL is a government body responsible for most of the transport network in London, UK — employing approximately 28,000 staff with an annual budget in the region of £10 billion.

Customer concerns

- Most robberies are carried out in or around public transport, in particular bus shelters.
- TfL needed video surveillance in vehicles and at vulnerable locations to ensure public safety and asset protection for 400 cycle-hire payment stations, 2,000 bus stops and 3,000 buses.
- It wanted to be able to access real-time video, voice and alarms from remote locations 24/7/365 — with fixed and mobile monitoring required.

Solution/benefits

- We delivered a semi-covert surveillance package — a 'video from anywhere to anywhere' solution that can be scaled as required by the customer.
- Our team integrated TVI with TfL's video management system of choice: Synectics.
- We also developed mobile apps to the customer's bespoke requirements.





Enhancing safety across transportation systems is a critical priority that requires innovative solutions to address complex challenges. Real-time video surveillance is up to the task, offering a powerful tool for improving safety, maximising fleet visibility and enabling faster emergency response.

By leveraging the advancements in video compression technology and the scalability of re-deployable cameras, transport operators can achieve comprehensive real-time video monitoring while minimising estate costs.

For safer, more connected transport networks.



Video evidence is useful. Real-time video from the scene is transformational.

Digital Barriers is a revolutionary video technology provider that empowers individuals, organisations and society with instant insights to make mission-critical decisions. We help customers in various markets — including transportation, law enforcement, defence and border protection, large-scale events, manufacturing and logistics, construction and retail — **unlock the full potential of real-time video.**

For 10 years, we've worked with governments, military and specialist law enforcement in the defence sector alongside numerous public and private-sector clients. **Our patented AI-based codec has been proven at scale** — keeping troops safe in Afghanistan and Iraq, deploying across NATO and securing presidential inaugurations, Olympic Games and royal events.

Today, we partner with major global network operators — including AT&T, BT and Vodafone — to deliver reliable real-time video over cellular and other transmission technologies that offer **up to 90% bandwidth cost reduction** without sacrificing quality in low-latency environments — ensuring our customers have a 360-degree view of their operations at all times.

For more information about our AI-based video codec, please contact hello@digitalbarriers.com.