

▶ Remote I/O Selection Guide

	 ioLogik E1200 Series	 ioLogik R1200 Series	 ioLogik 2500 Series	 ioThinX 4510 Series
I/O	DI, DO, Relay, AI, AO, RTD, TC	DI, DO, Relay, AI, AO	DI, DO, AI (Relay, AO, RTD, TC expandable by ioLogik E1200 series)	DI, DO, Relay, AI, AO, RTD, TC expandable by 45MR Series
Front-end Logic	–	–	Click&Go Plus	–
Ethernet Port	2	–	4	2
Serial Port	–	2 x RS-485	2 x RS-232/422/485	1 x RS-232/422 or 2 x RS-485
Northbound Protocol	Modbus TCP server EtherNet/IP adapter SNMPv1/v2c, RESTful API	Modbus RTU Server	Modbus TCP server SNMPv1/v2c/v3 RESTful API	Modbus TCP server SNMPv1/v2c/v3 RESTful API via TLS
Active Protocol	Moxa AOPC (Active tag) SNMPv1 Trap	–	Moxa AOPC (Active tag) SNMPv1/v2c Trap CGI command	MQTT via TLS SNMPv1/v2c/v3 Trap SNMPv2c/v3 Inform
Southbound Protocol	–	–	Modbus TCP client Modbus RTU client	Modbus RTU client

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 over 35 years of industry experience, Moxa has connected more than 118 million devices worldwide and has a distribution and service network that reaches customers in more than 87 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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Remote I/O Case Studies

Enabling Smarter Operations With Field Data




Ethernet Remote I/O


RS-485 Remote I/O


Smart Remote I/O


Modular Remote I/O

Overview

Seamless Data Acquisition for Real-world Applications

Moxa's industrial remote I/O solutions enable seamless data acquisition from sensors to the control systems, converting raw field signals into actionable intelligence for modern automation. This collection of case studies illustrates how our solutions integrate physical assets with contemporary platforms across various

sectors, from manufacturing to essential services like energy, utilities, transportation, and public safety. These integrations reveal new data insights and facilitate streamlined digital operations. Moxa's remote I/O solutions allow for real-time processing of varied field data, ensuring operators, engineers, and systems can reliably gather data, condition logic, and transmit it securely. This enhances operational visibility, efficiency, and resilience throughout your automation setup.

Proactive



Our remote I/Os feature event-driven reporting for immediate event notification—significantly faster than traditional polling. Built-in Click&Go Plus Logic enables instant responses at the edge, reducing reliance on host systems and lowering system load.



Easy to Use

Designed for fast deployment and seamless integration, our remote I/Os simplify installation with a front-wiring design and dual-LAN daisy-chaining, while supporting multiple protocols for easy connection to PLCs, SCADA, and IT systems. Flexible Modbus address mapping further reduces configuration effort and speeds up system integration.



Reliable

Backed by proven deployments and broad industry certifications, our remote I/Os deliver strong electrical isolation and reliable performance across extreme temperatures, making them ideal for applications from manufacturing to outdoor deployments.



Remote I/O Portfolio

ioLogik 2500 Series
Smart remote I/O



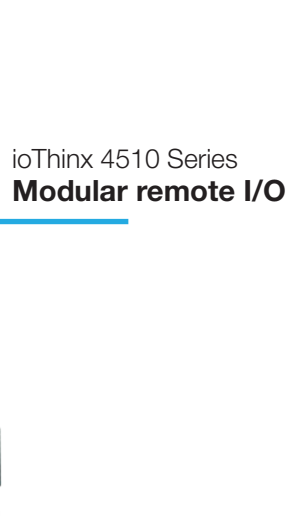
ioLogik E1200 Series
Ethernet remote I/O



ioLogik R1200 Series
RS-485 remote I/O



ioThinX 4510 Series
Modular remote I/O



Case Study Collection

Manufacturing and Machine OEM

- Case 1 **Machine Monitoring**
Turning Legacy Machines Into Actionable Insights
- Case 2 **Machine OEM**
Enabling Safe Human-robot Collaboration
- Case 3 **CEMS***
Seamless Emission Reporting for 15-minute Compliance

Energy & Power Infrastructure

- Case 4 **Data Center**
Optimizing PUE With Scalable RS-485 Monitoring
- Case 5 **BESS**
Optimizing Charge-discharge Efficiency for BESS
- Case 6 **Solar**
Reliable Solar Tracker Control at the Edge

Critical Infrastructure

- Case 7 **Water Utility**
Edge-driven Monitoring for Underground Water Networks
- Case 8 **Telecom**
Secure Edge Monitoring for Mission-critical P25 Networks
- Case 9 **Roadways**
Real-time Weather Monitoring for Smart Roadways

Transportation Systems

- Case 10 **Airport**
Securing Critical Facility Monitoring for Modern Air Traffic Management
- Case 11 **Bridge**
Illuminating a 1.2-mile Bridge With Smart Lighting Control
- Case 12 **ETC**
Enabling High-accuracy ETC at Highway Speeds

*CEMS: Continuous Emission Monitoring System



Turning Legacy Machines Into Actionable Insights

To avoid costly system overhauls, a smart factory integrator combined Moxa's proactive Ethernet I/O with their MES* platform to unlock real-time machine data. This solution transforms legacy CNC machines into data-driven assets, delivering actionable insights with minimal disruption.

Why Moxa

- Active communication with MX-AOPC UA servers for faster, event-driven data reports
- Cost-effective operational upgrades through simple yet reliable data collection powered by MX-AOPC integration
- Industrial durability for harsh factory environments

Product Showcase

ioLogik E1210 Series

Ethernet Remote I/O with 16 x DI

MX-AOPC UA Server

Industrial Software for active data polling and reporting

System Requirements

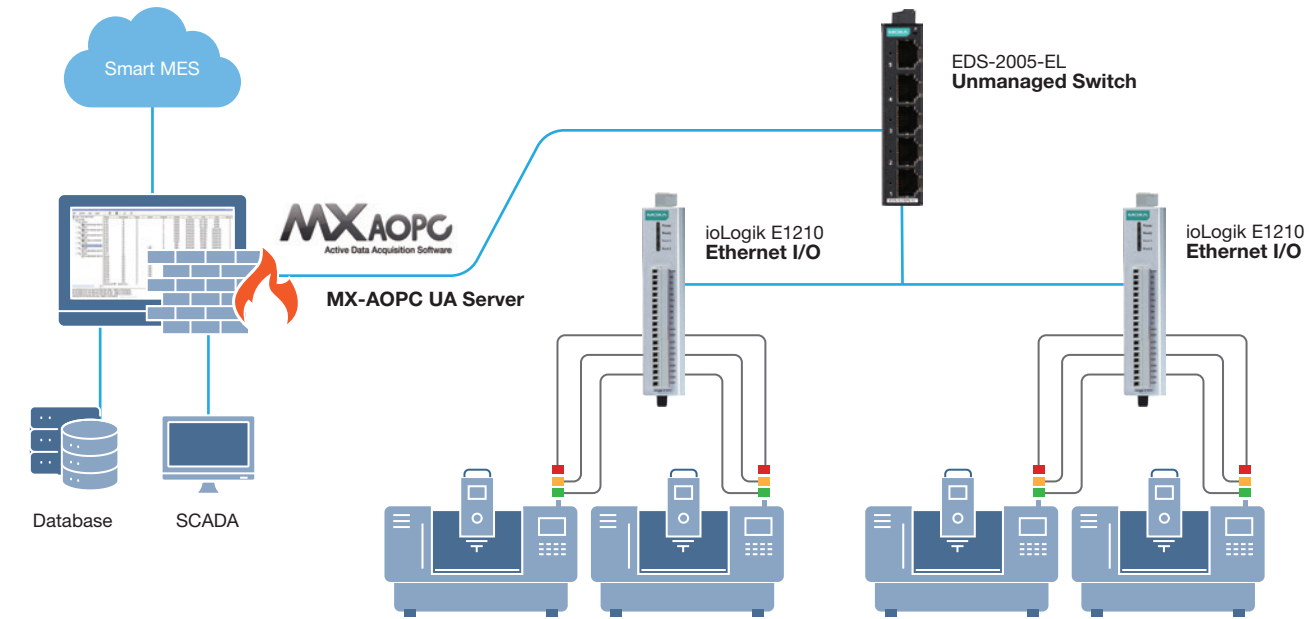
- Real-time monitoring of machine status and operational health
- Effortless integration with MES applications
- Reliable data collection in demanding industrial environments

Moxa's Solution

The factory's CIM* department needed real-time visibility into machine status to pinpoint production bottlenecks and improve output. The integrator began with a small, scalable solution, using Moxa's remote I/Os to collect stack light signals from CNC machines. These signals were then directed to a centralized MX-AOPC UA server, establishing a solid foundation for subsequent MES analysis and improvements.

Each ioLogik E1210 Ethernet I/O unit captures status signals from up to five machines simultaneously. The MX-OPC UA Server receives data, enabling CIM operators to perform real-time monitoring, review historical utilization, and take appropriate operational or maintenance actions. Unlike traditional polling, Moxa's active communication technology delivers real-time, event-driven updates—ensuring faster response and higher operational efficiency.

Built for the factory floor, the ioLogik E1210 features a compact design with front-facing wiring for quick installation and industrial-grade isolation. Dual LAN ports support flexible, future-ready upgrades and expansion. Overall, Moxa delivers a practical, scalable path to smart manufacturing, starting with machine utilization visibility.



*MES: Manufacturing Execution System; CIM: Computer Integrated Manufacturing.



Enabling Safe Human-robot Collaboration

An OEM robot arm helps small- to mid-scale manufacturers address their persistent labor shortages by enabling safe human-robot collaboration. At its core, a compact control cabinet leverages Ethernet-based I/O to ensure reliable operation across diverse and demanding industrial environments.

Why Moxa

- High-density, flexible DIO enabling safe, efficient coordination and control
- Rugged reliability with high surge, EFT, and EMC immunity
- Compact size and dual LAN ports for space savings and connection flexibility

Product Showcase

ioLogik E1212 Series

Ethernet Remote I/O with 8 x DI, 8 x DIO

System Requirements

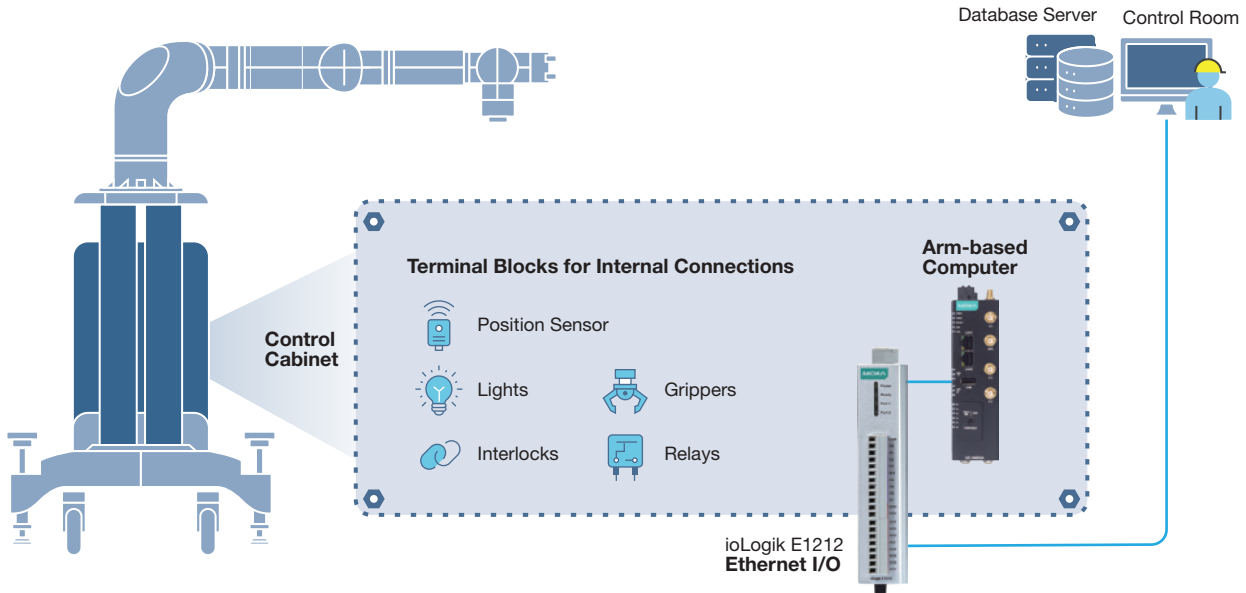
- High electrical isolation to prevent interruption and protect the core controller
- Stable operation in harsh and complex environments
- Easy maintenance and reduced risk to the robot controller

Moxa's Solution

Powered by the ioLogik E1212, the OEM robot enables safe human-robot collaboration by connecting sensors, tools, and its core control logic over Ethernet. Pre-configuration enables the I/O unit to be fully abstracted and embedded in the robot controller. Acting as an electronic isolation boundary, the ioLogik E1212 offloads external signal handling to shield the core controller from field-level noise and electrical risks.

The ioLogik E1212 also extends the robot's sensing and actuation capabilities with 8-channel DI and 8-channel DIO. Flexible channel configuration supports safe interaction with indicator lights, safety interlocks, emergency stops, and other devices. This enables rapid response to safety events and reliable control of external actuators in coordination with the robot's motion.

With its compact form, installation space is reduced and maintenance is made simpler. Dual LAN ports enable Ethernet connectivity without an additional switch, reducing system complexity and potential failure points. This ioLogik E1212 is certified for numerous industrial standards and is highly resistant to surges, EFT, EMI, ESD, shock, vibration, and extreme temperatures. It guarantees uninterrupted operation and protects the robot controller in tough environments.





Seamless Emission Reporting for 15-minute Compliance

To achieve net-zero goals and adhere to strict regulations, a global petrochemical manufacturer had to submit accurate emissions data to the Environmental Monitoring Center (EMC) on a 15-minute basis. Even small amounts of data loss at this rate could cause compliance issues and regulatory fines.

Why Moxa

- Enables seamless CEMS integration with built-in buffering and MX-AOPC UA Logger push
- Active monitoring technology with event-driven alarms and status notifications
- Delivers industrial-grade reliability in harsh environments

Product Showcase

ioLogik 2512 Series

Smart Remote I/O with 8 x DI, 8 x DIO and Click&Go Plus Logic

ioLogik E1212 Series

Ethernet Remote I/O with 8 x DI, 8 x DIO

MX-AOPC UA Suite

Industrial software for active data polling and logging

System Requirements

- Transmit emissions records from all sub-plants to the EMC every 15 minutes
- Ensure uninterrupted data collection and transmission
- Maintain measurements with complete logging and traceability

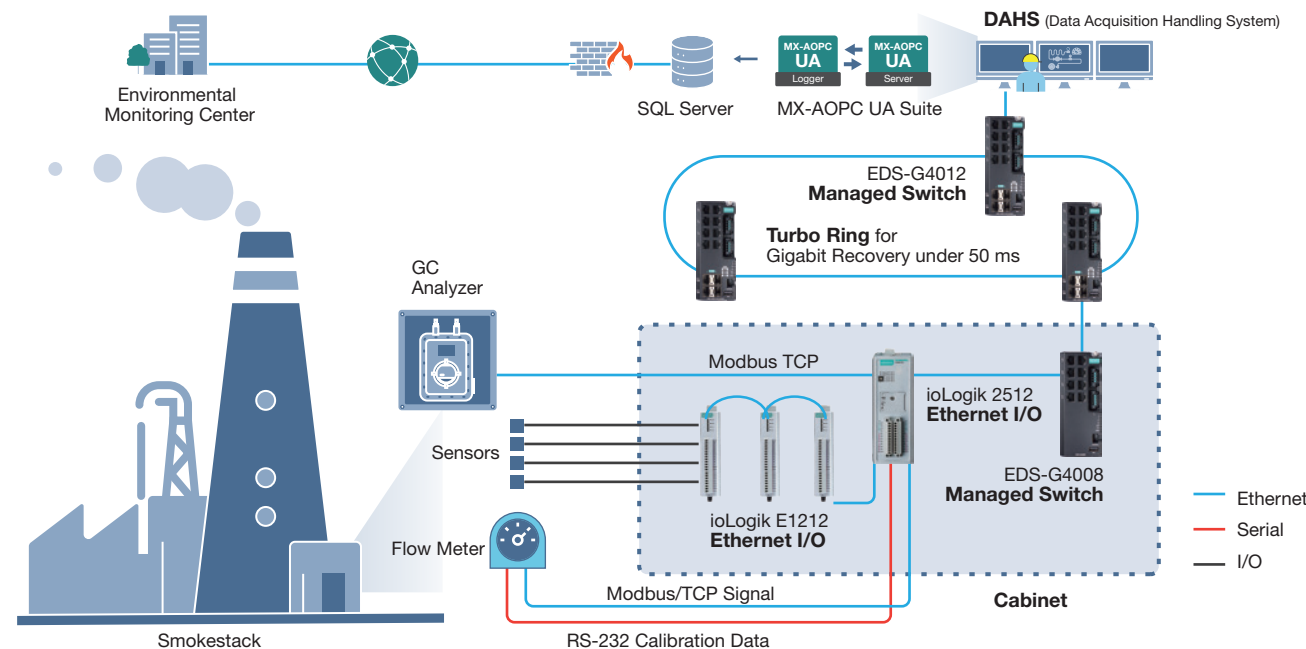
Moxa's Solution

The manufacturer deployed a scalable Continuous Emission Monitoring System (CEMS) architecture across all emission-generating plants, aiming for a constant data flow from the field to the regulator. The solution focuses on reliable data acquisition at the edge and seamless integration with its centralized reporting platform.

The ioLogik 2512 smart I/O, situated in a demanding environment by a smokestack, functions as a central point. It collects unprocessed information from linked ioLogik E1212 expansion units, which gather data on flow meters, vital temperatures, pressure, and flow speeds. Additionally, it receives processed insights from gas chromatographs (GCs). Equipped with Click&Go Plus control logic and active tag event-driven push communication, the smart ioLogik 2512 enables immediate response to alarms and status changes.

Under normal conditions, the ioLogik 2512 transmits data to the Data Acquisition and Handling System (DAHS) database via MX-AOPC. During network interruptions, the ioLogik 2512 buffers data locally. Once the connection is restored, the MX-AOPC UA Logger will automatically retrieve buffered data, ensuring data continuity, traceability, and reporting completeness.

Plant-level emissions data are sent to the centralized DAHS for compliance reporting and EMC submission every 15 minutes via the fiber backbone.



Optimizing PUE With Scalable RS-485 Monitoring

Facing swift expansion and escalating energy expenses, a data center aimed for enhanced control and monitoring of its HVAC, power, and lighting infrastructure to boost its Power Usage Effectiveness (PUE). To manage deployment costs at scale, the data center decided to leverage its existing RS-485 infrastructure to monitor field devices and operational status.

Why Moxa

- Dual RS-485 ports support multidrop and redundant connectivity
- Compact, front-wiring design with GUI utility enables fast, cost-efficient deployment
- 5-year warranty for reliable, long-term operation

Product Showcase

ioLogik R1212 Series

RS-485 Remote I/O with 8 x DI, 8 x DIO

ioLogik R1240 Series

RS-485 Remote I/O with 8 x AI

System Requirements

- Real-time monitoring of power systems, field devices, and environmental conditions
- Legacy compatibility with existing RS-485 serial infrastructure
- Space-efficient and cost-effective deployment

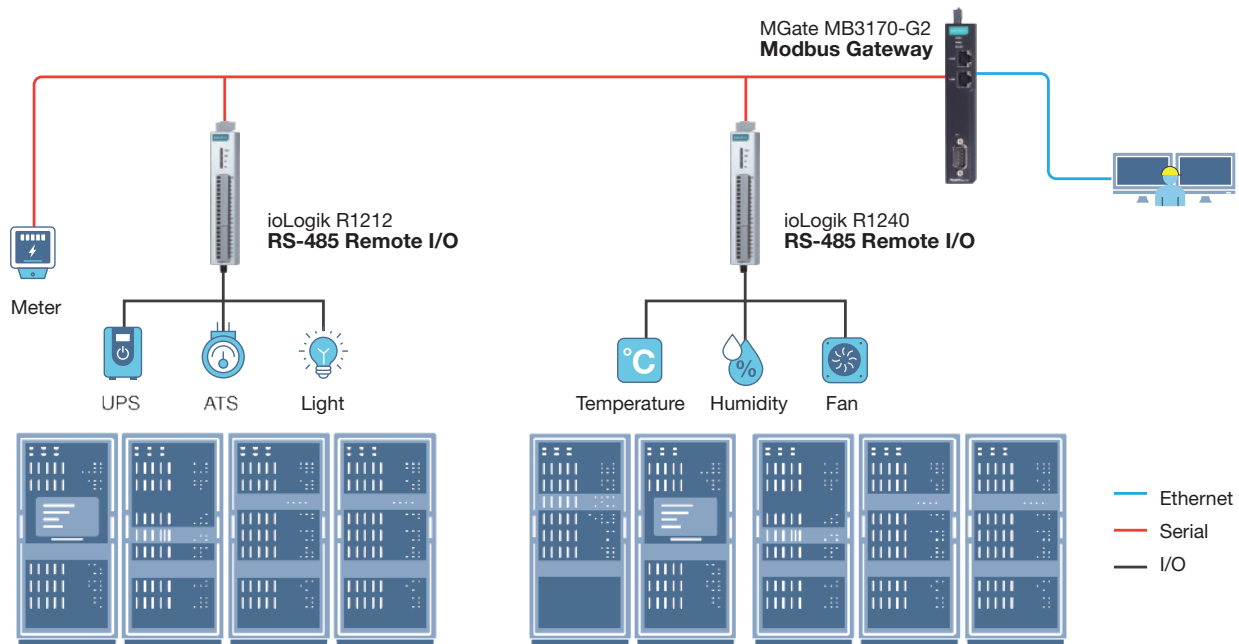
Moxa's Solution

To reduce non-IT energy consumption while maintaining peak operational performance, they implemented comprehensive monitoring across key infrastructure—including ATS*, UPS*, lighting, HVAC (fans, temperature, and humidity). Operators can quickly gain insights from extensive field data, helping them to identify inefficiencies, optimize energy consumption, and consistently enhance PUE for more sustainable operations.

A multidrop RS-485 architecture was retained as the backbone of the I/O layer, enabling robust monitoring without overhauling existing serial infrastructure. To gather data from remote field devices, the compact ioLogik R1200 Series RS-485 remote I/Os, featuring easy front wiring, were implemented. The MGate MB3170-G2 Modbus gateway gathers data from up to 32 serial devices, consolidating it into one IP endpoint to save IP addresses and maximize existing assets.

The ioLogik R1212 and ioLogik R1240 provide versatile digital and analog I/Os to support diverse monitoring needs. The user-friendly ioSearch utility, enabling quick setup, mass parameter copying, and remote firmware updates, speed up deployment.

Both models offer flexibility and reliability, with a built-in USB port for easy on-site setup when remote access isn't feasible. Additionally, dual RS-485 ports support redundant communication paths for critical monitoring with automatic failover to ensure operational reliability.



*UPS: Uninterrupted Power Supply; ATS: Automatic Transfer Switch.



Optimizing Charge-discharge Efficiency for BESS

To help integrate renewable energy and lessen the strain on the utility grid from power supply and demand swings, a 40 MWh energy storage system was put in place as a local buffer. A real-time battery monitoring system was necessary for stable and reliable operation.

Why Moxa

- Daisy-chain I/O connectivity simplifies data aggregation and reduces system costs
- -40 to 75°C operation, certified for industrial environments
- Compact, rugged design ideal for integration into battery packs

System Requirements

- Real-time monitoring of battery charging and discharging
- Data collection and analysis to optimize charge-discharge cycling efficiency
- High reliability under harsh temperature conditions

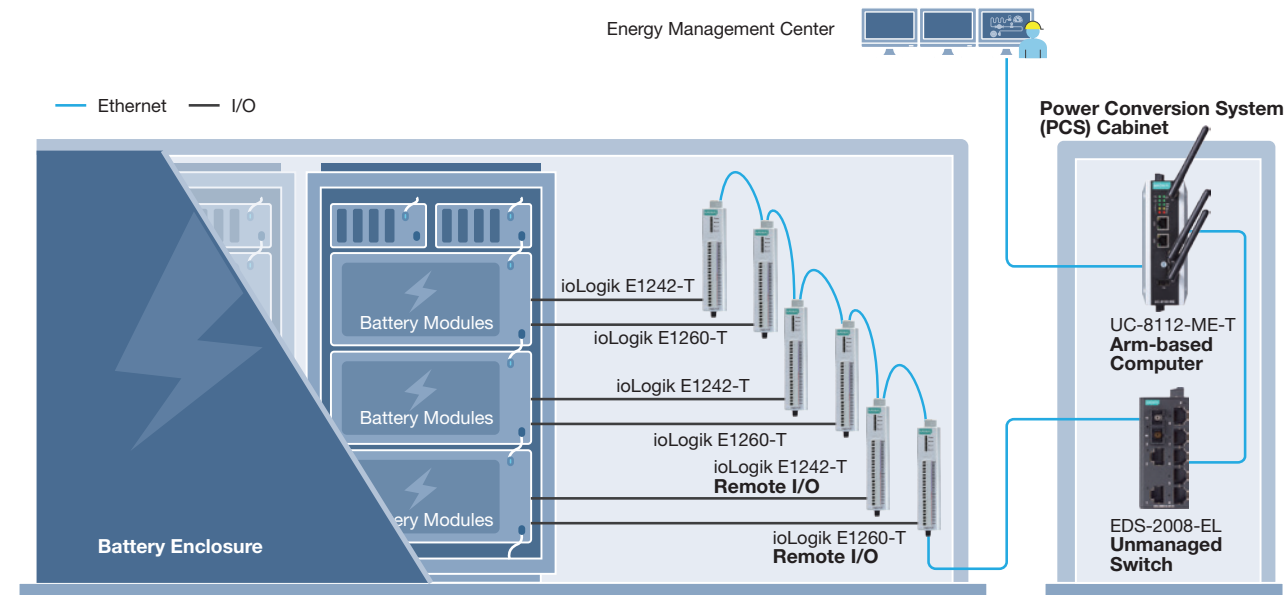
Moxa's Solution

Battery health is crucial for long-term ESS reliability and performance, given that batteries are repeatedly charged and discharged to manage energy. Monitoring battery charge and discharge in real time enhances operational safety and efficiency, also safeguarding battery lifespan.

Real-time monitoring and continuous optimization were achieved by integrating Moxa's ioLogik remote I/Os with the UC-8112-ME-T industrial computer. The ioLogik E1260-T monitors battery temperatures via RTD inputs, while the ioLogik E1242-T measures the current values of each battery module and controls relays for charging and discharging.

Designed to be compact for battery modules with limited space, both Ethernet remote I/Os offer daisy-chaining, streamlining the system architecture and eliminating the need for an additional network switch.

To manage high volumes of data from charge-discharge cycles, the system implemented UC-8112-ME edge computers. These units, each connected to over 260 I/Os, converted field data into actionable insights to boost charge-discharge efficiency. This solution offers dependable 24/7 operation in tough ESS container settings, using only air-flow cooling through smooth I/O and edge computing integration. This approach greatly simplifies the system and eliminates HVAC expenses.



Reliable Solar Tracker Control at the Edge

A utility-scale solar plant set out to increase energy yield by deploying solar trackers that could always position the PV panels toward the sun. To manage hundreds of tracker rows in a challenging outdoor setting, the plant needed a scalable Track Control Unit (TCU) solution capable of precise and reliable panel operation.

Why Moxa

- Compact DIN-rail design for easy cabinet integration
- Proven reliability under extreme temperatures and vibration
- 5-year warranty on remote I/O products

System Requirements

- Real-time monitoring and control of solar trackers
- Compact design to fit space-constrained TCU cabinets
- Rugged reliability to withstand harsh outdoor conditions

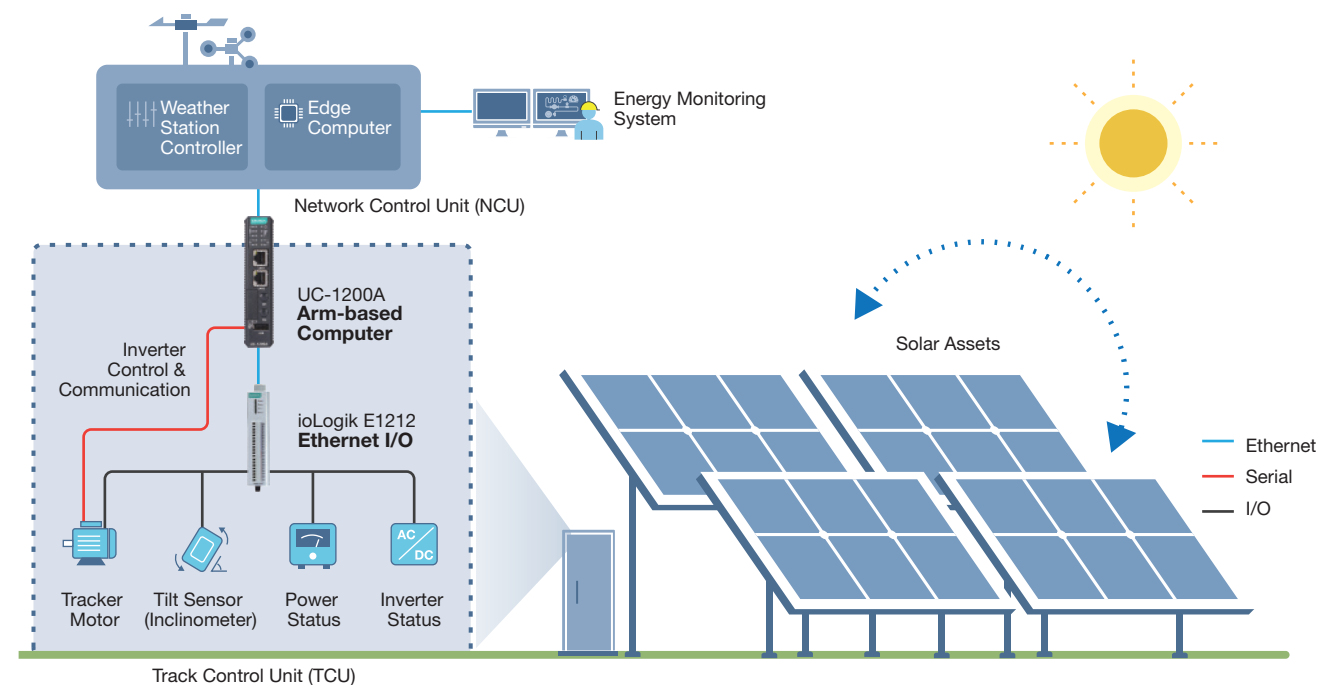
Moxa's Solution

Embedded intelligence was brought to the solar plant's field by deploying TCUs at the row level. Each TCU combines an Arm-based UC-1200A industrial computer with an ioLogik E1212 remote I/O. This combination enables autonomous, real-time tracker control at the edge.

At the row level, the TCU manages tracker positioning, motor coordination, and safety logic. The UC-1200A embedded computer enables real-time, local decision-making without reliance on continuous network communication, ensuring reliable operations, even during temporary network interruptions.

The ioLogik E1212 remote I/O brings critical control and sensing closer to the equipment, enabling direct motor activation and real-time monitoring of tilt sensors and status signals. The close distance means less complicated wiring and quicker response times, allowing the TCU to respond quickly to position changes, malfunctions, and safety events.

Designed for easy installation in tight TCU cabinets and built for durability in harsh outdoor environments, the UC-1200A and ioLogik E1212 feature compact, DIN-rail-mountable designs. This edge-driven TCU solution guarantees consistent performance, easy deployment, and reliable tracker operation throughout the site.





Edge-driven Monitoring for Underground Water Networks

Undetected leaks plagued a water utility's extensive network of underground tunnels and pipelines. The inability to clearly see water distribution conditions hindered the detection of leaks, leading to greater water loss. To speed up leak detection, the utility sought a real-time monitoring system that avoided the high costs associated with fiber infrastructure.

Why Moxa

- Edge logic with local buffering for immediate, rule-based responses
- MX-AOPC UA Server push technology for rapid critical alarm reporting
- Proven reliability in demanding environments

System Requirements

- Real-time monitoring with efficient critical event reporting
- Reliable data collection with secure communication
- Continuous 24/7 operation across geographically dispersed assets

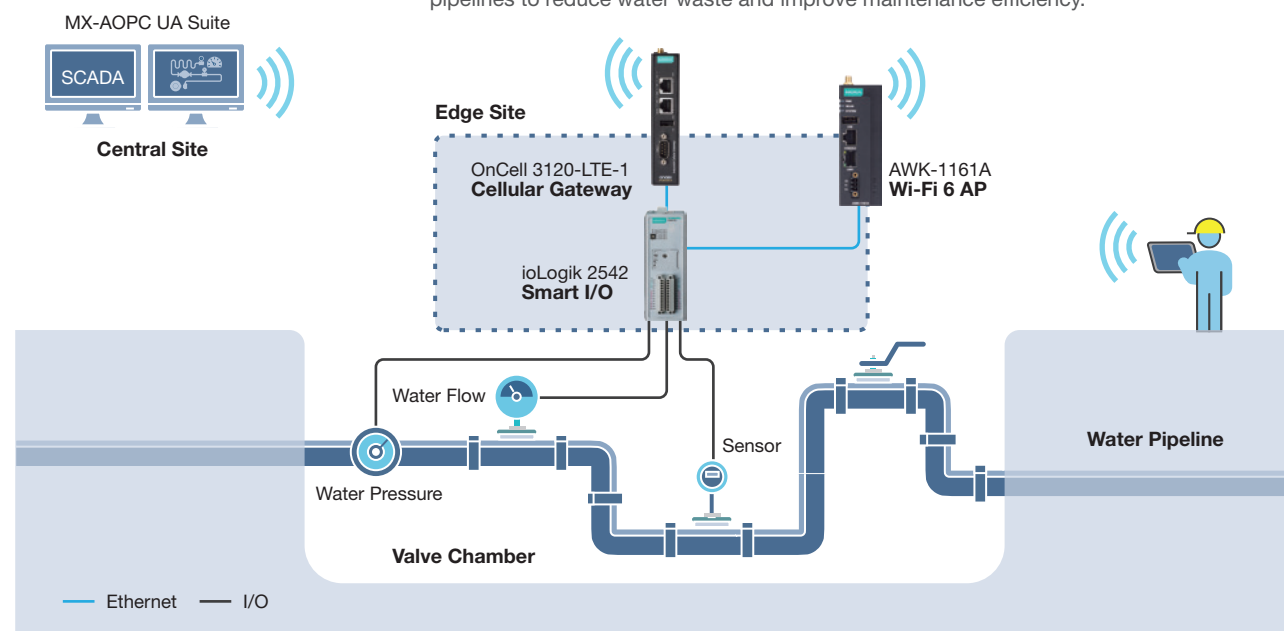
Moxa's Solution

To transform the blind water network into a responsive digital monitoring system, the system integrator deployed ioLogik 2542 smart remote I/O modules to enable intelligent data acquisition and edge control. The solution delivers real-time monitoring and automatic event notifications over a resilient wireless backbone supported by a cellular connection.

With high density and versatile I/O connectivity, the ioLogik 2542 were installed throughout the water network to collect real-time data from pressure sensors, flow meters, and other field devices. Unlike traditional passive I/O, the ioLogik 2542 leverages MX-AOPC UA Server technology to actively push data to a central SCADA system, ensuring critical events could be reported within milliseconds.

Running Click&Go Plus rule-based logic at the edge, the ioLogik 2542 can immediately respond to abnormal conditions, triggering alarms or control actions without waiting for central system commands. Built-in microSD data buffering ensures uninterrupted monitoring and data integrity during temporary communication outages.

Serving as a local hub, the quad-LAN ioLogik 2542 links with an AWK-1161A Wi-Fi 6 access point, enabling onsite staff to perform quick field diagnostics via local mobile access. Additionally, it integrates with a dual-SIM OnCell 3120-LTE-1 cellular gateway for a secure, redundant LTE connection from edge sites to the control center. This rugged, edge-powered solution is designed for harsh environments, offering actionable insights into underground pipelines to reduce water waste and improve maintenance efficiency.



Secure Edge Monitoring for Mission-critical P25 Networks

To facilitate secure site management and IP data mobility across multiple transmit sites within a P25 public safety network, a telecom system integrator set up a centralized base-station infrastructure. Mission-critical police, fire, and EMS operations depended on the system for fail-safe and secure communication delivery.

Why Moxa

- Secure SNMPv3 communication with SHA-2 encryption
- Streamlined integration with IT-based NMS platforms
- Industrial-grade durability with -40 to 75°C operating temperature range

System Requirements

- Encrypted communications across all remote sites
- Seamless integration with upper-level network management systems (NMS)
- Reliable operation in harsh, unmanned outdoor environments

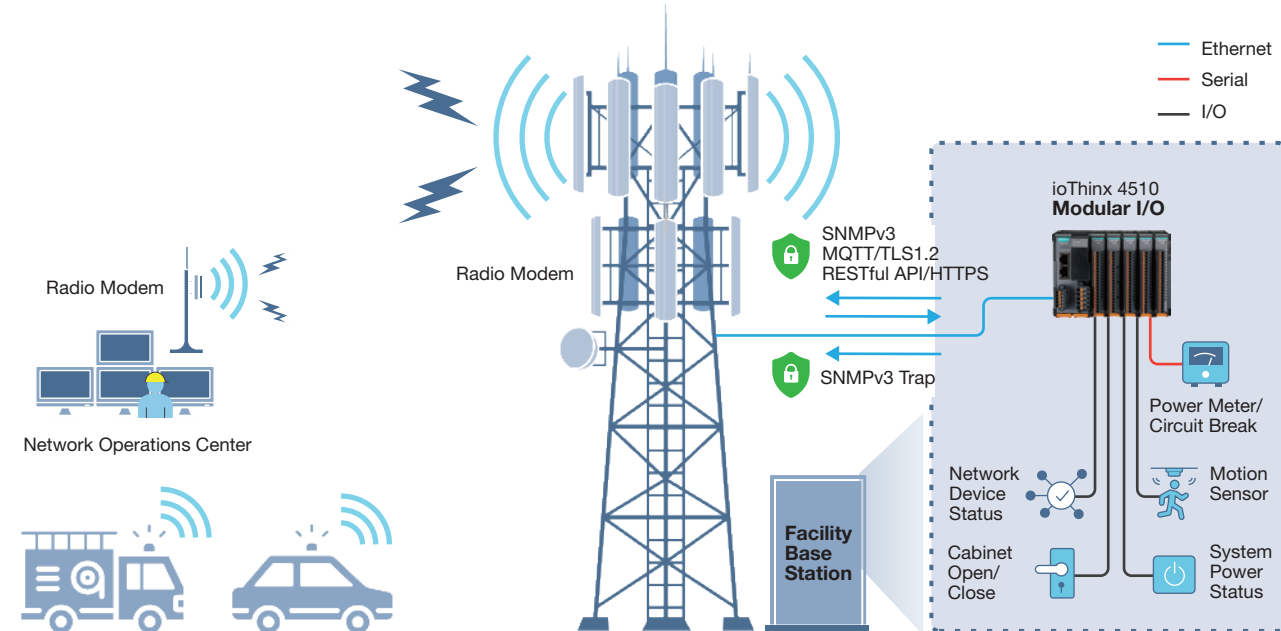
Moxa's Solution

The solution for dispersed, unmanned towers demanded secure remote monitoring, centralized system management, and rugged reliability. The compact ioThinX 4510 modular I/Os were deployed at each radio site to provide real-time monitoring of critical infrastructure, including power systems, environmental conditions, and equipment status.

With secure SNMPv3 and SHA-2 encryption, the ioThinX 4510 efficiently and securely collects I/O and serial data from field equipment, streamlining integration with central NMS. The ioThinX 4510 prioritizes security, ensuring authenticated and encrypted management traffic to meet the stringent security requirements of modern public safety networks.

With real-time SNMPv3 Trap, faults such as power loss, equipment alarms, intrusion events, or backhaul failures are immediately reported to the Network Operations Center (NOC). This automatic alerting capability reduces mean time to repair (MTTR), minimizes service disruption, and helps sustain uninterrupted communications for mission-critical P25 operations.

By combining secure communications, seamless system integration, and industrial-grade durability, the ioThinX 4510 strengthens operational continuity across distributed public safety radio networks.





Real-time Weather Monitoring for Smart Roadways

To enhance urban traffic efficiency and commuter safety, a city transportation agency deployed a Road Weather Information System (RWIS) to monitor real-time environmental and road conditions. The primary challenges were ensuring reliable, encrypted data transmission between distributed roadside cabinets and the central traffic control center. It was also critical to enable instant event notifications between distributed roadside cabinets and the control traffic center to keep commuters informed and safe.

Why Moxa

- Flexible I/O and serial interfaces for seamless sensor integration
- SNMPv3 with real-time SNMP Trap for encrypted data transmission and IT system integration
- Industrial-grade reliability for stable, robust operations

System Requirements

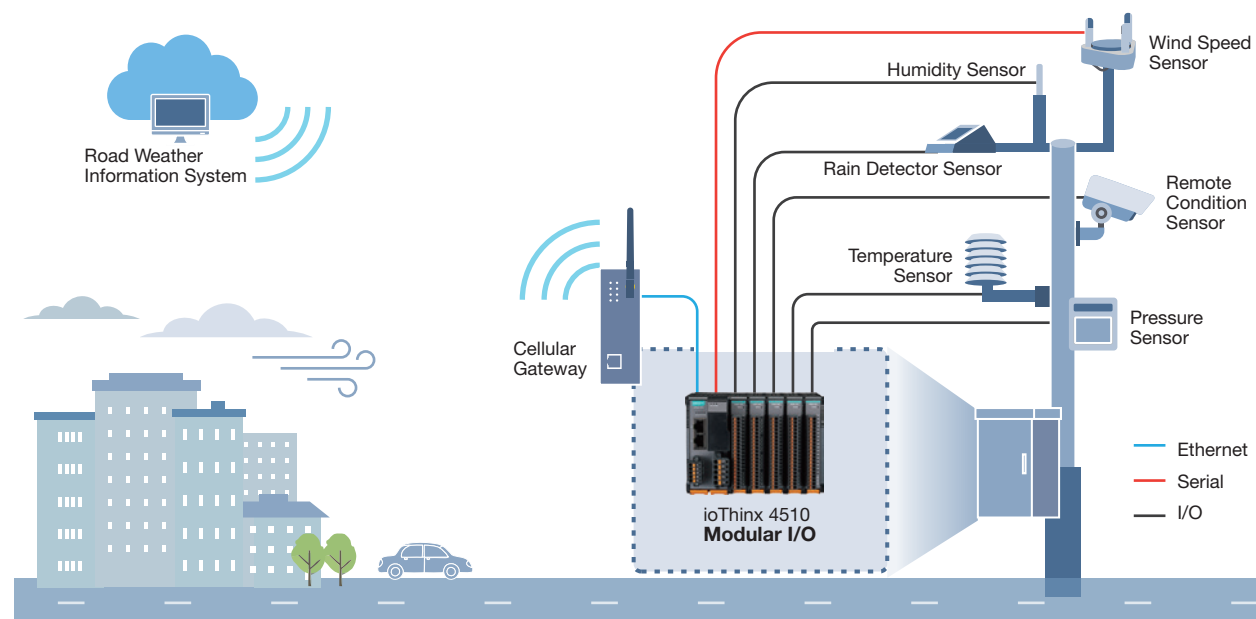
- Versatile I/O connectivity for diverse weather sensors
- Secure remote monitoring and data transmission to support IT-based central management
- High reliability for continuous operations in harsh roadside cabinet environments

Moxa's Solution

To guarantee 24/7 operation, rugged ioThinX 4510 modular I/Os were installed in compact roadside cabinets to interface with multiple weather monitoring devices, including temperature, rainfall, snowfall, fog, wind speed, and humidity sensors. Built for tough outdoor conditions, these units work dependably in temperatures from -40 to 75°C, guaranteeing continuous monitoring all year round.

This RWIS, essential for safety-critical intelligent transportation systems (ITS), demanded robust operational security. Adhering to IEC 62443-4-1 secure development standards, the ioThinX 4510 supports role-based access control (RBAC) and IP whitelisting to ensure stringent authorization for administrators, operators, and users, thereby securing system-wide operations against unauthorized access.

For secure communication over public networks, the ioThinX 4510 leverages SNMPv3 to ensure encrypted transmission and secure integration with IT-based management platforms. Real-time SNMPv3 Trap instantly report critical weather events to the ITS control center, enabling quick responses and timely driver alerts to reduce accident risks and optimize traffic flow.



Securing Critical Facility Monitoring for Modern Air Traffic Management

Airports need to update their airfield infrastructure to keep operations running smoothly and ensure flight safety as global air traffic increases. To strengthen air traffic management (ATM) operations, a system integrator worked alongside prominent airports to upgrade the monitoring of key ground systems, including runway lighting, tower beacons, and navigation aids (NAVAIDs).

Why Moxa

- Modular design with versatile I/O options for flexible airfield deployment
- SNMPv3 and real-time SNMP Trap notifications for secure, event-driven monitoring
- -40 to 75°C reliable operation in extreme outdoor conditions

System Requirements

- Rugged outdoor monitoring with reliable data acquisition and secure communications
- Supports IT management platforms for faster response and modernized operations
- Encrypted data transmission to protect critical facility operations

Moxa's Solution

Runway lighting, tower beacons, and navigation aids are mission-critical assets that guide aircraft during takeoff, landing, and low-visibility operations. Any failure can impact runway availability, disrupt airport operations, and compromise flight safety. Real-time monitoring enables immediate fault detection, accelerates maintenance dispatch, and helps prevent costly delays or cancellations.

The compact ioThinX 4510 modular I/Os were deployed in distributed airfield cabinets to enable continuous monitoring of these critical facilities. Built to withstand harsh outdoor and vibration-intensive airfield environments, the rugged devices deliver stable performance while supporting flexible, modular deployment across airport infrastructure.

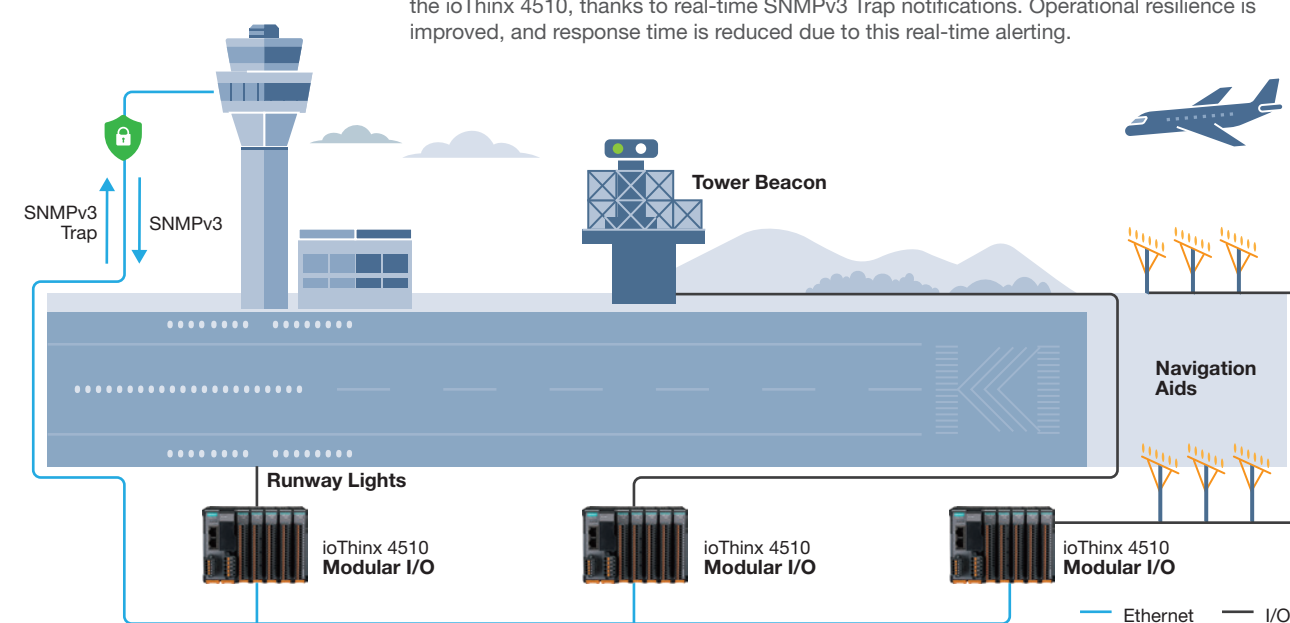
To secure sensitive operational data, the ioThinX 4510 supports SNMPv3 with encryption and authentication, protecting communications against unauthorized access and external interference. These units function as secure edge devices, integrating smoothly with IT network management systems. This enables airport ATM operators to monitor facility health directly via centralized IT management platforms.

Events like runway lighting failures are reported in milliseconds with instant alerts from the ioThinX 4510, thanks to real-time SNMPv3 Trap notifications. Operational resilience is improved, and response time is reduced due to this real-time alerting.

Product Showcase

ioThinX 4510 Series

Modular Remote I/O supports event-driven SNMPv3 Trap





Illuminating a 1.2-mile Bridge With Smart Lighting Control

An iconic bridge revamped its lighting system to enhance its landmark appeal while reducing energy costs. To ensure both economic savings and enduring operational dependability, the project implemented LED technology and an Ethernet-based control framework.

Why Moxa

- Daisy-chain connectivity for cost-effective deployment and simplified maintenance
- Rugged hardware for hassle-free operation in extreme environments
- Modbus support for simplified SCADA integration and real-time data acquisition

Product Showcase

ioLogik E1212 Series

Ethernet Remote I/O with 8 x DI, 8 x DIO

System Requirements

- Open-standard Ethernet technology for real-time control and system integration
- Cost-effective wiring and simplified maintenance over long-distance infrastructure
- Reliable operation in harsh over-water environments

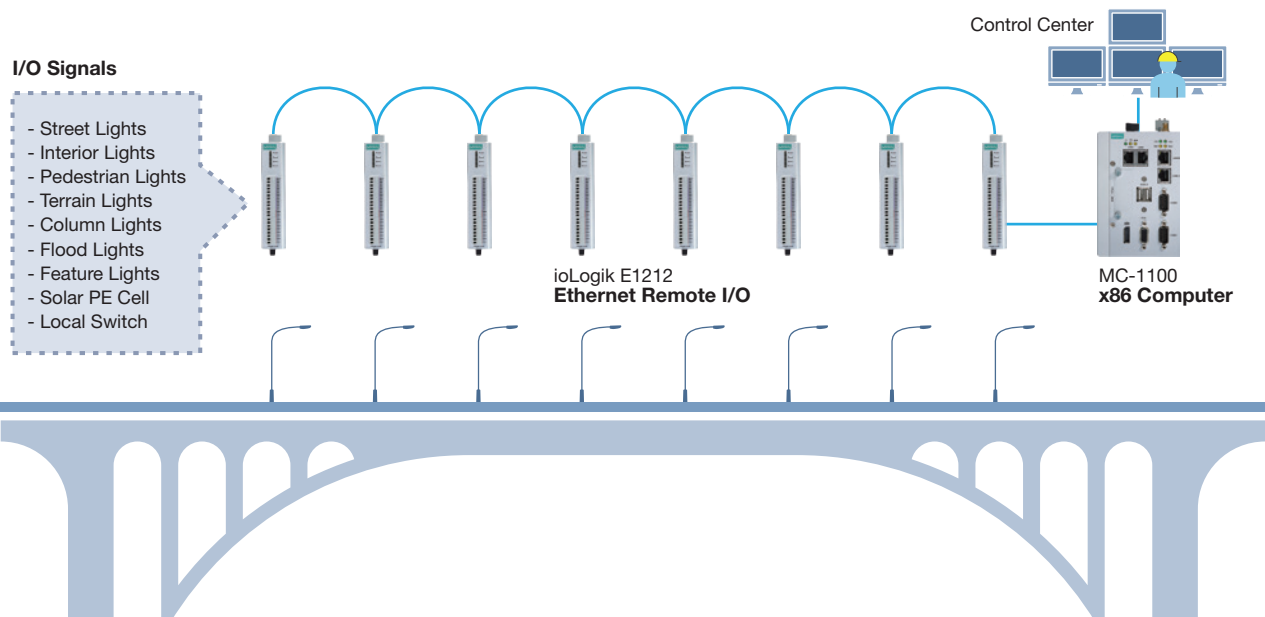
Moxa's Solution

To control and monitor 2,500 LED strips, totaling 90,000 individual lights over a 1.2-mile bridge, the system integrator used ioLogik E1212 remote I/Os and MC-1100 industrial computers, establishing a robust control backbone for easy deployment and remote monitoring.

With 8 DIs and 8 DIOs, the ioLogik E1212 remote I/Os were deployed in distributed cabinets along the bridge to control and monitor lighting devices and sensors across the bridge. The ioLogik E1212 features dual Ethernet ports and allows for daisy-chaining I/O connections. This design streamlines wiring, reducing installation time and cost for building multi-drop I/O networks across a 1.2-mile communication span.

The ioLogik E1212 also simplifies integration with the SCADA system at the bridge control center through the Modbus protocol. The slim I/O unit retrieves I/O data and converts it into Modbus/TCP for control center management systems, enabling real-time monitoring and effortless device management.

Certified to diverse industrial reliability standards, the ioLogik E1212 operates in temperatures ranging from -40 to 75°C. These I/O units withstand wind, moisture, and vibration from vehicle traffic, ensuring long-term stable operation, backed by a 5-year warranty.



Enabling High-accuracy ETC at Highway Speeds

A national freeway agency implemented a distance-based electronic toll collection (ETC) system that allows drivers to pay tolls without stopping. Handling tens of millions of transactions daily, the system achieves over 99.9% billing accuracy through precise vehicle detection and reliable signal collection.

Why Moxa

- Sub-4 ms I/O responses for accurate vehicle event detection
- -40 to 75°C wide operating temperature for reliable 24/7 roadside operations
- Built-in edge logic for instant event handling and event-driven alarms

Product Showcase

ioLogik E2212 Series

Smart Remote I/O with 8 x DI, 4 x DIO, 8 x DO, and Click&Go Logic

ioLogik 2512 Series

Smart Remote I/O with 8 x DI, 8 x DIO, and Click&Go Plus Logic

System Requirements

- High-speed I/O response to capture pulse signals from vehicle detection sensors
- Edge logic for instant event triggering and accurate timestamping
- Rugged durability for reliable 24/7 roadside operation

Moxa's Solution

Moxa smart remote I/O solutions enable ETC gantries to capture and transmit vehicle event data in real time, ensuring continuous monitoring and rapid fault detection across distributed tolling infrastructure.

The compact ioLogik E2212 smart remote I/Os were installed inside gantry cabinets to capture pulse signals from vehicle detection sensors with I/O latency under 4 milliseconds. These signals trigger IP cameras to capture vehicle images and activate the eTag reader for toll identification and billing. The ioLogik E2212 uses Click&Go logic for report-by-exception event handling, providing accurate timestamps that enable the backend system to match eTag readings with license plate images, thereby efficiently identifying missed reads for toll audits.

Built for harsh roadside environments, the rugged ioLogik I/Os perform 24/7 equipment and environmental monitoring, sending instant alerts when events such as cabinet intrusion or power instability occur.

The ioLogik 2512 smart remote I/Os were also installed in roadside shelters. These devices offer flexible I/O channels and serial ports for environmental monitoring and control. With Click&Go Plus intelligence, the ioLogik 2512 allows for rule-based logic control and event-driven notifications, protecting field systems from high ambient temperatures and unauthorized door access, even when networks are down.

