MOXA®

Application Blueprint

Road Weather Information Systems

www.moxa.com

Background

The impacts of adverse weather conditions on traffic operations, quality of traffic flow and safety has been widely recognized. A Finnish study* confirmed that adverse weather can impact traffic demand. The study mentioned that in total 62% of drivers had received or looked for information on road conditions and weather during their journey or beforehand. Therefore, Road Weather Information Systems (RWIS) play a vital role to provide instant alerts about constantly changing weather and road conditions - such as poor visibility due to heavy fog or dust storms, or icy conditions that can cause cars to skid - which enables the motorist to take proper precautions and improve traffic safety for everyone.

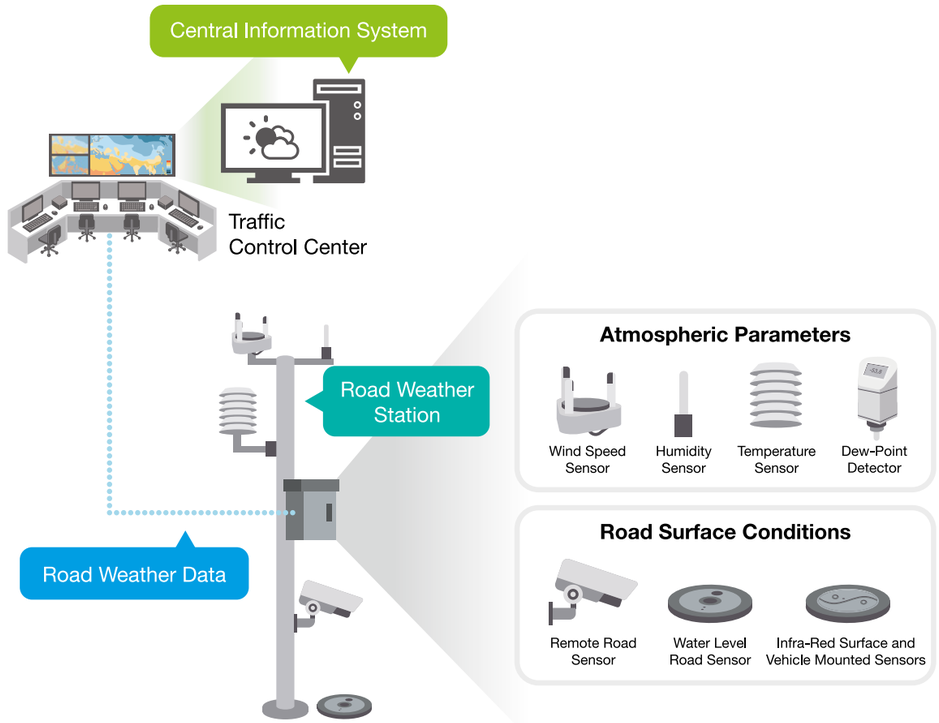
Road weather data is usually transmitted via a communication network to a central information system located at the regional traffic control center. Without reliable data communication between the remote weather stations and the central system, information cannot be relayed to the control center and disseminated to motorists.

Hence, reliable connectivity is critical!

*Source: https://cris.vtt.fi/en/publications/driver-assessment-of-road-weather-conditions-and-road-weather-inf

RWIS Topology & System Requirements

Topology



System Requirements

Low power consumption devices are required. RWIS often run on solar power modules and the frequency of packet-exchange is not high, but may have peaks of transmission, meaning large volume packets transmitted in a short time. Therefore, low power consumption, especially in idle mode, is required for networking equipment in RWIS applications.

Reliable and secure connections over cellular networks are important. Transmitting data over a wide range and across multiple sites is a challenge. RWIS are usually installed along the roads without connectivity to power and not connected to the network of highway infrastructures. Building a wired network with Ethernet cable or optical fiber cables is neither practical, nor a cost-effective option. Hence RWIS usually use cellular connections. In order to secure a stable remote connection, it is essential to have a connection recovery and backup mechanism which does not require onsite rebooting of cellular gateways. Data security is mandatory for RWIS when transmitting information over cellular networks and unsecured public connections. Therefore, end-to-end encryption or private networks are desired.

OT and IT protocols must be supported. Traffic control centers use IT protocols as mutual common language for communicating with respective network sub-systems. As most field sensors only support OT protocols, connectivity solutions that support both OT and IT protocols are preferred. They allow easier integration and save time and effort spent on converting different data formats.

Easy-to-use and reliable connectivity solutions to collect sensor data from multiple interfaces. Road weather stations employ a wide variety of field sensors to collect atmospheric, pavement, and water level conditions. These sensors often use different communication interfaces, such as digital, analog, or serial, to collect I/O data, which can make connecting, maintaining, and replacing multiple sensors extremely daunting. So, a reliable connectivity solution that provides easy-to-use hardware and software configuration is required.

Compact size, rugged, and reliable solutions are essential for roadside cabinets. The surge and intrusion detectors, voltage, temperature, wind speed, humidity sensors, and cameras are deployed in various road weather information systems. These need to be connected to the network in order to transmit data to the control center. In this context, the size, mounting types, level of functional integration, and reliability of communication devices to be installed in the space-limited roadside cabinets, must be carefully considered. A durable system reduces operating costs throughout the lifecycle as equipment is deployed mostly in harsh outdoor environments.

Moxa Solution

Security

Moxa has developed firewalling/IPS/IDS products to ensure data **security** is maintained and the OT/IT interface and policies are not impacted in any way.

Connect Multiple Data Nodes, Using OT/IT Protocols

Moxa ioThinx 4510 is ideally suited where customers want to **connect multiple data nodes, using OT/IT protocols** and provide a secure linkage to the main IT environment.

Central Supervision Network Management Software

Moxa has a **central supervision network management software** called MXview, which monitors all Moxa devices and supported 3rd party devices. This is done through SNMP MIB files, offering control centers the capability to monitor and visualize the connection status of networks within visibility via topology and multiple notifications. The control center can use this software for proactive monitoring, integration into IT/OT systems, maintenance (firmware upgrade and configuration change), failure troubleshooting, and network overview for operational use.

Secure Remote Access Solutions

Moxa has various **secure remote access solutions** to meet industrial business needs. For Road Weather Information Systems, Moxa recommends the Oncell product series with dual SIM and Guaranlink functionalities which guarantee hazzle-free stable cellular connectivity. Also, those devices deliver excellent low power consumption, especially when in idle mode.

QoS and Queue Prioritization

Moxa high-capacity switches have **QoS and queue prioritization** features in addition to hybrid Fast or Gigabit Ethernet interfaces, which allows not only high transmission speeds, but the packets are intelligently and automatically prioritized.

IEC-62443-4-2

Staying at the cutting edge of market trends, most of Moxa's products already provide security features corresponding to the requirements of **IEC-62443-4-2.**

Compact Products

Considering limited space in cabinets and outdoor environments, Moxa has a complete portfolio of **compact products** designed for rugged applications such as cellular routers, managed/unmanaged switches, serial device servers, remote IOs, and more.

Quickly Overcome Any Issues

Moxa devices, especially switches, support methods of debugging at device and system level, aiding the user to **quickly overcome any issues** that develop within the topology. Such facilities include port mirroring and event logging as well as internal tables for connection and redundancy port control monitoring.

Success Story

To achieve this, a system integrator helped develop road condition monitoring systems across 500 stations in Lithuania. Each station had sensors and IP cameras installed at roadside cabinets.

The Lithuanian road administration wanted to provide drivers with real-time road and weather condition updates on their website to improve travel experience.

Moxa's OnCell 5104-HSPA cellular routers, ioLogik E2242-T remote I/Os, and NPort 5150A-T serial device servers were used to connect these field devices and transmit both sensor and image data back to the traffic control center via cellular networks.

Building Reliable Connectivity for Road Condition Monitoring

Location: Lithuania

- One-stop shop for serial device servers, remote I/Os, and cellular routers
- Rugged design: -40 to 75°C wide temperature range
- Supports IF-THEN-ELSE control logic rules with our Click & Go function

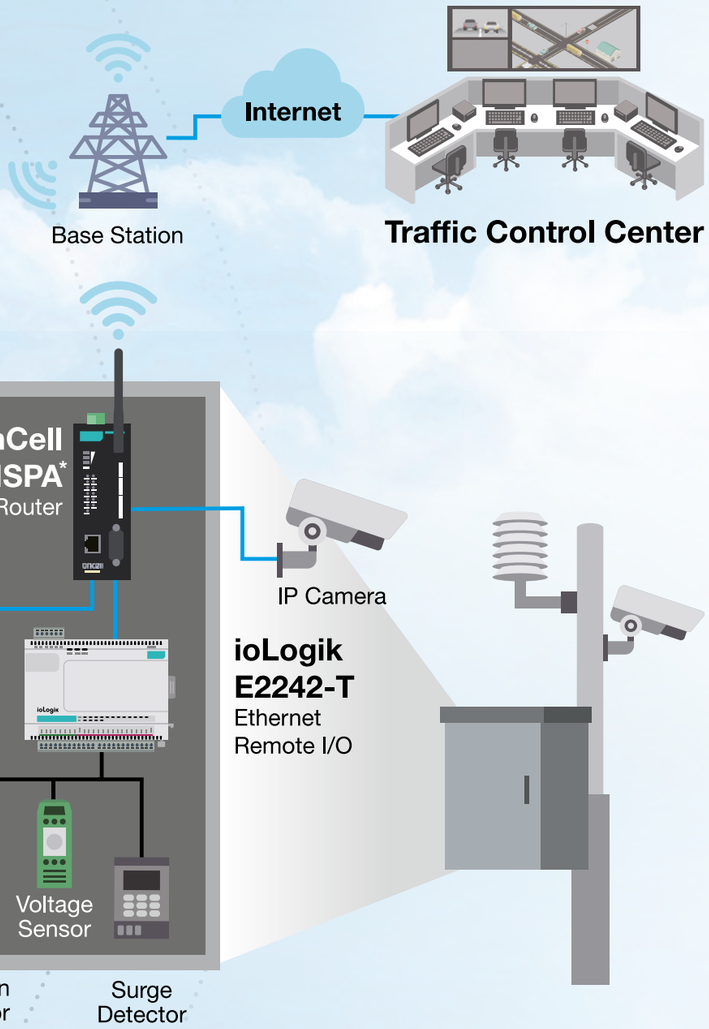
Our remote I/O features a smart function called Click & Go that allows operators to set up simple control logic rules during system operation without additional programming.

ioLogik E2242-T
Ethernet Remite I/O

NPort 5150A
Serial Device Server

OnCell 5104-HSPA
Cellular Router

For smooth data transmissions, our cellular routers support 4 Ethernet ports to get serial, I/O, and video data online and built-in dual-SIM redundancy so that operators can create a backup cellular link in case one of the telecom services becomes unavailable.



* OnCell 5104-HSPA is end-of-life and the replacement is the OnCell 3120.

Why Moxa

Moxa is an industrial connectivity and networking solution provider with over 30 years of industry experience.

- Moxa has a comprehensive industrial networking, computing, edge connectivity product portfolio.
- Moxa's products are certified for use in many industrial markets, easing the process of moving from design to device integration considerably.
- Moxa provides a one-stop-shop which is very time-saving and free from concerns regarding the compatibility between the products and systems.
- Moxa has a strong distribution network in Europe and South Africa to support local customers.
- Moxa has an excellent reputation for technical/ sales service and delivery support.

Moxa products have a long MTBF, which reduces system maintenance and repair costs.
Product quality is highly assured.

Moxa has strong R & D ability and focus on innovative product developments.

Strong Distribution Network

Moxa has a strong global distribution network to support local customers.

Complete High-Bandwidth Solution

A complete portfolio of secure high-bandwidth solutions that empowers data-rich ITS applications.

Trust in Moxa Quality

Moxa products have a long MTBF, which reduces system maintenance and repair costs.

Choose an

Ultra-small and Versatile Unmanaged Switch

Moxa's wide array of industrial unmanaged switches provide rock-solid reliability that withstands extreme conditions to earn the confidence and satisfaction of global customers through thousands of long-term deployments around the world.

Extra-Small Design

Ultra-small design for easy placement into control cabinets

QoS and BSP Functions

These two functions enhance data efficiency

Reliability

The device can operate in extreme cold and hot conditions

EDS-2000-EL/ELP/ML series

Features

- Compact size for easy installation
- QoS supported to process critical data in heavy traffic
- IP40-rated metal housing (EL/ELP series)
- Redundant dual 12/24/48 VDC power inputs (ML series)
- Relay output warning for power failure and port break alarm (ML series)
- 5 to 18 port options

Unmanaged Switches

Entry
Best Value

Advanced
High-port Density

Standard
Hardened Design

Full Gigabit
High Bandwidth

	EDS-2000-EL	EDS-2000-ML	EDS-200A	EDS-G200/G300
Features	• Extra-small size • QoS, BSP DIP switch • Metal/plastic housing	• High port density • QoS, BSP DIP switch • Relay output warning	Redundant dual 12/24/48 VDC inputs	• Fiber Gigabit connections • Jumbo frame supported for enhanced performance
Ethernet Ports	5/8	10/16/18	5/8	5/8
Gigabit Ports	–	2	–	5/8
Fiber Ports	Up to 1*	Up to 2	Up to 2*	Up to 2*
Operating Temp.	-10 to 60°C / -40 to 75°C (-T models)			
Industrial Certifications	CE/FCC, UL 61010-2-201, EN 62368-1 (LVD), CISPR (EN 55032)	C1D2, ATEX, IECEx, DNV**, EN 50121-4, NEMA TS2, UL 61010-2-201	C1D2, ATEX, IECEx, DNV, ABS, LR, NK, EN 50121-4, NEMA TS2, UL 508 ***	

*Available for some models only.
**DNV is for the EDS-2010/2018-ML Series only.
***IECEx is for the EDS-205A Series only, NEMA TS2 is for the EDS-200A Series only.

Choose a

Simple and Efficient Smart Switch (lightly managed switch)

Moxa's smart switches simplify daily tasks for industrial automation (IA) engineers with easy configuration and installation, interoperable communication, and ultimately, help reduce downtime.

OT Management

One click to enable SCADA/HMI/NMS integration and support Ethernet/IP, PROFINET, and Modbus TCP protocols

Robust Reliability

Supports RSTP/STP/MRP (Client) network redundancy and the security features based on IEC 62443 standard

Ease of Use

One-page dashboard GUI for easy configuration and diagnostic reports

SDS-3008/3016 Series

Features

- Compact and flexible housing design to fit into confined spaces
- Multi-language web GUI: English, German, French, etc.
- Supports RSTP/STP and MRP Client (SDS-3016 only) for network redundancy

8/16-port Smart Switches

	SDS-3008	SDS-3016-2GTX	SDS-3016-2GSFP
Total No. of Ports	8	16	16
10/100Mbits/s RJ-45 Ports	8	14	14
10/100/1000Mbits/s RJ-45 Ports	–	2	–
10/100/1000Mbits/s SFP Ports	–	–	2
Wide-temp. Available	Yes	Yes	Yes
Rotary Switch Protocol Config.	No	Yes	Yes

Choose a

Reliable and Versatile, Yet Cost Effective Managed Switch

Moxa's layer 2 managed switches, EDS-400 series, support a variety of useful management functions. The ready-to-use Turbo Ring can be set up easily using the web-based management interface.

Cost Effective

Fully-managed switch family provides visibility on network and redundancy solution with fast recovery (<20 msec)

Extremely Flexible

Large number of port options, industrial certificates, support for industrial protocols

Suitable for ITS & CCTV Market

Supporting built-in fibre optics, redundancy, supporting multicast and IGMP

EDS-400A Series

Features

- Turbo Ring and Turbo Chain (recovery time < 20 ms @ 250 switches), RSTP/STP, and MSTP for network redundancy
- Easy network management by web browser, CLI, Telnet/serial console, Windows utility, and ABC-01
- Supports MXstudio for easy visualized industrial network management

Fixed-type Managed Switches

	EDS-400A
Switch Types	Layer 2
No. of Ports	5, 8
Gigabit Ports	–
Fiber Ports	Up to 3*
Fiber Type	ST, SC
Indutrial Certifications	C1D2, ATEX Zone 2, IECEx*, DNV, EN 50121-4, NEMA TS2

* Available for selected models only.

Choose a

Reliable and Secure LTE Cellular Gateway

Moxa's LTE gateways bring an efficient way to implement high-performance, long-distance network applications with ease. The robust built-in VPN security and reliable cellular connectivity enable secure and uninterrupted data collection from serial and Ethernet devices.

Power Efficient

Low power consumption enables solar-powered battery operation

GuaranLink Reliability
Secure Wireless

GuaranLink enables uninterrupted connectivity to your devices

Secure Wireless

Secure wireless for remote control

Oncell 3120-LTE-1 Series

Features

- Low power consumption with time scheduling power saving (Oncell 3120-LTE-1 series)
- Serial and Ethernet to cellular solution
- GuaranLink for reliable cellular connectivity
- Dual cellular operator backup with dual-SIM
- Rugged hardware design well suited for hazardous locations (ATEX Zone 2/IECEx)
- VPN secure connection capability with IPsec, GRE, and OpenVPN protocols

Cellular Secure Gateways

	OnCell 3120-LTE-1	OnCell G3150A-LTE
4G	LTE Cat 1	LTE Cat 3
Supported Bands	EU, AU, US	EU
Ethernet Ports	2 FE	1 FE
Serial Ports	1 x RS-232/422/485	
VPN	IPsec, GRE, OpenVPN	IPsec, GRE, OpenVPN
NAT/Firewall	NAT, Port forwarding, IP/MAC/Port filtering	

Choose a

Serial Device Server

Bringing serial-based legacy devices into an Ethernet-based network can be easy. Moxa provides the best-in-class serial device servers for your industrial applications.

Your Trusted Serial Partner

We pledge to provide long-term availability of serial products and continuous driver support

Intuitive User Interfaces

Intuitive user interfaces that simplify configuration and operation, making connectivity simple and easy

Field-Proven Quality

Field-proven quality that endures harsh environments for any industrial applications

NPort Series

Features

- Low power consumption
- Compact design for fitting in cabinets
- Easy-to-use: 3-step web-based configuration
- -40 to 75°C operating temperature

General and Industrial Device Servers

Standard
General-purpose applications

Standard
General-purpose applications

Compact
High-port density in small form factor

	Model	NPort 5100A/ 5200A/5400	NPort 5600	NPort 5600-DT/DTL
Basic	Serial Ports	1-4	8/16	8
	RS-232/422/485	•	•	•
	Ethernet	1	1	1
	Window/Linux Driver	•	•	•
Security	Login Authentication	Password Protection (length, character enforcement)	Password Protection (length, character enforcement)	Password Protection (length, character enforcement)
	Console Management	• HTTPS • Unused services can be disabled	• HTTPS • Unused services can be disabled	• HTTPS • Unused services can be disabled
	Network Access Control	Accessible IP List	Accessible IP List	Accessible IP List
Reliability	Industrial Certifications	–	–	–
	Serial Isolation	•	•	•
	Wide Temperature	•	•	•

Choose a

Remote I/O Product

Moxa provides a wide range of remote I/O products for industrial automation in factories, energy, transportation, and city infrastructure applications.

Multiple Protocol Support

Supports various IT protocols and Modbus TCP protocol for easier deployment in different applications

Easy Configuration and Deployment

Supports a built-in web interface for quick configuration and an utility for mass deployment

Wide Selection

Compact standalone and modular I/O solutions for versatile data acquisition applications

ioThinx 4510 Series and Modules

Features

- Expansion Modules: 32
- IT Protocols: SNMPv1/v2c/v3, SNMPv1/v2c/v3 Trap, SNMPv2c/v3 Inform, RESTful API, MQTT
- OT Protocol: Modbus TCP Server (slave)
- Gateway Function: Modbus RTU Master to Modbus TCP, SNMP, RESTful API, MQTT
- Operating Temperature: Standard Models: -20 to 60°C; Wide Temp. Models: -40 to 75°C

Module	45MR-1600	45MR-1601	45MR-2600	45MR-2601	45MR-2606	45MR-2404	45MR-3800	45MR-3810	45MR-4420	45MR-6600	45MR-6810
Digital Inputs	16 (PNP)	16 (NPN)	–	–	8 (PNP)	–	–	–	–	–	–
Digital Outputs	–	–	16 (sink)	16 (source)	8 (source)	–	–	–	–	–	–
Relays	–	–	–	–	–	4 (N.O.)	–	–	–	–	–
Analog Inputs	–	–	–	–	–	–	8 (0/ 4-20 mA)	8 (-10/ 0-10 V)	–	–	–
Analog Outputs	–	–	–	–	–	–	–	–	4 (0/4-20 mA, 0-10 V)	–	–
RTDs	–	–	–	–	–	–	–	–	–	6	–
Thermocouples	–	–	–	–	–	–	–	–	–	–	8

ioLogik E2000 Series

Features

- Active OPC Server for seamless connection to SCADA systems
- Smart alarm management with email, SNMP trap, TCP, and UDP
- Front-end intelligence with patented Click&Go Plus™ control logic, up to 48 rules
- -40 to 75°C operating temperature range

Inputs/Outputs	E1210	E1211	E1212	E1213	E1214	E1240
Digital Inputs	8	8	8	–	–	–
Digital Outputs	–	–	–	–	–	–
Relays	–	–	–	–	–	–
Configurable DIO's	8	8	8	12	12	12
Analog Inputs	–	–	–	4	4	4
Analog Outputs	–	–	–	–	–	–

Gain Visibility

to Boost Your Network Availability

MXview is an industrial network management software that provides full visibility and troubleshooting functions for OT networks to ensure maximum uptime throughout all stages of network deployment, management, and maintenance.

Visualization for Easy Operation

Network Insight for Uptime Optimization

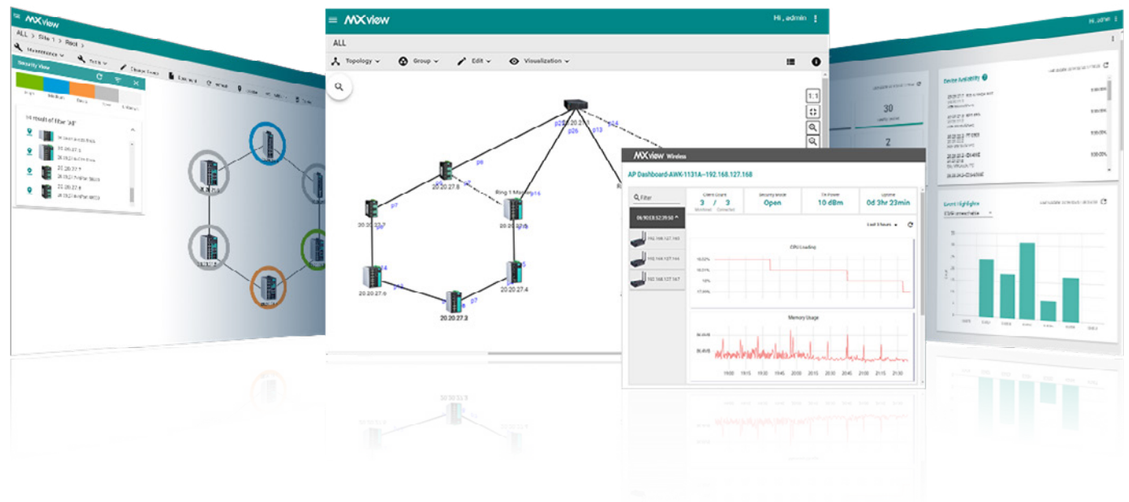
Easy Integration Into Your IT/OT System

Try Out MXview

Download the free trial version here

Features

- Live topology visualization
- Comprehensive analysis and historical data report
- Easily embed MXview into OT/IT systems
- Dashboard view with a complete network summary
- Instant alerts with multiple communication systems



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 30 years of industry experience, Moxa has connected more than 70 million devices worldwide and has a distribution and service network that reaches customers in more than 80 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**.

Moxa Americas

USA
Toll Free: 1-888-MOXA-USA
Tel: +1-714-528-6777
Fax: +1-714-528-6778
usa@moxa.com

Brazil
Tel: +55-11-95261-6545
brazil@moxa.com

Moxa Europe

Germany, France, UK
Tel: +49-89-37003-99-0
Fax: +49-89-37003-99-99
europe@moxa.com

Moxa Asia-Pacific and Taiwan

Asia/Japan/Taiwan
Tel: +886-2-8919-1230
Fax: +886-2-8919-1231
asia@moxa.com
japan@moxa.com
taiwan@moxa.com

India
Tel: +91-80-4172-9088
Fax: +91-80-4132-1045
india@moxa.com

Russia
Tel: +7-495-287-0929
Fax: +7-495-269-0929
russia@moxa.com

Korea
Tel: +82-2-6268-4048
Fax: +82-2-6268-4044
korea@moxa.com

Moxa China

Shanghai
Tel: +86-21-5258-9955
Fax: +86-21-5258-5505
china@moxa.com

Beijing
Tel: +86-10-5976-6123/24/25/26
Fax: +86-10-5976-6122
china@moxa.com

Shenzhen
Tel: +86-755-8368-4084/94
Fax: +86-755-8368-4148
china@moxa.com