A Synectics Guide To

# Using Data-Driven Surveillance For Efficient Operations

**Urban Transport Security and Surveillance**

**SYNECTICS**

# Contents

Improving operational and security efficiencies will help you keep passengers safer and more satisfied with the service they receive. This practical guide will show you how a more data-driven and connected security and surveillance system will help you achieve this.

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# Welcome

**Video surveillance has always played an essential role in helping urban transport operators overcome numerous operational, security and safety challenges. Now, more than ever before, so does data.**

Connecting visual detail with other data sources is crucial to delivering the holistic information - and the means to act on that information - necessary for modern transport to run efficiently and effectively.

This guide explains why this is, and how it is achieved.

You will learn how data-driven surveillance can help you RECOGNISE any threats to your operations, RESPOND to them in real-time with the help of analytics, automation and secure data sharing, and how the right solution will help you REVIEW information to make informed management decisions moving forward.

# Why Is Data So Important For Urban Transport?

## Because services are under pressure, as is our planet.

Increasing urban populations means demand for public transport services is high. Prior to COVID-19, public transport in Europe counted almost 60 billion passenger journeys per year[1]. In fact, annual public investment in local public transport accounts for €40 billion[2].

Transport also accounts for nearly 30% of the $CO_2$ emissions within the European Union, motorised mass transit (private vehicle use) being the biggest culprit. More sustainable urban transport systems are therefore needed to help decrease reliance on motorised mass transit.

As they contribute just 2% of total energy consumption in EU transport[3] "trains and railways will essentially be the backbone of a climate-compatible European transport system".

# A Greener, **Smarter** Future

**In a connected world, transport operators have at their disposal more data than ever before. And there is mounting evidence as to why they should use it.**

The European Commission's 'Transforming Transport' project[4], involving 13 large-scale pilots across Europe, demonstrated that operational efficiency improvements of up to 55% are possible in urban mobility.

In rail specifically, employing data-driven approaches to predictive maintenance and operational management were shown to reduce the number of interventions needed each month by more than 15% – resulting in less service disruption for passengers.

The research also suggests a monthly average reduction of pollutant emissions between 15%-25% is possible thanks to efficiency gains.

Such is the potential impact of data, that the European Commission names 'Boosting innovation and the use of data and artificial intelligence (AI) for smarter mobility' one of 10 key areas for action in achieving the goal of 'green, smart and affordable mobility'.

[1] UITP Europe - https://cms.uitp.org/wp/wp-content/uploads/2020/08/public-transport-iscritical-for-european-recovery-final-version.pdf

[2] UITP Europe - https://cms.uitp.org/wp/wp-content/uploads/2020/08/public-transport-iscritical-for-european-recovery-final-version.pdf

[3] European Mobility Atlas 2021- https://eu.boell.org/sites/default/files/2021-02/EUMobilityatlas2021_FINAL_WEB.pdf

[4] European Commission - https://transport.ec.europa.eu/transport-themes/mobility-strategy_en

[5] Periodic Reporting for period 2 - TT (Transforming Transport) | H2020 | CORDIS | European Commission - https://cordis.europa.eu/project/id/731932/reporting
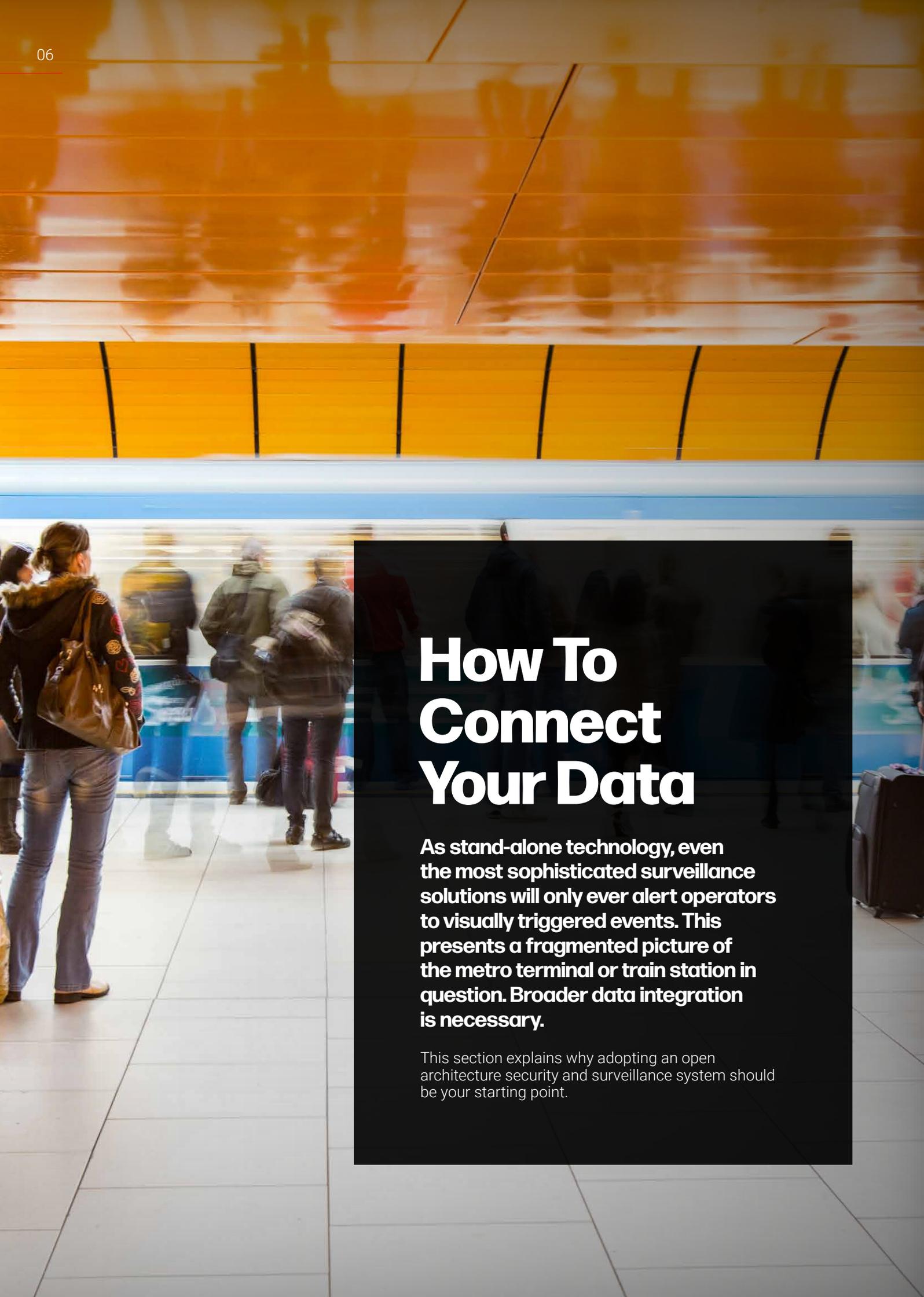
# How To Connect Your Data

**As stand-alone technology, even the most sophisticated surveillance solutions will only ever alert operators to visually triggered events. This presents a fragmented picture of the metro terminal or train station in question. Broader data integration is necessary.**

This section explains why adopting an open architecture security and surveillance system should be your starting point.

# What is Open Architecture Surveillance?

The term 'open architecture' or 'open platform' refers to the ability of software to easily integrate with other technologies. In the case of transport, this could refer to technologies linked to both station and on-vehicle operations.

**Here are some examples of third-party data sources that can be integrated with an open architecture security and surveillance system:**

| Security | Transport | Emergency | Society |
|---|---|---|---|
| Access control | Check-in desks | Fire alarms | Scheduling/updates from other transport providers |
| Perimeter detection | Baggage scanning | Smoke detection | Social media |
| Facial recognition | Ticket barriers | Chemical detection | News |
| Person of interest tracking | Turnstiles/lifts/escalator controls | Noise monitors | Weather |
| Loitering | Signalling control | Emergency helppoints (on platform/on vehicle) | |
| Object detection/recognition | Passenger counting | | |
| ANPR software | Passenger communications | | |
| Video analytics | | | |
| Dispatch and planning tools to help prioritise and action any required responses | | | |

# What's The Benefit?

An open architecture solution gives you the means to efficiently monitor and manage multiple systems through a single platform, and to tailor your solution to meet your specific needs.

It enables data-driven situational awareness of all events of potential interest, regardless of geographic location or threat type. It also helps future-proof your solution by allowing you to take advantage of the latest technology.



# Checklist: What To Look Out For

When deciding on an open architecture security and surveillance system, here are some important points to consider:

- **Check for ONVIF compliance:** ONVIF is a global and open industry forum focused on standardising communication between IP-based physical security products to achieve interoperability between equipment.

- **Look for existing integrations:** An open architecture platform will support integration with third-party systems, but these may need to be developed from scratch. Choosing a solution which already supports integration with leading technologies will help you get up and running more quickly.

- **Ask your vendor about system security:** A good solution will have measures in place to verify that any data received is from a genuine integrated source.

# Recognise Threats To Operations And Security

**Your open architecture platform is your foundation. It gives you the complete situational awareness essential for managing modern transport environments.**

But what next? You need a means to quickly recognise information that signifies a potential or actual threat to efficient operations.

This section explains how this can be achieved, focusing on using analytics and rules creation to ensure you never miss the details that matter.

# **What** Are Analytics?

## Video Analytics

Video analytics classify and accurately log a huge array of detail in any given scene – movements, colours, vehicle types, shapes, people and clothing.

A dedicated team watching screens 24/7 could only detect and log a fraction of this information.

## Data Analytics

Data analytics search and sort information from any source, including data generated by video analytics software and video analytics-enabled cameras.

# How Can I Use Analytics?

## In Real-Time

**By integrating analytics with your security and surveillance software, you will be able to create customised rules which can then be applied to all data captured to raise real-time alerts whenever specific criteria are met.**

You can even establish 'pre-warning alerts' to avoid incidents from escalating simply by applying analytics based on threshold detection.

| Recognise When: | | |
|---|---|---|
| Baggage is left unaccompanied | There is overcrowding of ticketing areas or turnstiles | Slip or trip hazards are present |
| People access restricted areas | Small children are unaccompanied | Individuals are standing too close to a platform edge |
| Turnstiles/platform barriers are not working during busy time periods | A person of interest from police watchlists is present | Maintenance issues require attention |

## Use Case Example

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**By integrating people counting analytics and setting threshold-based rules, operators can be alerted when a higher-than-expected number of people start to gather at any given location.**

**This could indicate an operational or security issue and needs to be investigated. Thresholds can be set to different levels based on area and/or specific day.**

**For instance, an increased threshold could be applied when operators know a major event e.g. concert or football game is taking place.**

## In Review

**As well as allowing control room teams to apply filters – such as the direction of travel for vehicles, face matching and clothing attributes – the integration of analytics also enables rapid footage review by presenting objects and events of interest (that appeared over the course of the filtered time period) on-screen simultaneously.**

This can dramatically reduce the amount of time and effort needed to investigate an interrogate footage - a huge benefit for busy transportation settings where teams are tasked with monitoring and managing hundreds, if not thousands of cameras.

# Three Ways To Integrate Analytics

**There are different ways of harnessing analytics from a technical point of view.**

**Here are three you might want to consider:**

### 1. Edge-Based Analytics

This refers to the application of video data analytics processed within a camera i.e., the camera filters the information.

This can be useful for keeping bandwidth usage and associated costs down if the only footage you want to store is incident footage.

### 2. Server-Based Analytics

If you want more choice with the cameras you use and to store all data captured, server-based analytics may be preferable. This option offers greater processing capability and the ability to manage and configure a wider range of analytics, i.e. not just video analytics.

### 3. Cloud-Based Analytics

Cloud-based analytics, builds on the advantages of server-based analytics but with even greater flexibility in terms of storage options and analytics processing capabilities.

Essentially, the cloud enables much larger data sets to be analysed without the need for investment in on-premises processing infrastructure.

# Not Sure Which To Choose?

Talk to your supplier about hybrid solutions which are a mix of all three to suit your specific needs.

# Respond Efficiently And Effectively To Events

**Analytics don't just help you to recognise events that pose a potential or actual risk to operations. They also help you take the right action. Quickly. After all, data only becomes a meaningful tool when the most optimal procedures and decisions can be automated from its analysis.**

Let's now look at how analytics can be used in conjunction with workflows – an automation and decision-making tool offered as a feature within an integrated security and surveillance system. This powerful combination can improve your operational efficiency and response times.

# Analytics-Driven Automation

**Working with analytics and data captured in real-time, your security and surveillance system can be programmed to immediately automate workflows in response to information received. Here are four examples:**

### 1. Avoid Crowd Disruption

Crowding can be indicative of an incident taking place but is also an incident itself given the potential disruption to passenger flow and service satisfaction. With analytics, the system automatically alerts operators to any people-count threshold breaches and can also automate dispatch of ground staff to support on scene.

### 2. Keep Passengers Informed

The system can automatically update passenger information, trigger audio announcements, and increasingly, prompt direct communication with passengers via help points to put the latest information at their fingertips.

### 3. Handle Security And Safety Breaches

Analytics will quickly detect risks such as unaccompanied luggage or 'person on track' scenarios and can be programmed to automate responses ranging from specialist support dispatch to emergency train holds.

### 4. Tackle Anti-Social Behaviour

Behavioural analytics such as loitering detection can be used to identify individuals who do not intend to travel, and who may be causing a nuisance to passengers. Automated security personnel dispatch can be applied in these cases. Another application of analytics-driven automation for tackling anti-social behaviour is graffiti detection. In this case, the automated action may be to instruct and dispatch cleaning crews.

Workflows can also be used to automate recurring tasks vital to efficient transport operations thereby alleviating pressure on human resources.

For example, camera security patrols that monitor the station and perimeter can be automated and scheduled to run at a pre-determined time and day. Maintenance schedules for vehicles and infrastructure can also be managed in this way.

# Workflow-Assisted <span style="color:red">Decision-Making</span>

**Workflows don't always have to trigger fully automated responses. Whenever specific alert criteria are met, they can be used to launch on-screen instructions that guide operators through the most appropriate next steps for that particular situation in line with their Standard Operating Procedures (SOPs).**

## What's The <span style="color:red">Benefit?</span>

The subjective nature of human decision making, and a finite capacity to process data, especially in stressful emergency situations, means that different operators faced with exactly the same scenarios can and do take different actions.

Workflows ensure consistent responses to scenarios every time. As any event unfolds and real-time data is received, the workflows adapt to the evolving situation. This ensures operatives are always making decisions and taking action based on the very latest information available.

Often the most effective workflows incorporate elements of automation and human intervention.

## Scenario: Protecting Depots From Damage And Intrusion

Transport depots are susceptible to incidents such as graffiti, copper theft and other forms of intrusion. Large perimeters, and the fact they contain lots of areas where intruders can hide, make them difficult to secure. It's a task ideally suited to analytics and workflows from both a RECOGNISE and RESPOND perspective.

A combination of data coming from on-site sources - systems/sensors that monitor movement, image variation (graffiti), forced fences, perimeter intrusion, noise etc. - is recognised by the analytics feature and turned into a meaningful alert for a central operations centre team.

The workflow triggered dispatches a drone to the exact location of the latest data source and starts a live video feed for the control team to confirm intrusion and asses the human resources needed to respond appropriately, from security personnel or engineers to cleaning crews. It is also increasingly common for automated loudspeaker messages to be triggered to inform persons of interest that they are being watched.

The operators authorise the drone to continue tracking movement until on-site support arrives.
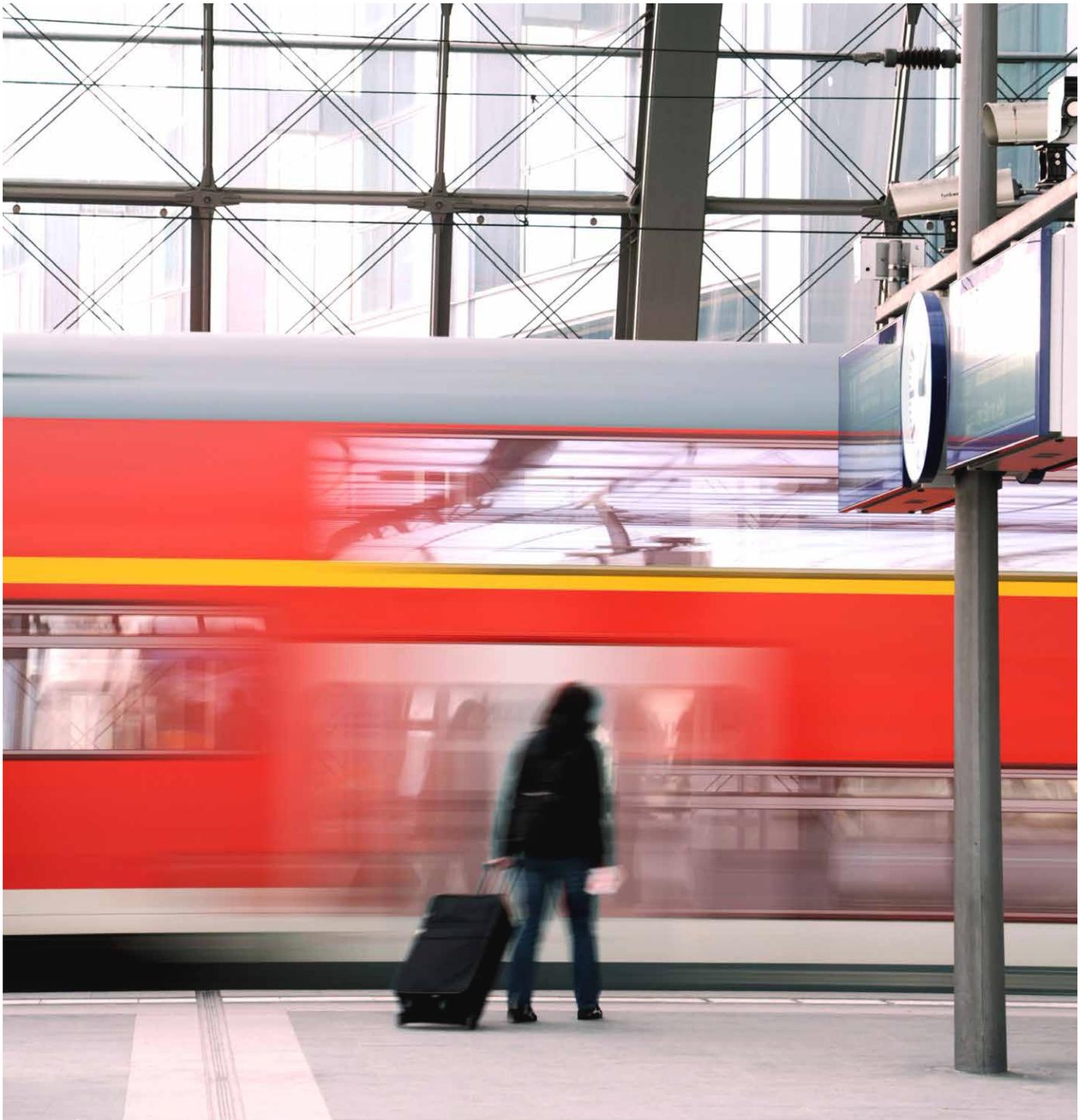
# Sharing Data and Collaborating

**Information silos present one of the biggest risks to incident response and efficient transport operations. An open platform security and surveillance system will help you address this by facilitating rapid data collaboration between staff, teams and external agencies such as emergency services.**

# Creating Efficient, Informed Teams

**Giving individuals and teams access to data and information that will help them do their jobs better, safer and faster is another advantage of intelligently integrated solutions. Particularly when used with secure web access functionality, sometimes referred to as a 'web-client' solution.**

These solutions, which utilise a WebRTC (Web Real-Time Communications) application to enable communication between devices, mean that authorised users can safely access data and key system functionality from authenticated mobile devices connected to the web. They can, for example, view live footage, recorded footage, receive alarms, and access reports.

Permission to access specific functionality and data can be tailored to an individual's job role and clearance level.

### Examples

1. Maintenance engineers can receive notifications of equipment issues alongside location data and information relating to the incident in question in order to help them fix the problem.

2. Security officers patrolling stations can receive risk alerts, e.g. left object detection, unauthorised access, sudden crowd formation, and view live footage from the area in question in order to assess threat level and inform their response.

3. Being able to bolster staff to improve efficiency at busy times is another advantage. If services are expected to be in high demand due to a major event, web clients can be used to give temporary users the tools they need to join the control room team. All that's needed are the necessary computer assets and internet access instead of requiring a significant infrastructure change.

# Third-Party Data Sharing And Collaboration

**To deliver optimal transport security and passenger safety, critical data and information needs to flow between control rooms, operational control centers, law enforcement, and local authorities.**

Incident lockers and digital evidence management capabilities held in the cloud offer a fast and secure mechanism for sharing critical data with external third parties.

With authorised users able to receive and send data via devices connected to the cloud, efficient safety, security and operational management moves out of the control room, into the field and beyond organisational barriers. True third-party collaboration is enabled – a key requirement for effective management of live security incidents.

### Examples

1. If a staff member experiences verbal or physical abuse at a station, local police can be immediately notified to access cloudbased footage of the perpetrator which is then securely shared to the mobile devices of officers in the surrounding area.

2. By securely sharing live people count numbers, video footage and incident data, transport operators, police and local authorities can work in unison to ensure large-scale events cause minimal disruption to public services.

3. Transport operators with arterial connections to each others' services, e.g. a metro line arriving directly into an airport, can provide live updates on delays or security issues that may impact onward journeys.

# Convergence With On-Vehicle Surveillance

**Expanding use of cloud-based platforms supports greater levels of collaboration and system convergence by enabling live vehicle-to-ground communication i.e. the opportunity for trains, trams, buses and hubs to 'talk to each other'.**

This provides a robust and secure mechanism for vehicles to share surveillance and security data with ground-teams – improving incident management and planning across national transport infrastructures.

## Examples

1. On-vehicle passenger help systems can be directed to a central team to provide a more efficient support service.

2. In the event of a medical emergency on a vehicle, network operators can alert emergency response teams at the nearest station, push any relevant audio or video data through, and brief teams at that location to prepare a fast/safe route through for responders.

3. In the event of an on-vehicle security incident, for instance a person with a weapon, transport police and nearest station staff can be alerted and updated with live video and audio data to best prepare their response.



## Checklist: Secure Data Sharing

Data sharing aids more efficient transport operations. It is also a secure process as long as your solutions addresses specific requirements. Check with your supplier that:

- Your system adheres to all the latest cybersecurity standards and data privacy requirements.

- Your data is encrypted while stored and while moving between devices. For things like evidence transfer, hashing should also be used to validate data integrity.

- Authentication measures are in place to validate the ID of users and connected devices.

- You can use permission settings to control what individuals or groups of users can access.

# Review Information and Make Improvements

**Maintaining operational efficiency requires continuous improvement. This can only be achieved by having a full and transparent overview of events, how they have been handled, and by understanding where changes can be made.**

Let's now look at how audit trails, transparent reports and analytics used for planning purposes, all help make this possible.

# The Importance Of <span style="color:red">Audit Trails</span>

**Unifying and cross-referencing data sources ensures all surveillance footage captured during an incident is automatically paired with authenticated operator action logs and relevant evidentiary data from third-party systems.**

Doing so provides a clear, secure and tamper-proof digital audit trail for post-event review, including potential procedural improvements and staff training requirements.

Any data misuse is also easily traced back to the source helping to maintain best practice around data processing.

## <span style="color:red">Scenario:</span> Reviewing An Incident

**A passenger has been injured on the platform of a busy train station. Using incident reports generated by the system, the management team review the footage alongside each action taken by the control room operatives involved in the response.**

**They review the requests made for support, the communications with emergency services and platform teams, and security protocols initiated including which areas became locked down during the incident.**

**They then use this to identify improvements to training and SOPs needed, and potential changes to workflow guidance issued.**

# Transparent Reporting

**Security and Surveillance software offer various reporting tools including threat level indicators, dashboards, and real-time reports.**

These can display key statistics from data analytics, values, and activity updates to inform individual operators and entire teams quickly and transparently.

KPI reporting to transport or city authorities is a necessary requirement for many operators. Each train line or station will have their own set of KPIs which have to be met including punctuality, cleaning, passenger counting and many more. Reports and dashboards can be configured and shared automatically with key stakeholders based on specific criteria.

# Analytics-Based Planning

**As well as real-time reports and dashboards, data analysis can also be used to inform decision making as part of long-term planning processes.**

For example, using analytics such as heat mapping can provide valuable insight into the most popular concessions in a train station. This can allow the operator to manage passenger flow at peak times and recommend the opening of a second franchisee space or a new location with more extensive square footage.

The same principle can be applied to all aspects for operations, from maintenance and staff management to passenger service and safety.

## Scenario: Improving Passenger Safety

**The operator of a metro network has identified an increase in 'slip and trip' claims from passengers.**

**Using sophisticated data analysis integrated into their security and surveillance system, they track the incidents against locations and create a heat map of the problem zones.**

**With the heat maps and associated footage, they identify infrastructure changes needed that may reduce the amount of incidents. Using the data, they also recommend which areas should be prioritised in order to efficiently improve passenger safety.**

# Preparing For The Future

**In addition to supporting heightened situational awareness in the here and now, adopting an intelligently integrated surveillance solution also ensures that transport operators are not hampered or restricted in future when expanding their infrastructure, or adopting new technologies – such as 4K cameras.**

# Upgrading And Scaling Efficiently

**Given the anticipated increase in global passenger numbers, expansion through new terminals, interchanges, or upgrades for most existing hubs is virtually guaranteed.**

By enabling any edge device or system, whether existing or newly introduced, to be monitored and managed holistically, an integrated open architecture solution avoids costly 'rip out and replace' scenarios. This allows hubs to introduce new technology at a pace which suits both needs and budget, without having to lay waste to legacy investment.

# Is A More Data-Driven Approach For You?

**The answer is almost certainly yes.**

**Why? Because the flexibility delivered by an open architecture security and surveillance system means you can choose:**

- Which data sources and technologies to integrate according to your specific safety and security requirements.

- What kind of workflows to employ to reflect your operating procedures.

- How you wish to use automation (through analytics) for improved operational efficiency and communications.

- Authorisation levels for different individuals and teams to ensure the right people have access to the right information.

- What KPIs matter to you and have the system report on them to deliver greater insight and control.

- How to share information with external parties, with the confidence that data is always secure.

- When and how to scale your solution to encompass new technology and meet evolving passenger demands, knowing that your previous investments are never wasted.

Stations, terminals and interchanges wanting to address risk mitigation and operational efficiency – while also ensuring that incident detection, response and reporting procedures comply with specific SOPs – can achieve this through a practical and scalable intelligent integration solution, with surveillance at its core.

# Want To Know More?

Synectics works with transport operators around the world to keep their staff, passengers and infrastructure safe and their services running smoothly.

To find out how we can help, contact us at synecticsglobal.com

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