Easy Integration of Renewable Energy Solutions Into the Power Grid

Country: Australia

Background & Requirements

- In a power substation, SCADA monitors power generation and consumption. However, newly purchased IEDs run the IEC61850 protocol, whereas the legacy SCADA and battery management system (BMS) run Modbus TCP. Overcoming this compatibility issue was required.

Why Moxa

- Easy to configure and import the relay CID file to the MGate
- Data Tag View displays real-time value read by the MGate and allows testing write values to devices for easy communication testing
- The rugged design and wide operating range of the MGate help withstand the impact of direct sunlight on cabinets

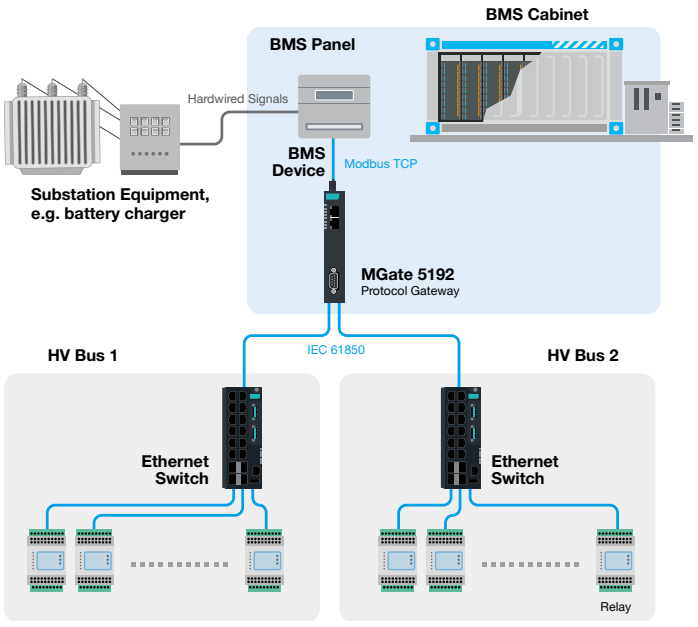
Moxa Products

MGate 5192 Series
IEC 61850-to-DNP3/IEC 101/ IEC 104/Modbus gateways

Newly built power utilities typically adopt IEC 61850 technology, originally designed for electrical substations. However, existing grid systems include legacy equipment with long lifespans that is only replaced when damaged or required by regulations. Consequently, a mix of legacy and new technologies coexists within the power grid. Existing substations or power grids commonly use legacy communication protocols, such as Modbus TCP, as seen in an Australian battery management system (BMS). Therefore, integrating new relays running on IEC 61850 into existing Modbus TCP BMS systems is a major challenge.

The MGate 5192 Series protocol gateway provided a seamless solution for integrating IEC 61850 with Modbus TCP. Importing the IEC 61850 CID file into the MGate enabled users to quickly retrieve relay settings and configure protocol conversions. Active read and write functions in the MGate 5192 Series facilitated testing without complete system connectivity. The MGate's rugged design and wide temperature range ensured reliable long-term operations, even in harsh environments like sunlit cabinets. Furthermore, the gateway's secure boot feature and support for encrypted data enabled safe conversion and transmission of information.

With the MGate 5192 Series, power grid operators can now ensure modern power grids have high availability, reliability, and security. The gateway streamlines the integration of new IEC 61850 technology into existing Modbus TCP systems, enhancing the efficiency of grid retrofitting processes. This solution not only simplifies protocol conversion but also maintains system integrity and security, crucial for the robust operations of modern power utilities.



MOXA®

Seamless Integration of Renewable Energy Solutions Into the Power Grid

Country: Vietnam

Background & Requirements

- The customer's existing solutions, such as local SCADA, weather station, inverter cabinet, string combiner box, communicate through Modbus TCP.
- The solar farm must report its power quality status to the National Power Grid, which uses IEC 60870-5-104 as its communication protocol.

Why Moxa

- Modbus TCP to IEC 60870-5-104 conversion
- An easy-to-use web console for fast configuration
- A protocol troubleshooting tool for quickly identifying root causes

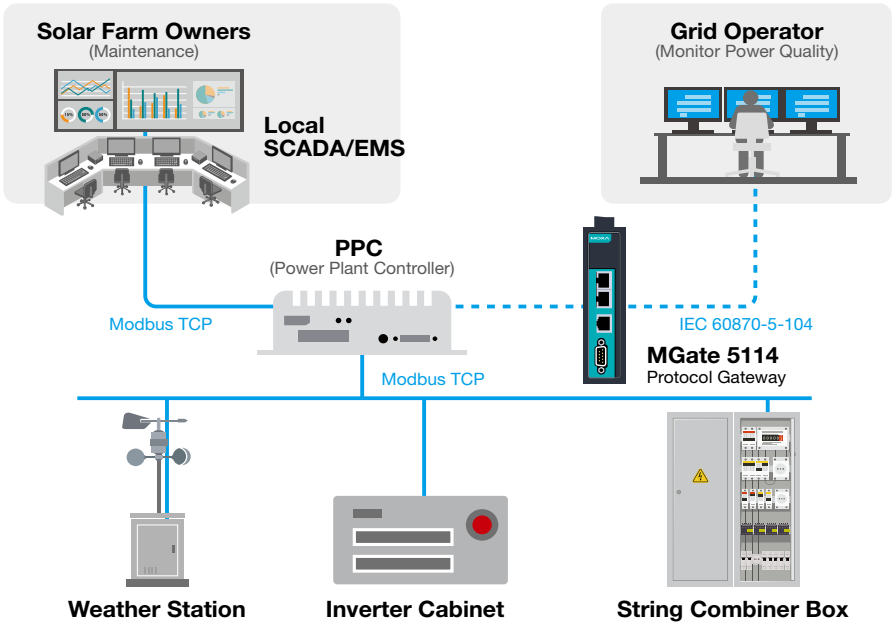
Moxa Products

MGate 5114 Series
Modbus RTU/ASCII/TCP/IEC 101-to-IEC 104 gateways

Connecting different communication protocols poses a significant challenge for system integrators who are integrating renewable energy solutions into the power grid. In Vietnam, our system integrator faced a complex situation involving the adoption of the end customer's solutions in a renewable energy operation. The entire system, including the local SCADA/EMS, weather station, inverter cabinet, and string combiner box, operated on Modbus TCP. However, the power quality status of the solar farm needed to be reported to both the local SCADA and the National Power Grid, which uses IEC 60870-5-104 as its communication protocol.

The MGate 5114 protocol gateway provided an effective solution for converting between Modbus TCP and IEC 60870-5-104. Thanks to a user-friendly web console, configuration was made easy. The web console is easily accessible via the network where the MGate is located. A built-in protocol troubleshooting tool on the console enabled users to swiftly address issues during testing and maintenance. Additionally, our team ensured comprehensive support throughout the deployment and operational stages, guaranteeing a seamless integration process.

With the MGate 5114 Series, the system integrator achieved reliable communication between the renewable energy field and the National Power Grid. The protocol gateway made data reporting efficient and streamlined the integration of Modbus TCP with IEC 60870-5-104. This solution not only made the conversion process simpler but also offered strong troubleshooting and continuous support, ensuring the smooth operation of the renewable energy system in the power grid infrastructure.



Integrating Factory Solar Power Monitoring With Existing Devices

Country: China

Background & Requirements

- Dashboard collects data from meters and inverters through a logger, all operating on Modbus RTU.
- Added their own solar PV monitoring system running on Modbus TCP to get additional data such as sunshine intensity, effective generation hours, and inverter efficiency.
- Favored the stability of Ethernet cables over GPRS.

Why Moxa

- Seamlessly integrates with the existing Modbus RTU system while adding a new Modbus TCP monitoring system for data retrieval
- Ensures stable Modbus conversion
- User-friendly web console for seamless operations
- Features a second Ethernet port and traffic monitoring for easy maintenance
- Rugged hardware design for durability

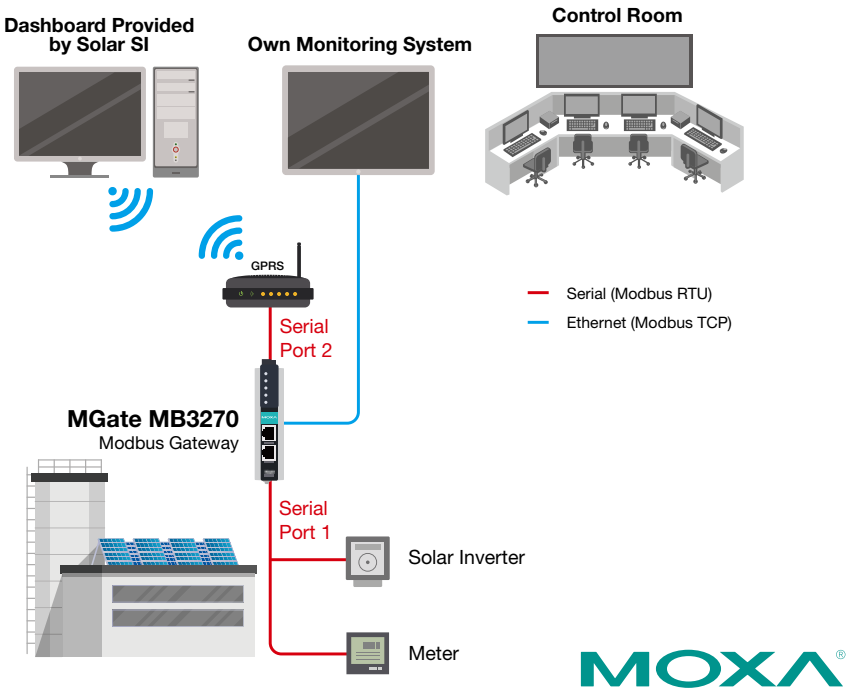
Moxa Products

MGate MB3170/MB3270
Serial-to-Ethernet Modbus Gateways

A manufacturing company partnered with a solar system integrator to monitor solar energy consumption at their factory. Initially, data from meters and inverters were collected using a logger on the Modbus RTU protocol and displayed on a dashboard for monitoring. However, the company faced limitations with this setup, such as incurring extra costs and difficulties in customizing monitored data items.

To overcome these challenges, the company kept the original Modbus RTU system and added a new monitoring system using Modbus TCP to gather additional data, including sunshine intensity, effective generation hours, and inverter efficiency. The MGate MB3270 Series provided the ideal solution, seamlessly integrating the existing Modbus RTU system with the new Modbus TCP monitoring system to retrieve data. The MGate MB3270's user-friendly web console simplified operations, while its rugged hardware design ensured durability. Additionally, the second Ethernet port and traffic monitoring tool of the gateway made maintenance easier.

This solution allowed the company to keep the original system intact while gaining the flexibility to adjust monitored data at no extra expense—greatly improving operational efficiency. The MGate MB3270 Series ensured stable Modbus conversion and reliable data integration, resulting in a more efficient and customizable solar energy monitoring system for the manufacturing company. The company improved energy management and saved costs by using the MGate MB3270 Series to monitor and optimize solar energy usage.



Enabling Connectivity for AC Power Monitoring

Country: U.S.

System Requirements

- Modbus RTU-to-Modbus TCP conversion
- Collecting both proprietary data and digital input data
- A single tool to configure and maintain Moxa products

Why Moxa

- A comprehensive product portfolio of Modbus gateways, serial-to-Ethernet servers, and remote I/Os
- Supports MXconfig and MCC tools for easy configuration and maintenance
- Protocol troubleshooting tools to easily identify the root cause of a communication failure

Moxa Products

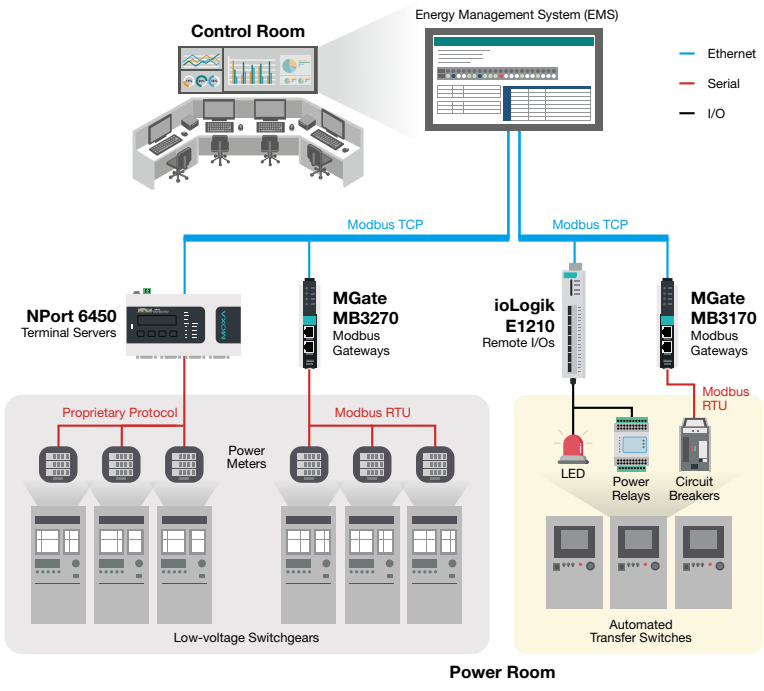
MGate MB3170/MB3270
Serial-to-Ethernet Modbus Gateways

NPort 6450
Secure Terminal Servers

ioLogik E1210
Ethernet Remote I/Os

A leading computer technology company runs several data centers in the U.S. To ensure smooth operations, a system integrator helped them develop an energy management system (EMS) to monitor the stability of AC power in their data centers. To achieve this, reliable communication between power devices, such as low-voltage switchgears and automated transfer switches (ATS), and the EMS was developed so that operators could receive power-related data timely and make quick decisions in order to reduce system downtime.

A variety of power devices inside low-voltage switchgears and ATS needed to connect and communicate with the EMS, such as power relays, power meters, and circuit breakers. Our NPort 6450 secure terminal servers, MGate MB3170/MB3270 Modbus gateways, and ioLogik E1210 remote I/Os enabled connectivity for different interfaces and protocols. Furthermore, our products support easy-to-use configuration tools, Ethernet cascading to simplify network topology, and Modbus protocol troubleshooting tools so that engineers can easily identify root causes when a communication error occurs.



Enhancing Your Power Stability With Switchgear Monitoring

Country: China

System Requirements

- Collecting large amounts of data from a variety of power monitoring devices and sensors
- The ability to endure high levels of electromagnetic interference (EMI)

Why Moxa

- IEC 61850-3 certified switches that operate under high EMI
- Modbus gateways feature an active polling mechanism for the fast acquisition of large volumes of data
- Compact remote I/Os support DI/DO/AI/AO interfaces

Moxa Products

PT-7828*
IEC 61850-3 Layer 3 Ethernet Switches

PT-7528
IEC 61850-3 Layer 2 Ethernet Switches

MGate MB3660
Serial-to-Ethernet Modbus Gateways

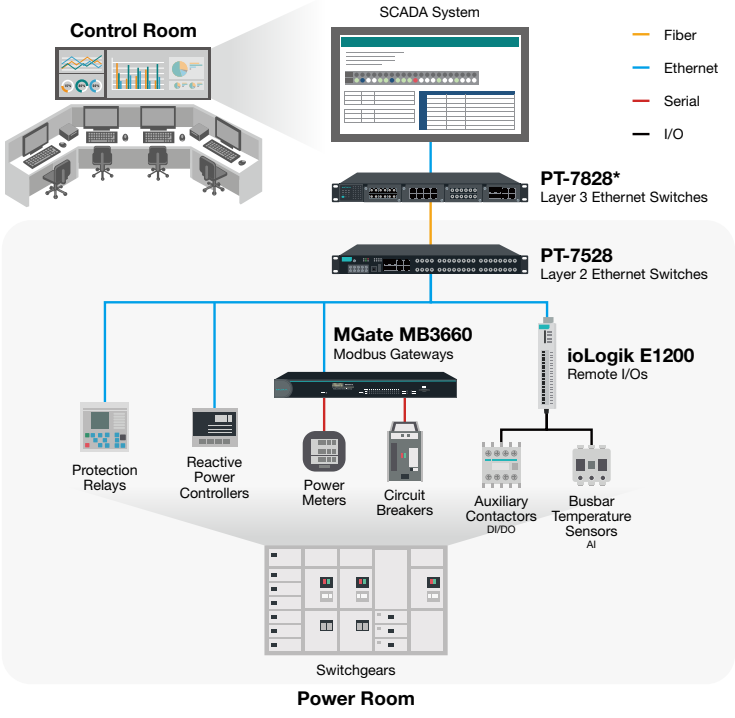
ioLogik E1200
Ethernet Remote I/Os

*Please note that PT-7828 Series has been phased out, and has been replaced by the RKS-G4028-L3 Series.

Enhancing the stability of power supply in mission-critical applications, such as data centers or semiconductor fabrication plants, requires the monitoring of switchgears deployed between power utility equipment and electrical equipment. An industry-leading power monitoring system integrator in China chose Moxa's networking solutions to enable reliable communication between the switchgears and the control center.

In the control center, our layer 3 PT-7828* Ethernet switches were deployed to collect a variety of power-related data from field sites and transmit it to SCADA systems. Our PT-7528 Ethernet switches were not only used to collect data from Ethernet-based power protection devices but also to enable reliable extensions from the switchgears to the control center through fiber-optic cables. Certified with IEC 61850-3, our Ethernet switches ensured reliable connections against high electromagnetic environments.

Inside the switchgears, numerous serial power meters had to be connected. Our MGate MB3660 protocol gateways provided up to 16 serial ports with active Modbus data polling to ensure the fast acquisition of large amounts of data. In addition, our compact ioLogik E1200 remote I/Os provided a variety of digital and analog I/O interfaces, which fit easily into cabinets, for the collection of data from auxiliary contactors and busbar temperature sensors.



Monitor Your Switchgears With Reliability and Cost-efficiency

Country: China

System Requirements

- Monitoring Modbus-based power meters via a PROFINET-based PLC
- Stable communication under extreme electromagnetic interference (EMI)

Why Moxa

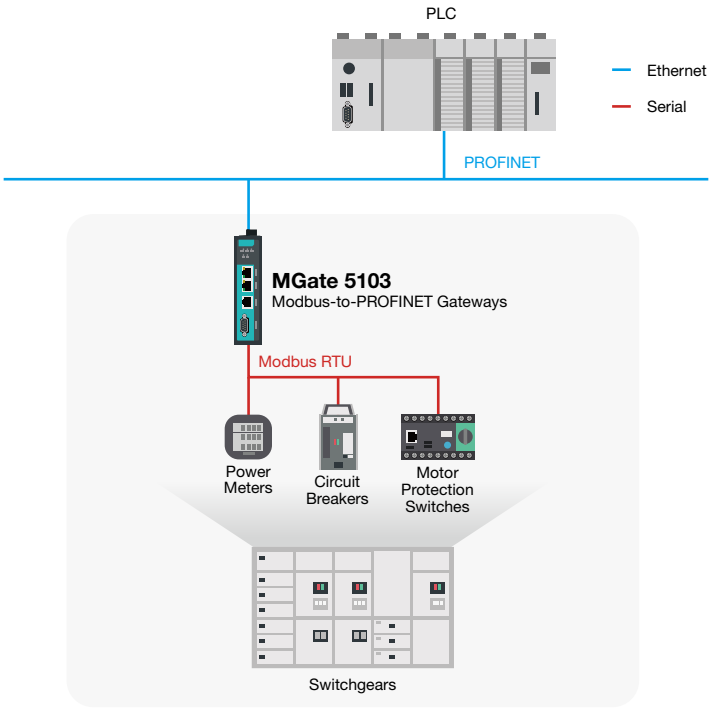
- Modbus-to-PROFINET conversion
- 2 kV serial isolation protection
- EMC level 3 standard
- Easy-to-use web UI for fast configuration
- 5-year warranty

Moxa Products

MGate 5103
Modbus-to-PROFINET Gateways

An industry-leading system integrator in China helped their customer to implement switchgears for power distribution in paper mills. To ensure a stable power supply, operators must control and monitor the switchgears through a PROFINET-based PLC. However, power meters used inside switchgear are usually Modbus RTU as it is a common cost-effective solution compared with PROFINET-based power meters. Thus, deploying a Modbus-to-PROFINET protocol gateway was the ideal choice to enable smooth communication.

Our MGate 5103 Modbus-to-PROFINET gateways not only enabled smooth communication between switchgears and PLCs but also featured a 2-kV serial isolation port and level-3 standard electromagnetic compatibility (EMC) to ensure a stable operation under extreme EMI environments. In addition, our compact and easy-to-use protocol gateways made deployment easier thanks to its user-friendly web UI that helped users complete configuration in just four steps.



Power Room

Monitoring Your Backup Power Systems With High Performance

Country: Taiwan

System Requirements

- High port-density Modbus RTU-to-Modbus TCP conversion
- A fast serial data acquisition mechanism to speed up traditional data polling time in a large-scale application
- Able to endure high EMI environments

Why Moxa

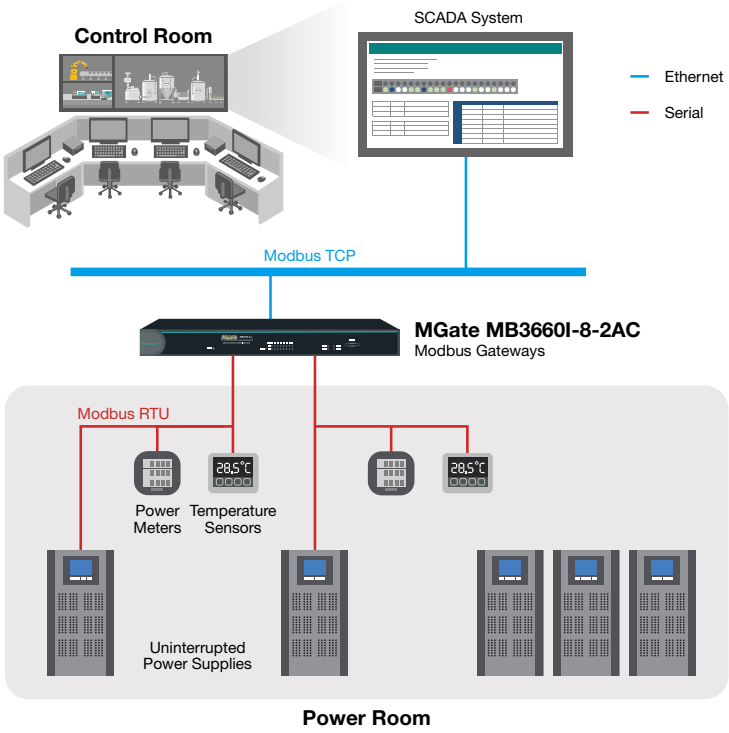
- 8 serial ports to collect data from numerous power devices at once
- Active polling mechanism to speed up the acquisition of data
- 2 kV serial isolation protection
- Dual power inputs

Moxa Products

MGate MB3660I-8-2AC
Serial-to-Ethernet
Modbus Gateways

A world-leading semiconductor company in Taiwan required the monitoring of their backup power systems in fabrication plants. Monitoring backup power systems, such as an uninterrupted power supply (UPS), provides operators information regarding the device status, sufficient power level, and current stability to ensure a stable power supply when emergencies occur. Each UPS comes with a power meter, monitoring the power level and quality, and a temperature sensor, ensuring the UPS is not overheating.

To achieve smooth communication between power devices and SCADA systems, our MGate MB3660 high port-density serial-to-Ethernet Modbus gateways were deployed to collect power data with high performance and reliability. These gateways support 8 serial ports and feature an active polling mechanism that allows simultaneous serial data acquisition among multiple serial power meters. In addition, the MGate MB3660 Series supports serial isolation and dual power inputs to ensure seamless communication in high EMI environments.



Developing Smooth Data Communications for Energy Usage Monitoring

Country: U.S.

System Requirements

- Smooth data communication from PDUs to the EMS
- Efficient configuration tools for fast deployment in large-scale applications
- Flexible wiring solution between dozens of PDUs

Why Moxa

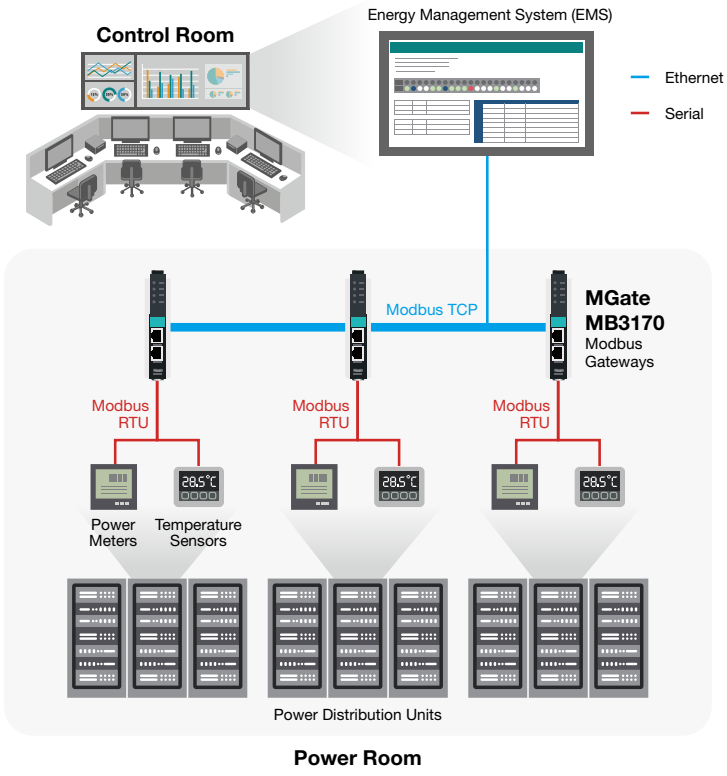
- Modbus RTU-to-Modbus TCP conversions
- Command line tools to make mass configuration easy for IT engineers
- Ethernet cascading to simplify network topology

Moxa Products

MGate MB3170
Serial-to-Ethernet Modbus Gateways

A multinational energy management system (EMS) integrator in the U.S. helped their client, a world-leading computer technology company, optimize energy efficiency in their data centers. The EMS required the collection of both power consumption and temperature data from power distribution units (PDU) so that operators could use this information to reduce energy waste and ensure suitable power distribution conditions.

To develop smooth data communication between the PDUs and the EMS, our MGate MB3170 Modbus gateways were deployed to convert Modbus RTU data, collected from power meters and temperature sensors, to Modbus TCP data for easy integration into the Ethernet-based EMS. In addition, the MGate MB3170 Modbus gateways come with IT-friendly command line tools for mass configuration and Ethernet cascading that enables flexible deployment between dozens of PDUs used in the data centers.



Enabling an Energy-efficient HVAC System for a Hypermarket

Country: Taiwan

System Requirements

- Automatically controls HVAC systems based on business hours and temperatures to save energy
- Requires DI, DO, AO, RTD, RS-485 interfaces for different types of data collection and machine control

Why Moxa

- Easy-to-use Click&Go Plus function enables simple logic control for HVAC systems
- Expansion capabilities by supporting various interfaces and protocols in one device (e.g., DI/DO, AI/AO, RS-485, Ethernet)
- Supports an active tag to send I/O and serial data to the MX-AOPC UA Server for HMI integration

Moxa Products

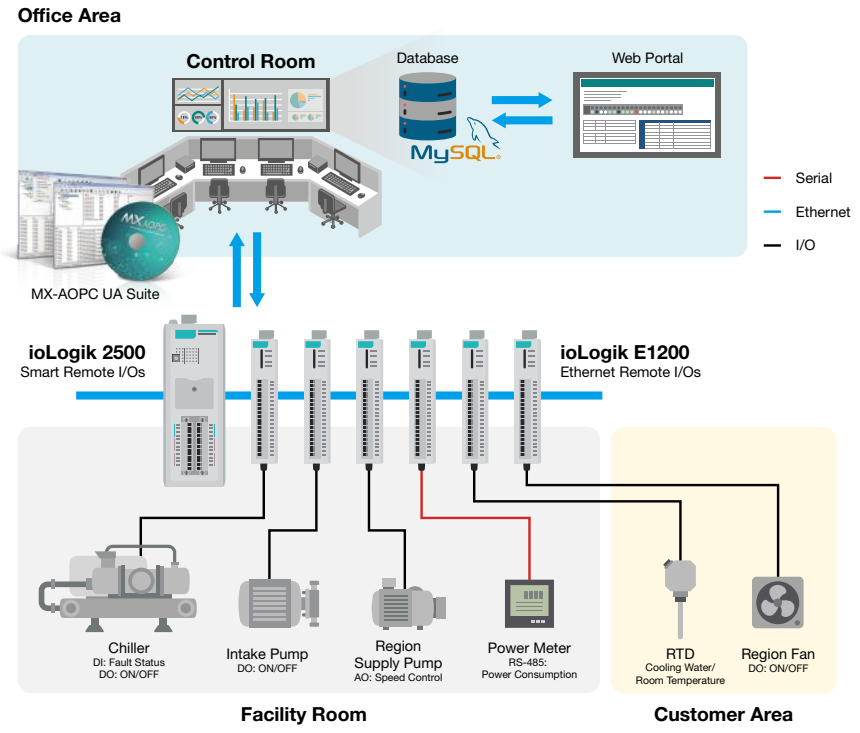
ioLogik 2500
Smart Remote I/Os

ioLogik E1200
Ethernet Remote I/Os

MX-AOPC UA Suite
OPC UA software

HVAC systems are mostly used in buildings to provide comfort and acceptable indoor air quality. However, they also consume massive amounts of energy. In order to optimize energy consumption, a hypermarket operator wanted to monitor the power usage in their HVAC systems. Most importantly, they wanted to enable automated demand response control, based on the real-time temperatures in the hypermarket during business hours, to decrease the activation time of chiller systems and help the hypermarket save energy and reduce operating costs.

To automatically enable the settings adjustment of the chiller, pump, and fan, our ioLogik 2500 smart remote I/Os were used to provide programming-free control logic through our unique Click&Go Plus function. Also, our ioLogik E1200 Ethernet remote I/Os were deployed to collect serial, digital, and analog data from chillers, pumps, power meters, and resistance temperature sensors (RTD). In addition, our remote I/Os come with MX-AOPC suite, making the integration of a variety of field data acquisitions into your database (i.e., MYSQL database) easy.



Developing Efficient Communication for Water Booster Monitoring

Country: Canada

System Requirements

- Controls Modbus-based VSD via an EtherNet/IP-based PLC

Why Moxa

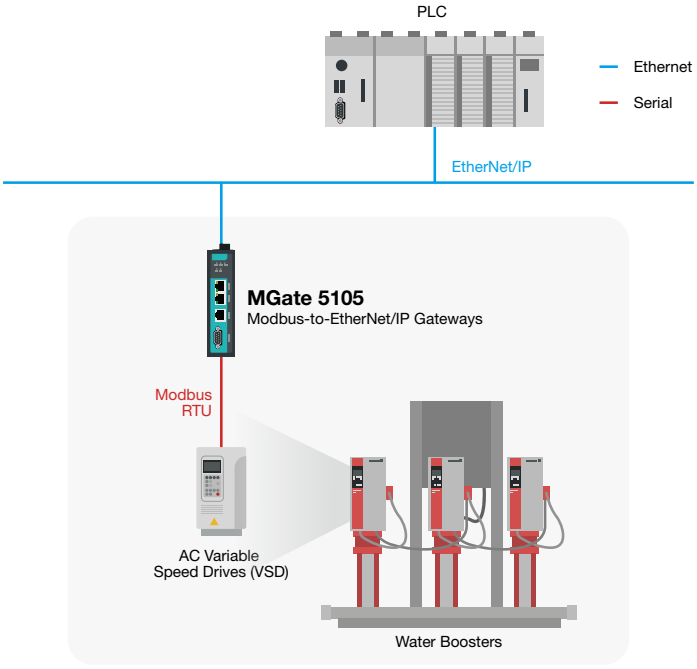
- Modbus-to-EtherNet/IP conversion
- Supports a microSD card for configuration backup
- Quickly identifies communication issues through fault alarm and data value tracking

Moxa Products

MGate 5105
Modbus-to-EtherNet/IP Gateways

The automotive manufacturing industry consumes tremendous amounts of energy for various production processes, which include cooling, air-conditioning systems, and boilers. An intelligent HVAC system builder developed a water pump booster that allows automotive manufacturers to control and monitor the AC variable speed drive (VSD) used inside boosters so that operators can optimize energy efficiency when boosters are not required. To achieve this, they needed to develop reliable connectivity from the boosters to an EtherNet/IP-based PLC.

Our MGate 5105 Modbus-to-EtherNet/IP gateways were deployed to convert Modbus RTU data from AC VSDs to an EtherNet/IP-based PLC so that factory operators could receive real-time status and make instant adjustments to optimize energy usage. In addition, our MGate 5105 protocol gateways are designed to make protocol conversion easy by featuring a user-friendly web console for easy configuration, a built-in microSD card for configuration backup, and functions such as fault alarm and data value tracking for easy troubleshooting when a communication error occur.



Facility Room

Monitoring Data Center Infrastructure With One Integrated Network

Country: South Korea

System Requirements

- Reliable network for managing the data center infrastructure
- Smooth integrated communication for power, cooling, and managing other systems within the building
- Collecting large amounts of data from a variety of power and cooling monitoring devices and sensors

Why Moxa

- A comprehensive product portfolio of Modbus gateways, and industrial Ethernet switches
- IEC 61850-3 certified switches that can operate reliably in a high electromagnetic environment
- Modbus gateways that have an active polling mechanism for the fast acquisition of large volumes of data

Moxa Products

PT-G7828
IEC 61850-3 Layer 3 Ethernet Switches

EDS-528E
24+4G-port Gigabit Layer 2 Ethernet Switches

MGate MB3660
Serial-to-Ethernet Modbus Gateways

A leading data center system integrator helped their client, one of the largest broadband and media companies in South Korea, design and deploy the next generation of data center infrastructure. The entire infrastructure includes multiple critical systems, including a backup power generation, Automatic Transfer Switches (ATS), uninterrupted power systems (UPS), as well as chillers and water-cooling systems. All the systems must be monitored and fully controlled through a DCIM (Datacenter Infrastructure Management) system.

To develop a reliable communication network across these critical systems, Moxa's rugged DIN-rail Ethernet switches, the EDS-500E Series, were installed to connect the backup generator, chiller, and power quality (PQ) meters to the network backbone. Legacy devices, such as flow meters and circuit breakers were connected to Moxa's MB3660 Series protocol gateway, which supports routing by IP addresses or TCP ports for flexible deployment. Moxa's PT-G7800 Series was selected because of its IEC 61850 certification which confirms the product was designed for non-stop operation in the harsh environment of a power substation and will provide maximum reliability for the DCIM system.