Industrial Wi-Fi for the Demands of Today and Tomorrow

Realizing Futureproof
Industrial Networks

Your Trusted Partner in Automation

Moxa is a leading provider of edge connectivity, industrial computing, and network infrastructure solutions for enabling connectivity for the Industrial Internet of Things (IIoT). With 35 years of industry experience, Moxa has connected more than 102 million devices worldwide and has a distribution and service network that reaches customers in more than 85 countries. Moxa delivers lasting business value by empowering industries with reliable networks and sincere service. Information about Moxa's solutions is available at www.moxa.com.

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| Network and Security Management | Secure Routers | LAN Firewalls | Next-generation Managed Switches | Unmanaged Switches | Industrial Wi-Fi 6 & Private 5G |

www.moxa.com

Building Tomorrow's Connectivity Today

Unlock growth opportunities and elevate your digital operations through the optimization of your IT/OT converged network infrastructure. This investment ensures uninterrupted connectivity and speeds up the integration of emerging technologies such as AI, IIoT, TSN, and 5G—bridging the gap between the digital and physical domains.
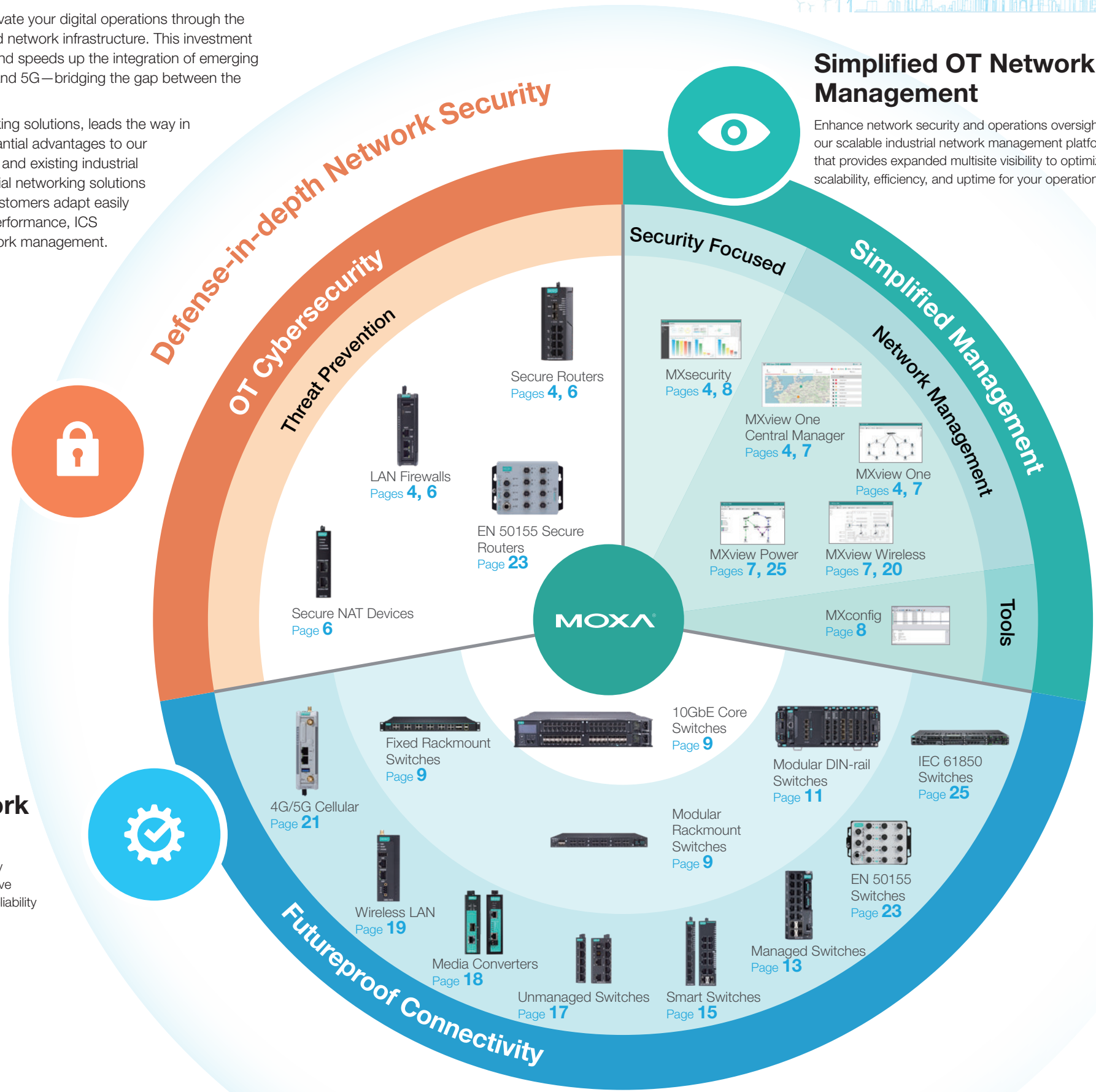
Moxa, a pioneer in industrial networking solutions, leads the way in IT/OT convergence, providing substantial advantages to our partners and customers in emerging and existing industrial automation applications. Our industrial networking solutions provide proven reliability and help customers adapt easily to trends and changes in scalable performance, ICS tailored security, and simplified network management.

Defense-in-depth Network Security

Build strong network security at every level, including real-time visibility, network segmentation, and secure infrastructure, along with proactive threat detection, analysis, and intelligent threat responses.

Futureproof Network Infrastructure

Transform your network's performance by implementing smart designs and innovative flexibility to meet speed, versatility, and reliability requirements.

Simplified OT Network Management

Enhance network security and operations oversight with our scalable industrial network management platform that provides expanded multisite visibility to optimize scalability, efficiency, and uptime for your operations.

Circular diagram labels

Defense-in-depth Network Security
- OT Cybersecurity
- Threat Prevention
  - Secure Routers — Pages 4, 6
  - LAN Firewalls — Pages 4, 6
  - EN 50155 Secure Routers — Page 23
  - Secure NAT Devices — Page 6

Simplified Management
- Security Focused
- Network Management
  - MXsecurity — Pages 4, 8
  - MXview One Central Manager — Pages 4, 7
  - MXview One — Pages 4, 7
  - MXview Power — Pages 7, 25
  - MXview Wireless — Pages 7, 20
- Tools
  - MXconfig — Page 8

Futureproof Connectivity
- 4G/5G Cellular — Page 21
- Fixed Rackmount Switches — Page 9
- 10GbE Core Switches — Page 9
- Modular Rackmount Switches — Page 9
- Modular DIN-rail Switches — Page 11
- IEC 61850 Switches — Page 25
- EN 50155 Switches — Page 23
- Wireless LAN — Page 19
- Media Converters — Page 18
- Unmanaged Switches — Page 17
- Smart Switches — Page 15
- Managed Switches — Page 13

MOXA

▶ HIGHLIGHTS

Easy Security Upgrades

The EDF-G1002-BP LAN firewall simplifies security updates for critical OT assets and internal LAN protection. The bump-in-the-wire installation offers firewall, IPS, and DPI protections, as well as real-time visibility and security updates via the MXsecurity platform.

See pages **4-6**

Scalable Backbone Trunking

Everything depends on bandwidth. The MRX-Q4064 rackmount switches offer versatile capacities for high-speed networking, with options for up to 16-port 10G and 48-port 2.5G modules. With these features, you can aggregate multiple 10G links to expand your network backbone up to 80 Gbps. Furthermore, our industrial connectivity solution ensures millisecond-level failover redundancy to ensure robustness.

See page **9**

One Click for Smart Integration

With our smart switches, network connectivity and system integration have never been easier. The SDS-3000/G3000 Series smart switches offer 6 to 16 port options for GbE/FE/PoE/fiber, allowing field engineers to easily set up industrial protocols for system integration with a simple click on a single-page dashboard.

See page **15**

Wi-Fi 6 Devices Offer 5-port Gigabit

Offering reliable Wi-Fi 6 features, the AWK-1165A/1165C APs and clients ensure Gigabit speeds, low latency, and minimal congestion for high-density wireless connectivity. Both models include a 5-port full Gigabit switch to improve WLAN operations.

See page **19**

*IPS stands for intrusion protection system, DPI for deep packet inspection.

Build Up Manageable Secure Network Infrastructure

As industries and companies embrace remote and distributed operations, the threat of cyberattacks is growing. Cyberattacks often target industrial control system (ICS) networks because of their low tolerance for downtime. Therefore, strengthening the network security infrastructure is of utmost importance to safeguard against cyberattacks.

Moxa offers comprehensive IT/OT integrated network security solutions that align with IEC 62443 standards, bolstering OT-specific network security with three layers of defense-in-depth protection.

Identify Network Statuses

Moxa helps customers detect and respond to cyberthreats faster by providing centralized visibility of OT networks and security statuses.

MXview One Central Manager
Centralized Platform for MXview One Sites
- Manages MXview One sites, groups, accounts, and licenses
- Monitors and accesses sites easily with an intuitive dashboard
- Customizes event severities, notifications, and reports

MXview One
Industrial Network Management
- Full visibility of real-time network statuses, traffic, and activity
- Security View for viewing the security level of network devices
- Scalable add-on modules for vertical market applications, including MXview Wireless and MXview Power

MXsecurity
Network Security Management
- Centralized network security and unified policy management
- Full visibility of real-time network security activities and threat analysis
- Unified mass deployment of security configurations and virtual patch updates
- Aggregates security logs based on configurable security policies to issue real-time alerts

Protect Your Networks

Moxa uses a defense-in-depth architecture to protect network infrastructure through secure segmentation and threat defense.

Start by establishing secure segments using VLANs, VPNs, firewalls, access control, DPI, and implementing security policies on security controls. Then, enhance threat defenses by using IDS/IPS devices and virtual patching.

EDR-G9010/8010 Series
Industrial Multiport Secure Routers
- All-in-one firewall/NAT/VPN/router/switch for network segmentation, data encryption, and security control
- Access control and traffic filtering with OT protocol deep packet inspection (DPI)
- IPS/IDS functions for defense against malicious activity
- Supports MXsecurity for security updates and real-time monitoring

EDR-G9004 Series
Industrial Secure Routers
- Feature firewall/NAT/VPN/router
- Gen3 LAN Bypass for system fault tolerance
- Dual WAN redundancy
- IPS/IDS functions for defense against malicious activity
- Supports MXsecurity for security updates and real-time monitoring

EDF-G1002-BP Series
Industrial LAN Firewall
- Stateful firewall for critical asset protection
- OT-centric DPI to prevent data-driven attacks
- IPS/IDS functions for defense against malicious activity
- Gen3 LAN Bypass for fail-safe networking
- Bump-in-the-wire installation without impacting networks

Moxa Security Advisories

Moxa's Product Security Incident Response Team (PSIRT) takes a proactive approach to protect our products from security vulnerabilities and help our customers better manage security risks. Stay informed by scanning this QR code to subscribe to our Security Advisories and receive notifications about product vulnerabilities and security updates.
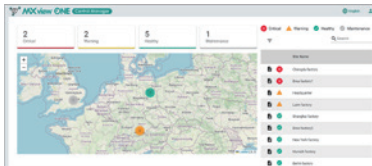
Select Secure Devices

Following the IEC 62443 standard, Moxa's industrial Ethernet products prioritize security features during the design and development phases to set a new benchmark for industrial network reliability, including for:
- Industrial Ethernet switches
- Industrial device servers
- Industrial protocol gateways
- Modular remote I/Os

EDS-4000/G4000 Series
8/9/12/14 Port Managed Switches
- Secure by design in compliance with the IEC 62443 standards
- Developed according to the IEC 62443-4-1 standard to ensure robust vulnerability management throughout the product life cycle
- Compliant with the IEC 62443-4-2 standard to ensure component-level security as an extra layer of network protection

NPort 6000-G2 Series
Preliminary*
Secure Terminal Servers
- Secure by design based on IEC 62443-4-1
- Security features based on the IEC 62443-4-2 standard to safely connect serial field devices to the network
- Supports remote authentication and syslog for enterprise network integration

*Available in Q4 2024

ioThinx 4510 Series
Modular Remote I/O
- Sets up devices easily with the Security Hardening Guide
- Secured configuration with AES-128 encryption
- Protects your data in SNMPv3 with the SHA-256 cryptographic hash function and AES-128 encryption
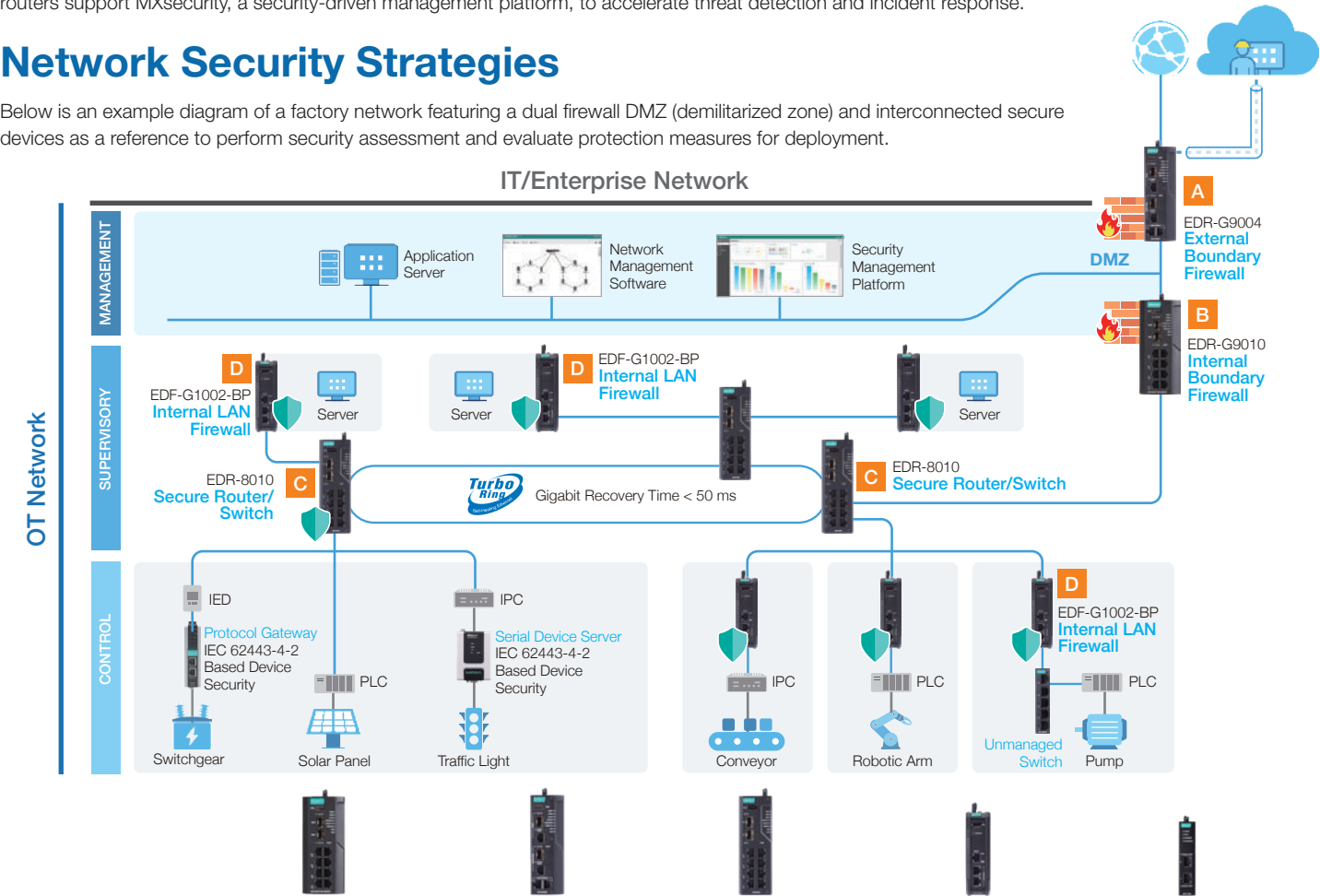
Customize Defense-in-depth
Cybersecurity for Your IIoT Network

OT cyberthreats are evolving quickly as OT environments embrace more interconnectivity across IT, OT, and IIoT assets. Traditional zones and conduits may no longer be enough to protect against emerging malware or cyberattacks. Industries like manufacturing, energy, utility, and transportation, require more advanced and highly customized solutions to safeguard staff, critical operations, and infrastructure.

Moxa offers a range of industrial secure routers that integrate firewall, VPN, NAT, and IPS functions to provide defense-in-depth cybersecurity for OT networks. The all-in-one protection mechanisms can be deployed at various control points to protect operations and minimize potential downtime. Some router/switch combo models provide an extra layer of security while also offering switch connectivity for more cost-efficiency. Moreover, all our secure routers support MXsecurity, a security-driven management platform, to accelerate threat detection and incident response.

Network Security Strategies

Below is an example diagram of a factory network featuring a dual firewall DMZ (demilitarized zone) and interconnected secure devices as a reference to perform security assessment and evaluate protection measures for deployment.

Security Requirements

Scenario A
- To protect the factory network, the external firewall needs to be deployed at the OT/IT boundary and segment a DMZ area to allow secure information exchange

Scenario B
- The internal boundary firewall should isolate the DMZ from internal LAN traffic to prevent breaches affecting internal operations

Scenario C
- Factory floor needs micro-segmentation for granular security
- Protective measures to guard vulnerable systems

Scenario D
- Ability to detect malware and threats within the internal zone for growing data traffic from field systems
- Minimal impact on regular network operations
- Seamless upgrading of the existing network with security features

Security Roles and Moxa Solutions

Role: External Boundary Firewall
EDR-G9004 Series
4-port Gigabit Secure Router/Firewall/VPN
- Supports dual WAN firewall with a data rate of up to 2 Gbps
- Supports VPN for secure remote access
- Supports MXsecurity to identify cyberthreats, ideal for securing the boundary between public and private networks
- Tailored size and functionality to prevent unnecessary overhead

Role: Internal Boundary Firewall
EDR-G9010 Series
10-port Full Gigabit Secure Router/Firewall/VPN/Switch
- 10-port GbE for both firewall and switch performance
- Built-in firewall for LAN segments, access control, and data protection
- Supports OT-centric DPI to prevent data-driven attacks
- Supports IPS and virtual patching for vulnerable system protection
- Supports MXsecurity for security updates and real-time threat monitoring

Role: Secure Router/Switch
EDR-8010 Series
8-port FE + 2-port GbE Secure Router/Firewall/VPN/Switch
- All-in-one functionality for multi-layered defense
- Supports OT-centric DPI for traffic filtering
- Supports IPS and virtual patching for vulnerable system protection
- Cost-efficient protection with multiport connectivity
- Supports MXsecurity for IPS updates and real-time threat monitoring

Role: Internal LAN Firewall
EDF-G1002-BP Series
2-port Gigabit LAN Firewall
- Bump-in-the-wire installation enables seamless security upgrades for legacy OT assets
- Stateful firewall and IPS features for critical system protection
- OT-centric DPI to prevent data-driven attacks
- Gen3 LAN Bypass to prevent single points of failure
- Supports MXsecurity security monitoring and management

	EDR-G9010	EDR-G9004	EDR-8010	EDF-G1002-BP	NAT-102
Use Cases	• Configurable multiport connectivity and security • Security between WAN and LAN	• Dual WAN redundancy • Security between WAN and LAN	• Configurable multiport connectivity and security	• Protection between devices within a LAN	• Protection within a machine network
Ports for DMZ/WAN	User-configurable	1/2	User-configurable	–	–
Ethernet Ports	8 GbE + 2 GbE SFP	2 GbE + 2 GbE Combo	2 GbE SFP + 8 FE	2 GbE	2 FE
Redundancy Protocols	VRRP, Turbo Ring, Turbo Chain, RSTP/STP	VRRP	VRRP, Turbo Ring, Turbo Chain, RSTP/STP	–	–
Throughput	Up to 2 Gbps		Up to 500 Mbps		Up to 100 Mbps
Firewall	DDoS, Ethernet protocols, ICMP, IP address, MAC address, Ports				IP address, MAC address
Deep Packet Inspection	DNP3, EtherNet/IP, IEC 60870-5-104, IEC 61850 MMS, Modbus TCP, Modbus UDP, Omron FINS, Siemens S7 Comm., Siemens S7 Comm. Plus**, OPC UA**, MELSEC communication protocol**				–
VPN	Up to 250 IPsec VPN tunnels		Up to 50 IPsec VPN tunnels	–	–
Certifications	IEEE 1613, IEC 61850-3 Ed. 2.0, DNV, ATEX, CID2, EN 50121-4, NEMA TS2*			NEMA TS2, EN 50121-4, CID2**, ATEX**, DNV**	ATEX, CID2
Software Management	MXview One, MXsecurity				MXview One**

*Certifications for EDR-G9004 models are ongoing and will be available in Q4, 2024.
**Available in Q3, 2024.

Simple and Secure

Scenario: Machine Network Defense

The compact NAT-102 fits perfectly inside most machines and uses IP translation to protect your machine networks against unauthorized access.

NAT-102 Series
Industrial NAT Devices
- OT-friendly NAT functionality
- Automatic network access control
- Ultra-small footprint
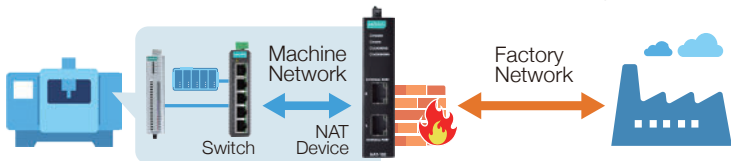
Expand Visibility and Intelligence
to Ensure Network Availability

Moxa's scalable industrial network management and security management suites visualize real-time operations to boost network efficiency and availability throughout all stages of network deployment, management, and maintenance.

• MXview One

Network management software to visualize network devices and topology changes with Rogue Device Detection to identify unknown connected devices. Additional features such as product warranty tracking and bulk firmware management further streamline inventory management and boost the efficiency of your operations.

• MXview One Central Manager

Central management platform to simplify monitoring for large-scale multisite MXview One deployments.

• MXsecurity

Security management platform designed to identify cyberthreats and prevent security misconfiguration to bolster network defenses.

Optimize Industrial Network Management Throughout the Entire Network Life Cycle

▶ **Challenges**

Deployment

Deploying factory-default devices one by one is both time-consuming and prone to errors.

Operation

Ensuring network resilience and availability against evolving cyberthreats and unplanned downtime is resource-intensive.

Maintenance

Network maintenance takes up a lot of resources and involves repetitive and error-prone manual tasks.

Troubleshooting

Unstructured troubleshooting often leads to inefficiencies and errors, wasting time and resources.

▶ **Why Moxa**

Faster Mass Deployment
- **MXconfig** speeds up device deployment through group configuration and duplication
- **MXsecurity** allows users to configure and apply bulk firewall policies for secure devices at scale

Smart Visualization
- **MXview One** visualizes the network topology, offers real-time email alerts, and enhances security by detecting default passwords and disabling unused ports and unsecured links
- **MXsecurity** offers enhanced visibility by showing real-time network activity and notifying users when detecting cyberthreats
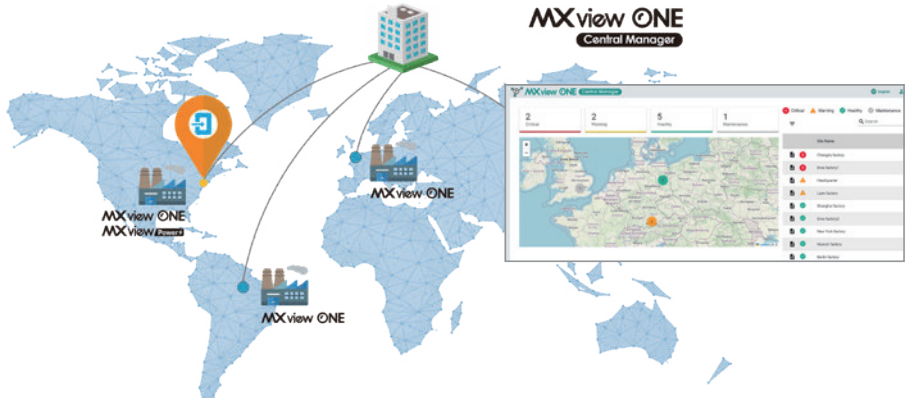
Efficiency and Security
- **MXview One** supports mandatory regular password changes, shows the firmware and patch update status, and features SCADA-like buttons to easily run batch configurations
- **MXsecurity** supports scheduled batch updates for policy rules and IPS pattern updates

Quick Diagnostics
- **MXview One** supports event searching
  - **MXview Wireless** can retrieve the roaming history of Wi-Fi clients to assist troubleshooting
  - **MXview Power** provides GOOSE packet path tracking and step-by-step resolution instructions within GOOSE events for efficient troubleshooting

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MXview One Central Manager	MXview One		MXsecurity	MXconfig

▶ **Industrial Network Management Software**

Centralized Platform for Remote MXview One Site Management and Monitoring
- Centralized management of remote sites, groups, accounts, and licenses
- Intuitive dashboard to easily monitor the status of MXview One sites
- Remote access to specific MXview One sites for troubleshooting
- Customizable event severity and notifications
- User-defined schedules to automatically generate reports

Industrial Network Management Software
- Automatic device and topology visualization
- Real-time dashboard with a complete network summary
- Enable single-pane monitoring through a RESTful API, web widgets, and syslog support
- Send device information to SCADA systems via OPC UA
- Run CLI scripts and configure customizable automation buttons for easy bulk configuration

Management Add-ons

MXview Wireless
- Dynamic topology view for Wi-Fi networks
- Client roaming playback for troubleshooting
- Device dashboards and performance charts for wireless devices

MXview Power
- Automatic concise visibility of PRP/HSR dual LAN topologies
- Automatically scans and detects unauthorized IEDs for preemptive threat management
- Real-time visibility of GOOSE control messages for quick troubleshooting
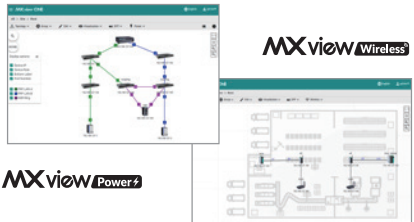
**Industrial Network Security Management Software**
- At-a-glance dashboard showing cyberthreat events and their location
- Centralize security settings and policies to increase efficiency and minimize configuration errors
- Auto IPS pattern upgrades from the Moxa server
- Real-time alerts with email notifications

Industrial Network Configuration Tool
- Bulk configuration to deploy devices 10x faster than one-by-one deployment
- Link sequence detection eliminates manual configuration errors
- Security Wizard for device security setup and updates
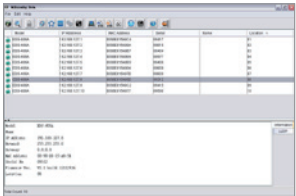
Embrace a Scalable Backbone That Grows With Your Application

To power the digital transformation driving IT/OT convergence, Moxa's industrial rackmount switches create a high-speed backbone that surpasses 10GbE/GbE to ensure seamless and scalable interconnectivity. With flexible port trunking and 24 to 64-port modules supporting copper, fiber, and PoE interfaces, these switches ensure adaptive, reliable, and secure data aggregation from edge to core in demanding environments.

Boost Your Backbone Scalability

MRX-Q4064/G4064 Series

Layer 3 64-port 10GbE/2.5GbE/GbE Modular Industrial Rackmount Switches

MRX-Q4064/G4064 Series modular industrial switches are designed to boost backbone bandwidth and availability, which are essential for IT/OT converged applications. With a 16-port 10GbE uplink capacity, MRX-Q4064 switches allow strategic aggregation of multiple 10GbE links to expand backbone bandwidth up to 80 Gbps. Featuring multiple hot-swappable components—media modules, power supplies, and fans—the rugged MRX Series switches deliver industrial-grade reliability, ensuring uninterrupted network communication.

High Performance
- Up to 16 10GbE uplinks
- Up to 48 2.5GbE ports for data aggregation
- Supports HAST* trunking for enhanced bandwidth and availability
- Supports hardware-based IEEE 1588 PTPv2 for high-precision time synchronization
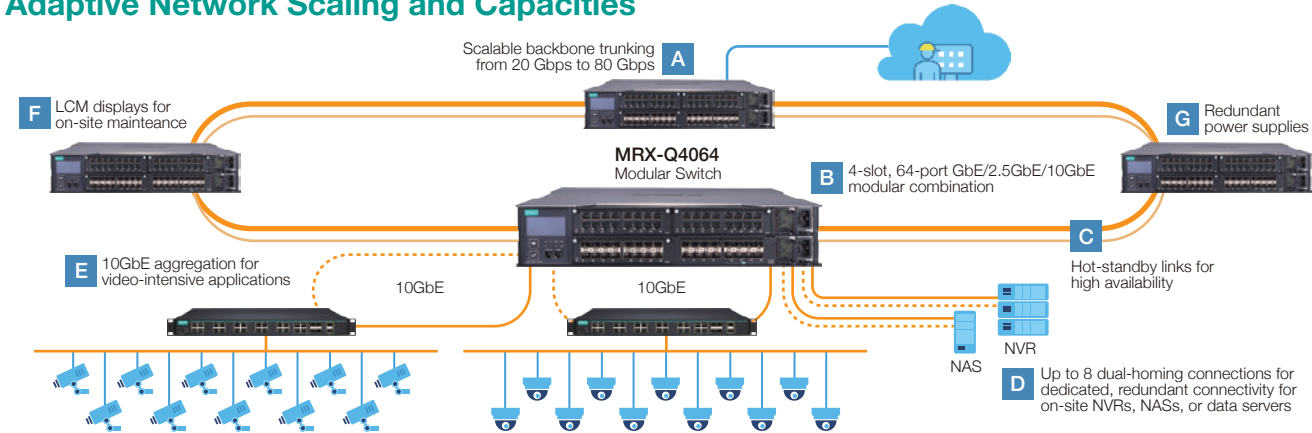
Non-stop Reliability
- Supports millisecond-level failover network redundancy
- Supports ITC* to prevent overheating and ensure stable operation
- 6+2 redundant fan design ensures active heat dissipation for non-stop operation

Easy Maintenance
- Interactive LCM* for easy on-site maintenance and troubleshooting
- Supports out-of-band access for remote diagnostics and troubleshooting
- Supports MXview One for easy device monitoring and management

*HAST stands for High-availability Static Trunk, ITC for Intelligent Temperature Control, LCM for Liquid Crystal (Display) Module.

Adaptive Network Scaling and Capacities

A. Scalable backbone trunking from 20 Gbps to 80 Gbps
F. LCM displays for on-site maintenence
G. Redundant power supplies
MRX-Q4064 Modular Switch
B. 4-slot, 64-port GbE/2.5GbE/10GbE modular combination
C.
E. 10GbE aggregation for video-intensive applications
10GbE
10GbE
Hot-standby links for high availability
NAS
NVR
D. Up to 8 dual-homing connections for dedicated, redundant connectivity for on-site NVRs, NASs, or data servers

Moxa Industrial Rackmount Switches

10GbE Backbone Convergence

Moxa's industrial rackmount switches offer 10GbE backbone convergence and diverse fiber/copper/PoE scalability to simplify your edge-to-core network infrastructure.

- 4- to 16-port 10GbE options
- Up to 48 PoE ports
- Supports GbE/2.5GbE/10GbE redundancy under 50 milliseconds
- Supports Turbo Chain* to create redundant sub-chain expansion without disruption

*Available for ICS/RKS/IKS Series only.

Robust Reliability

If your core network can't withstand harsh conditions such as extreme temperatures, power surges, or EMI noise, look to Moxa's industrial rackmount switches for robust durability and reliable performance.

- Industrial-grade EMI/EMC shielding
- Fanless design*
- Extended operating temperature ranges
- Dual isolated power supplies
- Diverse industry certifications

IACS-level Device Security

All our industrial rackmount switches feature IACS-compliant (Industrial Automation Control System) security features that are available through firmware updates.
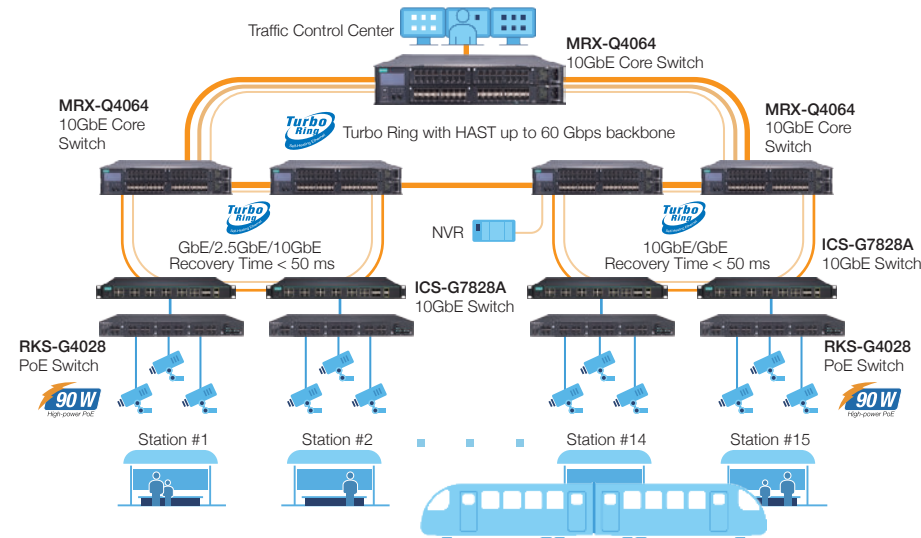
- Built-in security features based on IEC 62443 standards
- Device-based security for data protection and access control
- Supports MXview One for device security profiling and status monitoring

Use Case

10GbE Backbone for Tram Station Surveillance

An urban tram system required a reliable network backbone across 15 stations to ensure operational safety and security.

Traffic Control Center
MRX-Q4064 10GbE Core Switch
MRX-Q4064 10GbE Core Switch
MRX-Q4064 10GbE Core Switch
Turbo Ring with HAST up to 60 Gbps backbone
GbE/2.5GbE/10GbE Recovery Time < 50 ms
NVR
10GbE/GbE Recovery Time < 50 ms
ICS-G7828A 10GbE Switch
ICS-G7828A 10GbE Switch
RKS-G4028 PoE Switch
RKS-G4028 PoE Switch
90 W High-power PoE
90 W High-power PoE
Station #1
Station #2
Station #14
Station #15

Network Requirements
- High-capacity data aggregation and long-distance transmissions
- Network resilience for operational safety and security
- MXview One support for real-time visibility of network device, topology, and activities

Why Moxa
- MRX-Q4064 switches facilitate up to 8 10GbE trunking ports for remote station data backhaul
- RKS-G4028 switches deliver up to 24 PoE++ links to PoE powered devices (PDs) for reduced cabling and Smart PoE efficiency
- Supports Turbo Ring and Turbo Chain for GbE/2.5GbE/10GbE recovery time under 50 ms for up to 250 switches

	MRX-Q4064-L3-16XGS/ MRX-G4064-L3-8XGS	ICS-G7852A/ ICS-G7850A	ICS-G7828A/ ICS-G7826A	ICS-G7848A	RKS-G4028-L3	IKS-G6824A
	L3 10GbE	L3 10GbE	L3 10GbE	L3 Full GbE	L3 Full GbE	L3 Full GbE
10GbE Ports	16/8	4/2	4/2	–	–	–
2.5GbE Ports	Up to 48/–	–	–	–	–	–
10/100/1000 BaseT(X) or 100/1000 BaseSFP Ports	Up to 48/56 (1000 BaseT(X) or 1000 BaseSFP)	Up to 48	24	Up to 48	Up to 28	24
PoE Ports	–	Up to 48	–	Up to 48	Up to 24	–
Operating Temp.	-10 to 60°C	-10 to 60°C	-40 to 75°C	-10 to 60°C	-40 to 75°C	-40 to 75°C

	ICS-G7752A/ ICS-G7750A	ICS-G7528A/ ICS-G7526A	ICS-G7748A	RKS-G4028	IKS-G6524A	IKS-6728A/ IKS-6726A
	L2 10GbE	L2 10GbE	Full GbE	Full GbE	Full GbE	Best Value
10GbE Ports	4/2	4/2	–	–	–	–
10/100/1000 BaseT(X) or 100/1000 BaseSFP Ports	Up to 48	24	Up to 48	Up to 28	24	4/2
FE Ports	–	–	–	–	–	Up to 24
PoE Ports	Up to 48	–	Up to 48	Up to 24	–	Up to 24*
Operating Temp.	-10 to 60°C	-40 to 75°C	-10 to 60°C	-40 to 75°C		

*For IKS-6728A only.

Turn Connectivity Into **Operational Advantages**

Industrial networks need to keep up with increasing complexity, speed, and scale to meet changing demands and add value to provide a competitive edge.

The MDS-G4000 Series modular switches are designed to help turn every challenge into an opportunity, thanks to their wide variety of Ethernet and power modules you can freely mix and match as needed. The MDS-G4000-4XGS Series features 10GbE ports to facilitate large-scale IT/OT convergence.

Standards-based security and industry-certified reliability are built into all modules to support sustainable operations. Meanwhile, the hot-swappable modules can be replaced without causing any interruptions or downtime.

With a variety of power, interface, and installation options, the MDS-G4000 Series lets you customize your network to meet your needs of today and tomorrow.

MDS-G4000 Series

Industrial Layer 2/3 10GbE/GbE/FE Modular Managed Switches

Network Scalability
- Layer 3 routing interconnects multiple LAN segments
- Layer 2 switching supports Turbo Chain for uninterrupted and unlimited sub-ring expansions

Performance Flexibility
- 10GbE/GbE/FE port speed options
- 4-port RJ45, SFP, and PoE interface modules
- Up to 6 module slots for 12/20/28 ports

Availability
- Supports VRRP for routing redundancy
- Supports Turbo Ring and Turbo Chain for Gigabit redundancy under 50 ms
- Dual isolated redundant power units

Security
- Built-in device security based on the IEC 62443 standard
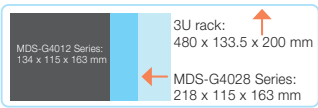- Role-based access control
- MAC-based IP assignment

Continuity
- Hot-swappable modules for uninterrupted operations
- Power outage protection during firmware upgrades

Reliability
- Die-cast design with superior vibration and shock resistance
- Diverse industry certifications

MDS-G4012 Series: 134 x 115 x 163 mm

3U rack: 480 x 133.5 x 200 mm

MDS-G4028 Series: 218 x 115 x 163 mm

POWER 720 W

Installation Flexibility
- Ultra-compact to fit in most cabinets
- Supports DIN-rail, rack*, and wall-mounting options

*Rack-mounting is available with an optional installation kit.
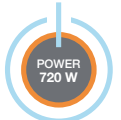
Smart PoE Delivery
- Up to 24 PoE links with 36 W output per port and a 720 W budget
- Built-in Smart PoE firmware for easy PD links, diagnostics, and monitoring

OT-friendly Usability
- HTML5 dashboard for device summary, smart search, and configuration
- Supports MXview One for simplified network management

10GbE IT/OT Convergence for Mining Automation

Underground mines rely on high-speed and robust network infrastructure to support real-time control and monitoring systems to ensure overall operational continuity, safety, and productivity. The MDS-G4000 Series modular switches feature futureproof performance, industry-proven reliability, and extensive flexibility to accommodate large, complex, and mission-critical mining network communications.

Network Requirements
- Simultaneously support multiple applications
- Non-stop communications to ensure operational safety, continuity, and productivity
- Fast responses to critical events
- Maximized network flexibility to support additional network services
- Hardened reliability and security to minimize downtime and maintenance

Why the MDS-G4000 Modular Switches

Futureproof Scalability
- Build 10GbE network backbones to aggregate massive data flows from underground subsystems
- Interchangeable GbE/FE modules with RJ45/SFP/PoE interface options to connect different devices

Constant Availability
- Failover with millisecond-fast redundancy for maximum uptime
- Hot-swappable modules for maintenance without downtime
- Built-in security against unauthorized access

Robust Reliability
- Die-cast design with superior vibration and shock resistance
- CID2 and ATEX Zone 2 certified for use in hazardous locations**

Simplified Operation
- HTML5 dashboard for enhanced network visibility and control
- Supports MXview One network management for real-time alerts and troubleshooting
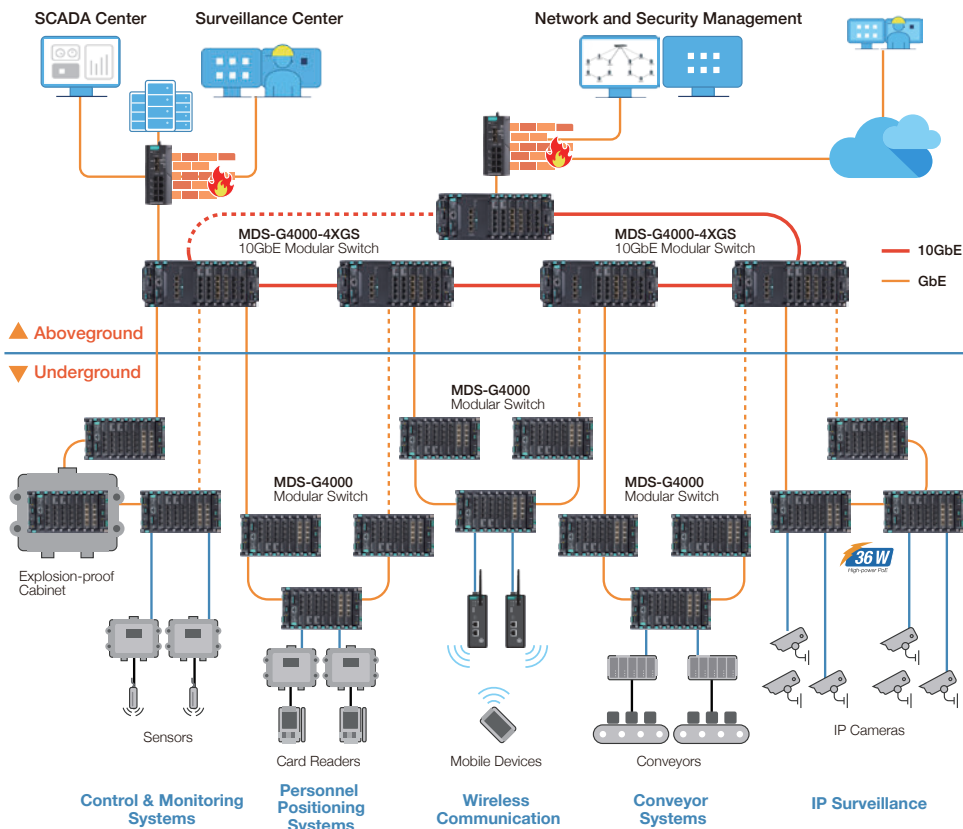
	MDS-G4000	MDS-G4000-L3	MDS-G4000-4XGS	MDS-G4000-L3-4XGS
Layer	Layer 2	Layer 3	Layer 2	Layer 3
No. of Ports	12, 20, 28	12, 20, 28	12, 20, 28	12, 20, 28
10GbE Ports	–	–	4	4
GbE Ports	Up to 28	Up to 28	Up to 24	Up to 24
Fiber Ports	Up to 24	Up to 24	Up to 28	Up to 28
Fiber Type	SFP			
Industrial Certifications	CID2, ATEX Zone 2, IEC 61850-3, IEEE 1613, EN 50121-4, NEMA TS2		IEC 61850-3, IEEE 1613, EN 50121-4, NEMA TS2	

**Available for the MDS-G4000/MDS-G4000-L3 Series only.

Built-in Scalability to Strengthen Network Resilience

Industrial networks need to evolve to support resilient operations. When integrating new network components, even small changes can run into unexpected challenges, such as limited installation space.

The EDS-4000/G4000 Series industrial managed Ethernet switches offer 68 interchangeable models with a unified form factor for unprecedented scalability and versatile connectivity to effortlessly expand your network and meet changing demands. Adding more bandwidth or more PoE power is now easier than ever. More importantly, the EDS-4000/G4000 switches are certified for the latest security and industry standards to ensure robust network resilience.

EDS-4000/G4000 Series
Industrial Managed Ethernet Switches

- 68 models with 8 to 14 ports
- 2.5GbE/GbE/FE/PoE port options
- Supports Turbo Ring and Turbo Chain millisecond-level failover redundancy
- Security compliant with the IEC 62443-4-2 standard
- Diverse industry certifications
- Compact size of 55 x 140 x 122.5 mm

PoE Power over Ethernet · MXview ONE · IEC 61850-3 / IEEE 1613 · DNV · NEMA TS2 · EN 50121-4

OT Security Benchmark

With a portfolio of 68 IEC 62443-4-2 certified models, the EDS-4000/G4000 Series switches are designed to help build secure, scalable infrastructure to ensure operational security.

Smart Usability

The intuitive user interface streamlines and simplifies network management. LED indicators on both sides help identify the device status while the unique rotatable, replaceable power module helps speed up installation and maintenance.

Industry-proven Reliability

Network reliability remains a top priority for industries that can't afford unplanned downtime. The EDS-4000/G4000 switches are certified for multiple industry standards to ensure reliability in demanding industrial applications.

	EDS-4008	EDS-4009	EDS-4012	EDS-4014	EDS-G4008	EDS-G4012	EDS-G4014
2.5GbE Ports	–	–	–	2	–	Up to 4	6
GbE Ports	Up to 4	–	4	4	8	Up to 12	8
FE Ports	Up to 8	9	8	8	–	–	–
90 W PoE Ports	Up to 4	–	Up to 8	–	–	Up to 8	–
Operating Temp.	-10 to 60°C, -40 to 75°C (-T models)						
Power Input	-LV models: 12/24/48 VDC, -HV models: 110/220 VDC/VAC						
Industrial Certifications	IEC 62443-4-2, IEC 61850-3, IEEE 1613 (Class 1), DNV*, ABS*, NK*, LR*, EN 50121-4, NEMA TS2 ATEX**, CID2**, IECEx**						

*Only available for -LV and PoE models. **Only available for -LV models.

TSN-enabled Networks

Moxa provides TSN-enabled industrial switches that prioritize network traffic and deliver time-critical data to the right place at the right time for truly real-time IIoT applications.

TSN Enabled

TSN-G5004/G5008 Series
Industrial Managed TSN Switches

- Compact design to fit into confined spaces
- Supports time-sensitive networking (TSN) technology
- Security features based on IEC 62443
- Web-based GUI for easy device configuration and management
- Field-proven use cases by industrial leaders

EDS-400A/500A/500E Series
Optimized for Reliability and Productivity

Moxa's rugged DIN-rail managed switches feature robust durability and failover redundancy to enable uninterrupted connectivity required for industrial applications.

The EDS-400A/500A/500E Series switches offer diverse capabilities while sharing industry-proven availability, reliability, and security features to enable seamless integration, build strong resilience, and improve network efficiency.

Security
- Advanced security features based on the IEC 62443 standard (EDS-500E Series only)
- Supports MXview One to audit user accounts and firmware updates

SCADA Integration
- Supports multiple industrial automation (IA) protocols for easy SCADA and PLC network integration

Constant Availability
- Millisecond-level failover recovery
- Unlimited subnetwork expansion
- Live node expansion without network interruptions
- Large savings on cabling costs
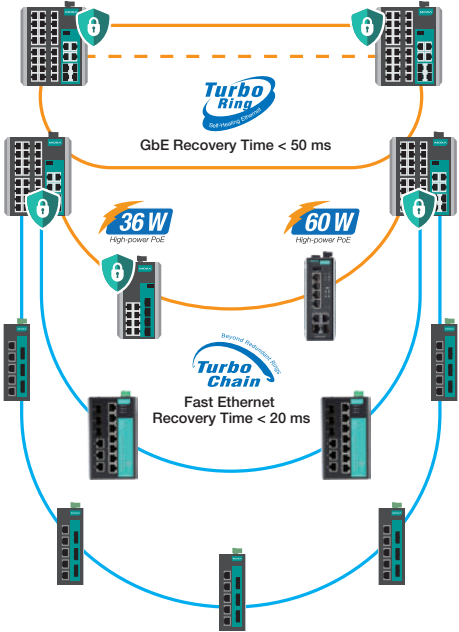
Smart PoE
- Up to 60 W PoE+ output
- Built-in Smart PoE for remote PD links, diagnostics, and failure recovery

Industrial Reliability
- High EMI resistance
- Diverse industry certifications
- Fanless and wide operating temperature

Simplified Management
- Error-free and time-saving mass configuration
- Live topology monitoring and instant alerts

Turbo Ring — GbE Recovery Time < 50 ms
36 W High-power PoE · 60 W High-power PoE
Turbo Chain — Fast Ethernet Recovery Time < 20 ms

|	TSN-G5000	EDS-G500E	EDS-500E	EDS-500A	EDS-400A
No. of Ports	4, 8	8, 12, 16	6, 10, 18, 28	5, 8, 10	5, 8
GbE Ports	4, 8	8, 12, 16	2, 3, 4, 4	Max. 3*	–
Fiber Ports	Max. 2 (Combo)	Max. 4*	2, 3, 4, 4	Max. 2*	Max. 3*
Fiber Type	SFP	SFP	SFP	ST, SC, SFP	ST, SC
PoE Ports	–	Up to 8 (EDS-G512E only)	Up to 4 (EDS-P506E-4PoE only)	Up to 8 (EDS-P510A-8PoE only)	–
PoE Output	–	36 W	Up to 60 W	36 W	–
Industrial Certifications	–	CID2, ATEX, IEC 61850-3, IEEE 1613, DNV, ABS, LR, NK, EN 50121-4, NEMA TS2		CID2, ATEX, DNV, EN 50121-4*, NEMA TS2*	

*Available for selected models only.

Simplify to Amplify
Your Efficiency in the Field

OT field engineers often face complicated networking challenges, such as protocol incompatibility, complex deployment, and limited installation space. To help them face these challenges, Moxa's smart switches are designed with features that address these pain points to simplify deployment and maintenance, and ensure smooth operations.

The SDS-3000/G3000 Series smart switches give you fast, easy integration and interoperability with Industrial Control Systems (ICSs) through one-step industrial protocol configuration via the web GUI or the rotary DIP switch. With this simple step, automation engineers can monitor the status of both the control system and the network from their SCADA/HMI systems, allowing rapid response to minimize issues and downtime.

Additionally, Moxa's smart switch portfolio offers a wealth of connectivity options for machine and control cabinet deployment. With a compact form factor as small as 20 mm, the SDS-3000/G3000 Series includes models with diverse 6 to 16-port Gigabit, copper, fiber, and PoE connectivity in a versatile DIN-rail mountable device. All SDS models are built with an IP40 rugged design and support full MRP functionality to provide the best value to build reliable networks for industrial automation applications.

Smart Monitoring
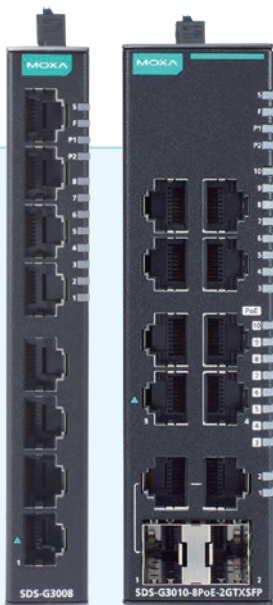
Seamless SCADA/HMI integration and monitoring with support for a variety of industrial protocols.

Scalable Versatility

High-density Gigabit and PoE options provide versatile solutions to meet the needs of different networks.

Smart UI

One-page dashboard makes navigation and configuration easy and efficient.
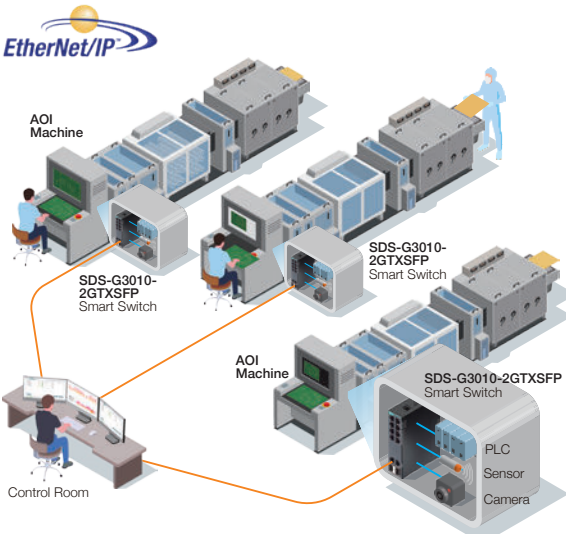
SDS-3000/G3000 Series
6/8/10/16-port Smart Switches

NEW

- Up to 16 GbE ports
- Up to 8 GbE/FE PoE+ ports
- Supports EtherNet/IP, PROFINET, and Modbus TCP protocols
- Security features based on IEC 62443 standards
- Supports RSTP/STP/MRP network redundancy
- Supports Smart PoE for remote diagnosis and recovery
- Flexible mounting options and double-sided LEDs
- -40 to 75°C operating temperature (-T models)

	SDS-G3016	SDS-G3010	SDS-G3008	SDS-G3006	SDS-3016	SDS-3010	SDS-3008	SDS-3006
Total Ports	16	10	8	6	16	10	8	6
GbE Ports	16	10	8	6	Up to 2	2	–	Up to 2
FE Ports	–	–	–	–	Up to 16	8	8	Up to 6
Fiber Ports	Up to 2	2 (Combo)	–	Up to 2 (Combo)	Up to 2	2 (Combo)	–	Up to 2 (Combo)
PoE Ports	–	Up to 8	–	Up to 4	–	Up to 8	–	Up to 4
Industrial Protocols	EtherNet/IP, Modbus TCP, PROFINET							

*Non-PoE models: Available in Q3, 2024. PoE models: Available in Q4, 2024.

Preliminary*

Automated Optical Inspection for PCB Manufacturing

A PCB manufacturer wanted to adopt modern Automated Optical Inspection (AOI) systems to enhance their production efficiency. Each AOI machine needed Ethernet switches for network connectivity. The entire production line used EtherNet/IP.

Network Requirements
- High-bandwidth for high-definition image transmission
- EtherNet/IP support for integration with existing systems
- Ease of use would be crucial for field engineers to improve operational efficiency

Why the SDS-G3010-2GTXSFP Smart Switch
- 10 GbE ports provide sufficient bandwidth for machine vision data transmission
- Supports SCADA/HMI integration through one-click EtherNet/IP configuration
- One-page dashboard streamlines network operation

Use Case

## Control and Monitoring for Mining Wastewater Treatment Plant

A diamond mining customer needed to build a wastewater treatment plant for their process control. The plant needed an industrial Ethernet switch compatible with PROFINET and Media Redundancy Protocol (MRP: IEC 62439-2) to support the control and monitoring of the entire wastewater treatment system.

Network Requirements
- PROFINET support for field network interoperability
- MRP support for fast network redundancy
- Hardened design to ensure operational reliability
- Compact design with high port density required for installation in cabinets with limited space

Why the SDS-3016 Smart Switch
- 16 Fast Ethernet ports for scalable IoT connectivity
- One-click PROFINET setup for easy device monitoring
- Supports both MRP client and manager for redundant connectivity
- Three installation options and a slim design that fits into most cabinets
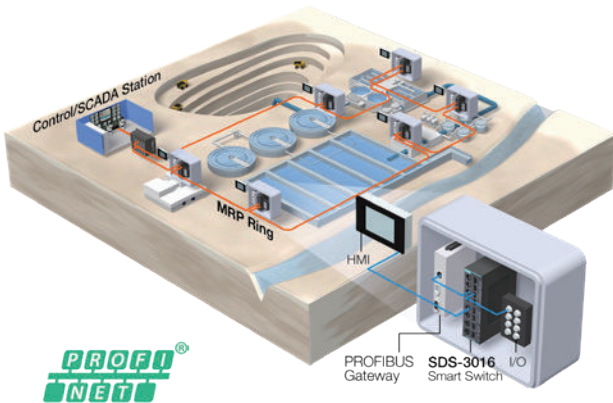
Application

Remote IP Surveillance for Factory Automation

A large material handling company sought to deploy extensive IP surveillance for multiple new plants that were spread out geographically. High-speed video transmission for remote diagnostics and monitoring was a key requirement to ensure operational safety, security, and efficiency.

Network Requirements
- High bandwidth and high-power PoE capacity to facilitate extensive IP camera deployment
- Support for remote network monitoring and troubleshooting for operational efficiency
- Long-lasting reliability to minimize maintenance needs

Why the SDS-G3006-4PoE-2GTXSFP Smart Switch
- The 6-port full Gigabit PoE switch provides 4 PoE ports to connect and power IP cameras, and 2 fiber uplink ports for long-distance video transfer
- Built-in Smart PoE software enables monitoring, diagnosis, and recovery of remote PDs (powered devices)
- Durable design with IP40 protection and a -40 to 75°C wide operating temperature range
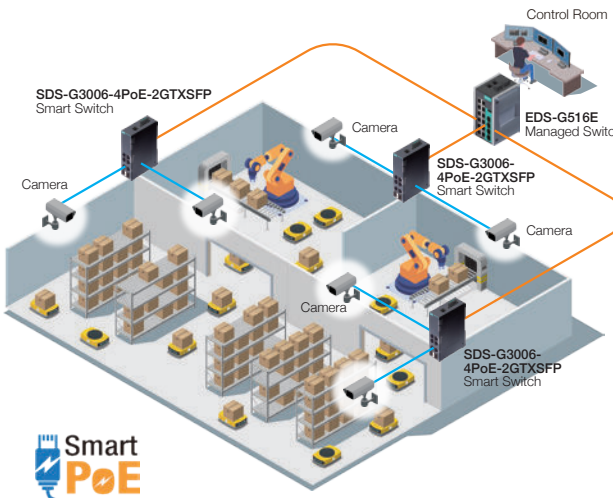
Reliable Network Expansion
Made Easy

Fast and reliable network expansion is crucial for industrial applications to ensure safety and productivity, especially for hazardous data collection or continuous manufacturing operations.

Our incredibly compact EDS-2000/G2000 Series unmanaged switches, offering 5 to 18-port FE/GbE/fiber connectivity options with advanced data control, meet evolving connectivity needs while saving time and effort. They provide the rugged reliability you can depend on for seamless performance in demanding environments.

Additionally, you can rely on their plug-and-forget performance that has been proven to withstand harsh conditions. Our unmanaged switches have gained the trust and satisfaction of customers worldwide with thousands of long-term deployments.

EDS-2000/G2000 Series
Industrial Unmanaged Ethernet Switches

Performance
- 5 to 18 ports with FE/GbE/fiber options
- Up to 8 GbE ports

Advanced Efficiency
- Microsecond-level latency for faster MES response times
- Supports automatic warnings for power and port failures*

Easy Deployment
- Plug-and-play simplicity
- QoS and BSP can be enabled via DIP switches
- Multiple DIN-rail mounting options*

Reliability
- Power redundancy*
- -40 to 75°C wide operating temperature
- Supports PROFINET Real-Time (RT) communication**
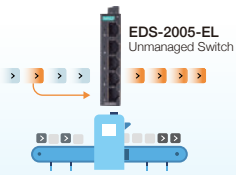
*Only available for the EDS-2000-ML Series.
**Only available for the PROFINET Conformance Class A compliant EDS-2000/G2000-EL/ELP Series.

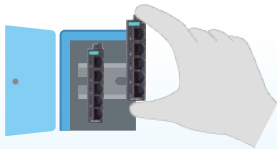### Ultra-compact Design
For easy deployment inside cabinets

81 mm / 85.6 mm

EDS-G2008/G2005-EL Switches Vs. Credit Card

Best Fit Scenarios ▶

EDS-G2005-EL Unmanaged Switch — Camera, Drive, PLC
AGV/AMR
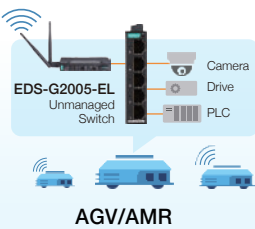
EDS-2005-EL Unmanaged Switch
Data-critical Applications

Cabinets and Machinery With Limited Space

	Extra-compact Full Gigabit	Extra-compact Best Value	Advanced High Port Density	Standard Hardened Design	Advanced Full GbE
	EDS-G2000-EL/ELP	EDS-2000-EL/ELP	EDS-2000-ML	EDS-200A	EDS-G200/G300
Features	• Extra-compact size • Enable QoS and BSP via DIP switches • Compliant with PROFINET Conformance Class A		• High port density • Enable QoS and BSP via DIP switches • Relay output warnings	• Redundant dual 12/24/48 VDC inputs	• Fiber Gigabit connections • Jumbo frames for enhanced performance
GbE Ports	5/8	–	Up to 2	–	5/8
FE Ports	–	5/8	Up to 16	5/8	–
Fiber Ports	–	Up to 1	Up to 2	Up to 2	Up to 2
PoE Ports	–	–	–	Up to 4 PoE+	Up to 4 PoE+
Operating Temperature	-10 to 60°C, -40 to 75°C (-T models)				
Industrial Certifications	CE/FCC, UL 61010-2-201, EN 62368-1, CISPR 22/32, EN 55032		CID2, ATEX, IECEx, DNV, ABS, LR, NK, EN 50121-4, EN 62368-1, NEMA TS2, UL 508, UL 61010-2-201		*

Empower Long-distance
Connectivity

Network operators often prefer wired connections over wireless for critical long-distance data transmissions to avoid interference that can lead to errors and downtime. Moxa's Ethernet-to-fiber industrial media converters (IMCs) ensure interference-free Ethernet extensions up to 80 km with Gigabit speeds and high PoE deliveries, even in harsh conditions.

The PoE models provide up to 36 W of power to PTZ cameras and other wireless devices. Featuring an ultra-slim 20-mm design, the robust IMC-P21 Series PoE models are ideal for space-constrained installations, such as outdoor pole-mounted cabinets.

The IMCs also feature link fault pass-through to prevent data loss during link failures and smart LED indicators for easy diagnosis and maintenance.

— GbE — Fiber — PoE+ Connection

IMC-21GA Media Converter
Gigabit Switch

Fiber up to 80 km

36W High Power PoE

IMC-P21GA-G2 PoE Media Converter — IP Camera
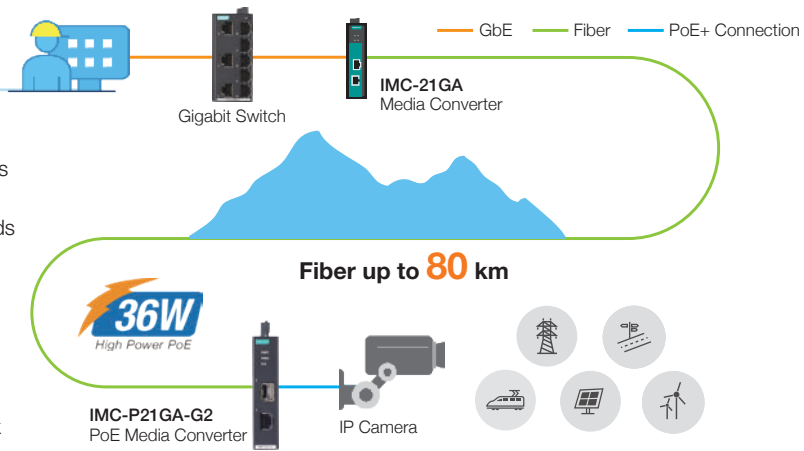
IMC-P21A/P21GA-G2 Series
Industrial PoE Ethernet-to-fiber Media Converters

Performance
- FE/Gigabit speeds
- Up to 80 km transmission distances
- Up to 36 W power supply

Easy Maintenance
- Link fault pass-through for tracing link failures
- LED indicators for easy troubleshooting and maintenance

Easy Deployment
- Compact size
- Plug-and-play
- DIN-rail installation

Reliability
- Dual power inputs
- Surge protection up to 2 kV for power and 1 kV for LAN
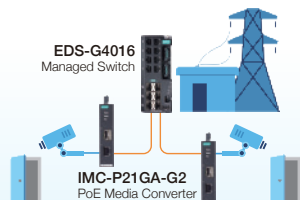- -10 to 60°C operating temperature*

Ultra-slim Design
For easy installation in small cabinets

90 mm / 85.6 mm

IMC-P21GA-G2 Vs. Credit Card

Best Fit Scenarios ▶

IMC-21GA Media Converter — PoE-powered Camera
IMC-P21GA-G2 PoE Media Converter
Traffic Monitoring

IMC-21GA Media Converter — PoE-powered Wi-Fi AP
IMC-P21GA-G2 PoE Media Converter
Bus Stops

EDS-G4016 Managed Switch
IMC-P21GA-G2 PoE Media Converter
Entrance Surveillance

	Cost-effective	Gigabit	PoE	PoE	Certified Reliability	Gigabit	PoE
	IMC-21A	IMC-21GA	IMC-P21A-G2	IMC-P21GA-G2	IMC-101	IMC-101G	IMC-P101
Ethernet Ports	1 FE	1 GbE	1 FE	1 GbE	1 FE	1 GbE	1 FE
Fiber Ports	100BaseFX (SC/ST)	1G SX/LX or 1G SFP slot	100BaseFX (SC/ST)	1G SX/LX or 1G SFP slot	100BaseFX (SC/ST)	1G SFP slot	100BaseFX (SC/ST)
Single-mode Transmission Distance	Up to 40 km	Up to 120 km	Up to 40 km	Up to 80 km	Up to 80 km	Up to 120 km	Up to 40 km
PoE Power Budget	–	–	36 W	36 W	–	–	30 W
Operating Temperature	-10 to 60°C / -40 to 75°C (-T models)		-10 to 60°C		0 to 60°C / -40 to 75°C (-T models)		
Industrial Certifications	UL 60950-1	UL 60950-1	UL 62368		UL 508, CID2, ATEX Zone 2, IECEx, DNV	UL 508, CID2, ATEX Zone 2, IECEx	UL 508

*Available for selected models only.

Boost Your **IIoT With Wi-Fi 6**

As IIoT grows and wireless needs surge, Moxa's AWK 802.11ac/ax industrial wireless solutions stand ready to meet evolving communication needs with high-density, high-speed, reliable, and secure connectivity solutions.

Our AWK 802.11ax Wi-Fi 6 solutions offer speeds over a Gigabit, 160 MHz bandwidth, and 1024 QAM* to meet demanding IIoT applications. AWK 802.11ax APs and clients use OFDMA* to optimize spectrum efficiency and ensure high-speed, low-latency, and congestion-free wireless operations in dense noisy environments. To support Gigabit wireless, AWK-1165A/C products come with a built-in 5-port full Gigabit switch for expanded wired connections while saving on hardware and cabling costs.

To maximize wireless reliability, all our AWK products offer field-proven features including IEC 62443-4-2 based security, millisecond-level client roaming, wide temperature tolerance, and strong electromagnetic immunity. In addition, MXview One and its wireless add-on can be effectively utilized to gain real-time visibility into dynamic wireless connections and link changes for efficient monitoring, management, and troubleshooting of networks.

AWK-1165A/1165C Series
Industrial IEEE 802.11ax Wireless APs/Clients

• 2.4/5 GHz dual-band, up to 1,201 Mbps data rate
• Built-in 5-port Gigabit unmanaged switch
• Security features based on IEC 62443-4-2
• Millisecond-level client-based Turbo Roaming
• UN model available with multiregion RF compliance
• -40 to 75°C operating temperature range

*QAM: Quadrature amplitude modulation; OFDMA: Orthogonal frequency-division multiple access;
AGV: Automated guided vehicles; AMR: Autonomous mobile robots

Availability
• Turbo Roaming for sub 150 ms client handovers
• AeroMesh for reducing dead zones and swift recovery from AP failures
• MXview Wireless support for monitoring dynamic topology and roaming playback for quick troubleshooting

Reliability
• 500-V power input insulation resistance
• Level-4 ESD protection on antenna ports
• Anti-vibration design
• -40 to 75°C operating temperature range (-T models)

Security
• Security features based on IEC 62443-4-2
• WPA3 data encryption support
• One-to-many NAT to secure and simplify outbound connections

Preliminary* Preliminary*

|	AWK-1151C	AWK-3252A	AWK-4252A	AWK-1161A/ AWK-1165A	AWK-1161C/ AWK-1165C	AWK-3262A	AWK-4262A
Operation Mode	Client/Client-router/ Slave/Sniffer	AP/Client/Client-router/Master/ Slave/Sniffer		AP/Master/ Sniffer	Client/Client-router/ Slave/Sniffer	AP/Client/Client-router/Master/ Slave/Sniffer	
Standards	802.11a/b/g/n/ac Wave 2			802.11ax			
Data Rate	400 Mbps (2.4 GHz) / 867 Mbps (5 GHz)			574 Mbps (2.4 GHz) / 1201 Mbps (5 GHz)			
Link Interface	GbE	GbE (PoE-powered)		GbE/ 5 GbE	GbE/ 5 GbE	GbE + 2.5GbE (PoE powered)	
Roaming Ability	Turbo Roaming (Client-based handover < 150 ms)			–	Turbo Roaming (Client-based handover < 150 ms)		
Security	WPA3, IEC 62443-4-2 certified			WPA3, based on the IEC 62443-4-2 standard			
Mesh	–	AeroMesh		–	AeroMesh**		
Operation Temperature	-25 to 60°C / -40 to 75°C (-T models)		-40 to 75°C	-25 to 60°C / -40 to 75°C (-T models)			-40 to 75°C
RF Certifications	EN 300 328, EN 301 893, ANATEL, FCC, MIC, NCC, RCM, SRRC, WPC, KC, IC			EN 300 328, EN 301 489-1/17, EN 301 893, ANATEL, FCC, MIC, NCC, RCM, SRRC, WPC, KC, NBTC, IC			

*Available in Q1, 2025.   **Available in Q3, 2025.

Speeding Up Material Handling on the Move

A global AMR manufacturer aimed to upgrade their AGVs and AMRs to Wi-Fi 6 to enable effortless handling of growing volumes of materials in challenging operating environments.

Moxa Solutions

AWK Wi-Fi 6 APs and clients offer broader IoT capabilities that deliver Gigabit speeds for wired and wireless connections, millisecond-level client-based roaming, reduced network congestion, and flexibility to accommodate growing connectivity needs. The AWK-1165C clients fit perfectly into space-limited AGVs and AMRs to offer resilient mobility with minimal interference in dense, noisy operating environments.
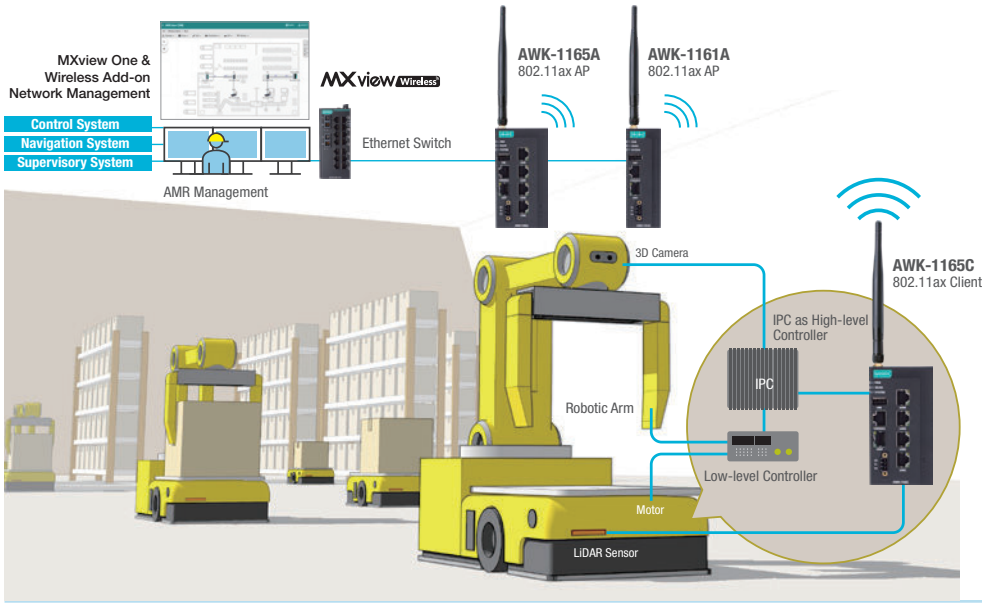
Network Requirements
• Compact Wi-Fi devices for tight machine spaces
• High-speed, low-latency wireless to ensure smooth navigation and coordination among robots
• Reliable operations in environments with vibration and EMI

Why Moxa
• Compact, robust design for easy machine integration and enhanced EMC and RF protection
• 802.11ax performance with integrated 5-port switch for cost efficiency
• UN model available with multiregion RF compliance and certifications

Driverless Trucks for Safety and Productivity in Mining

A mining machinery manufacturer needed a robust wireless solution to solidify driverless truck operations for non-coal underground mining.

Moxa Solutions

The IP68-rated AWK-4252A 802.11ac devices double as Wi-Fi access points mounted on the tunnel walls and as Wi-Fi clients installed on the autonomous trucks. The AP devices support Moxa's AeroMesh to create a self-healing mesh that extends the radio coverage and facilitates fast recovery in case of AP failures. The client devices deliver high EMC immunity and robust mobility to transmit real-time video and telemetry to enable operational safety and efficiency.
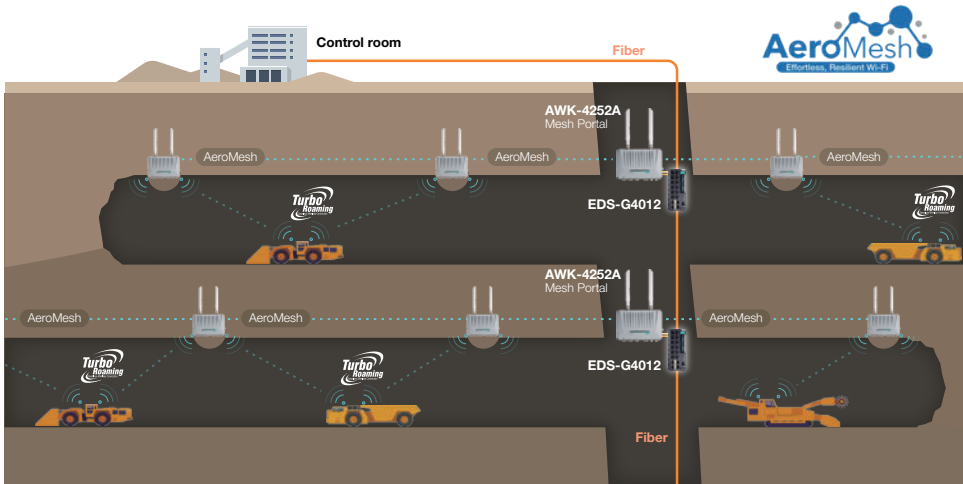
Network Requirements
• Robust and high-speed wireless to support bandwidth-heavy data and video streaming
• Ability to withstand harsh underground conditions, including EMI from nearby machines and motors
• Robust wireless coverage for mobile connectivity

Why Moxa
• 802.11ac and resilient wireless technologies such as Turbo Roaming and AeroMesh for reliable wireless connectivity
• Industrial hardened devices with EMC and antenna protection to prevent downtime
• IP68 sealed waterproof design to withstand extreme underground conditions

Ensure **Secure Cellular Operations** Over Private and Public Networks

Experience the power of Moxa's industrial cellular solutions tailored for smart manufacturing and distributed operations, offering best-in-class cellular security, reliability, and easy management.

Private networks — Elevate OT-to-5G data transmissions in a controlled cellular environment with the CCG-1500 Series private 5G gateways, ensuring on-site data security.

Private 5G Gateways for Energy-efficient Operations

Moxa's private 5G solutions connect OT devices to private 5G networks without any wiring hassle. The CCG-1500 Series private gateways deliver 5G speeds of up to 920 Mbps downlink and 440 Mbps uplink to enable low-latency serial/Ethernet-to-5G data transmissions at a minimal average power consumption of just 8 W. Combined with a compact size of only 100 x 125 x 35 mm, these power-efficient gateways are ideal for battery or solar-powered operations in remote applications.

CCG-1500 Series
Industrial Private 5G Gateways

- Serial/Ethernet-to-5G converter
- Dual SIM for network redundancy
- Supports Keep Alive for forced recovery
- Low 8 W power consumption
- -40 to 70°C operating temperature

Additional Benefits

- ✓ Specialized 5G accessories to improve signal strength and coverage
- ✓ Supports cloud-based Device Lifecycle Management (DLM) Service for streamlined device monitoring and management (Available in Q3, 2024)
- ✓ Strong ecosystem partnership to ensure network interoperability and reliability
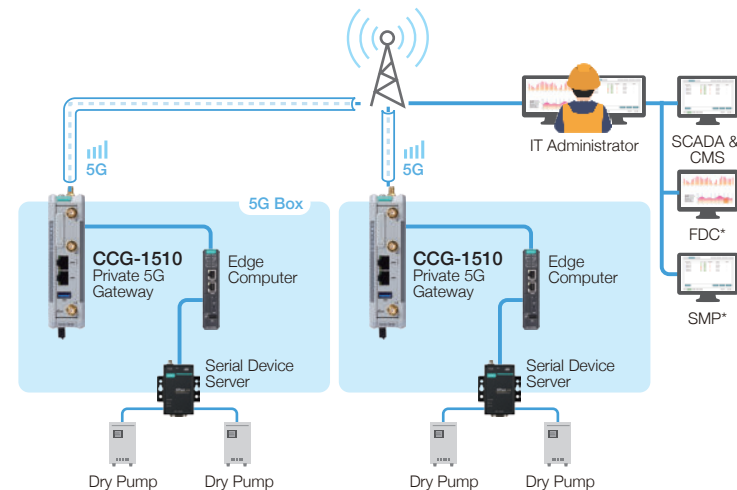- ✓ Provides diagnostic tools and technical support

Success Case

Dry Pump Monitoring for Critical Manufacturing

Dry pump monitoring is crucial for achieving high vacuum purity in dust-free production. Real-time monitoring of I/O modules on dry pumps over a private 5G network was required to support critical asset monitoring and operations.

Moxa Solutions

The CCG-1500 Series private 5G gateway was selected for its stable performance, dedicated 5G band spectrum, and Layer 2 tunneling for end-to-end field communications.

Network Requirements

- High-speed operation and stable reliability
- Machine-to-machine field communication
- Easy integration with third-party 5G equipment

Why Moxa

- Proven stability and reliability, strong compatibility with other third-party 5G systems
- Supports autonomous 5G traffic analysis for swift troubleshooting
- Professional technical support and troubleshooting

5G Box — CCG-1510 Private 5G Gateway — Edge Computer — Serial Device Server — Dry Pump, Dry Pump — IT Administrator — SCADA & CMS — FDC* — SMP*

*FDC stands for Fault Detection & Classification, SMP for Super Manufacturing Platform.

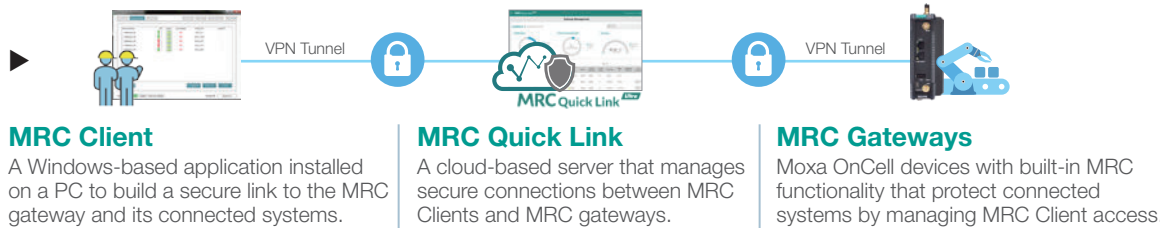|	CCG-1520-T	CCG-1510-T
Cellular Bands	5G R15 NR: N79	5G R15 NR: N1 / N3 / N28 / N41 / N48 / N77 / N78 LTE: B1 / B3 / B7 / B8 / B28 / B38
Ethernet Ports	2	
Serial Ports	1	
Dimensions	100 x 125 x 35.2 mm (3.93 x 4.92 x 1.38 in)	
Operating Temperature	-40 to 70°C (-40 to 158°F)	

Public networks — Leverage the OnCell Series industrial cellular products to facilitate secure remote access for prompt machine maintenance via the cloud-based MRC platform.

Secure Remote Access Over LTE Cellular

Remote access to PLCs, SCADAs, and critical machines is crucial for prompt support services in distributed environments. Moxa Remote Connect (MRC) is a cloud-based secure remote access platform that features connection encryption and scalable tunneling to protect your remote device interactions. MRC enables better and safer remote operations, allowing field engineers to minimize on-site troubleshooting and perform more efficient remote maintenance from anywhere.

MRC Solutions ▶

VPN Tunnel — MRC Quick Link — VPN Tunnel

MRC Client
A Windows-based application installed on a PC to build a secure link to the MRC gateway and its connected systems.

MRC Quick Link
A cloud-based server that manages secure connections between MRC Clients and MRC gateways.

MRC Gateways
Moxa OnCell devices with built-in MRC functionality that protect connected systems by managing MRC Client access.

Success Case

Remote Maintenance for EV Charging Systems

A charging point operator (CPO) deployed a chain of unmanned electric vehicle (EV) charging stations. By integrating Moxa's OnCell G4302-LTE4 cellular routers and MRC Quick Link service into each charging station, the CPO was able to manage and monitor all systems with ease. This solution also minimized on-site troubleshooting when a system goes offline.

Moxa Solutions

To ensure 24/7 charging services, the OnCell G4302-LTE4 routers provide stable data transfer from each charging system to the CPO cloud. The dual SIM, LTE/Ethernet-to-WAN redundancy, and GuaranLink cellular auto-recovery features further enhance operational reliability.

For EV supply equipment (EVSE) maintenance, the OnCell G4302-LTE4 acts as an MRC gateway, allowing the CPO to remotely monitor all connected systems through the MRC cloud.

- The MRC server allows customizable access control for the CPO and EVSE provider to access MRC gateways for EVSE diagnostics and troubleshooting
- MRC access control is managed by the CPO via dedicated access accounts and time slots for remote access
- EVSE engineers can use the MRC Client software to remotely access EVSE for troubleshooting from anywhere

OnCell G4302-LTE4 Series
Industrial Secure Cellular Routers
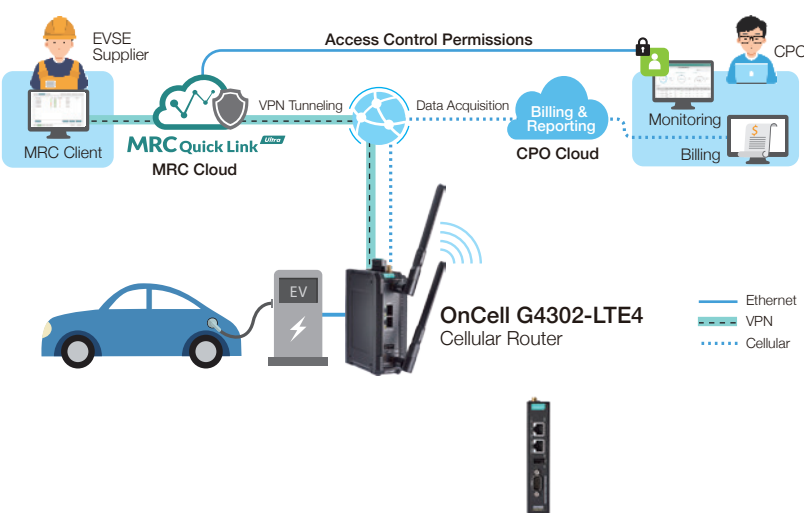
Network Requirements

- Reliable data acquisition to sustain EV charging operations
- Simple and secure online management for monitoring and maintaining multiple systems at once
- Easy-to-use tools for diagnosing and troubleshooting EV charging systems

EVSE Supplier — MRC Client — MRC Quick Link — MRC Cloud — Access Control Permissions — VPN Tunneling — Data Acquisition — Billing & Reporting — Monitoring — Billing — CPO Cloud — CPO — OnCell G4302-LTE4 Cellular Router — Ethernet — VPN — Cellular

Why Moxa

- Data segregation for charging service operations and EVSE maintenance
- Cloud-based MRC Quick Link for secure remote management and service scalability
- Easy for non-IT CPO staff to set up and leverage on-demand remote access to devices via the MRC Quick Link service

	OnCell 3120-LTE-1	OnCell G4302-LTE4
WWAN	4G LTE Cat. 1	4G LTE Cat. 4
Ports	2 FE + 1 Serial	2 GbE + 1 Serial
Layer 2 Switching	–	Yes
VPN	IPsec VPN, GRE, OpenVPN	IPsec VPN
Firewall	ICMP, IP address, MAC address, Ports	DDoS, Ethernet protocols, ICMP, IP address, MAC address, Ports, DPI
Hardware-based Security	–	Secure Boot
Redundancy	• GuaranLink for cellular failover • Cellular and Ethernet WAN failover • VRRP for routing redundancy (OnCell 4302-LTE4 only)	

Enable Smart Railways With Ethernet

Railway systems are designed to operate for decades. Using divergent networks to support multiple services in railway systems can be costly and hard to deploy, maintain, and scale. As an IRIS-certified company, Moxa provides Ethernet-compliant railway solutions for onboard, train-to-ground, and trackside communication and control systems that enhance operational capacity, efficiency, and passenger services.

Moxa Offers
- EN 50155 proven reliability from trains to tracks
- Ethernet compatibility with equipment from different train builders
- Complete wired and wireless product portfolio
- IRIS rev 0.4 certified quality

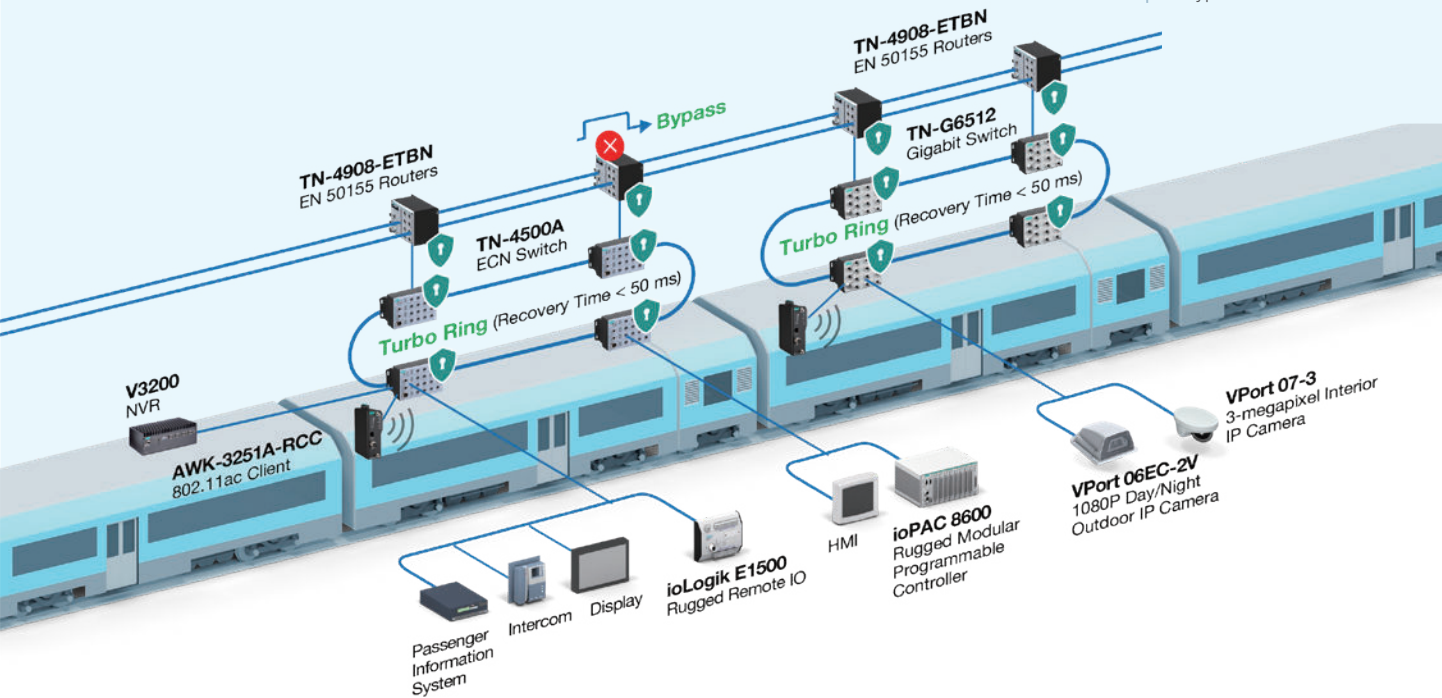## Ethernet-connected
Onboard Networks

Moxa's EN 50155 Ethernet solutions enable high-bandwidth communications for CCTV, passenger information systems (PIS), passenger Wi-Fi, and other train-wide communication services in space-constrained onboard environments.

Performance
- » GbE and 10GbE for network convergence
- » 802.11ac data rates of up to 1.267 Gbps

Security
- » Device-level cybersecurity
- » Built-in firewall protection (TN-4900 Series only)

Reliability
- » Complies with all EN 50155 mandatory test items
- » Seamless failover with network redundancy and bypass

TN-4500A Series
Gigabit PoE Switches
- 12+4G/24+4G-port Gigabit Ethernet switches with up to 20 PoE ports
- Push-pull Ethernet connectors

AWK-3251A-RCC Series
802.11ac AP/Clients
- IEEE 802.11ac Wave 2
- Up to 1.267 Gbps data rate
- Auto Carriage Connection (ACC) technology for inter-carriage wireless connections

VPort 07-3 Series
3MP H.265 IP Cameras
- Resolutions up to 2048 x 1536
- -40 to 70°C operating temperature
- IP66, IK8 housing

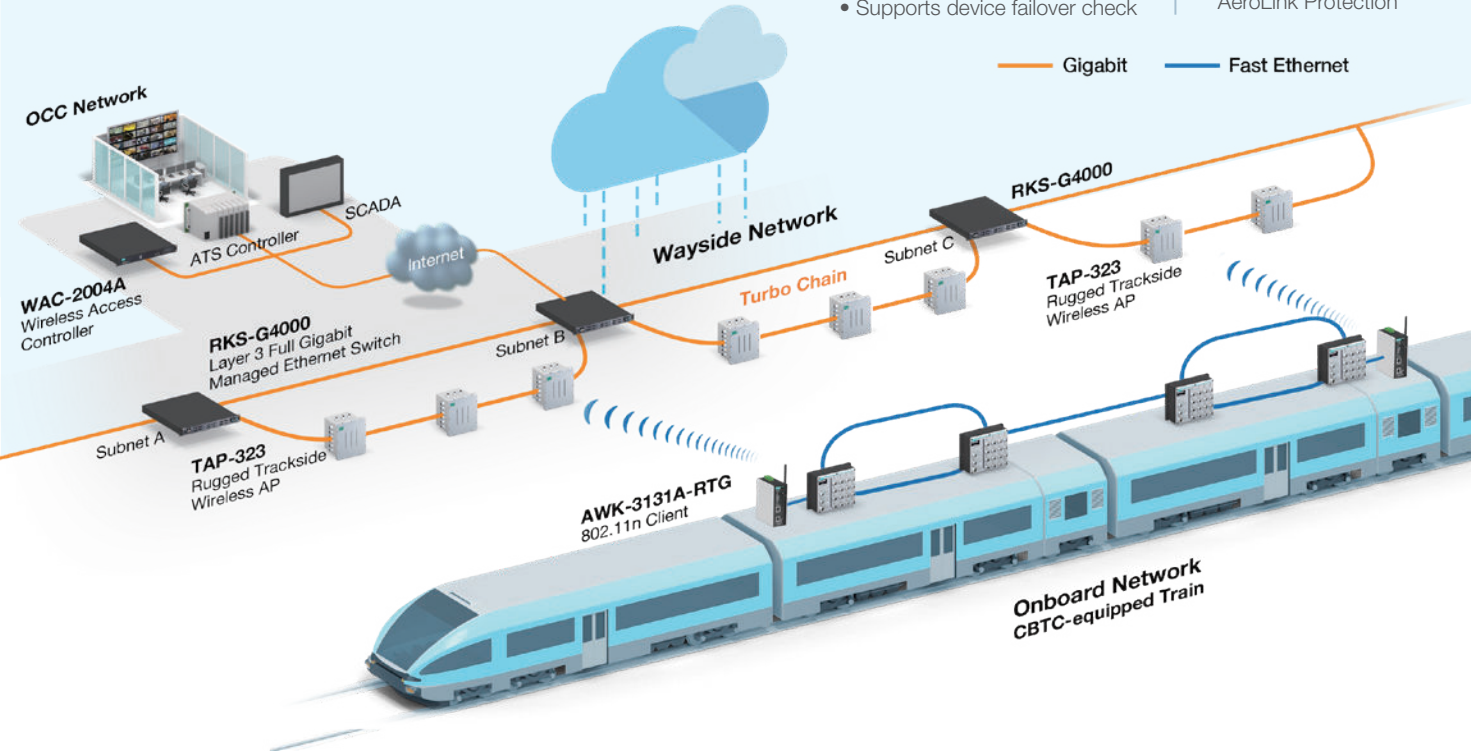## Train-to-ground
Wireless Solutions

From vital train-to-ground communications (such as CBTC) to onboard infotainment systems, high bandwidth and rapid handoffs for wireless transmissions on fast-moving trains are more crucial than ever. Moxa provides robust 802.11n-based train-to-ground connectivity solutions to ensure real-time train status updates and control for smoother rides and improved passenger safety.

Performance
- » Up to 300 Mbps data rate
- » Turbo Roaming under 50 ms*

Security
- » Device-level security
- » WPA/WPA2 and 802.1x security

Reliability
- » Complies with all EN 50155 mandatory test items
- » Complies with EN 50121-4
- » IP68-rated APs and clients
- » Wi-Fi link redundancy with AeroLink Protection

AWK-3131A-RTG Series
TAP-213 Series
Onboard 802.11n AP/Clients
- PoE-powered or dual DC inputs
- Wi-Fi redundancy with AeroLink Protection

TAP-323 Series
Trackside 802.11n Dual Radio AP
- IP68-rated
- Dual-band AP and switch combo device
- Gigabit Ethernet/fiber redundancy with Turbo Chain

WAC-2004A Series
Industrial Wireless Access Controller
- IEEE 802.11i/802.1x compliant security
- Up to 450 Mbps throughput for tunneling
- Supports device failover check

Diagram labels (left): TN-4908-ETBN EN 50155 Routers; Bypass; TN-G6512 Gigabit Switch; TN-4500A ECN Switch; Turbo Ring (Recovery Time < 50 ms); Turbo Ring (Recovery Time < 50 ms); V3200 NVR; AWK-3251A-RCC 802.11ac Client; VPort 07-3 3-megapixel Interior IP Camera; VPort 06EC-2V 1080P Day/Night Outdoor IP Camera; ioPAC 8600 Rugged Modular Programmable Controller; HMI; ioLogik E1500 Rugged Remote IO; Display; Intercom; Passenger Information System

Diagram labels (right): Gigabit; Fast Ethernet; OCC Network; SCADA; ATS Controller; Internet; WAC-2004A Wireless Access Controller; RKS-G4000 Layer 3 Full Gigabit Managed Ethernet Switch; Subnet A; TAP-323 Rugged Trackside Wireless AP; Subnet B; Wayside Network; Turbo Chain; Subnet C; RKS-G4000; TAP-323 Rugged Trackside Wireless AP; AWK-3131A-RTG 802.11n Client; Onboard Network CBTC-equipped Train

▶ EN 50155 Switches

	GbE Router	Full GbE	10GbE	High Port Density	IP54
	TN-4900-ETBN	TN-G6512	TN-G4516	TN-4500A	TN-5500A
10GbE Ports	–	–	4	–	–
GbE Ports	Up to 8	12	12	Up to 4	Up to 2
GbE Fiber Ports	–	–	–	Up to 2	Up to 2*
FE Ports	Up to 12	–	–	Up to 24	Up to 16
PoE Ports	Up to 12 PoE+	8 PoE+	Up to 12 PoE+	Up to 20 PoE+	Up to 8 PoE+

*Available for the TN-5510A Series only.

▶ EN 50155 IP Cameras

	VPort 07/06	VPort 06EC
Day/Night	Day	Day/Night
Resolution	3MP/1080P & HD	1080P
Power Input	PoE or 24 VDC	PoE (24 VDC for heater)
Operating Temperature	-25 to 55°C / -40 to 70°C (-T models)	
Protection	IP66, IK10/IK8	IP67, IK7

▶ EN 50121 Wireless LAN and Controllers

	AWK-3251A-RCC	AWK-3131A-RCC	AWK-3131A-RTG	TAP-213	TAP-323	WAC-2004A
Best Scenarios	Inter-carriage, P Wi-Fi	Inter-carriage, passenger Wi-Fi	Train-to-ground	Train-to-ground	Train-to-ground	Wi-Fi Controller
Wi-Fi Capability	802.11a/b/g/n/ac	802.11a/b/g/n	802.11a/b/g/n	802.11a/b/g/n	802.11a/b/g/n	–
Network Interfaces	1 GbE	1 GbE	1 FE	1 GbE + 1 GSFP	2 GSFP + 4 FE	1 GbE
Wi-Fi Roaming	Client-based Turbo Roaming* < 150 ms handover time			Controller-based Turbo Roaming* < 50 ms handover time (with WAC Series)		–
Reliability	-40 to 75°C operating temperature			IP68-rated, -40 to 75°C operating temperature		–

*Turbo Roaming performance may vary based on infrastructure and parameter configurations. Refer to the product manuals for more information.

IEC 61850 **Visibility** and **Reliability** for Substation Digitalization

The IEC 61850 standard defines communication protocols for intelligent electronic devices (IEDs) and enables interoperability between devices from different vendors. However, interoperability alone is not enough to ensure reliability and visibility into modern substations.

Moxa introduces MXview Power for deep visibility into substation communication and monitoring. Dedicated to IEC 61850 power network monitoring, MXview Power provides visibility not only into industrial Ethernet networks but also into IED statuses, GOOSE messages, and redundant connections in PRP/HSR networks.

Moreover, MXview Power coupled with the PT-G7728/G7828 Series switches is ideal for transforming traditional substation communication for a digitalized substation automation system (SAS).

The PT-G7728/G7828 switches are compliant with the latest IEC 61850-3 Edition 2 Class 2 and IEEE 1613 Class 2 standards to achieve error-free delivery in harsh conditions. Embedded with the innovative GOOSE Check function, MMS server capability, and nanosecond-level time synchronization, the PT-G7728/G7828 switches ensure reliable data transmission in power substations.

Built for Maximum System Availability

PT-G7728/G7828 Series

28-port Layer 2 and Layer 3 Gigabit rackmount switches

▶ **Minimize Errors**
▶ **Detect Errors**
▶ **Fix Errors**

Enhanced Performance

- Up to 28 GbE ports with RJ45/SFP/PoE+ modules
- Up to 24 GbE PoE+ connections
- PRP/HSR module support for seamless failover
- IEEE 1588 v2 PTP support on all ports
- IEC 61850 QoS to prioritize critical GOOSE/SMV transmissions
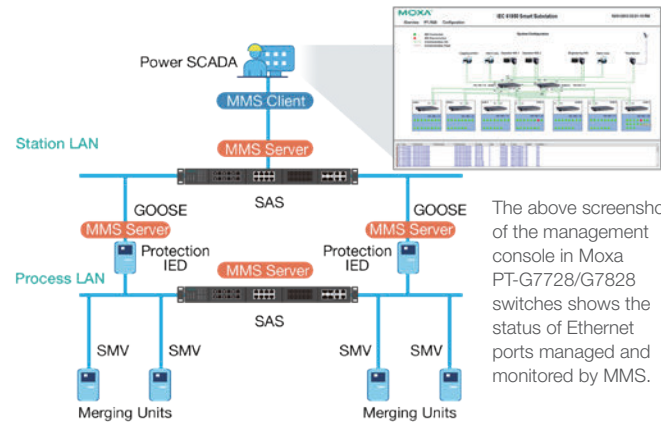
Purpose-built Management

- Real-time visibility of network and device statuses
- Built-in IEC 61850-90-4 MMS server for centralized monitoring by Power SCADA
- Embedded GOOSE packet monitoring for quick troubleshooting
- 3-second dying gasp to trigger alarms and logs for quick troubleshooting
- PTP-sync LED that shows the time-sync status

All-round Reliability

- Security features that reference the IEC 62443-4-2 standard
- IEC 61850-3 and IEEE 1613 compliance
- Turbo Ring, Turbo Chain, and PRP/HSR support for seamless failover
- Dual isolated power modules for power redundancy
- Hot-swap design for continuous availability and easy maintenance

MXview Power

Substation-focused Network Management Software

- Visualize the substation network topology in real time
- Automatically scan and detect unauthorized IED devices for preemptive protection
- Automatic and concise visibility of PRP/HSR dual LAN topology for simplified management
- Real-time visibility of critical packets such as GOOSE messages to speed up troubleshooting
- Visualization of key components, such as fiber interfaces, to speed up troubleshooting

MMS for Power SCADA Supervision

With a built-in MMS server, the PT-G7728/G7828 switches can be controlled, monitored, and managed via a centralized Power SCADA system for enhanced efficiency and availability.

The above screenshot of the management console in Moxa PT-G7728/G7828 switches shows the status of Ethernet ports managed and monitored by MMS.

GOOSE Check

The PT-G7728/G7828 switches feature the GOOSE Check function that monitors GOOSE packets and sends instantaneous alerts to the Power SCADA system and MXview Power when timed-out and tampered GOOSE packets are detected.

Together with GOOSE Lock, which creates an allowlist of legitimate GOOSE packets, the PT-G7728/G7828 switches can block malicious traffic to effectively defend substation networks.

	Index	APP ID	GOOSE Address	IED Name	VID	Ingress Port	Rx Counter	Status	Type
☐	1	1	01:0c:cd:01:00:00	BC_CONTCTRL	1	1-2	85	Health	Static
☐	2	1	01:0c:cd:01:00:01	BC_CONTCTRL	1	1-2	85	Health	Dynamic
☐	3	1	01:0c:cd:01:00:02	BC_CONTCTRL	1	1-2	85	Timeout	Dynamic
☐	4	1	01:0c:cd:01:00:03	BC_CONTCTRL	1	1-2	85	Health	Dynamic
☐	5	1	01:0c:cd:01:00:04	BC_CONTCTRL	1	1-2	85	Health	Static
☐	6	1	01:0c:cd:01:00:05	BC_CONTCTRL	1	1-2	85	Health	Dynamic
☐	7	1	01:0c:cd:01:00:06	BC_CONTCTRL	1	1-2	85	Tampered	Static
☐	8	1	01:0c:cd:01:00:07	BC_27_1CTRL	1	1-2	85	Health	Dynamic

Use Case

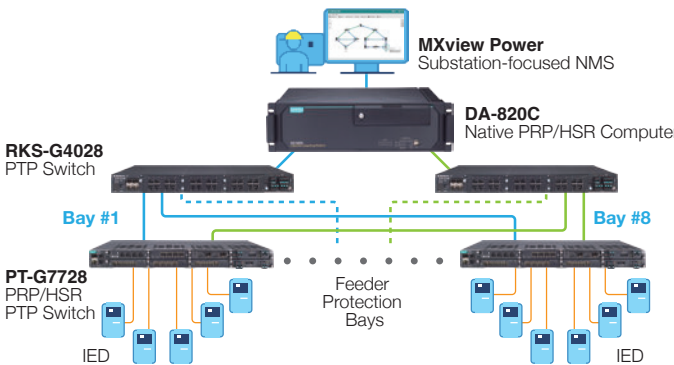## PRP/HSR Networks and IEC 61850 System Visibility for Substation Digitalization

A conventional substation operator wants to upgrade to a digital IEC 61850 substation by implementing accurate time synchronization between its feeder protection bays. Moxa PT-G7728 switches are used to scale up existing networks for seamless PRP/HSR data transmissions and MXview Power is used for network visibility and management.

Network Requirements

- Redundancy to ensure seamless failover and precise time synchronization
- Ensure always-on zero-packet-loss communication
- Easy management of IEC 61850 data and networks
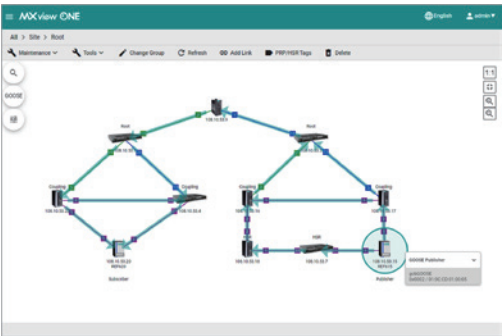
Why Moxa

- Comprehensive portfolio that supports IEEE 1588 PTP solutions
- Zero-packet-loss transmission support in harsh environments with EMI
- Hot-swappable expansion modules for scalability without system downtime
- Real-time visibility into PRP/HSR topology and GOOSE packet flow in the substation network

▶ IEC 61850-3 Switches

	PT-G7828	PT-G7728	PT-7528	PT-G503	PT-G510	RKS-G4000	MDS-G4000
Device Design	Modular	Modular	Fixed ports with single-slot module	Compact fixed ports	Fixed ports	Modular	Modular
Max. No. of Ports	28 GbE	28 GbE	4 GbE + 24 FE	3 GbE	10 GbE	28 GbE	4 10GbE + 24 GbE
Max. No. of PTP Ports	28	28	–	3	10	28	28
Seamless Failover	–	PRP/HSR	–	PRP/HSR	PRP/HSR	–	–
Proprietary Redundancy	Turbo Ring, Turbo Chain (Fast Ethernet recovery time < 20 ms, Gigabit Ethernet recovery time < 50 ms)						
RSTP Grouping	–	✓	–	✓	✓	–	–
MMS Server	✓	✓	✓	✓	✓	✓	✓ (MX-NOS v3.0 and later)
GOOSE Check	✓	✓	–	–	–	✓	–
IEC 61850 QoS	✓	✓	✓	–	–	✓	–
Industrial Certifications	IEC 61850-3, IEEE 1613 Class 2					IEC 61850-3 , IEEE 1613 Class 1	
Operating Temperature	-40 to 85°C					-40 to 75°C	