INDUSTRY PAPER

Safer, Reliable Transportation

Rail and Metro in Asia Pacific

MOTOROLA SOLUTIONS

Estimates suggest that about one-third of all railway expansion in Asia from 2020 to 2035 would consist of high-speed rail[3]

A foundation for development and growth

Rail is the cornerstone of infrastructural development in the Asia Pacific region, connecting vast territories and fueling economic growth across this diverse and populous region. APAC already has the largest rail network in the world, and the future of rail in APAC looks just as bright. Its extensive high-speed rail (HSR) network, which enhances connectivity, stimulates economic growth, and fosters regional development, is expected to expand to over 90,000 km across 15 countries by 2035. Mass rapid transit (MRT), light-rail transit (LRT) and urban metro systems, meanwhile, are also experiencing a period of significant growth; It is estimated that, between 2025 and 2035, the region could build a further 15,000 km of metro and 2,000 km of LRT lines. These network expansions will support urban mobility, reduce congestion and drive sustainable development.

Technology and politics are shaping the transportation landscape

Economic growth

Due to economic growth, countries across Asia are investing significantly in metro and suburban rail infrastructure, especially HSR, MRT and LRT.

Technological advancements

From bustling metropolises to remote rural areas, technological advancements are driving a revolution in mobility and connectivity[1].

Emerging technologies

With high-speed trains, huge expansions to metro and LRT networks and smart infrastructure, the future of railways and metro systems in the region is being reshaped by emerging technologies such as driverless trains, smart railways, and smart stations[2].

The benefits of mass transit systems remain clear. Rail and metro are one of the fastest, most efficient, and sustainable modes of transportation. A single metro line can accommodate circa 70 times as many people as a city street filled with cars[4].

Navigating hi-tech network growth

The expansion of highly automated rail and metro networks leads to some obstacles, including:

- An **increasingly pressurised operational environment** due to larger fleet sizes, the need for shorter departure times, and lower tracking intervals, to meet rising demand. Some operator teams may lack experience due to the requirement for increased recruitment and are also often having to deal with disparate networks and systems and greater passenger flow
- With rising project complexity and vast amounts of data, **the need for interoperability and uniformity** is essential to ensure that systems can work together seamlessly, for strong regional connectivity
- The increasing digitalisation of rail systems raises concerns about **cybersecurity**, and there is also a continuing risk of other **safety and security threats**, such as crime and vandalism, antisocial behaviour towards staff and other passengers, public health, track intrusion, overcrowding, and natural disasters

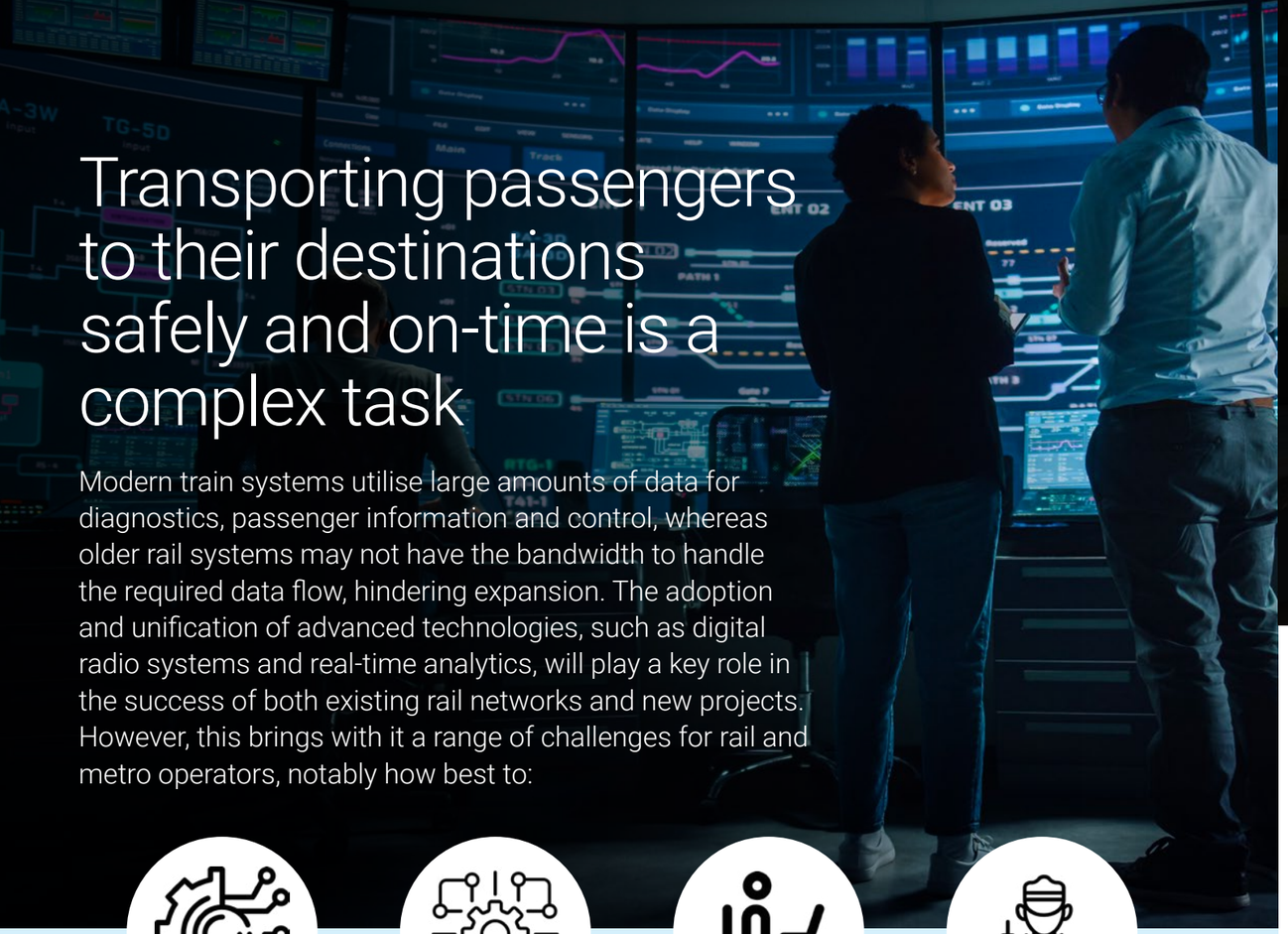
> We have a responsibility as a transport operator to do everything possible to ensure our employees and passengers travel safely by train.[8]
>
> – Birgitta Angard, Head of Onboard Personnel at SJ AB

→ Developing HSR networks

While offering numerous benefits, HSR systems also present unique safety risks, including the potential for infrastructure failures, accidents due to high speeds, and challenges in managing complex systems and evolving technologies; and, as HSR systems rely heavily on advanced technology, any malfunctions or cyberattacks can have significant safety implications[5].

→ Growing LRT and metro systems

More than 200 people were injured when two metro light rail trains collided in Malaysia in May 2021[6]. The accident was caused by human error[7]. Indeed, although the safety record for APAC is generally good, incidents still occur, and may become more frequent as older railways are renewed and lines are extended. And, while digital solutions are crucial for improving efficiency and safety, there are often challenges in adopting and integrating new technologies.



Transporting passengers to their destinations safely and on-time is a complex task

Modern train systems utilise large amounts of data for diagnostics, passenger information and control, whereas older rail systems may not have the bandwidth to handle the required data flow, hindering expansion. The adoption and unification of advanced technologies, such as digital radio systems and real-time analytics, will play a key role in the success of both existing rail networks and new projects. However, this brings with it a range of challenges for rail and metro operators, notably how best to:

- Modernise and maximise existing infrastructure and unify technologies
- Manage system complexity
- Improve the passenger-centric travel experience
- Enhance safety and security for passengers and staff

Safety and reliability are the most important factors for passengers when considering transport options. Incidents can result in the loss of public confidence in the mass transit system. Enhancing safety requires improving real-time situational awareness across train operations, including stations, tracks, trains and control centres

CHALLENGE 1

Modernise and maximise existing infrastructure and unify technologies

- **Disparate communications and video security infrastructure can lead to a range of challenges, from compromised safety and efficiency, to operational disruptions, reduced reliability and a drop in customer trust; older systems may suffer from signal dropouts, interference, and cyberattacks, hindering emergency response and safety**
- **Operators should invest in progressively modernising, integrating and unifying their infrastructure for greater capacity, coverage, functionality, resilience, and security**

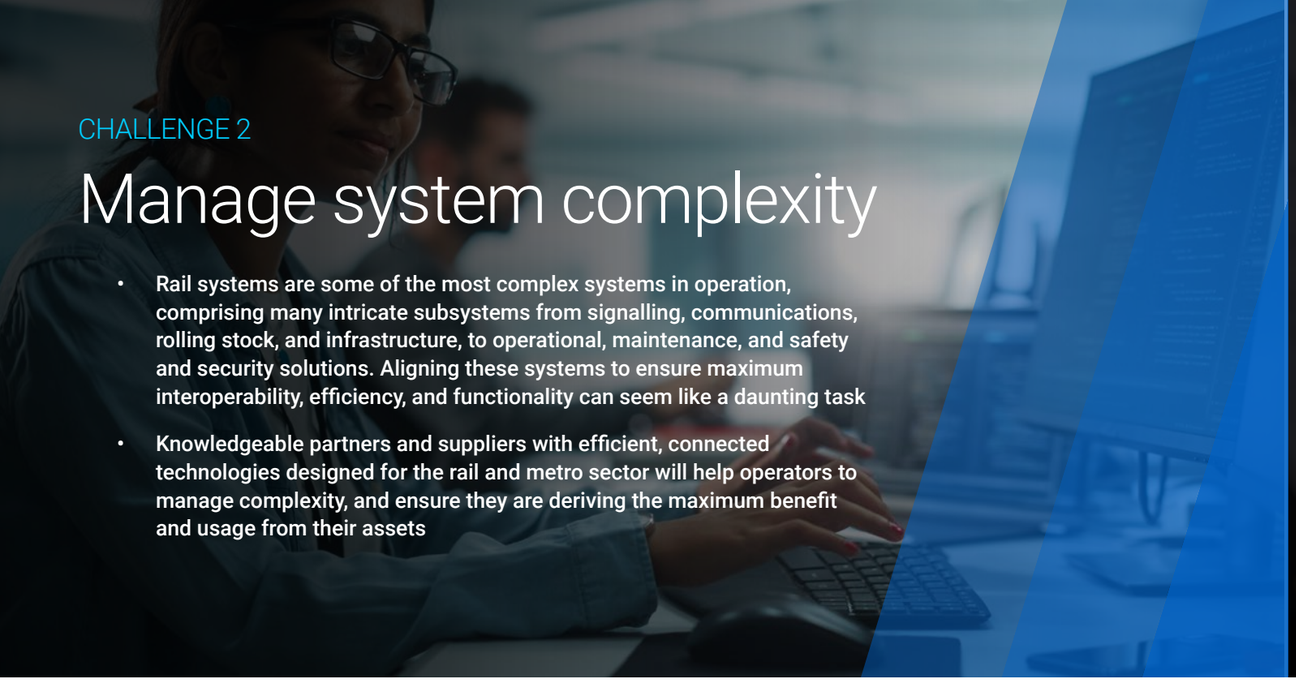
How can we help? We offer:

- **A strong local presence** and a long history of supporting rail projects in the region
- **Advanced, consolidated systems and architecture** from our comprehensive, feature-rich safety and security ecosystem
- **Proven, scalable, secure critical communications solutions, built to last**, providing reliable voice and data services no matter the circumstances
- **Rail standards compliant technology** such as EN50121 compliant radios and cameras, EN50155 certified in-train radios and cameras and EN 50128 software aligned to Safety Integrity Levels (SIL) compliance
- **Systems with high-level compatibility** that can be progressively deployed and integrated into existing systems, to ensure full asset utilisation
- **Leading lifecycle management services** to keep older infrastructure that may suffer from performance issues and cyberattacks current and future-proof through regular updates. Services offered include software maintenance, system upgrades, and security updates
- **Solutions to challenges** working in collaboration with partners across the region to ensure your systems provide the coverage, capacity, functionality, and resilience you need
- **And a wealth of industry experience** from decade-long partnerships with numerous rail and metro operators worldwide

→ The result

Efficient, reliable, secure, futureproof systems, built to last and tailored to your operations for maximum asset lifecycle

> By accessing our solutions as a managed service, SBS Transit can remain focused on delivering its daily operations while planning for continued growth and expansion of its rail services over time.
>
> — Rajat Gupta, vice president for Motorola Solutions Asia Pacific, Middle East and Africa[9]



CHALLENGE 2

Manage system complexity

- Rail systems are some of the most complex systems in operation, comprising many intricate subsystems from signalling, communications, rolling stock, and infrastructure, to operational, maintenance, and safety and security solutions. Aligning these systems to ensure maximum interoperability, efficiency, and functionality can seem like a daunting task
- Knowledgeable partners and suppliers with efficient, connected technologies designed for the rail and metro sector will help operators to manage complexity, and ensure they are deriving the maximum benefit and usage from their assets

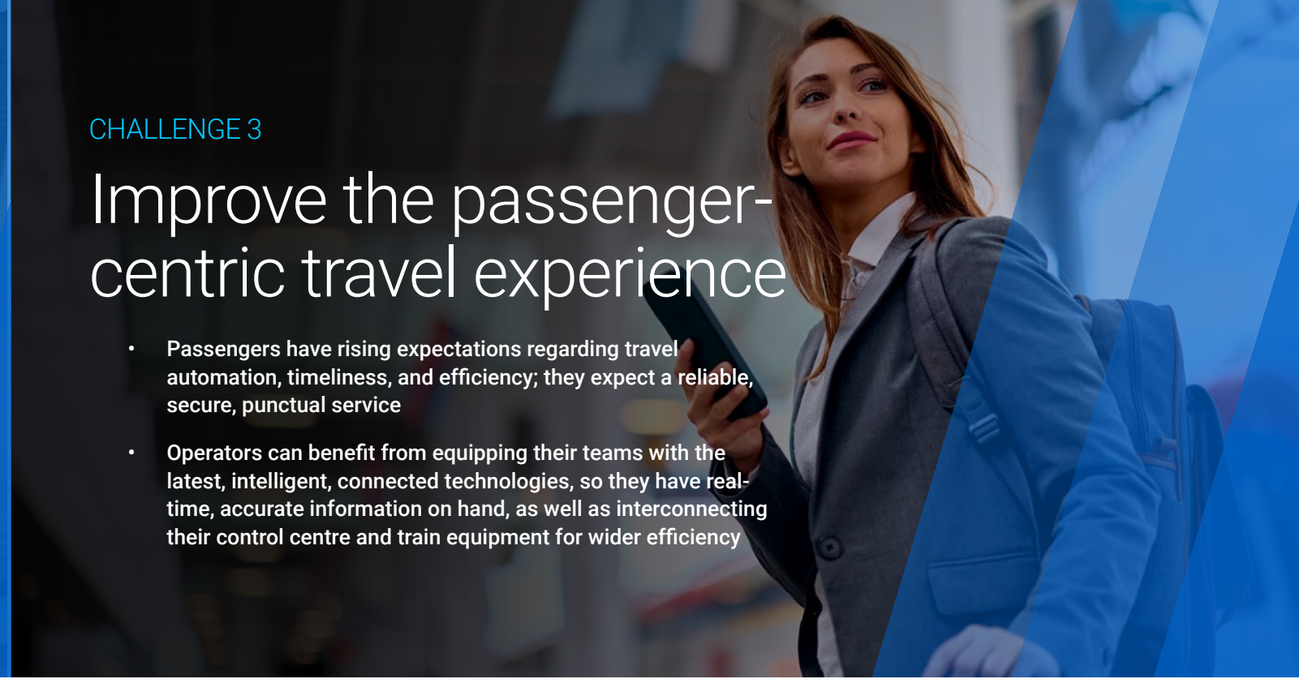
How can we help? We offer:

- **A unified, connected technology ecosystem** that connects various critical communication tools like voice, data, video security, and access control, as well as control centre solutions such as train dispatch solutions and automatic location tracking systems
- **Consistent systems that enable seamless collaboration** between different teams and departments, ensuring everyone is working towards the same goals, and utilising consistent systems, for a coordinated response
- **Integrated operations control centre software** for real-time monitoring, and dispatch to mass coordination of events in a single ecosystem for greater control of operations and effective decision making
- **Advanced integration services** delivered by our teams and partners, from system planning and design, to integration and implementation, for on-time, on-budget deployments
- **Solutions that maximise CapEx and OpEx**, as we are aware of the need to achieve efficiency, whilst respecting budgets
- **Managed services** from locally based teams to ensure your systems maintain the best possible performance and evolve with your infrastructure
- **Ongoing innovation**, having spent over $12bn in R&D and accretive acquisitions since 2015, and we will continue to invest in new, connected technologies[10]

→ The result

A true partnership to ensure the integrity and sustainable performance of your assets.

Taiwan High Speed Rail Corporation chooses the state-of-the-art TETRA system for **safety, reliability and customer service**. The project involves the integration of complex systems as well as ongoing operational, maintenance and support services to be delivered over the next two-and-a-half years.[11]



CHALLENGE 3

Improve the passenger-centric travel experience

- Passengers have rising expectations regarding travel automation, timeliness, and efficiency; they expect a reliable, secure, punctual service
- Operators can benefit from equipping their teams with the latest, intelligent, connected technologies, so they have real-time, accurate information on hand, as well as interconnecting their control centre and train equipment for wider efficiency

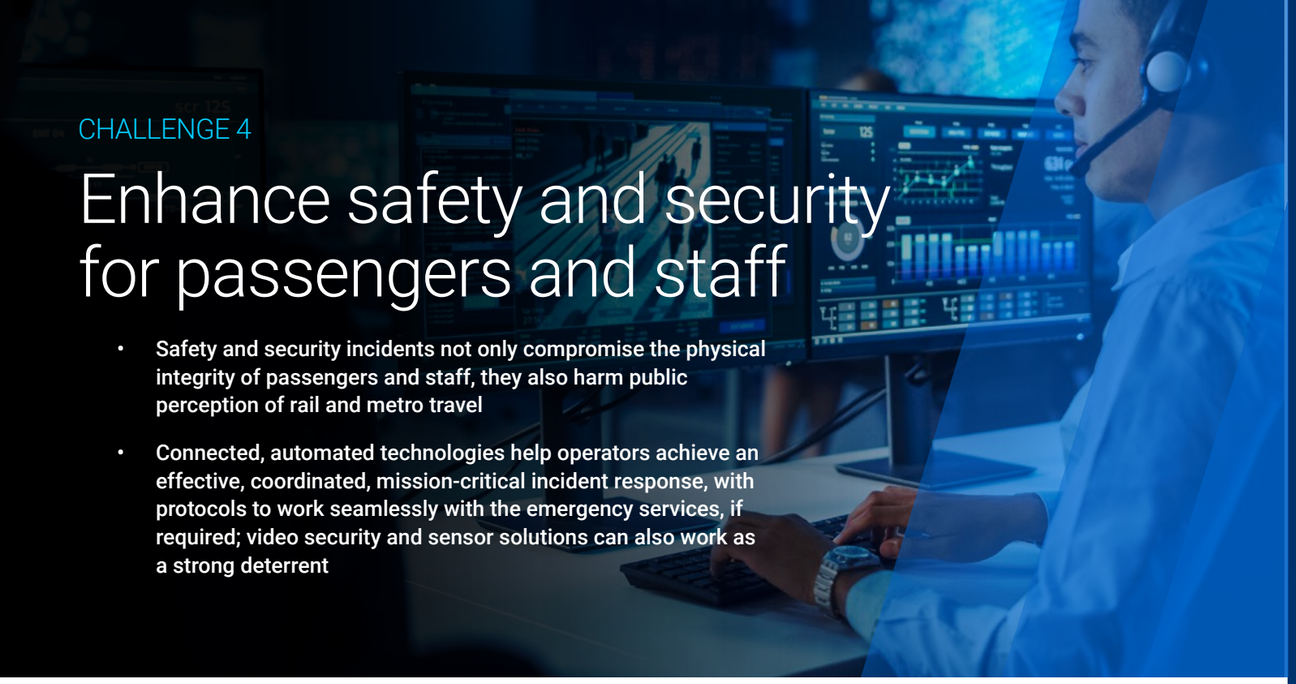
How can we help? We offer:

- **Connected communications** that combine voice, video, and data onto a single platform for faster response times and better coordination across teams
- **Improved situational awareness** and access to real-time information (from multiple sources) to enable a holistic view of events, for informed decision-making
- **Streamlined operations** through the integrations of different technologies that simplify workflows and reduce the need for multiple systems
- **Systems that link** to your public address systems, emergency intercoms, and passenger information systems, so you can keep your passengers informed about events, such as adverse weather conditions, delays, or service suspensions
- **Technologies that enable real-time insights**, such as AI-analytics on video footage and data from various sensors, to provide insights to help operators proactively address potential issues
- **Crowd detection** for safety and service efficiency, both at stations and platforms, to manage crowds and cordon off areas if needed
- **Smart sensors** showing occupancy status in restrooms, or to alert station control to gunfire, yelling, smoking, or vaping, for example
- **Automated announcements** providing warnings and security instructions, in case of emergencies or incidents

→ The result

Your teams have the right information on hand at the right time, to correctly inform and appropriately safeguard your passengers for an improved experience.

TETRA radio communications are used extensively by Singapore's leading public transport operator, SBS Transit throughout its daily operations, from mobilising teams in response to incidents, to **keeping passengers safe and informed** via public announcements and emergency call buttons on trains.[9]



CHALLENGE 4

Enhance safety and security for passengers and staff

- **Safety and security incidents not only compromise the physical integrity of passengers and staff, they also harm public perception of rail and metro travel**
- **Connected, automated technologies help operators achieve an effective, coordinated, mission-critical incident response, with protocols to work seamlessly with the emergency services, if required; video security and sensor solutions can also work as a strong deterrent**

How can we help? We offer:

- **A company focus on safety and security** to help protect people, property, and places; we believe that people and technology are stronger when united
- **An evolving safety and security ecosystem** to equip teams with the best tools to detect, analyse, communicate, and respond to threats and incidents
- **Connected, sector-specific technologies** for a faster, coordinated incident response and in collaboration with the emergency services, if needed
- **Reliable, high-performance systems** which always ensure the best possible radio, video, and sensor coverage
- **AI-trained and -driven technologies** such as noise-cancelling audio, to ensure users can hear and be heard, and video security and analytics, to help with issues, such as track intrusion, crowd management, unattended baggage, loitering, and staff safety
- **Solutions to protect workers** such as body cameras, emergency buttons, fall alert and lone worker, to enhance safety in high-risk situations
- **Technology to deter crime and record prosecution-grade evidence**, our fixed video and body-worn security solutions do much more than just detect and analyse
- **Incident management software** to manage any type of incident, from an individual customer complaint to a major emergency, in a single integrated platform

→ The result

You can keep your passengers and staff safe, and teams connected, during a security incident

> We decided that body-worn video could have a positive impact in keeping our staff and passengers safe and making all journeys more comfortable
>
> – Nicholas Allen, Technology Improvement Lead, Transport for London.[12]

Customer focus

Malaysia's KVMRT has integrated a number of technologies from Motorola Solutions to increase safety and efficiency

The Klang Valley Mass Rapid Transit (KVMRT) in Kuala Lumpur is an integral part of the city's public transport system, and operates alongside other networks such as light rail, trams, monorails and commuter trains. It is managed by Prasarana.

KVMRT Corp has integrated various Motorola Solutions' technologies to increase the safety and efficiency of its operations, teams and passengers[13]. It has installed fixed video cameras on every train and station to improve security monitoring and safety for passengers during an incident. Digital radios, meanwhile, keep staff connected to instant team-based communication and data, providing fast access to incident details whenever needed.

Finally, KVMRT also has a modern command-and-control platform that enhances its capabilities for incident handling and evidence gathering for successful case investigations and resolutions. All these connected technologies help KVMRT to operate safely and efficiently and increase passenger confidence.

Safeguard what matters with a connected ecosystem

Motorola Solutions simplifies the complexity with its rail-certified unified portfolio of radio, video, and software offerings, along with application integration, managed services, and field services.

Central to intelligent, aligned rail transportation solutions is a single, connected communications and video security ecosystem capable of supporting a full array of mission-critical and business-critical requirements. Our unique, futureproof offering mobilises intelligence and delivers real-time situational awareness across stations, trains, operational control centres and mobile staff.

This protects workers and boosts the reliability, safety and security of passenger travel, whilst helping operators reach new heights of service, productivity, and cybersecurity; and our solutions are built to last.

Our technology ecosystem for connected rail and metro: safety and security are at our very core

We unify voice, video and data feeds into the command center, connecting the dots to simplify workflows and help provide the overarching perspective to make decisions with greater focus, accuracy and speed.

We make critical communications devices and networks that perform exceptionally in the harshest conditions and are proven to help you stay connected and communicate with clarity.

We design video security systems powered by responsibly-built AI analytics that can alert you when action is needed, focusing human attention to cover more ground and act with more certainty.

Managed and Support Services

The Motorola Solutions Connected Rail and Metro Transport System improves **passenger experience** whilst improving **safety**, **reliability** and **efficiency**

Work smarter and safer with connected metro rail transportation

Keeping distributed transport workers, the public, and valuable rail fleet and sites protected means being connected, and having eyes on every aspect of the transport network, 24/7

Connected Train

- Mission-critical radio communications
- Trainborne radio communications
- In-train video cameras and control systems

Connected Station

- Mission-critical radio communications
- Fixed video security
- Access control
- Smart sensors

Connected Rail Worker

- Rugged mobile radios
- Body-worn cameras
- Broadband push-to-talk (PTT)

Connected Control Centre

- Integrated radio and video dispatch software
- Video management system (VMS) and AI-driven analytics
- Emergency and incident management software

Managed and Support Services

Motorola Solutions' Managed & Support Services help you simplify complexity with people, processes, and tools to support your technology ecosystem throughout its lifecycle and help increase availability, security, and resiliency. Comprehensive service offerings to protect your investment are just one aspect of how Motorola Solutions can help:

- Cybersecurity services
- Lifecycle management services
- Customer care and technical support services
- Field services

Customised Solutions

As a full-service provider, we collaborate with our third-party ecosystem partners to create tailored solutions adapted to the unique requirements of metro and rail operators, enabling operational excellence and realising long-term goals.

Let your journey begin

Our solutions are trusted by thousands of businesses and organisations worldwide; we have a wealth of experience in the transport sector and a wide range of systems and solutions designed specifically for metro and rail transportation.

Contact us to learn more:

https://view.motorolasolutions.com/en-xp-metro-contact-us/p/1

1. Telecom Review article
2. Metro Rail Today article
3. Asian Transport Observatory Report
4. McKinsey article
5. Science Direct article
6. Reuters article
7. AP news article
8. Swedish Rail press release
9. Singapore SBS press release
10. Computer Weekly article
11. Motorola Solutions press release
12. Transport for London case study
13. MRT case study

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