



COMMUNICATION NETWORKS

**Empowering
Underground Mining
Operations with
Advanced Connectivity
Solutions from Control
Room to Mine Face.**

A Komatsu technology brand

CONTENTS

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OVERVIEW

One Network to Connect the Entire Mining Operation.

MST's communication solution, powered by the AXON infrastructure and the HELIX management platform, delivers reliable, high-performance connectivity throughout the underground mine. It integrates communications, positioning, smart monitoring and control, and data analytics into a scalable ecosystem that enhances safety, optimises productivity, and enables the digital mine.



PRODUCTIVITY, CONNECTIVITY AND SAFETY

SINGLE NETWORK

One Network. Connecting Your Entire Operation:

MST's communication network delivers a robust, scalable, and future-ready infrastructure engineered to support the most demanding mining operations. By integrating multiple communication technologies within a modular architecture, it enables communications, automation, monitoring, and data transmission over a single platform—simplifying network management while supporting operational growth.

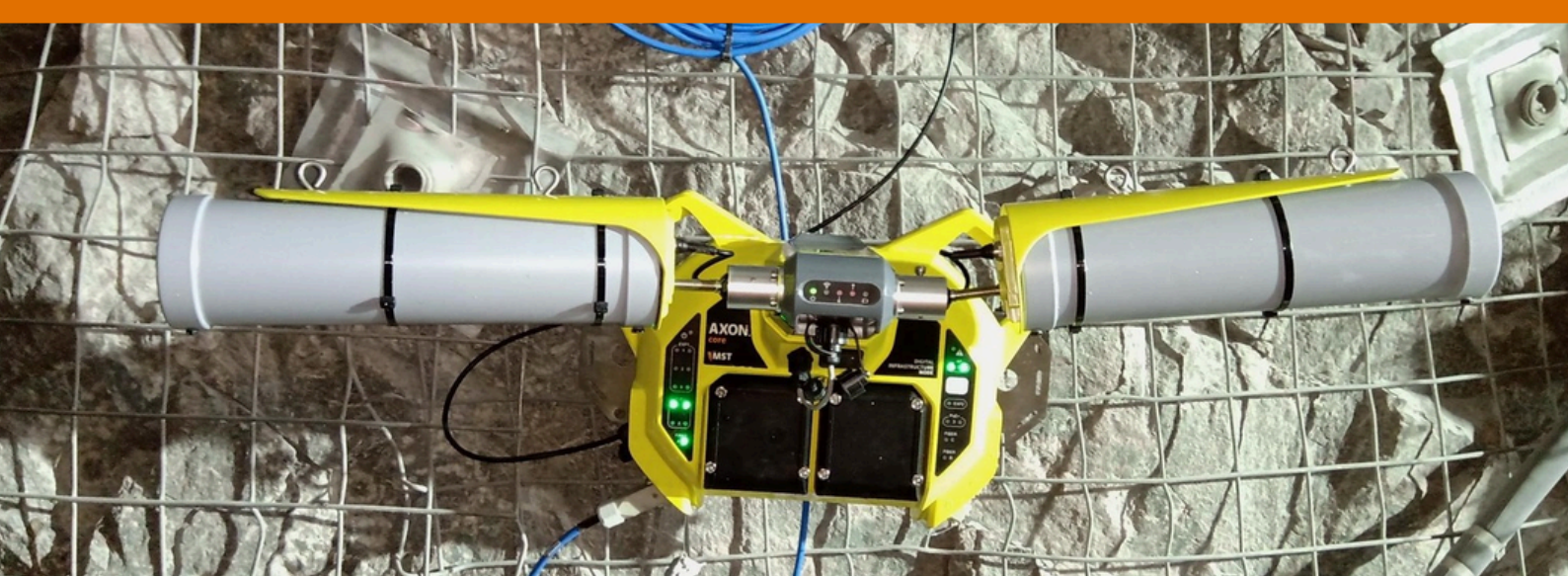
Infrastructure Engineered for Critical Operations:

Reliable communications begin with an infrastructure designed for continuous operation in harsh industrial environments. MST combines industrial-grade equipment, redundant systems, and a resilient architecture to maximise network availability and operational continuity.

Key Features:

- Highly secure and resilient communications infrastructure.
- Redundant data management.
- Reliable backup power systems to ensure continuous operation.
- Industrial-grade equipment designed for extended service life.
- Rugged IP65-rated design for demanding mining environments.
- Fibre-optic infrastructure using composite cable (fibre + power).





HIGH PERFORMANCE FOR MISSION-CRITICAL APPLICATIONS:

The MST communication network provides the performance required to support multiple mission-critical applications simultaneously, ensuring reliable communications while enabling future expansion.

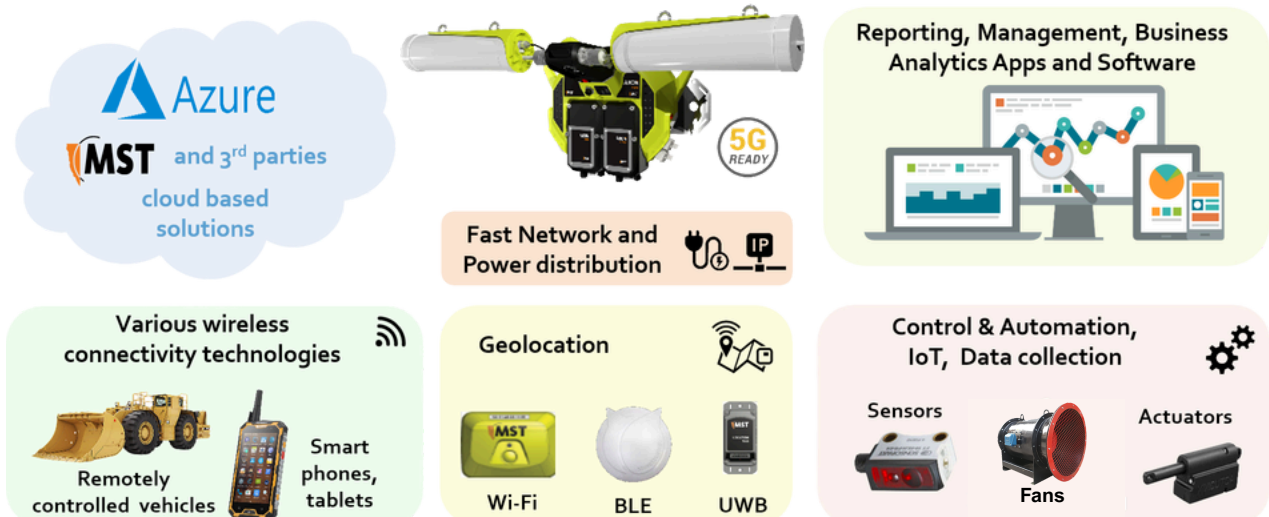
Key Features:

- Low latency - High bandwidth: Data transmission speeds of up to 1 Gbps for voice, video, and data.
- Modular and scalable platform (AXON Core, Air+, Mini, Force, and expansion modules).
- Plug-and-play architecture with Power, Control, Fiber4, Gateway, and Dock modules.
- Extended wireless coverage through AXON Air+ and AXON Mesh.

Integrated Connectivity Across the Entire Operation: A single communications infrastructure brings together multiple wireless technologies and connected devices, enabling seamless connectivity between personnel, equipment, vehicles, and operational systems.

Key Features:

- Connectivity for mobile equipment and vehicles.
- Integrated voice, video, data, and IoT communications over a single infrastructure.
- Compatibility with smartphones, tablets, and other connected devices.
- Real-time tracking and geolocation of personnel and equipment using integrated technologies such as Wi-Fi, BLE, and UWB.
- Integration of multiple wireless technologies: Wi-Fi, BLE, UWB, LTE/5G Ready.





REMOTE MONITORING AND AUTOMATED OPERATIONAL CONTROL:

The communication network provides the foundation for digital mining solutions by enabling real-time monitoring, remote operations, and process automation from a centralised platform.

Key Features:

- Remote visualisation of the communications network and connected solutions.
- Remote monitoring, control and management of the communications infrastructure.
- Advanced teleoperation capabilities enabled by a robust communication network.
- Real-time data processing through Edge Computing and IoT capabilities.
- Integration of sensors, actuators, and automation systems.

A Platform Built for Growth: MST's modular architecture allows the communications infrastructure to expand as operational requirements evolve, enabling new technologies to be incorporated without replacing the existing network.

Key Features:

- Modular architecture / Easy expansion.
- Adaptation to emerging technologies.
- Designed to support long-term operational growth.
- Unified platform for communications, control, and data.
- Integration with cloud-based solutions and analytics applications.

Delivering Measurable Operational Benefits: More than a communications infrastructure, the MST network provides the foundation for the digital transformation of mining operations by improving productivity, safety, and operational efficiency.

Key Benefits:

- Increased productivity through real-time monitoring and automation.
- Reduced costs with a simple, modular, and scalable deployment.
- Enhanced safety through continuous communications, real-time personnel and equipment tracking, and rapid response capabilities.
- High reliability for operation in demanding underground mining environments.
- Future-ready platform designed to support emerging technologies and long-term operational growth.



EXPAND THE POWER OF YOUR DIGITAL MINE:

AXON Core + AXON Air+ / Engineered to provide high-performance connectivity, scalability, and integration.

AXON Core and AXON Air+ form a powerful, fully integrated connectivity solution that combines a high-bandwidth fibre backbone, PoE+ power distribution, network intelligence, and high-performance wireless coverage in a rugged IP65 design for underground mining.

Together, they deliver reliable Wi-Fi, BLE, and real-time tracking, enabling seamless voice, video, data, and geolocation communications through PoE-powered, daisy-chainable nodes that support scalable, high-performance underground operations.

AXON Core

- The AXON Core is the central device of the AXON platform, technically functioning as a managed industrial Layer 2 Ethernet switch designed for harsh mining environments.
- It combines high-speed fibre connectivity (1 Gbps), PoE+ ports, and advanced power management within a modular architecture, enabling the integration of communications, automation, and IoT applications in a single platform.
- Key Technical Points:
 - Industrial Layer 2 Ethernet switch.
 - 3 × 1 Gbps fibre ports + 4 × 1 Gbps PoE+ ports
 - Integrated power distribution (PoE+ and composite fibre)
 - Modular design with expansion slots (Power, Control, Gateway)
 - Supports network protocols: VLAN, RSTP, QoS, SNMP.



AXON Air+

- The AXON Air+ is an industrial Wi-Fi access point and wireless connectivity node designed to deliver reliable, high-bandwidth communication in demanding underground environments.
- It integrates Wi-Fi (802.11), BLE, and geolocation capabilities into a single rugged device.
- Key Technical Points:
 - Dual 1 Gbps PoE+ ports for easy daisy-chaining.
 - Wi-Fi connectivity (2.4 / 5 GHz) with support for voice and data.
 - BLE beaconing and tag detection for tracking personnel and assets.
 - Wi-Fi mesh capability (802.11s) for network extension.
 - Integrated geolocation support for real-time tracking.



AXON



AXON IS A ROBUST, SCALABLE, AND MODULAR SOLUTION:

Plug-and-play modules that extend connectivity, automation, and control.

AXON Expansion Modules are a family of plug-and-play hardware components designed to extend the capabilities of the AXON Core platform, providing greater flexibility, scalability, and control for underground mining operations.

- Built for seamless integration and harsh mining environments, each module enhances the network with additional power distribution, fibre connectivity, industrial automation, wireless sensor integration, and deployment flexibility.
- As operational requirements evolve, AXON Modules allow mines to expand their digital infrastructure without replacing existing equipment.
- This modular approach delivers a cost-effective solution for implementing automation, IoT, real-time monitoring, and advanced communications while maintaining a reliable, high-performance network across the entire operation.

AXON Power / Power Distribution & Network Expansion:

- AXON Power increases the capacity of the AXON Core by adding three additional 1 Gbps PoE+ Ethernet ports and regulated 12/24/48 VDC outputs for external equipment. It simplifies the deployment of cameras, access points, sensors, and industrial devices while providing reliable power distribution throughout the underground network.

AXON Fiber4 / Fiber Network Expansion:

- AXON Fiber4 extends the AXON Core with an additional 1 Gbps fibre-optic port, providing greater flexibility for expanding the communication backbone. It enables longer network reach, simplified infrastructure growth, and additional high-bandwidth connectivity for demanding underground applications.

AXON Dock / Flexible Installation & Deployment:

- AXON Dock provides greater installation flexibility by allowing AXON modules to be mounted remotely from the AXON Core. This simplifies deployment in confined spaces, improves equipment accessibility, and enables optimised hardware placement while maintaining seamless integration with the AXON platform.



MODULAR BY DESIGN. READY FOR THE FUTURE.

Whether expanding communications, enabling automation, integrating IoT devices, or increasing network capacity, AXON Expansion Modules provide the flexibility to build a smarter, safer, and more connected underground mine.

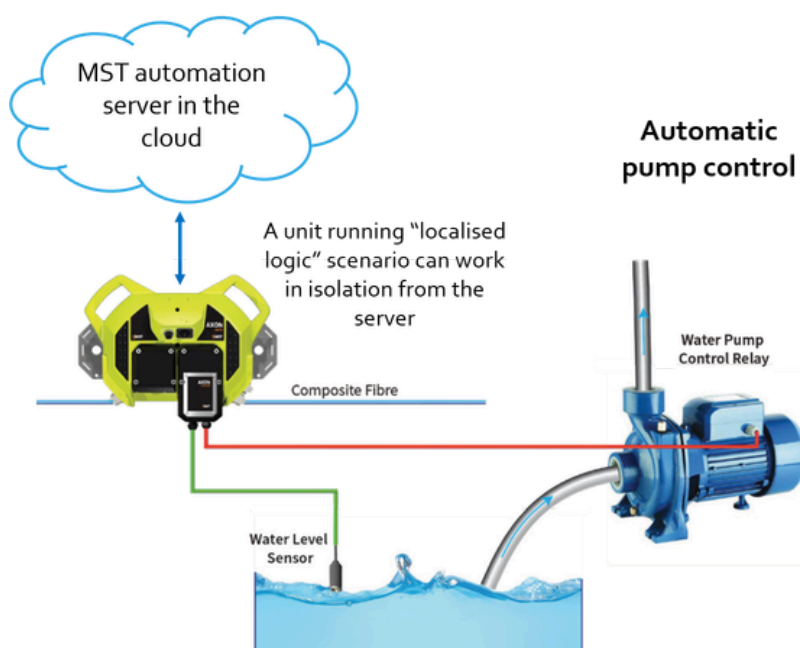
AXON Control / Process Control & Automation:

- AXON Control brings industrial automation directly to the AXON platform by enabling local process control and real-time monitoring of field equipment. With integrated digital and analogue I/O, it connects sensors, actuators, pumps, fans, and other critical systems, allowing mines to automate processes, improve operational efficiency, and reduce response times.

AXON Gateway / Industrial Wireless & IoT Integration:

- AXON Gateway bridges the AXON communication network with industrial wireless technologies, enabling seamless integration of Bluetooth® Low Energy (BLE) devices. It provides real-time connectivity for wireless sensors, asset tracking, environmental monitoring, and IoT applications, extending operational visibility across the digital mine

Example: Tailored Control and Monitoring Solutions to meet your mines needs:



AXON Control Module

Sensor Inputs

- 2 x 4..20mA analogue inputs
- 2 x 0..10V analogue inputs
- 2 x digital (on/off) inputs

Outputs

- 2 x DPDT relay outputs (rated : 30 VDC)
- 12 / 24 Volt DC, used to power external sensors

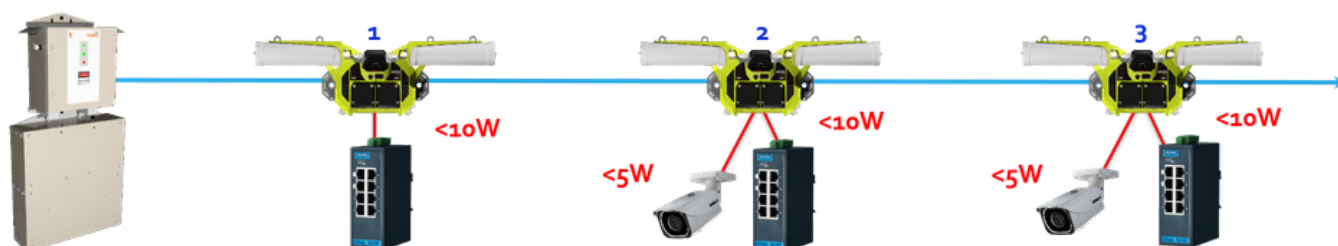


ENSURING UNINTERRUPTED CONNECTIVITY AND A RELIABLE POWER SUPPLY IN UNDERGROUND NETWORKS:

The AXON Mini UPS and AXON Force UPS are purpose-built power solutions designed to seamlessly integrate with the AXON Core platform and composite cable infrastructure, ensuring continuous and reliable power delivery to underground communication networks.

By leveraging the combined capabilities of fibre and power over composite cable, these UPS systems enable stable operation of AXON network nodes, supporting uninterrupted connectivity, automation, and real-time data across mining operations.

- **Continuous operation:**
 - Maintains network availability during power outages.
- **Optimized for AXON networks:**
 - Fully integrated with AXON Core and composite cable.
- **Flexible deployment:**
 - Supports both single-node (Mini) and multi-node (Force) applications.
- **Extended coverage:**
 - Enables long-distance power distribution across the network.
- **Improved reliability:**
 - Protects critical communications and automation systems.
- **Scalable solution:**
 - Adapts to small or large underground network requirements.
- **Enhanced safety:**
 - Ensures communication and monitoring systems remain active at all times.
- **Cost-efficient infrastructure:**
 - Reduces the need for additional power installations.





Extend reliable, real-time connectivity to any point in the mine:

Portable, self-organising wireless networks.

The AXON Mesh and AXON Mesh+ are intrinsically safe, portable wireless access points and self-meshing network nodes designed to rapidly extend network coverage in underground mining environments.

- They utilise 802.11 Wi-Fi with full self-healing mesh capability (802.11s), enabling multiple units to automatically form a resilient communication network in areas where fixed infrastructure is not available.
- Both devices are powered by hot-swappable batteries (over 120 hours of autonomy) and feature a rugged IP67 design, making them ideal for dynamic, hazardous, or temporary mining zones.
- The AXON Mesh+ adds Bluetooth Low Energy (BLE) functionality, enabling real-time tracking of personnel and assets through beaconing and tag detection, enhancing visibility and operational awareness underground.

Designed to deliver reliable, flexible, and cost-effective connectivity while enhancing safety and operational efficiency in dynamic underground environments.

- **Rapid deployment:**
 - No cables required—instant connectivity where it's needed most.
- **Flexible network expansion:**
 - Self-forming mesh adapts to changing mining conditions.
- **Enhanced safety:**
 - Enables real-time communication and personnel tracking.
- **High reliability:**
 - Redundant mesh architecture minimizes communication gaps.
- **Long Autonomy:**
 - More than 120 hours of battery operation with hot-swap capability.
- **Cost-efficient:**
 - Eliminates need for additional cabling and infrastructure.
- **Scalable solution:**
 - Easily expands as operations evolve.





How can AXON address and solve the unique operational challenges faced by mining companies?

AXON offers customised solutions!

Solutions that improve safety, increase efficiency, and future-proof operations by directly addressing the unique challenges of the mining industry.

Key Challenges in Mining Operations.

Safety Risks:

- AXON enhances safety by providing real-time tracking and communication, enabling swift response to emergencies and reducing the likelihood of accidents.

Operational Efficiency:

- AXON's automation and edge computing capabilities streamline workflows, optimise resource use, and increase overall operational efficiency in mining.

Environmental Impact:

- AXON supports better environmental management by enabling precise control of ventilation, reducing energy consumption, and minimising emissions.

Cost Control:

- AXON's scalable, modular design allows for cost-effective deployment and expansion, ensuring that mining operations can stay within budget while maximising ROI.

Need for Real-time Data and Automation.

Real-time Data Access:

- AXON provides instant access to critical data from across the mining site, enabling real-time monitoring and informed decision-making for more efficient operations.

Seamless Automation:

- AXON's Control and Automation software automates routine tasks, reducing manual intervention and increasing productivity while maintaining operational accuracy.

Integrated Systems:

- AXON's modular design ensures that real-time data and automation tools work together seamlessly, optimising resource management and enhancing overall operational efficiency.

Safety and Productivity Concerns.

Enhanced Safety Monitoring:

- AXON's real-time tracking of personnel and equipment improves safety by allowing swift responses to potential hazards and ensuring compliance with safety protocols.

Accident Prevention:

- With its advanced communication systems, AXON minimises the risk of accidents by providing constant connectivity, even in remote areas of the mine.

Productivity Optimisation:

- AXON's automation capabilities streamline workflows, reducing downtime and enabling more efficient use of resources, leading to higher productivity.

Data-Driven Decisions:

- AXON's real-time data analysis supports quick, informed decisions that enhance both safety and productivity, ensuring operations run smoothly and efficiently.



HELIX software and AXON hardware: Underground Performance:

AXON HELIX

Built specifically for underground mining environments, AXON works seamlessly with the HELIX software platform, combining robust field hardware with advanced analytics and control systems to maximise safety, productivity, and operational efficiency.

This unified solution enables seamless connectivity, real-time visibility, and advanced control across critical operations. AXON provides the physical backbone of the digital mine, while HELIX delivers the intelligence and control layer.

Together, they enable:

- High-performance connectivity (up to 1 Gbps)
- Real-time data processing at the edge.
- Automation of critical mining processes.
- Real-time tracking and geolocation.
- Integration with IoT, Cloud, and advanced analytics.
- A fully integrated ecosystem from field hardware to enterprise software.

The following examples illustrate the range of advanced applications that can be enabled through this integrated platform:

- Real-time tracking of personnel, vehicles, and critical assets for enhanced visibility and safety.
- Advanced IP communications, including integrated camera monitoring and management systems.
- Reliable last-mile connectivity ensuring continuous communication in challenging environments, even in areas without a physical communication network.
- Intelligent sensor integration and equipment automation to optimize operational efficiency.
- Telemetry and Fleet Management System (FMS) capabilities for data-driven decision-making.
- Communication networks, tracking, and much more for environments that require intrinsically safe solutions.

Together, HELIX and AXON empower the deployment of innovative applications that enhance operational performance, efficiency and safety.



Intrinsically secure connectivity that powers the digital mine:

AXON IS + HELIX: **Intrinsically Safe.**

The AXON Intrinsically Safe (IS) ecosystem by MST Global is a next-generation digital platform designed to deliver high-performance connectivity, real-time data, and advanced communications in hazardous underground mining environments.

- Built around the AXON product suite, the new IS offering includes the new Core and Air with Wi-Fi 6 and high throughputs, of up to 2.5 Gbps, that seamlessly integrate with the network. This fibre network infrastructure supports tracking, voice, and data/analytics into a single, scalable ecosystem.
- What sets AXON IS apart is its intrinsic safety design, ensuring that all critical network components can operate safely in explosive or high-risk environments without becoming a source of ignition, while still delivering the performance required for modern digital mining.
- **Safety-Critical by Design (Intrinsic Safety):**
 - Operates safely in hazardous and explosive environments.
 - Eliminates ignition risk through controlled energy design.
 - Ensures compliance with strict mining safety standards.
 - Enables deployment in critical zones (coal mines, development areas, active faces)
- **High-Performance Connectivity:**
 - High-speed network (up to 1–2.5 Gbps) for voice, video, and data.
 - Low latency, high reliability communication across the mine.
 - Supports Wi-Fi 6 and fiber backbone integration.
- **Enhanced Safety & Visibility:**
 - Real-time tracking of personnel, assets, and vehicles.
 - Continuous communication for emergency response.
 - Improved operational awareness with live data monitoring.
- **Scalable & Future-Ready:**
 - Modular ecosystem that grows with the operation.
 - Supports IoT, tracking, automation, and analytics platforms.
 - Seamless integration with HELIX and third-party systems.
- **Operational Efficiency:**
 - Optimizes workflows through real-time data and automation.
 - Reduces downtime with reliable, always-on connectivity.
 - Supports digital applications across the mine.





Built for Underground Performance:

A successful underground communication network goes beyond technology—it requires specialist engineering, effective deployment, and the confidence of trained teams to maintain reliable performance in demanding environments.

Designed specifically for the realities of underground mining, MST's Networking solutions adapt to changing mine layouts and harsh operating conditions while delivering robust, efficient, and easy-to-maintain communication infrastructure.

From network design and deployment to training and long-term support, our approach helps optimise performance, simplify operations, reduce complexity and costs, and ensure the reliable connectivity that drives safety, productivity, and long-term operational value.

Why it Matters ...

Expertly Engineered Networks:
Designed and implemented by experienced specialists to deliver high-performance, reliable communication infrastructure that supports long-term operational value.

Lower Total Cost of Ownership:
Streamlined design reduces installation time, maintenance effort, and associated costs while improving system reliability.

Practical Knowledge Transfer:
Comprehensive training for mine personnel and contractors, enabling confident deployment, effective maintenance, and consistent system performance.

Reduced Operational Disruption:
Reliable connectivity supports continuity in material movement, production cycles, and day-to-day mine operations.

Simplified Field Deployment:
Built for practical installation and maintenance, with plug-and-play connectivity, direct wall mounting, and no requirement for special cabinets.

The Result:
A robust, future-ready communication network that is easier to deploy, simpler to maintain, and engineered to deliver sustained performance where it matters most.





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