



Integrated Network Solutions for Intelligent Transportation

MOXA[®]
Reliable Networks ▲ Sincere Service

Real-Time Convergence for Non-Stop Safety

Roadway safety and efficiency depend on real-time information and communication more than ever. To increase traffic flow, reduce congestion, and improve incident response times, Moxa provides Intelligent Transportation System (ITS) solutions that collect and transmit real-time information about traffic conditions to traffic management centers and motorists.

From roads to tunnels to bridges, intelligent transportation systems rely on a myriad of data about traffic flow, speed, and density, as well as weather conditions, and surveillance video. Moxa's industrial Ethernet solutions facilitate real-time convergence of various sensor data, voice, and video by providing high-speed throughputs and a wide range of network interfaces, such as Ethernet, WLAN, serial, PoE, DSL, and various video compressions.

The comprehensive solutions employ a wide array of Ethernet connectivity, I/O data acquisition, embedded computers, and HD surveillance products. All solution ingredients address extreme reliability, smart redundancy, easy manageability, and a lower total cost of ownership.

▶ High-Bandwidth

To support the constant increase in traffic, many transportation authorities leverage information networks to improve road utilization, safety, and efficiency.

Moxa solutions offer high-bandwidth wired, wireless, and secure connectivity to support flexible expansion, real-time convergence, and fast growing data services, especially for demanding HD video surveillance applications.

Moxa's industrial networking solutions offer a robust combination of voice, video, and data in up to 10GbE and 1GbE speeds, as well as Turbo Chain topology that allows flexible expansion and guarantees fast Ethernet recovery under 20 ms before a connection fails. The rich media alternatives, including coaxial, fiber optic, twisted-pair, and DSL cabling, help customers formulate optimal performance while reducing deployment cost.

- * 1GbE/10GbE switching and routing
- * Up to 300 Mbps wireless transmission
- * Up to 500 Mbps router throughput
- * Up to 150 Mbps VPN traffic

Benefits

- High density 1GbE/10GbE capability
- Millisecond-scale resilience
- Versatile I/O and HD video solutions
- User-friendly management suite
- Industrial-grade reliability

Expert applications

- ATMS (Advanced Transportation Management Systems)
- ETC (Electronic Toll Collection)
- Tunnels
- E-Bus and Tramways

▶ Comprehensive Coverage of Industrial Networking Solutions

Industrial Ethernet



Industrial Ethernet Switches



Industrial DSL Extenders



Ethernet Fieldbus Gateways



Industrial VPN Secure Routers



MXstudio Industrial Network Management Suite (includes MXconfig, MXview, and N-Snap)

Industrial Wireless



Industrial Wireless AP/Bridge/Client



Industrial LTE Cellular Gateways



Tunnels

▶ see page 5

ETC

▶ see page 9

ATMS

▶ see page 3

E-Bus

▶ see page 7

▶ Extreme Reliability

Intelligent highway systems need to perform long distance communication under extreme weather and environmental conditions. With over 25 years of experience in hardened networks, Moxa brings seamless redundancy and extreme reliability to intelligent transportation networks around the world.

For seamless operation in harsh outdoor environments, Moxa's transportation networking devices provide superior network reliability with high levels of EMI shielding and an extreme operating temperature range from -40 to 75°C without relying on a fan or heater.

All Moxa managed switches ensure non-stop availability with dual power supplies and innovative Turbo Ring and Turbo Chain technologies, both of which enable fast Ethernet recovery of less than 20 ms at a full load of 250 switches. Wireless connections are reinforced with concurrent dual-radio transmissions and Turbo Roaming technology for millisecond-scale handovers. System integrators can be assured of non-stop continuity and low-cost maintenance for smart ITS deployment in challenging roadway conditions.

▶ Ease and Efficiency

Moxa's ITS solutions offer highly versatile and collaborative capabilities to control and monitor traffic conditions, including road signs and signals, video surveillance, weather and air condition measurements, IP surveillance, fire detection, and emergency systems.

To meet dynamic transportation network requirements, Moxa facilitates layer-by-layer, edge-to-core strategic deployment to make the network infrastructure easy, fast, and flexible to deploy and upgrade.

Moreover, Moxa offers MXstudio, a suite of industrial network management software that provides easy and fast operations from installation to monitoring to maintenance to failure diagnostics. Non-IT staff can read the edge-to-core network status and traceable event history of all connected SNMP devices and physically wired links quickly and easily.

Serial Connectivity



Serial-to-Ethernet Device Servers

Remote I/O



Smart Remote I/O with Click&Go Plus

Industrial Computing



Embedded Computers

IP Surveillance



Industrial HD IP Cameras

Today's road operators are faced with many challenges. For example, better management of the often near capacity traffic levels on highways and city streets can improve safety and reduce travel times and greenhouse gas emissions. In addition, replacing low-bandwidth legacy copper ITS with high data rate real-time network backbones can reduce traffic accidents by providing control center managers with the critical road condition information they need to react quickly and decisively. Commuter, holiday, and event related traffic flows need the same timely management to prevent traffic jams. Weather changes, road construction, maintenance, and other possible conditions need a responsive system that can warn drivers, or even close roadway access automatically to prevent accidents from occurring.

Advanced Transportation

Network Requirements

Reliable, High Capacity Hierarchical IP Network

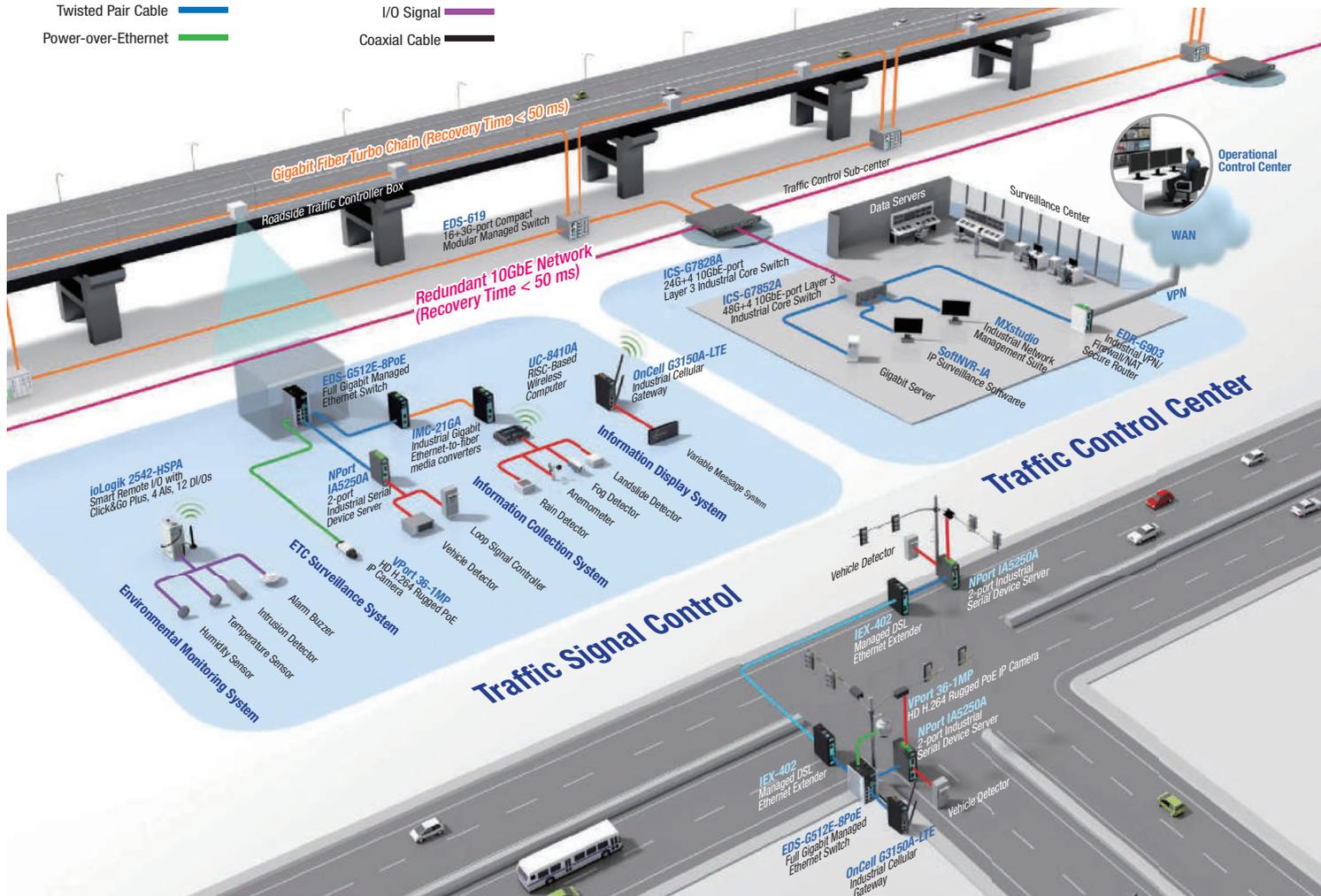
An ATMS needs a multi-layered network to interconnect the large number of monitoring nodes that deliver traffic and road condition data and signaling information to and from centralized controllers. Top layer full-Gigabit Ethernet switches can be used to aggregate multiple lower level 10/100 Fast Ethernet switches housed in wayside cabinets onto high capacity SDH or 10G links. The entire network needs to be resilient and redundant enough to ensure that data gets transmitted even when faced with network failures or unanticipated data bursts that exceed the network's capacity. Furthermore, the entire network needs to be easily managed and serviced using a straightforward management platform that can be remotely operated from a central control location.

Efficient Video Surveillance System

Traffic engineers need access to a reliable video feed to see current traffic levels, road incidents, and weather hazards. The video stream should use optimal video compression for efficient transmission over high capacity Gigabit Ethernet networks, with features such as IGMP snooping and multicast filtering.

Key Products

- 10G Ethernet ■
- Gigabit Fiber Optic Cable ■
- Twisted Pair Cable ■
- Power-over-Ethernet ■
- Serial ■
- Voice-Grade Copper Wire ■
- I/O Signal ■
- Coaxial Cable ■



Automation Management Systems

Moxa Solutions

Real-Time Advanced Traffic Management System

Central controllers digest data from sensors monitoring current traffic and road conditions to operate variable message signs, roadway access controllers, traffic lights, and the dispatch of emergency vehicles. Advanced sensors that actively respond to pre-defined events can be used to update variable message signs in real time to warn drivers of accidents, treacherous weather conditions, and heavy traffic, resulting in safer driving conditions and more efficient and comfortable travel. Over-utilization of roadways can be prevented using controlled roadway access, which can also prevent the accidents that often accompany stop-and-go traffic.

Reliable and Secure Control and Monitoring of City Traffic

Traffic controllers and network cameras in any city or street intersection must be rugged enough for wide temperature environments to provide constant remote traffic flow information for automated traffic signal control. Network encryption and authentication over public wired and wireless networks are essential to protect information access and asset security from cyber-attacks.

- Comprehensive portfolio, including wired and wireless devices, HD video solutions, remote I/Os, and serial-to-Ethernet devices
- Up to 1GbE/10GbE speed edge-to-core industrial switches
- Redundant technologies: Turbo Ring and Turbo Chain (recovery time < 20 ms), GuaranLink (wireless)
- Easy-to-use, complete software: MXstudio network management suite, NVR and VMS surveillance management, and open OS platforms
- High speed firewall and VPNs for uncompromised cybersecurity
- Rugged operation in harsh, -40 to 75°C conditions
- Active OPC-enabled I/Os reduce the loading of networks and control centers
- Complete management and security features: Modbus/TCP, LLDP, QoS, VLAN, IGMP snooping, IEEE 802.1X, SSH, and more



MXstudio

Industrial Network Management Suite

- All-in-one management suite, composed of MXconfig, MXview, and N-Snap
- 10-times faster configuration
- Smart visualized monitoring
- Easy backup and maintenance
- Quick diagnostics



ICS-G7852A

48G+4 10GbE-Port Layer 3 Industrial Core Switch

- Up to 52 SFP connections
- Turbo Ring, Turbo Chain, and RSTP/STP for Ethernet redundancy
- Two isolated redundant power supplies (110/220 VAC)
- Fanless, 0 to 60°C operating temperature
- Hot-swappable media modules for continuous operation



IKS-G6824A

24G-port Layer 3 Full Gigabit Managed Ethernet Switches

- Layer 3 routing interconnects multiple LAN segments
- 24 Gigabit Ethernet ports
- Up to 24 optical fiber connections (SFP slots)
- Fanless, -40 to 75°C operating temperature range (T models)



EDS-611/619

8+3G/16+3G-Port Compact Modular Managed Switches

- Up to 3 Gigabit ports for Gigabit redundant ring and uplink and up to 19 fiber connections
- Modular form factor supports multiple fiber connections
- Hot-swappable media modules for continuous operation



EDR-810/G903

Industrial VPN Secure Router

- All-in-one Firewall/NAT/VPN/Router capability
- Multipoint secure router with switch functions (EDR-810)
- Dual WAN redundancy (EDR-G903)
- Up to 500 Mbps router throughput and 150 Mbps VPN traffic (EDR-G903)
- Built-in PacketGuard™ for Modbus TCP packet inspection



SoftNVR-IA

64-Ch IP Surveillance Software

- Live view with H.264, MPEG4, and MJPEG, from VPort products
- Video recording and playback functions by event
- Built-in OPC server for easy communication with automation systems



VPort 36-2L

Full HD H.264 Rugged PoE IP Zoom Camera

- Wide temperature IP zoom camera (-40 to 75°C)
- P-IRIS zoom lens with 3x (3 to 9 mm) and 2x (10 to 23 mm) optical zoom
- Full HD (1920x1080) resolution lets you see the finest detail
- RJ45 PoE
- OnVIF supported



VPort 36-1MP

HD H.264 Rugged PoE IP Box Camera

- World's first wide temperature IP camera (-40 to 75°C)
- Built-in IVA function for more efficient surveillance (IVA model)
- HD (1280x720) resolution to display the finest detail
- RJ45 PoE for easy installation
- OnVIF supported



EDS-G512E-8PoE

8-Port PoE+ Full Gigabit Managed Switch

- Built-in 8 PoE+ full Gigabit ports compliant with IEEE 802.3af/at standards
- Up to 36 W output per PoE+ port
- 3 kV LAN surge protection for extreme outdoor environments
- PoE diagnostics for powered device mode analysis



UC-8410A

RISC-Based Wireless Computer

- ARMv7 Cortex-A7 dual-core 1 GHz processor
- Wireless enabled
- 4 digital input channels and 4 digital output channels
- -40 to 75°C wide operating temperature range



OnCell G3150A-LTE

Industrial LTE Cellular Gateway

- Dual-SIM GuaranLink for reliable cellular connectivity
- VPN secure connection capability with IPSec, GRE, and OpenVPN protocols.
- Power isolation design for device protection against harmful electrical interference
- Rugged hardware design for hazardous locations (ATEX Zone 2/ IECEx)



ioLogik 2542-HSPA

Smart Remote I/O with Click&Go Plus, 4 AIs, 12 DI/Os

- Supports SNMPv1/v2c/v3 and SNMP Trap
- Front-end intelligence with Click&Go Plus control logic, up to 48 rules
- Active communication with MX-AQPC UA Server
- I/O expansion port for daisy chaining up to 8 ioLogik E1200 units



IEX-402

Managed DSL Ethernet Extender

- G.SHDSL/VDSL2 standards
- Up to 8 km @ 15.3 Mbps (G.SHDSL); up to 3 km @ 100 Mbps (VDSL2)
- Auto CO/CE negotiation for zero configuration
- LFP for quick failure recovery
- Visualized web UI and LED indicators



IMC-21GA

Industrial Gigabit Ethernet-to-Fiber Media Converters

- Supports 1000Base-SX/LX with SC connector, or SFP slot
- Link Fault Pass-through (LFP)
- Redundant power input
- -40 to 75°C operating temperature range (T models)
- Supports Energy Efficient Ethernet (IEEE 802.3az)



NPort IA5000A

1, 2, and 4-Port Industrial Serial Device Servers

- Enhanced surge protection for serial, LAN, and power
- 2 kV isolation for serial signals
- Rugged screw-type terminal blocks for power and serial connectors
- -40 to 75°C operating temperature range (T models)
- Relay output or email alert notifications

Intelligent transportation solutions for tunnels require an integrated and completely reliable solution. Tunnels not only require management of vehicle traffic, but also control of multiple infrastructure systems. For very long tunnels, this means an integrated system that can control ventilation, road and signage lighting, fire detection and alarms, redundant power systems, air quality measurements, water drainage systems, and emergency communications such as emergency telephones. To meet tunnel safety requirements, an operator needs to both monitor and control traffic. The operator must be able to detect tunnel incidents immediately to minimize risk and to determine if vehicles must be prevented from entering danger zones, or to clear traffic from the tunnel as quickly as possible.

Intelligent Tunnels

Network Requirements

High Resiliency and Responsiveness

Since tunnel safety is top priority, an operator needs rugged network switches that can provide resiliency and redundancy, such as those using Turbo Ring redundancy with less than 20 ms recovery from faults. In addition, control centers need all tunnel sensor data to be delivered with a minimum delay so that action can be taken as soon as adverse tunnel conditions arise.

Centralized Traffic Gate Control

Depending on the length of the tunnel, gateways need to be deployed at tunnel entrances and predefined locations inside the tunnel. The gateway controllers need access to robust serial-to-Ethernet devices to provide connectivity to the tunnel control center to automatically or manually lower and raise traffic access gates for both safety and incident management.

Live Traffic Video Monitoring

Continual monitoring of traffic within a tunnel requires visual information from CCTV cameras placed along the tunnel interior, and at the entrance and exit. Traffic density, accidents, and speeders need to be monitored and controlled to prevent safety issues from arising. The cameras employed need to be rugged, and sensitive to the darker conditions of the tunnel interior. Eventually, intelligent HD IP video and management become a necessity for low-light tunnel applications with image enhancement and bandwidth optimization technologies.

Highly Reliable Alarm System

The atmosphere inside a tunnel must be continuously monitored, not only to raise alarms when needed, but also to control the tunnel's automatic ventilation system. In addition, although tunnel fires may be rare, when they do occur it should be possible to detect them immediately so that vehicles and passengers can be evacuated from the tunnel as quickly as possible. The devices used need reliable and uninterrupted access to the tunnel's data communication system and a separate I/O control functionality should be provided to operate the devices remotely.



► Key Products



V2403

x86-Based Celeron/Core Embedded Computer

- -40 to 70°C (system+LTE) operating temperature
- Variety of interfaces: 4 serial ports, 2 Ethernet LAN ports, 4 DIs, 4 DOs, USB, HDMI, wireless
- Triple mini-PCIe sockets for storage and wireless modules; supports mSATA, Wi-Fi, 3G, LTE, GPS, and Bluetooth



UC-8112-ME-T-LX

Communication-Centric RISC Computing Platform

- ATI AM3352 1Ghz processor
- Dual auto-sensing 10/100 Mbps Ethernet port
- Industrial grade fanless design
- 40 to 70°C wide operating temperature with LTE



EDS-619

16+3G-Port Compact Modular Managed Switch

- Up to 3 Gigabit ports for Gigabit redundant ring and uplink and up to 19 fiber connections
- Hot-swappable media modules for continuous operation
- Complete management and security features: Turbo Ring, Turbo Chain, Modbus/TCP, LLDP, QoS, VLAN, IGMP snooping, IEEE 802.1X, SSH, and more
- -40 to 75°C operating temperature range



EDS-G512E-8PoE

12G-port Full Gigabit PoE+ Managed Ethernet Switches

- 8 IEEE 802.3af and IEEE 802.3at PoE+ standard ports
- 36-watt output per PoE+ port in high-power mode
- Intelligent PoE power management functions
- Operate with 240 watts full PoE+ loading at -40 to 75°C
- Turbo Ring and Turbo Chain (recovery time < 20 ms @ 250 switches), RSTP/STP, and MSTP for network redundancy



EDS-510E

7+3G-Port Gigabit Managed Switch

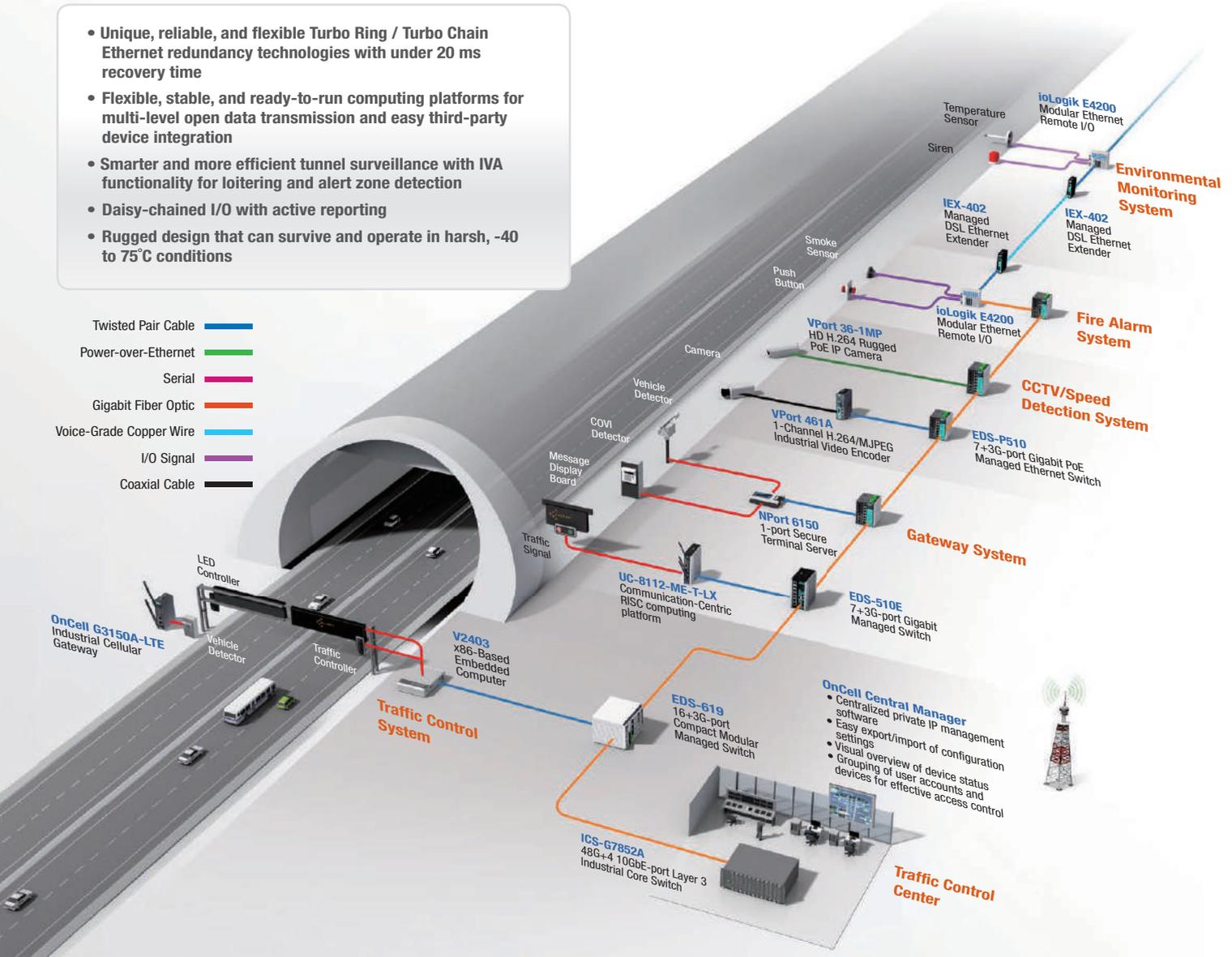
- 3 Gigabit Ethernet ports for redundant ring or uplink solutions
- Gigabit fiber Turbo Ring and Turbo Chain (recovery time < 20 ms), and RSTP/STP
- Long-distance fiber transmission up to 120 km
- -40 to 75°C operating temperature range



Moxa Solutions

- Unique, reliable, and flexible Turbo Ring / Turbo Chain Ethernet redundancy technologies with under 20 ms recovery time
- Flexible, stable, and ready-to-run computing platforms for multi-level open data transmission and easy third-party device integration
- Smarter and more efficient tunnel surveillance with IVA functionality for loitering and alert zone detection
- Daisy-chained I/O with active reporting
- Rugged design that can survive and operate in harsh, -40 to 75°C conditions

- Twisted Pair Cable
- Power-over-Ethernet
- Serial
- Gigabit Fiber Optic
- Voice-Grade Copper Wire
- I/O Signal
- Coaxial Cable



VPort 36-1MP

HD H.264 Rugged PoE IP Box Camera

- World's first wide temperature IP camera (-40 to 75°C)
- Built-in IVA function for more efficient surveillance (IVA model)
- HD (1280x720) resolution to display the finest detail
- RJ45 PoE for easy installation
- OnVIF supported



VPort 461A

1-Channel H.264/MJPEG Industrial Video Encoder

- Supports up to 3 video streams simultaneously for H.264 and MJPEG
- Industrial design with -40 to 75°C operating temperature
- 2 Ethernet ports for cascade and Ethernet port redundancy
- Local storage capability with SD card slot
- OnVIF supported



NPort 6000

1 to 32-port RS-232/422/485 Secure Terminal Servers

- Secure operation modes
- Supports IPv6
- Port buffers for storing serial data when the Ethernet is off-line
- -40 to 75°C operating temperature range (T models)



ioLogik E4200

Modular Ethernet Remote I/O

- Support SNMPv1/v2c protocol, SNMP Trap, and RESTful API
- Front-end intelligence with patented Click&Go control logic up to 80 rules
- Active communication with patented Active OPC Server
- Allow up to 16-module expansion without needing a backplane



IEX-402/IEX-408E

Managed DSL Ethernet Extender

- Up to 15.3 Mbps data rates with a transmission distance of up to 8 km (G.SHDSL); up to 100 Mbps at distances of up to 3 km (VDSL2)*
- Automatic C/O/CPE negotiation
- LFP for quick failure recovery
- Visualized web UI and LED indicators

* IEX-408E only supports VDSL2

Adoption of intelligent bus transportation systems and networks provides multiple benefits for both the operator and passengers. Employing an intelligent E-Bus solution allows an operator to increase bus capacity and route efficiency. In addition, with the additional passengers that E-Bus routes attract, an operator can expect increased passenger revenue. Passengers are attracted to riding E-Buses for multiple reasons, and one of the most important is a feeling they can control their own journey. An intelligent E-Bus solution can provide passengers with bus arrival time information using electronic signs at bus stops, smart phones, web pages, and even automated telephone information systems. Using these systems, passengers can optimize their time and depending on the local climate, they can avoid being exposed to uncomfortable weather conditions. While onboard, passengers utilizing the automated bus stop notification displays can easily arrive at their destination even if it is their first time in the destination area. Another important intelligent E-Bus attraction for passengers is safety. Central monitoring of both the bus and bus driver improves safety by providing real-time incident reporting and management. Connectivity with an ATMS solution means the driver can be updated with the latest road information and traffic lights can be optimized to allow the bus to remain on schedule. As an added benefit, to attract even more passengers, WiFi can be deployed on an intelligent E-Bus so that passengers can enjoy productive connectivity during their transit. Most importantly, efficient bus utilization and more bus passengers means fewer vehicles on the road, and reduced road congestion and greenhouse emissions.

Intelligent E-Bus

Network Requirements

Shock and Vibration Resistant

All nodes in an intelligent E-Bus, including embedded controllers, switches, and I/O devices, must be able to withstand the constant vibration and occasional heavy shocks that inevitably occur. The nodes should be reliable enough to continue providing surveillance and data communication despite being continually exposed to mechanical stresses.

Rugged Embedded Computers

ITS applications require self-contained embedded computers that can stand up to all types of harsh weather conditions. Despite being exposed to wide temperatures and wet humid conditions, the computers need to provide constant control of the surveillance nodes and continual output for information display panels.

Reliable Mobile Connectivity

Providing network communication to and from moving intelligent E-Buses and multiple remote bus stops requires mobile connectivity. Cellular IP gateways need to provide reliable connectivity and be tough enough to withstand the rough environment of both buses and bus stops.

Integrating ATMS with Dispatch Systems, and Information Distribution Systems

The data produced by the surveillance and data communications equipment onboard an E-Bus must be compatible with the existing ATMS and bus dispatch systems so the systems can be integrated with the intelligent E-Bus solution. In addition, bus location data needs to be integrated with multiple information distribution systems to provide convenient passenger access.

Key Products



V2616A

x86-Based Core i5/i7 Embedded Computer

- High performance network video recorder for rolling stock applications
- Compliant with EN 50121-4 and essential sections of EN 50155
- IEC 61373 certified for shock and vibration resistance
- Two hot-swappable storage trays for 2.5" SSDs or HDDs
- RAID 1 mirroring for full data redundancy



V2416A

x86-Based Celeron/Core i7 Embedded Computer

- Dual independent DVI-I displays
- 2 gigabit Ethernet ports with M12 X-coded connectors
- Two hot-swappable trays for 2.5-inch HDD/SSD storage expansion



UC-8580

Industrial Multi-Radio Programmable Router

- ARMv7 Cortex-A7 dual-core 1 GHz processor
- 4 PCIe mini slots (1 x PCIe and 3 x USB2.0 signals)
- Up to 8 SIMs
- Single-end access
- EN50155 Tx compliant
- Ignition supported for graceful shutdown



WDR-3124A

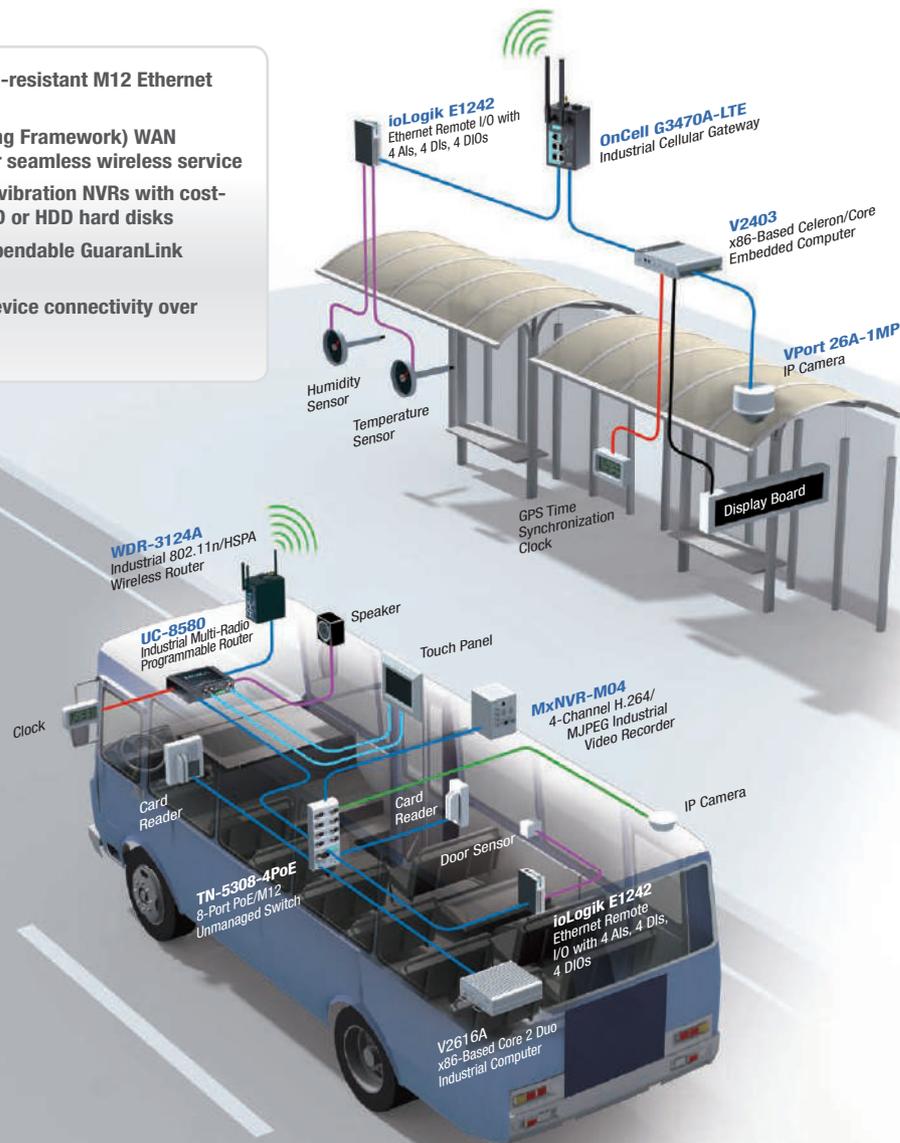
Industrial 802.11n/HSPA Wireless Router

- Universal GSM/GPRS/HSPA 2G/3G cellular communication
- 2.4GHz/5GHz 300Mbps WiFi communication
- Build-in high speed 4-ports Ethernet switch
- Industrial design with dual power inputs and build-in DI/DO support
- Dual cellular operator backup with dual-SIM GuaranLink Support
- Antenna and power isolation design for better device protection against harmful electrical interference

** Available in Q2, 2015*

Moxa Solutions

- Rugged design with vibration-resistant M12 Ethernet connectors
- MIRF (Moxa Intelligent Routing Framework) WAN management software AP for seamless wireless service
- Reliable moving vehicle anti-vibration NVRs with cost-effective hot-replaceable SSD or HDD hard disks
- Cellular connections with dependable GuaranLink technology
- Versatile Ethernet or serial device connectivity over cellular networks



OnCell G3470A-LTE
Industrial LTE Cellular Gateway

- Built-in 4-port Gigabit Switch
- Dual-SIM and GuaranLink for reliable cellular connectivity
- Antenna and Power isolation for device protection
- VPN, port forwarding, IP/MAC/Port filtering for secure routing



TN-5308-4/8PoE
8-Port M12/PoE Unmanaged Switch

- M12 connectors and IP40 metal housing
- 4/8 IEEE 802.3af compliant PoE and Ethernet combo ports
- Provides up to 15.4 watts at 48 VDC per PoE port
- EN 50155/50121-4 compliant
- -40 to 75°C operating temperature range



MxNVR-M04
4-Channel H.264/MJPEG Industrial Video Recorder

- Meets EN 61373 vibration criteria with a built-in 2.5-inch hard disk
- Anti-vibration design with M12 Ethernet/power connectors and DB9 audio/DI/DO connectors
- -40 to 75°C operating temperature range (works with SSD)
- OnVIF supported for standardization and interoperability



VPort 26A-1MP
HD H.264 Rugged PoE IP Dome Camera

- -40 to 75°C operating temperature range, with fanless design
- HD (1280x720) resolution for finest image details
- Supports DNR and WDR
- OnVIF supported



ioLogik E1242
Ethernet Remote I/O with 4 Als, 4 DIs, 4 DIOs

- Supports SNMPv1/v2c, RESTful API
- User-definable Modbus/TCP Slave addressing
- Supports EtherNet/IP adapter mode
- 2-port Ethernet switch for daisy-chain topologies

Electronic Toll Collection (ETC)

Traditional toll plazas are costly to construct and incur labor costs from collection booth personnel, but more importantly, they have become traffic bottlenecks for many highway systems. Because of this, instead of renovating old toll plazas, many governments have chosen to construct intelligent ETC gantries to make toll collection more efficient, and keep highway congestion to a minimum for commuters and travelers.

ETC gantries make use of open road tolling (ORT) to allow travelers to pay tolls without stopping at toll booths. When a vehicle enters the toll road, sensors installed atop the gantry detect the transponder or GPS device already installed on the vehicle, and then use the vehicle's ID to debit their account. When a non-compliant vehicle enters the toll road, cameras mounted on the gantry send the license plate image of the offending vehicle to the control room for payment collection processing.

Network Requirements

High Bandwidth for Video/Data Transmission

With multiple vehicles entering the toll road every second at high speeds, network latency is unacceptable. Large amounts of traffic data from sophisticated gantry devices, such as cameras, scanners, and sensors, will require Gigabit transmission speeds across the ETC network backbone, especially for the transmission of high-resolution images from multiple cameras atop every gantry.

Wide-Temperature Operation

Network devices must have a wide operating temperature range to ensure network reliability. For outdoor applications, temperatures can dip well below freezing at night, and exceed 120°F (49°C) during the day. Temperatures can even reach extreme temperatures of over 140°F (60°C) inside roadside cabinets.

Compact Dimensions for Gantry Installation

Each lane of the highway requires a camera, sensor, scanner, and cabinet for ETC detection and traffic monitoring. Although cabinets have a limited amount of space, they must house a variety of ETC equipment and network devices. Network equipment housed in the cabinets must be compact, and should also be DIN-rail mountable.

Key Products



EDS-G512E-4GSFP

12G-port full Gigabit Managed Ethernet Switches

- Superior Level 4 EMS protection against harsh environmental interference
- Supports Turbo Ring and Turbo Chain (recovery time < 50 ms @ 250 full-Gigabit switches), RSTP/STP, and MSTP for fast recovery
- -40 to 75°C operating temperature range



IKS-G6824A

24G-port Layer 3 Full Gigabit Managed Ethernet Switches

- Layer 3 routing interconnects multiple LAN segments
- 24 Gigabit Ethernet ports
- Up to 24 optical fiber connections (SFP slots)
- Fanless, -40 to 75°C operating temperature range (T models)



OnCell G3150A-LTE

Industrial LTE Cellular Gateway

- Dual-SIM GuaranLink for reliable cellular connectivity
- VPN secure connection capability with IPSec, GRE, and OpenVPN protocols.
- Power isolation design for device protection against harmful electrical interference
- Rugged hardware design for hazardous locations (ATEX Zone 2/IECEx)



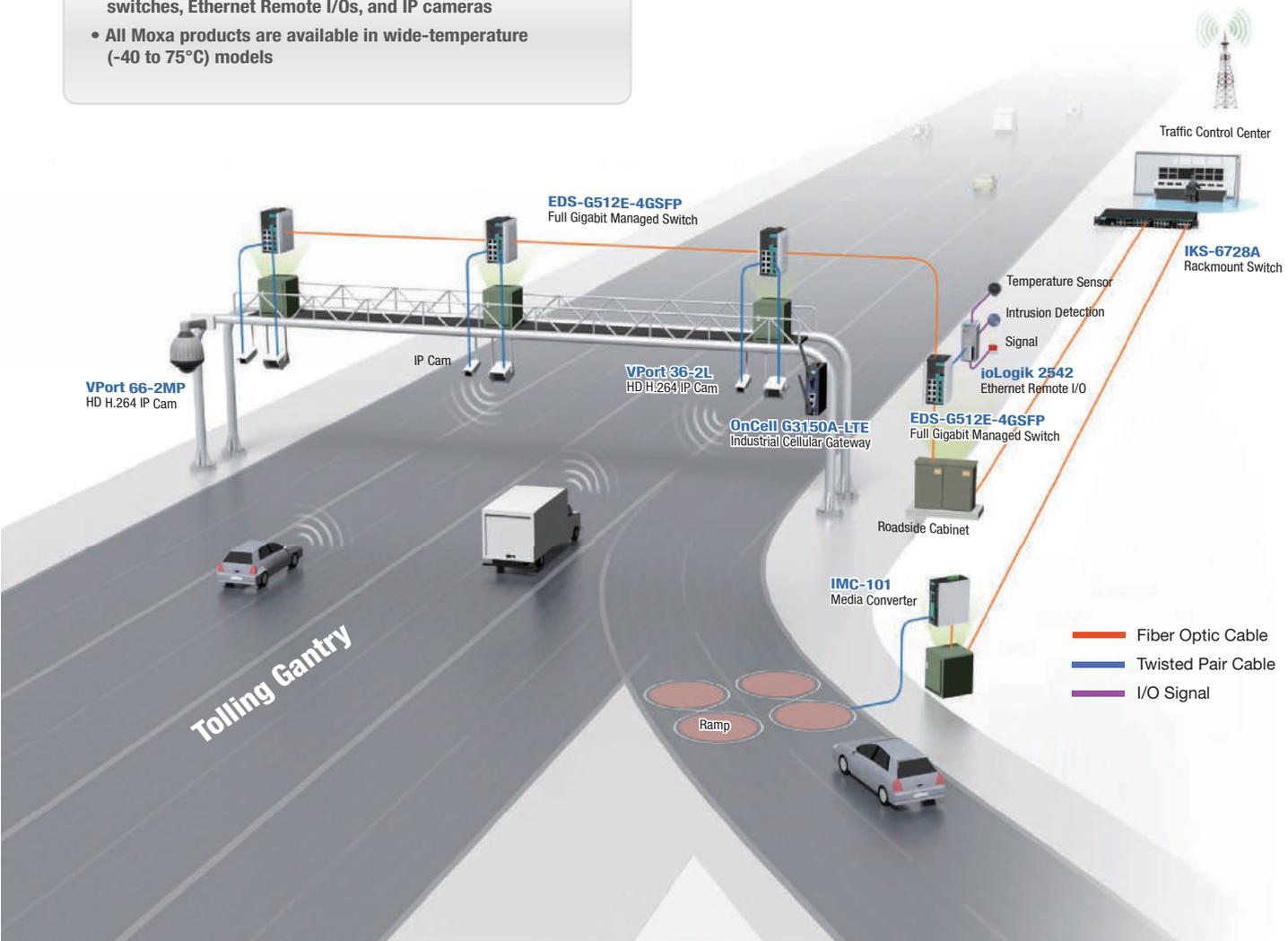
IMC-101

Industrial Ethernet-to-Fiber Media Converter

- 10/100BaseT(X) auto-negotiation and auto-MDI/MDI-X
- Link Fault Pass-Through (LFP) (media converters should work as a pair)
- Redundant power inputs
- Power failure, port break alarm by relay output
- -40 to 75°C operating temperature range

Moxa Solutions

- Gigabit Ethernet for massive video and data transmissions
- Fiber interface for long distance transmission
- Comprehensive solutions including full Gigabit Ethernet switches, Ethernet Remote I/Os, and IP cameras
- All Moxa products are available in wide-temperature (-40 to 75°C) models



ioLogik 2542

Smart Ethernet Remote I/O with Click&Go Logic

- Supports SNMPv1/v2c/v3 and SNMP Trap
- Front-end intelligence with Click&Go Plus control logic, up to 48 rules
- Active communication with MX-AOPC UA Server
- I/O expansion port for daisy chaining up to 8 ioLogik E1200 units
- Built-in Modbus Gateway for collecting data from serial devices



VPort 66-2MP

Rugged 1080P PTZ speed dome IP cameras for outdoors

- Industrial-grade extreme weather pan, tilt, zoom IP camera
- Full HD 1080P resolution, H.264 encoding
- 22x/30x optical and 20x digital zoom
- Outdoor-ready, vandal-proof, IP66-rated, NEMA Type 4 form factor and EN 50121-4 compliance

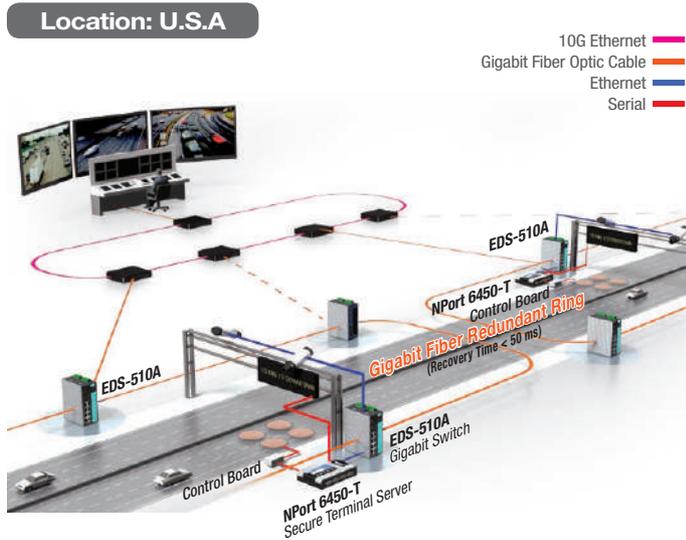


VPort 36-2L

H.264 Rugged PoE Box-Type IP Camera

- Wide temperature IP zoom camera (-40 to 75°C)
- P-IRIS zoom lens with 3x (3 to 9 mm) and 2x (10 to 23 mm) optical zoom
- Full HD (1920x1080) resolution lets you see the finest detail
- RJ45 PoE for easy installation
- OnVIF supported

Centralized Traffic Control over Fiber Gigabit Ethernet



▶ System Introduction

The third largest state-owned highway system in the United States is maintained by that state's DOT (Department of Transportation). The DOT planned to centralize traffic control and monitoring of highways (including roads, bridges, and tunnels) across the state's five central TMCs (traffic management centers). These TMCs serve as hubs for regional emergency response and incident management operations of traffic-related events. TMC operators will have access to real-time traffic information from DOT personnel, state police, emergency response agencies, cameras, sensors, and other tools to ensure traveler safety by notifying drivers of traffic conditions and emergency events via VMS (variable message sign) broadcasts and other public media.

▶ Network Requirements

- Gigabit network backbone for large volumes of video data
- NEMA TS2 compliance for network components
- Network redundancy with secure data encryption capability
- Network traffic management for bandwidth efficiency

▶ Why Moxa?

- Reliable Gigabit data transmission with recovery time < 50 ms (@ 250 switches)
- Secure connection for existing serial devices
- NEMA TS2 certified and -40 to 75°C operating temperatures

▶ Key Products

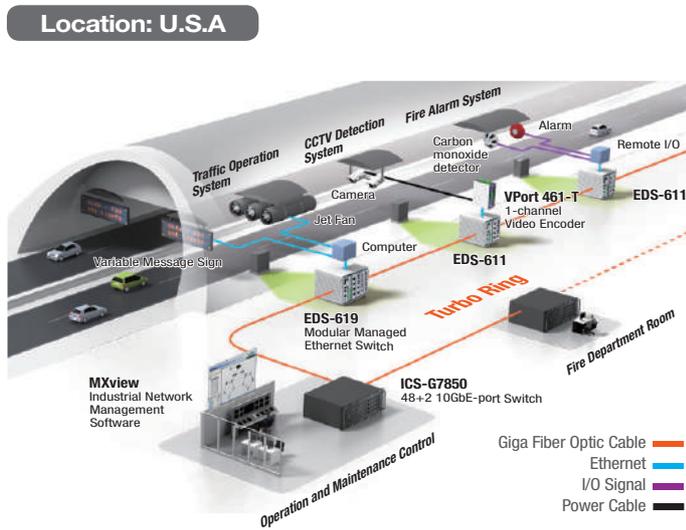


EDS-510A-T
7+3G-Port Gigabit
Managed Ethernet Switch



NPort 6450-T
RS-232/422/485 Secure
Terminal Server

10GbE Core Backbone for Critical Tunnel Traffic and Safety



▶ System Introduction

Caltrans (California Department of Transportation) planned to construct the fourth bore of the Caldecott Tunnel to relieve traffic congestion in the off-peak direction between Alameda and Contra Costa counties.

A robust communication infrastructure was projected for the Operation and Maintenance Control (OMC) center to support continuous traffic management and an emergency system composed of fire detectors, radio broadcast systems, video image detection (VID) cameras, jet fans, variable message signs, and emergency stations.

▶ Network Requirements

- Superior bandwidth connectivity to ensure smooth video, messaging, and data transmissions
- Self-healing redundancy to ensure non-stop updates and alerts
- Industrial-grade durability to withstand extreme conditions

▶ Why Moxa?

- One-stop-shop solution makes network communication and management simple, reliable, and cost-effective
- The 10-gigabit core backbone enables real-time aggregation of massive video and data flows
- Sub-20 ms Ethernet resilience (@ 250 switch load) and wide temperature operation ensure excellent reliability

▶ Key Products



MXview
Industrial Network
Management Software



ICS-G7850A
48G + 2 10GbE Modular
Managed Ethernet Switches



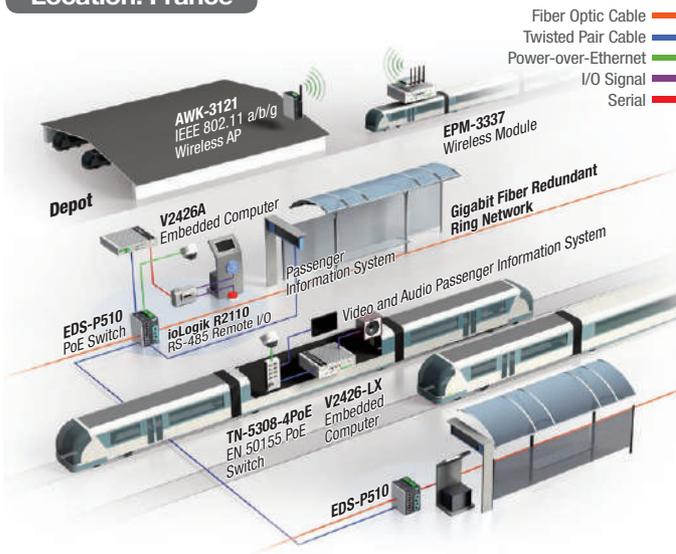
EDS-611/619
8+3G/16+3G-Port Compact
Modular Managed Switches



VPort 461A-T
1-Channel H.264 Industrial
Video Encoder

Tramway Integrates Ticketing and Onboard Systems over Fiber Network

Location: France



System Introduction

A major tramway linking northern and southern communities in a highly-populated region of France will stretch 14.5 km and have 31 stations. To ensure that this transportation development project can be completed under budget, the tramway network infrastructure must be highly cost-effective and perform with industrial reliability, particularly since France has more than 20 tram networks country-wide. Onboard passenger infotainment is delivered via audio speakers and display boards, and IP cameras are used to ensure smooth tramway operation. During maintenance, vehicles will connect with the depot via secure wireless access points, and for passenger convenience, tickets will be available at each tramway station through automated ticketing kiosks.

Network Requirements

- Long-distance data transmission between ticketing kiosks
- Redundant network connectivity to ensure system operations
- Industrial-grade durability to withstand onboard shock and vibration
- Cost-effective solution

Why Moxa?

- Turbo Ring and Turbo Chain technologies for Gigabit recovery time < 50 ms (@ 250 switches)
- Complete edge-to-core solutions for high interoperability
- EN 50155 certification for onboard applications

Key Products



TN-5308-4PoE
8-Port EN 50155 PoE Ethernet Switch



AWK-3121
Industrial IEEE 802.11a/b/g Wireless AP/Bridge/Client



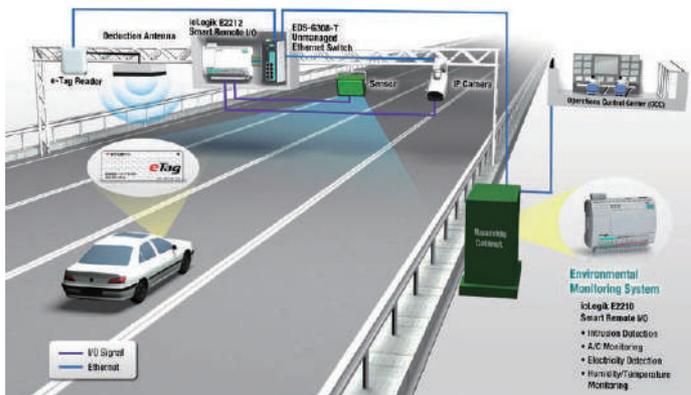
V2426A
x86-Based Celeron/Core i7 EN50155 Embedded Computer



EDS-P510A-8PoE
8+2G-port Gigabit PoE+ Managed Ethernet Switches with 8 PoE+ ports

Enabling 99.99% Tolling Accuracy for the World's No. 1 ETC Network

Location: Taiwan



System Introduction

Commissioned by the Taiwan Area National Freeway Bureau (TANFB), FETC (Far Eastern Electronic Toll Collection Company) designed a nationwide electronic toll collection (ETC) system that allows freeway users to pay toll fees without stopping their vehicles at tollgates. The ETC system's scope included the development of an automated information system that collects distance-based toll charges and trip data within milliseconds of vehicles passing by, as well as to safeguard the roadside cabinets to ensure the integrity and accountability of vital data. Furthermore, to overcome the challenges presented across 325 gantries, the products need to be installed to work in changeable weather conditions without any support from a fan or heater.

Network Requirements

- A high-speed I/O scanning rate to capture pulse signals from laser sensors
- Broad bandwidth to transfer high volumes of data and images
- Weatherproof durability for 24/7 operations
- Easy integration with the back-end IT system
- Environmental monitoring of roadside units.

Why Moxa?

- -40 to 75°C wide operating temperature range for 24/7 nonstop operation
- Fast I/O latency under 4 milliseconds for data accuracy and integrity
- Smart I/O devices for diverse environmental monitoring, including intrusion detection and sending alerts.
- Gigabit data and image transmissions for information efficiency
- IT-friendly SNMP communication for easy integration

Key Products



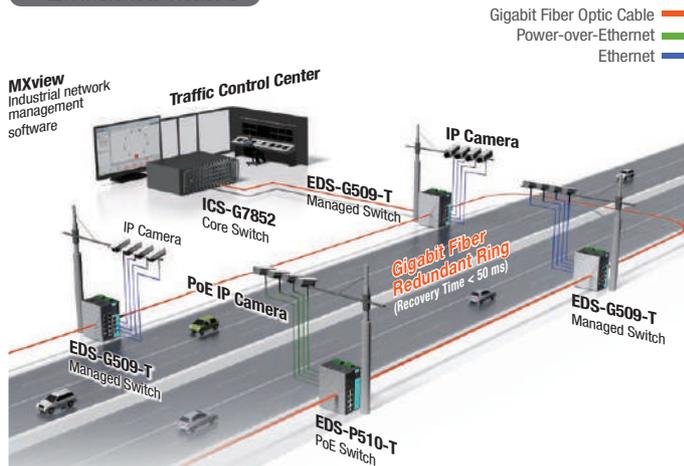
ioLogik E2210
Smart Remote I/O with 12 DIs, 8 DOs



EDS-G308-T
8G-port Full Gigabit Unmanaged Ethernet Switches

Highways Deployed HD IP Surveillance with Network Management

Location: China



▶ System Introduction

The “Safe City” program, launched nationwide in 2006, has triggered the installation of millions of surveillance cameras across China in over 600 cities. Surveillance systems are increasingly implementing high-definition IP cameras and many have also deployed PoE-based IP cameras to take advantage of straightforward deployment, cost-effectiveness, and easy maintenance. These high-definition IP cameras will provide real-time traffic information via fiber transmission for traffic management teams at the central command center and assist government agencies with vehicle tracking when needed.

▶ Network Requirements

- Gigabit fiber network backbone for large volumes of video transmissions
- Network redundancy with secure data encryption capability
- Intelligent network management software to monitor all network nodes
- Wide-temperature tolerance for outdoor operation
- Rugged and compact design for installation in roadside cabinets

▶ Why Moxa?

- Redundant Gigabit Turbo Ring technology for fast recovery time < 50 ms (@ 250 switches)
- Moxa’s MXview industrial network management software can monitor up to 2,000 network nodes
- All Moxa products are available in -40 to 75°C wide operating temperature models

▶ Key Products



ICS-G7852A
10GbE-Port Layer 3 Full Gigabit Modular Ethernet Switch



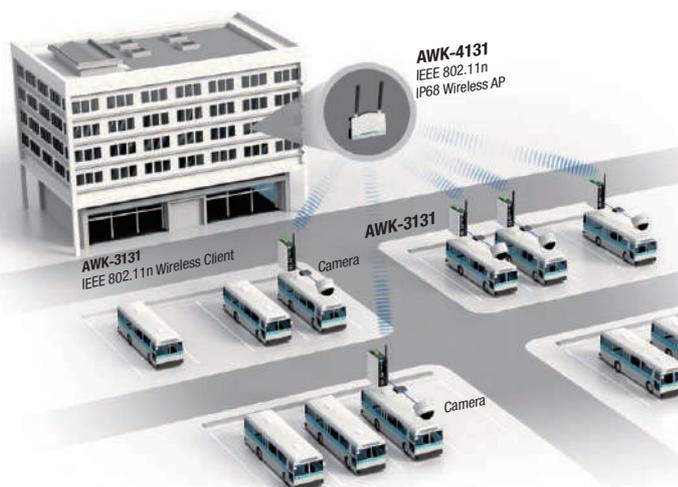
EDS-G509-T
9G-port Full Gigabit Managed Switch



MXview
Industrial Network Management Software

Video Transmission over IEEE 802.11n WLAN for Bus Surveillance

Location: U.S.A



▶ System Introduction

A transportation company in Hawaii serves thousands of travelers each day across over 100 routes with 50 bus vehicles. The administration wanted to implement an intelligent surveillance system to provide standard video recordings (300 dpi) during normal operating conditions but also be able to capture high-definition (720 dpi) video footage. The enhanced recording of the event will be stored on the bus until it can be extracted via a wireless connection when the vehicle returns to the depot. The file size for 20 minutes of 720 dpi video is approximately 200 MB.

▶ Network Requirements

- Substantial bandwidth will be required to upload high-definition video via a wireless connection to the depot command center
- Wireless access points must work reliably when exposed to high humidity, constant downpours, and the rusting effects caused by salty sea water

▶ Why Moxa?

- IEEE 802.11n transmission with MIMO capabilities provides data rates of up to 300 Mbps to provide efficient transfer of 720 dpi video footage from the bus to the control center
- IP68 rated (AWK-4131 only) for outdoor protection against severe rain, and corrosion-resistant connectors against the salty precipitation to reduce maintenance effort

▶ Key Products



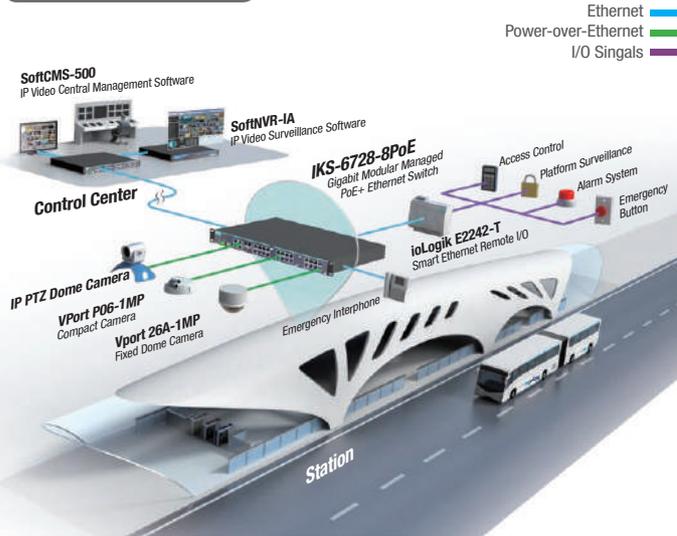
AWK-3131
IEEE 802.11a/b/g/n WLAN AP/Bridge/Client



AWK-4131
IEEE 802.11a/b/g/n IP68 WLAN AP/Bridge/Client

PoE-Wired Surveillance for City Bus Transportation

Location: Taiwan



System Introduction

The city of Taichung, Taiwan, has invested in six BRT lines that together cover the entire city, and a real-time control and monitoring system is essential to ensure safe and smooth operation for the entire BRT system. The network mainly covers all BRT stations and the control center. Taking into consideration the hierarchical nature of BRT systems, the best solution for the application is to build a powerful Ethernet backbone to support centralized management and massive data and video aggregation from the more than 40 BRT stations.

Network Requirements

- Centralized video management with multiplex operations of live display, recording, playback, and alarm reports
- Easy location awareness and event alerts
- Proven reliability for non-stop operations

Why Moxa?

- Tailor-made solution offers full-function integration, cost-effective deployment, and easy management
- 24+4G-port rackmount switches offer 8 PoE ports and high-density connection to surveillance cameras, ticketing systems, security alarms, and emergency call-out systems
- IP cameras offer several compact options, extended temperature operation, and PoE connections
- Perfect video software for centralized management: SoftNVR-IA for intelligent recording, and SoftCMS for video management

Key Products



SoftNVR-IA
64-Ch IP Surveillance Software

SoftCMS-500
500-channel Central Management Software



VPort 26A-1MP
1280 x 720HD, -40 to 50°C, Fixed Dome Camera

VPort P06-1MP
1280 x 800HD, -25 to 55°C Mini Dome Camera



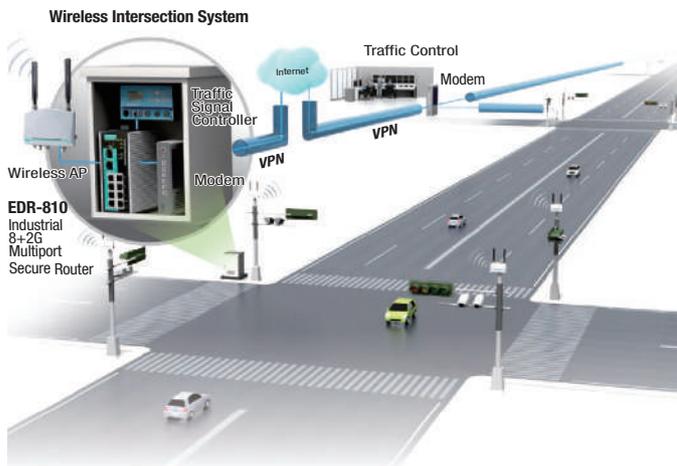
IKS-6728A-8PoE
24+4G-Port Modular PoE+ Managed Switch



ioLogik E2242-T
Smart Ethernet Remote I/O with Click&Go™ Logic

Secure Traffic Signal Controls over Public Networks

Location: U.S.A



System Introduction

Henrico County, USA, wanted to upgrade existing closed-loop traffic signaling control systems to a distributed traffic management system comprised of 140 intersections with traffic signals. Before upgrading, only 25 intersections were interconnected while the remaining 115 intersections used isolated signal control circuits.

The new signaling network will have a distributed architecture, where the central operation center can communicate with each local traffic signal controller over a public network for real-time monitoring and emergency response.

Network Requirements

- Real-time performance and durable outdoor connectivity
- Encrypted network connections between 140 intersections and the traffic control center
- NEMA TS2 compliance to enable coordinated-actuated traffic signal operations

Why Moxa?

- Cost-effective deployment with Moxa's EDR-810 secure router that offers Firewall, NAT, VPN, and switch functions all in one device
- 8+2G ports for Ethernet and VPN connections
- Secure data connection with 20 Mbps VPN bandwidth for remote communication and centralized control
- Dual power inputs for redundancy
- NEMA TS2 compliance

Key Products



EDR-810
Industrial 8+2G-Port All-in-One Firewall/NAT/VPN/Router/Switch

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. With over 30 years of industry experience, Moxa has connected more than 50 million devices worldwide and has a distribution and service network that reaches customers in more than 70 countries. Moxa delivers lasting business value by empowering industry with reliable networks and sincere service for industrial communications infrastructures.

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