



Accelerate IIoT-Ready Applications with Smart Industrial Computing

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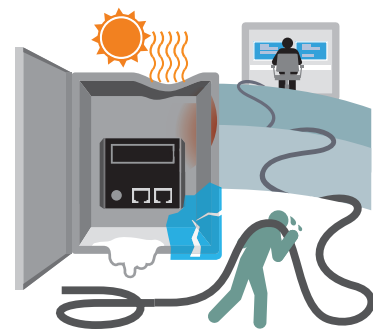
Data is at the heart of the Internet of things (IoT). To make critical data-informed decisions, businesses first need to capture and collect data from all sorts of devices over the Internet before converting the data into valuable business information. However, implementing an Industrial IoT application is even less straightforward. When putting an Industrial IoT strategy into action, businesses are faced with a number of critical challenges, including handling data acquisition from a heterogeneous network as well as the need to use devices that can withstand harsh environmental conditions. Moxa has applied its rich experience in the industrial automation field to provide industrial computing solutions that integrate data acquisition and device management for large-scale, Industrial IoT applications.

Challenges and Moxa's Offering



Complex Integration of Devices for Mass Deployment

In Industrial IoT environments, it is very common that several devices share the same network; but it is often the case that these different devices support different communications protocols. This problem can be overcome by companies writing their own programs to ensure that their devices communicate with each other. However, taking into consideration that this is a complex and costly integration procedure that could prolong the installation process, this is not an ideal choice for smart companies. Moxa's ThingsPro™ Suite enables the integration of data acquisition and wireless management in a few simple steps.



Unstable Data Transmission in Extreme Environments

Cabling constraints and transmission limits are common obstacles for establishing field site computing systems. Over the past few years, utilizing wireless connectivity has become an effective solution to this problem. However, the downside of this is the extra heat generated by these wireless components. In addition, many computing devices are not built to withstand extreme temperatures, causing unstable and unreliable data transmission. Moxa offers industrial computers that support 4G LTE connectivity with an operating temperature range from -40 to 70°C.



Maintaining Uptime in Unstaffed Locations

In a typical Industrial IoT environment, the computing systems at the edge of the network are often located at unstaffed or remote sites, which make troubleshooting, maintenance, and ensuring system uptime extremely difficult and expensive. Moxa's Proactive Self-Maintenance utilities help maintain remote systems and minimize system downtime.



Keeping Valuable Business Data Secure

As industry professionals keep up with the Industrial IoT trend and enjoy the benefits of valuable data transmission between devices, servers and databases, they are aware that privacy is a serious concern and industrial systems must be secure to prevent unauthorized access. Moxa enhances security with a prebuilt network security tunnel and authentication algorithm for the Linux kernel.

In this brochure, we will examine several typical applications to see how Moxa's integrated data acquisition platform can help businesses conquer the challenges in Industrial IoT environments.

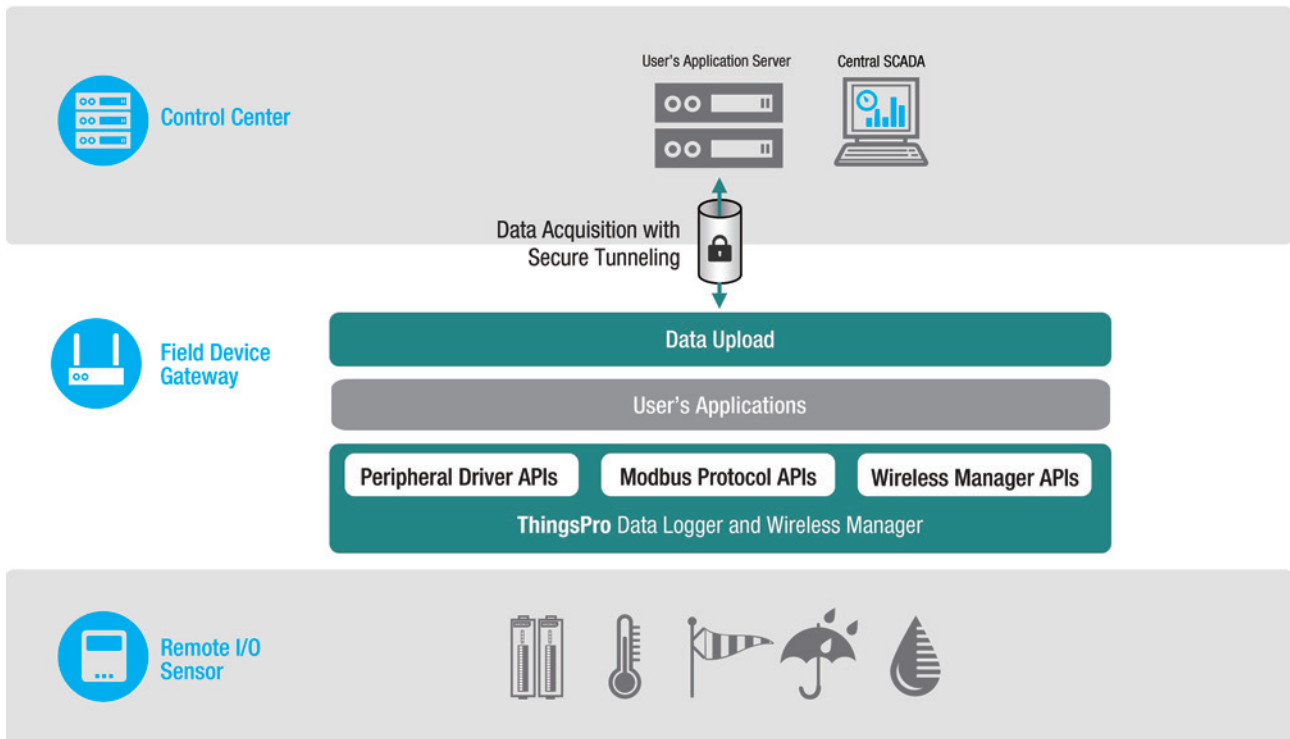
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Integrated Data Acquisition Platforms for Industrial IoT Applications

Introduction

For Industrial IoT applications, the value is in the data. Before the data can be used however, it must be extracted from thousands of industrial sensors and machines. This is often a cumbersome and time-consuming task, not to mention a drain on engineering resources. Moxa's Industrial Computing Solution is an integrated data acquisition and device management platform designed for large-scale, Industrial IoT applications that help overcome the aforementioned problems. Complementing Moxa's hardware solutions is Moxa's ThingsPro™ Suite, a set of software solutions that are designed to simplify the development of applications that facilitate remote device management and data acquisition. The ThingsPro™ Suite enables the integration of Modbus communications, data acquisition, data processing, wireless networking, and device management, all in a few simple steps, allowing users to focus on their applications instead of complex integrations.

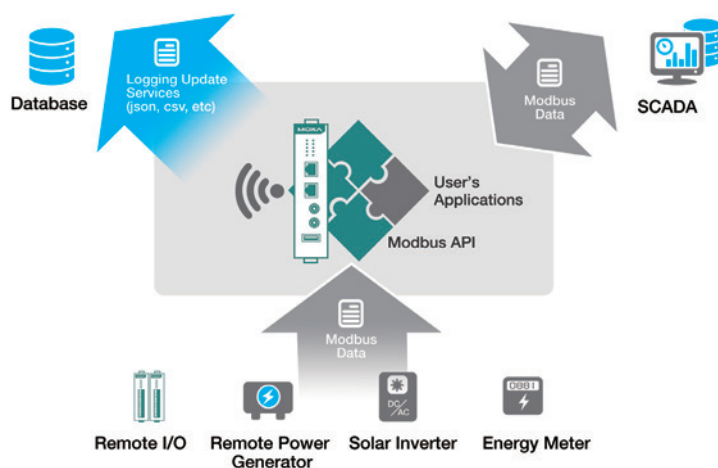


By using Moxa's industrial computing solutions as the field device gateway, users can remotely monitor and control their field devices. In addition, the ThingsPro™ Suite can also serve as a ready-to-run data acquisition system to convert the Modbus data from the field I/O devices and then transfer it to the central database to accelerate the deployment of multiple field devices.



ThingsPro™ as a Programmable Modbus Data Logger between Field Devices and a Database

For users who develop data acquisition and asset management software programs on their own database, the ThingsPro™ Suite provides the ability to transfer field data directly into the remote database without any additional programming on the gateway. Because ThingsPro™ Suite includes generic Modbus protocol support, users can easily configure the protocol polling tables and then all the data can be uploaded to the back-end database for end devices running on those protocols. This way, users can focus on developing applications without having to worry about how to get and transfer the data to the back-end database.



ThingsPro™ as a Communication-Ready Programmable Platform

An Industrial IoT environment comprises several areas, each of which requires a different type of expertise. For example, many people in the automation industry are knowledgeable about industrial protocols such as Modbus, but they are not familiar with Information Technology and 4G LTE. ThingsPro™ assists people who are familiar with automation technology in connecting their field devices to a wide area network (WAN) by conducting the conversion work for them. The result is that engineers don't have to spend extra effort to become familiar with wireless connectivity technology so they can focus more on their applications. The advantage of this approach is that it allows businesses to deploy their equipment faster, complete their projects more quickly, and develop more effective solutions.

<p>4G Communication Ready</p>	<p>Debian Linux Open Platform</p>	<p>VPN Ready</p>
<p>Modbus Protocol Ready</p>		<p>Serial-to-Cellular Routing Ready</p>
<p>Network Diagnosis Ready</p>		<p>Ethernet-to-Cellular Routing Ready</p>

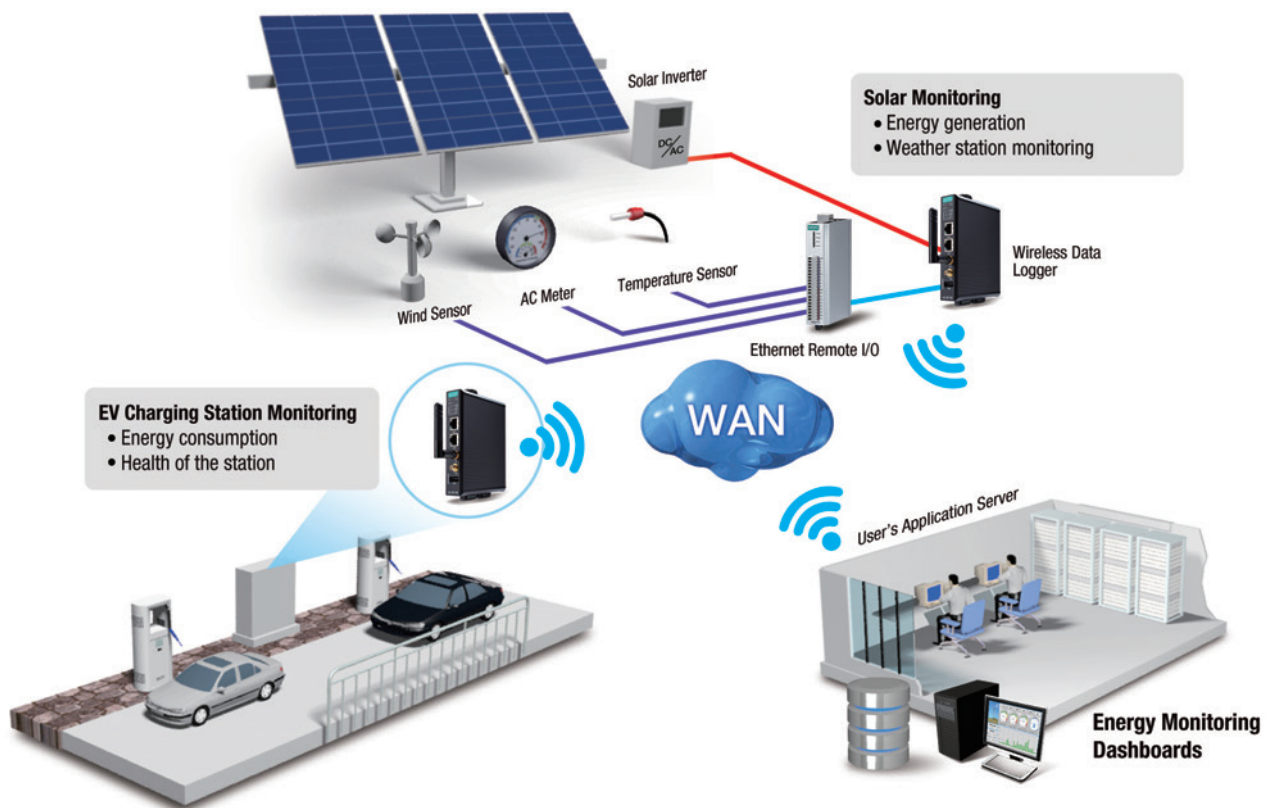
For more information about ThingsPro™, please see: <http://www.moxa.com/product/ThingsPro.htm>

Solar Energy Management Systems

Industry Background

In order for solar energy management firms to be successful, they must produce scalable software to serve everything from small residential solar installations all the way up to large buildings and power plants. The purpose of the software is to extract data from the database and display it on dashboards to allow users and administrators to see how much power they have produced, as well as the status of their field equipment.

System Architecture



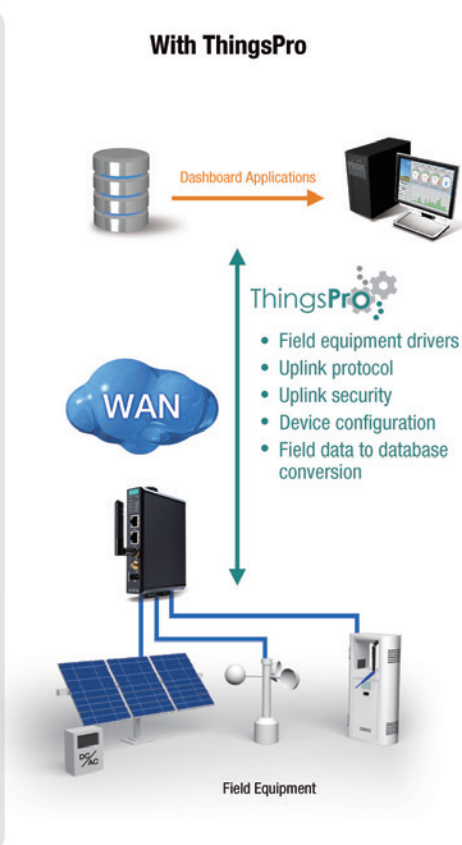
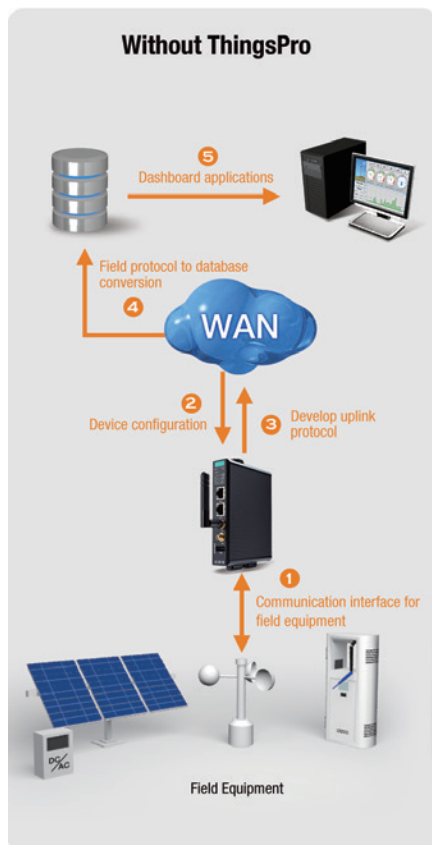
Users' Needs and Requirements

Users require a solar energy management company with expertise in data processing and the ability to display information on dashboards. Solar energy management companies must allocate their engineering resources on how to display the information on dashboards, instead of taking care of remote device management and data transmission from the field to the central server. Thus, solutions that can help businesses take care of data acquisition and device management are going to be the most beneficial for them.



Why ThingsPro™ Works for the Customer

ThingsPro™ is an integrated Modbus communications, computing, data acquisition, and wireless networking solution. ThingsPro™ has a ready-to-run field device management utility built in so the customer can use a web browser to remotely manage and configure their field gateways and field equipment. The ThingsPro™ Data Logger utility, hosted on the field gateway, supports generic Modbus/TCP and Modbus RTU protocols. This allows the user to interact with field equipment without needing to build the protocol from scratch. ThingsPro™ also manages field data uploads and data conversions to the central database. One of the challenges faced by users is that field device protocols are mostly industrial protocols that were not designed for remote data transmission, and normally aren't compatible with IT-based SQL protocols. ThingsPro™ enables customers to focus on developing their energy analysis applications instead of wasting time on complex integration tasks.



Related Products

UC-8100-CG Series

RISC-Based Wireless Computer

- Supports 4G LTE connectivity
- -40 to 70°C wide operating temperature range
- ARM Cortex-A8 300MHz/1GHz processor



ioLogik E1200 Series

Ethernet Remote I/O

- 2-port Ethernet switch for daisy-chain topologies
- -40 to 75°C wide operating temperature range
- Wide selection of AI/O and DI/O types including AI and DI/O all-in-one model



Benefits

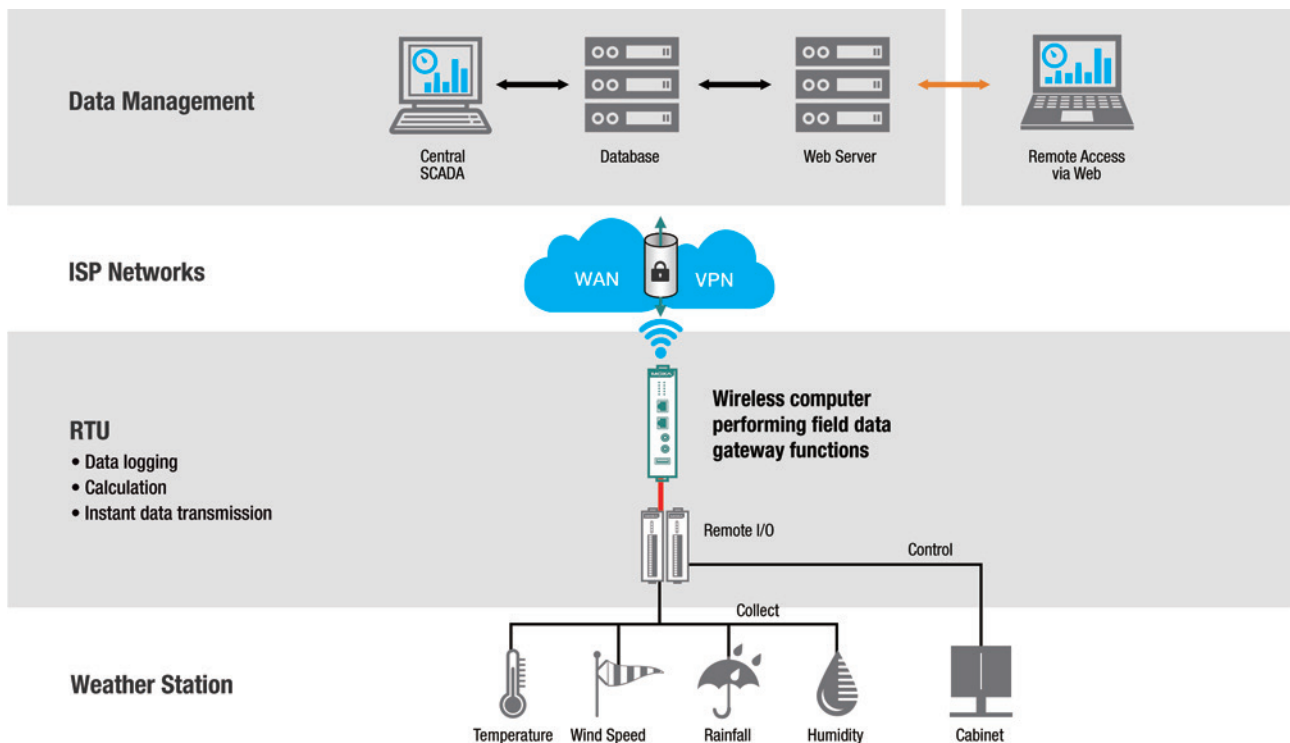
- Ready-to-run device management, field device protocols, and field data to database conversion
- Free up the customer's software resources so they can focus on developing energy-analysis dashboards
- Open Debian Linux platform for creating custom drivers

Weather Station Monitoring Systems

Industry Background

National weather monitoring systems are very important for countries that experience monsoon seasons. National weather monitoring installation projects must have an experienced and professional team who know how to customize the systems. The monitoring systems should provide the government agency with a mechanism to provide an early warning alert to the general population when an emergency situation arises in order to prevent catastrophe.

System Architecture



Users' Needs and Requirements

Due to the fact that weather stations are often in remote locations, if there is a system failure, site visits are often not a feasible option. Therefore, system administrators must be able to remotely apply preventive maintenance or restore the systems in case of failure. This remote monitoring and control is critical for the success of any project.

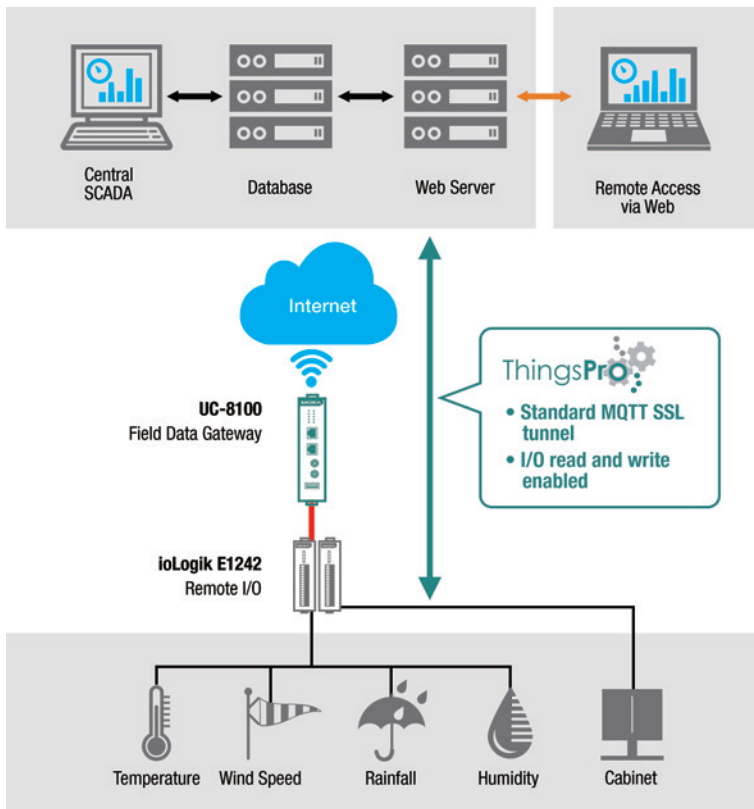
Another challenge is that despite their familiarity with Fieldbus protocols, implementing a lightweight WAN protocol to reduce data usage is a big concern for industrial automation users. Furthermore, they must also translate the industrial protocols to an IT-based protocol and vice versa in order to give users the ability to remotely activate an I/O control signal.



Why ThingsPro™ Works for the Customer

The UC-8112 field data gateway that runs the ThingsPro™ Suite is equipped with drivers for the ioLogik E1242 remote I/O device. When the ioLogik driver is selected, all I/Os will be available for the data-logging program to use. Weather monitoring system manufacturers can build the logging and control logic per the government's request, and use the pre-packaged MQTT and SSL tunneling API to push the data back to the central site. MQTT is a proven lightweight protocol that is used by many mobile devices to reduce wireless overheads.

ThingsPro™ automatically takes care of the data conversion to and from the database. Therefore, the end user's software program can easily use the APIs that ThingsPro™ provides to read and write the data from the remote field sites. The device management capability of ThingsPro™ also allows the system administrator to remotely access the field data gateway and ioLogik remote I/Os to monitor the health of their devices and reboot the system in case of failure.



Recommended Products

UC-8100-CG Series

RISC-Based Wireless Computer

- Supports 4G LTE connectivity
- -40 to 70°C wide operating temperature range
- ARM Cortex-A8 300MHz/1GHz processor



ioLogik E1200 Series

Ethernet Remote I/O

- 2-port Ethernet switch for daisy-chain topologies
- -40 to 75°C wide operating temperature range
- Wide selection of AI/O and DI/O types including AI and DI/O all-in-one model



Benefits

- Secure data transmission, from edge to central, with MQTT & SSL
- Ready-to-run drivers for analog and digital I/O modules
- Easy-to-use native APIs for data access
- Open source computing platform for data logging and control logic programs

Remote Asset Management for Intelligent Transportation Systems (ITS)

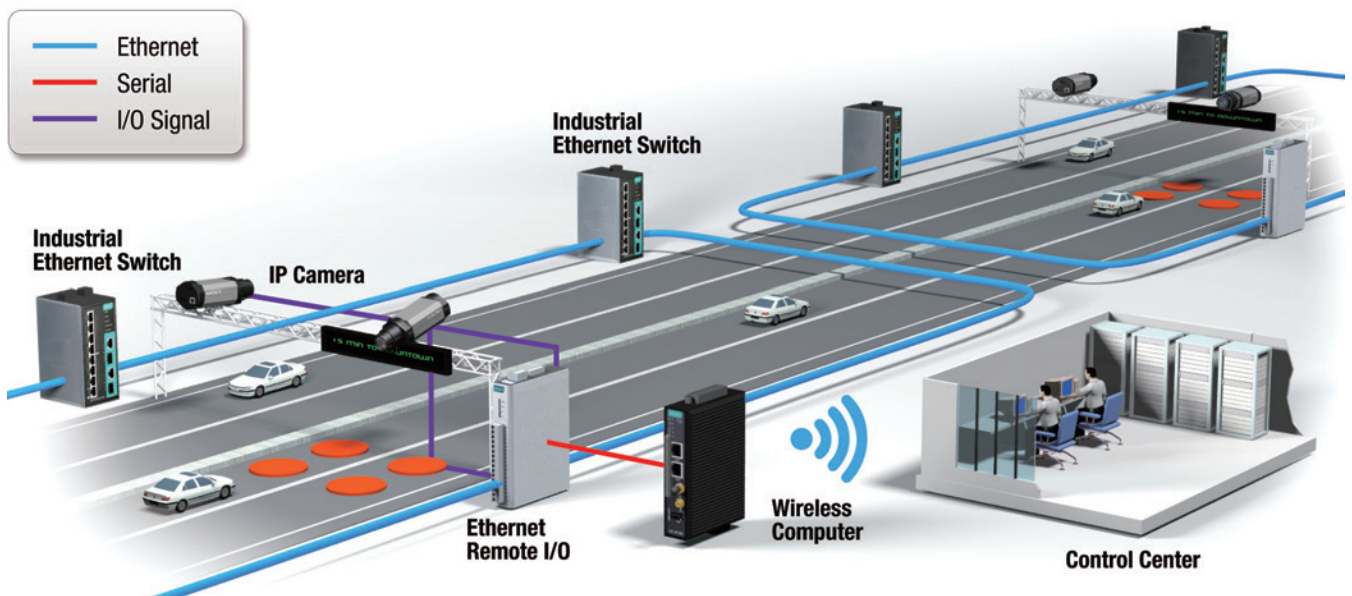
Industry Background

In smart cities, intelligent transportation systems are already an essential part of people's daily lives. Keeping such a complex system operating smoothly is a big challenge for city transportation authorities who typically incur high costs sending personnel to sites where equipment has malfunctioned. In addition, some authorities have noted that the real challenge is to know that a malfunction has occurred.

Users' Needs and Requirements

City transportation authorities need to know when there has been a system failure and be able to remotely diagnose the problem in real time. Since there are often thousands of devices deployed across the city, they also need to be able to remotely reboot systems without deploying personnel unless it is absolutely necessary. In addition, they must keep track of the health of the equipment and provide preventative maintenance to avoid system failures, and be able to remotely configure and manage onsite equipment.

System Architecture





Why ThingsPro™ Works for the Customer

ThingsPro™ provides the ability to use a web browser via the server and a field programmable gateway to access all of the field devices. Typically, the majority of industrial equipment, including switches, remote I/Os, RTUs, and fieldbus gateways all support Modbus/TCP. Moxa's end-to-end data conversion solution uses ThingsPro™ to convert the data from the Modbus devices so they can be remotely monitored on a web browser by the user.

The data captured by the gateway can be fed directly to the user's database. Users can also use the Linux programming environment and the SDKs that are provided to interact with the field devices to do advanced data processing and then use the SDK to send the data directly to the server and the database. That is, users do not have to worry about protocols used for uplink and how to convert the I/O data from the field to the database.

Benefits

- Reduce system downtime
- Reduce personnel site visits for device checkup and reboot
- The UC-8100 computer can also be used as a controller to replace old control systems, thus reducing system upgrade costs

Recommended Products

UC-8100-CG Series

RISC-Based Wireless Computer

- Supports 4G LTE connectivity
- -40 to 70°C wide operating temperature range
- Multiple ports to support versatile applications



ioLogik E1200 Series

Ethernet Remote I/O

- 2-port Ethernet switch for daisy-chain topologies
- -40 to 75°C wide operating temperature range
- Wide selection of AI/O and DI/O types including AI and DI/O all-in-one models



EDS-P510 Series

Managed Ethernet Switch

- SmartPoE for easy PoE links, diagnostics and monitoring
- -40 to 85°C wide operating temperature range



VPort 36-1MP Series

Rugged IP Camera

- -40 to 75°C wide operating temperature range
- HD resolution (1280 x 720)



Remotely Controlled Monitoring Systems for Digital Advertisement Boards

Industry Background

Digital Technology has taken advertising into a new era. In recent years, billboards are being replaced by digital signage advertisement boards. This trend has seen a significant increase in digital advertisement service providers' projects, who typically place their digital advertisement boards along highways, in shopping centers, or at other locations with high volumes of human traffic.

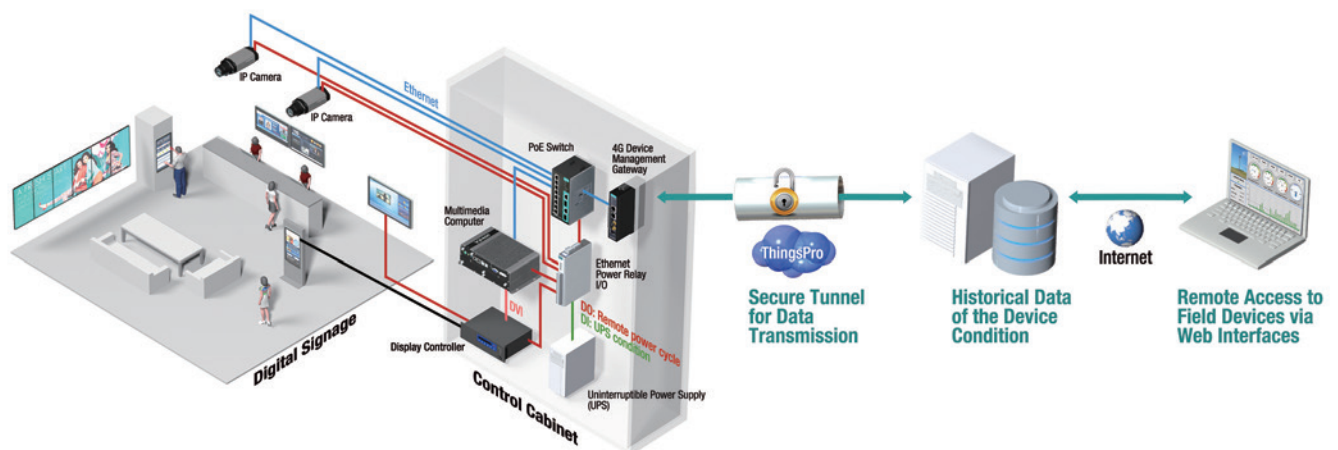
Users' Needs and Requirements

The digital signage system consists of an outgoing leased line that allows the system administrator to remotely upload the multimedia content. The multimedia computer is responsible for receiving the video data and then sending it via the display ports to the display controller that controls the digital signage.

Digital advertisement service providers' sales are often hampered by the short response time required by their clients. It is often part of their service contract with their clients that if the system goes down, they must restore it within 24 to 48 hours. The fact that displays must be physically checked means that clients are limited to advertisement locations that are easily reachable by service crews.

To address these issues and to extend their business reach to areas outside the current capabilities of their service crews, many advertisement companies install IP cameras to allow remote visual checkups and also add cellular links to increase the flexibility of communications methods. Moreover, they also want to be able to remotely monitor the conditions of all the onsite equipment and have the ability to remotely reset the system to see if it recovers before deploying service crews.

System Architecture





Why ThingsPro™ Works for the Customer

Moxa's total solution for remote control, networking, monitoring systems, and asset management has been designed to work for most projects. First, almost all of Moxa's equipment, including switches and I/Os, support Modbus/TCP protocols for monitoring or controlling field devices. Thus, the user can use Modbus/TCP as the generic protocol to allow the UC-8100, a 4G LTE device management gateway, to monitor or control the field devices. For example, when the UC-8100 detects a failure in one of the PoE ports, an IP camera, or the UPS, it will send an alert to the server. The UC-8100 can also be used to remotely send relay power cycle commands to the Ethernet power relay to power on devices remotely, as a first attempt at system recovery.

The UC-8100 can store the device status in a local database, and then later synchronize the data with the central database for overall system optimization analysis. ThingsPro™ also supports secure connections and data transmission between the device management gateway and the server. That is, users can rest assured that the kind of communication protocol and the data sent between the field devices and the server are compatible. Finally, in order to make the set up easier, the UC-8100 system can be set up and ready-to-run with a few simple configuration steps.

Benefits

- Ready-to-use Modbus/TCP frameworks for field device monitoring and control
- Secure data transmission, from edge to central, with MQTT & SSL
- Ready-to-use web user interface to remotely trigger power-on to reduce service crew overhead

Recommended Products

UC-8100-CG Series

RISC-Based Wireless Computer

- Supports 4G LTE connectivity
- -40 to 70°C wide operating temperature range
- ARM Cortex-A8 300MHz/1GHz processor



MC-7270-DC-CP Series

x86 Fanless Computer

- Intel® Core™ i7/i3 processor
- -40 to 70°C wide operating temperature range
- 3 video outputs with 2 DVI-I and 1 VGA ports



EDS-P510 Series

Managed Ethernet Switch

- SmartPoE for easy PoE links, diagnostics and monitoring
- -40 to 85°C wide operating temperature range



ioLogik E1200 Series

Ethernet Remote I/O

- 2-port Ethernet switch for daisy-chain topologies
- -40 to 75°C wide operating temperature range



VPort 36-1MP Series

Rugged IP Camera

- -40 to 75°C wide operating temperature range
- HD resolution (1280 x 720)



Geographic Information Systems for Natural Disaster Prevention

Industry Background

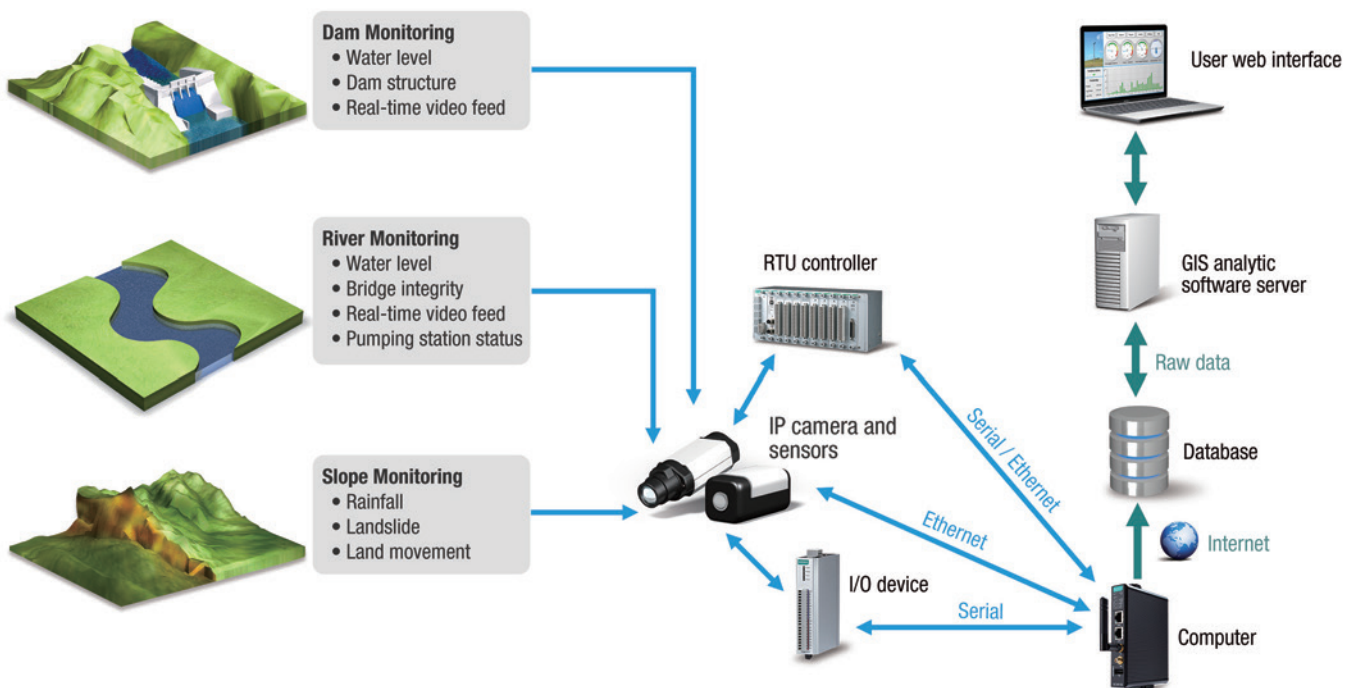
Disaster prevention is an essential consideration for smart cities. Many disaster prevention service providers and research centers are using information gathered by Geographic Information Systems (GISs) to collect all the data pertaining to rainfall, landslides, dam and river levels, and lake changes, and then transfer that data to a map-based GIS. This information will then be utilized by fire and rescue departments to limit the damage caused by natural disasters.

Users' Needs and Requirements

Disaster prevention service providers need to collect various kinds of data from remote locations. This data often comes from different devices using different formats and protocols. The fact that this data often takes a long time to process before it is usable reduces the time available for the development of the GIS. To overcome the incompatibilities of different data formats, service providers should offer a total data acquisition solution that can store the data in a database that the GIS can use.

An additional drawback is that current systems do not support remote management. Therefore, when the system settings need to be changed or a firmware upgrade must be performed, personnel have to be dispatched to the site in order to carry out their tasks.

System Architecture





Why ThingsPro™ Works for the Customer

ThingsPro™ provides the ability to use a web browser via the server and a field programmable gateway to access all of the field devices. Typically, the majority of industrial equipment, including switches, IP cameras, remote I/Os, RTUs, and fieldbus gateways all support Modbus/TCP. Moxa's end-to-end data conversion solution uses ThingsPro™ to convert the data from the Modbus devices so they can be remotely monitored on a web browser by the user.

The data captured by the gateway can be fed directly to the server, and then to the user's database. Users can also use the Linux programming environment and the SDKs that are provided to interact with the field devices to do advanced data processing and then use the SDK to send the data directly to the database. That is, users do not have to worry about protocols used for uplink and how to convert the I/O data from the field to the database. ThingsPro™ takes care of the data flow for you.

Benefits

- Ready-to-run device management, field device protocols and field data to database conversion
- Free up customer's software resources to focus on energy analysis dashboard development
- Open system for the customer to build customized drivers if needed

Recommended Products

UC-8100-CG Series

RISC-Based Wireless Computer

- Supports 4G LTE connectivity
- -40 to 70°C wide operating temperature range
- ARM Cortex-A8 300MHz/1GHz processor



VPort 36-1MP Series

Rugged IP Camera

- -40 to 75°C wide operating temperature range
- HD resolution (1280 x 720)
- Triple video streams with H.264 and MJPEG



ioLogik E1200 Series

Ethernet Remote I/O

- 2-port Ethernet switch for daisy-chain topologies
- -40 to 75°C wide operating temperature range



EDS-405A Series

Managed Ethernet Switch

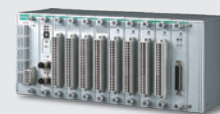
- Supports EtherNet/IP, Modbus/TCP and PROFINET protocols for device management and monitoring
- Turbo Ring and Turbo Chain (recovery time < 20 ms @ 250 switches)
- RSTP/STP for network redundancy



ioPAC 8600 Series

Modular RTU Controller

- Modular CPU/PWR/Backplane/IO design
- Supports 24 to 110 V power input range and DI/O modules
- Supports C/C++ and IEC 61131-3 programming languages



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 25 years of industry experience, Moxa has connected more than 40 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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