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WISE-EdgeLink
Application Cases

Discover how WISE-EdgeLink, the IoT gateway software, is deployed in real-world scenarios

∕ Oil and Gas
∕ Urban Construction
∕ Industrial Facility Management
∕ Distributed Energy Resources
∕ Asset Performance Management

Connect to Cloud

Connect to SCADA/MES

WISE-EdgeLink

Connect to Devices

Connect to Third-party Devices

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Vertrieb durch **AMC**

AMC — Analytik & Messtechnik GmbH Chemnitz

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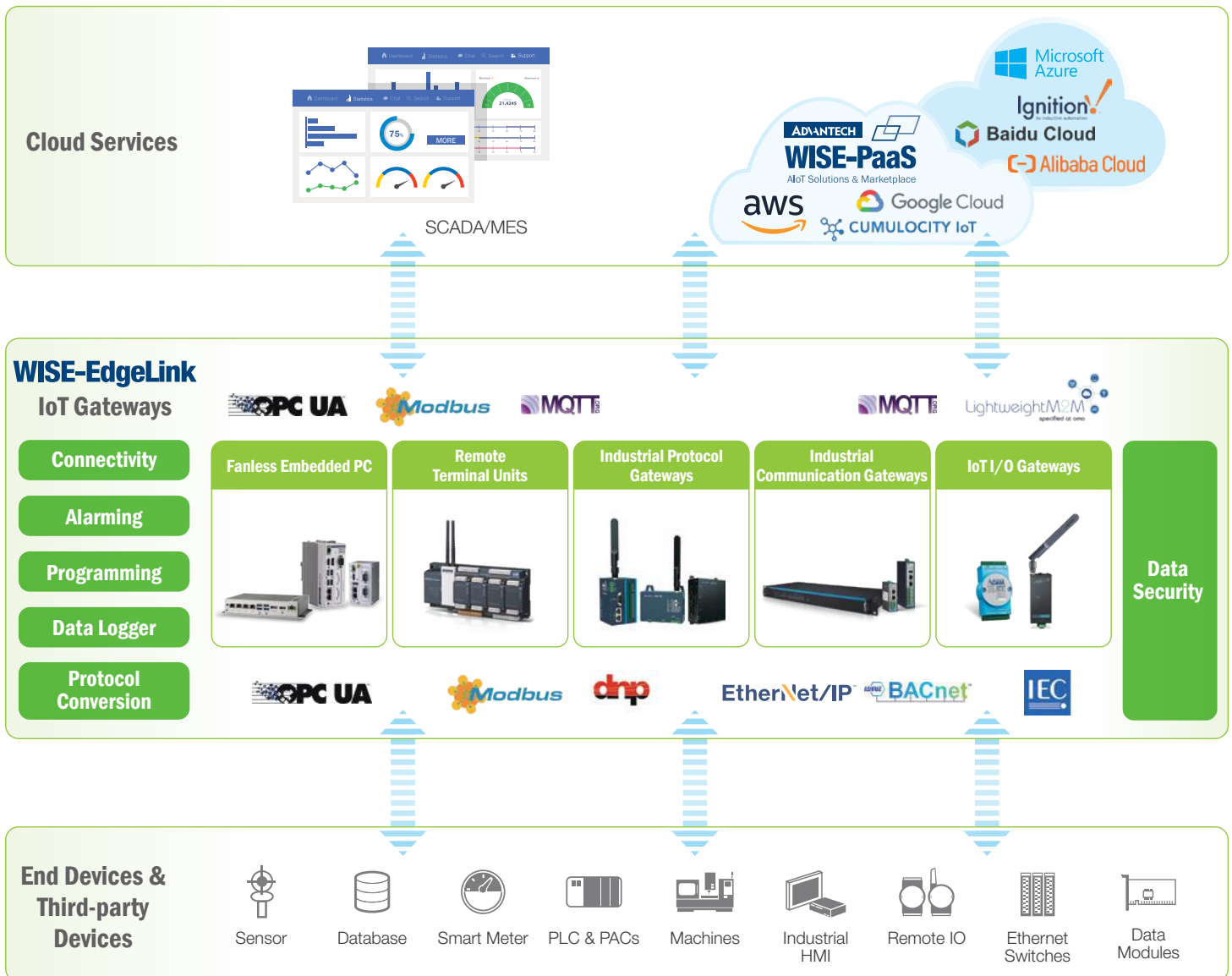E-Mail: info@amc-systeme.de   Web: www.amc-systeme.de

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ADVANTECH iAutomation
Premier Partner

WISE-EdgeLink

Transmit Data to the Cloud with WISE-EdgeLink

With the emergence of industrial IoT, companies are seeking solutions that facilitate the use of data analytics to improve service levels, create superior products, and reduce operating costs. The first step in this process is the digitalization of all assets, which means data collected from different equipment must first be analyzed. Equipment operators therefore require an easy and reliable method for collecting data from field-based equipment. Advantech's WISE-EdgeLink provides a data acquisition solution that does not require frequent on-site maintenance and service trips. With this solution, users can monitor critical assets, track equipment performance, receive alarm notifications, and perform system management and configuration using handheld devices. This will substantially reduce costs and ensure field equipment and facilities are better monitored and controlled.

Cloud Services

SCADA/MES

ADVANTECH WISE-PaaS — AIoT Solutions & Marketplace

Microsoft Azure · Ignition · Baidu Cloud · Alibaba Cloud · aws · Google Cloud · CUMULOCITY IoT

WISE-EdgeLink

IoT Gateways

OPC UA · Modbus · MQTT · MQTT · LightweightM2M

Connectivity	Fanless Embedded PC	Remote Terminal Units	Industrial Protocol Gateways	Industrial Communication Gateways	IoT I/O Gateways	
Alarming						Data Security
Programming						
Data Logger						
Protocol Conversion						

OPC UA · Modbus · dnp · EtherNet/IP · BACnet · IEC

End Devices & Third-party Devices

Sensor · Database · Smart Meter · PLC & PACs · Machines · Industrial HMI · Remote IO · Ethernet Switches · Data Modules

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Advantech's Edge Solutions Enable Real-Time Oil Tanker Monitoring

Location: **Tailand**

Background

Unloading an oil tanker is a job that must be handled in a meticulous, step-by-step fashion. Missteps can lead to casualties and/or severely pollute local waters. Even if the unloading process avoids an accident, any error in the calculation of the quantity of oil unloaded can trigger costly, time-consuming disputes. To minimize these risks, many governments have introduced a SCADA graphics control system into their IoT infrastructure to monitor oil pipelines in real time and ensure an accurate calculation of the quantities unloaded.

ESRP-PCS-ADAM3600, an edge data acquisition (DAQ) platform developed by Advantech, is designed to serve the SCADA graphics control system by collecting data from the lower layers of the IoT framework, performing edge computing, and connecting to upper-level applications. The edge DAQ platform uses a flexible and modularly designed input/output (I/O) interface layout to fetch different kinds of data, preprocess raw data into meaningful information, and upload it. It connects seamlessly with upper-level applications through various communications protocols. Moreover, this platform aids SCADA developers in bringing their projects to fruition—and thus can be harnessed to reduce accident risks and human error during the oil unloading process.

System Requirements

Thailand, ringed by thousands of kilometers of coastlines, is home to hundreds of ports. In a country heavily dependent on imported oil, Thai ports bustle with tankers docking and being unloading supplies. Although the Thai government hires numerous workers to monitor and calculate the quantities of oil being unloaded, both processes are prone to human error. However, the Royal Thai government has recently decided to adopt new technologies to better ensure the real-time monitoring of oil unloading and make more accurate calculations.

The system integrator contracted to undertake this project is a world-renowned SCADA systems provider. For this project, the company designed a SCADA program and integrated it with Advantech's edge solutions to visualize collected data, calculate oil quantities accurately when they're delivered onshore, monitor oil unloading remotely, and switch oil pipelines on or off whenever necessary.

The edge solution had the following features:
• Included DAQ platforms for outdoor use that were capable of withstanding the harsh environmental conditions at the ports.

• Have enough I/O interfaces to connect to different devices.

• Support DNP3 to convert data to a proper format for use by SCADA.

• Contain an industrial computer designed to process massive data volumes.

Project Implementation

ADAM-3600

All-in-one intelligent remote terminal unit

ACP-4000

Quiet 4U rackmount chassis with visual & audible alarm notification

WISE-EdgeLink

WISE-EdgeLink

IoT gateway software supporting the transfer of data from device to cloud

System Description

Advantech provided two edge solutions for the project's development. One was the ESRP-PCS-ADAM3600—an edge DAQ platform that collects data and oversees devices on-site. The other was ACP-4000, a high-performance industrial computer that runs the SCADA program designed by the contractor.

Dozens of ESRP-PCS-ADAM3600 units—which are installed respectively on the front, middle, and rear parts of the many pipelines that lie on the left and right sides of piers connecting tankers to shores—use their I/O interfaces to gather data on temperatures, water flow, and weather conditions. They then preprocess this data, convert it through communication protocols, and upload it over a 4G wireless network to the ACP-4000 in the control room for visualization and other computation processes.

Through the ACP-4000 in the control room, personnel can keep an eye on oil unloading, find out what the weather looks like on the ground, issue commands over wireless connections for the edge DAP platforms to open/close the valves or pumps of the pipelines, and better understand exactly how much oil has been moved off a tanker.

The ESRP-PCS-ADAM3600, which comprises ADAM-3600 (a remote terminal unit) and WISE-EdgeLink (a protocol conversion program), is an edge solution ready package that readily gathers data from devices on the ground without requiring complex programming or setup. This edge DAQ platform functions at a temperature between -40 °C and 70 °C and provides multiple analog and digital I/O interfaces. Moreover, with four slots for I/O expansion, the platform can accommodate plenty of devices that are being monitored on-site.

The edge DAQ platform supports wired and wireless networks—for this project, it sends data over a 4G wireless network because it is not easy to deploy network cables around ports. The SD memory card of this terminal unit, coupled with WISE-EdgeLink (which creates timestamps and sends data even after a disconnection), ensures data integrity. This helps to free oil estimations from any inaccuracy even when the wireless network is down.

The edge DAQ platform has a handy preprocessing feature that allows users to convert raw data into meaningful information without having to write a program. For example, you can use the built-in formulas to convert 10 mA to 100 °C or draw on temperature and pressure data to estimate water flows. Moreover, the platform's compatibility with Modbus, DNP3, and IEC-60870-5-104 protocols equips it to convert its data to a proper format and upload to SCADA, thus speeding up a project's development timeline.

System Diagram

APC-4000
4U Rackmount Chassis with Visual &
Audible Alarm Notification

Real-Time Monitoring

4GLTE

WISE-EdgeLink
ADAM-3600
Edge Intelligence for Facility
Monitoring

I/O   RS-485

Oil Pipeline System   Temperature   Wind speed   Meter

Summary - Why Advantech?

It is critical for oil importers, port workers, and tanker operators to unload oil safely while obtaining accurate data regarding the quantities of oil unloaded. In this arena, IoT is conducive to creating a synergy of human intelligence and technology. This synergy is materialized through projects like this one in Thailand.

The project was completed in just a few months, thanks in no small part to Advantech's edge solutions. Without the edge DAQ platform—which features modular I/O design, broad operating temperature, compatibility with multiple communication protocols, and connection with wired and wireless networks—and Advantech's technical support, it would have taken the SCADA developer substantially more effort and time to achieve real-time monitoring for both unloading and accurate oil volume calculations. Going forward, Advantech will continue working closely to co-create IoT solutions for customers in the energy sector.

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ADVANTECH iAutomation
Premier Partner

An OPC UA Solution for Wastewater Treatment Monitoring System

Location: **Taiwan and other countries**

Background

Wastewater treatment involves processes and equipment units dealing with screening, pumping, aeration, sedimentation, filtration, neutralization, chlorination, residuals removal, sludge digestion, and the discharge of effluent. It all requires an automated monitoring system to ensure that each and every of the equipment units is operating in good standing and protect workers from exposing to pollutants, pathogens or harmful chemicals as possible. For long, Advantech has been an important supplier for data acquisition modules and other products needed for building an intelligent SCADA system in many sewage treatment projects in Taiwan and other countries around the world, with its newest deliverables supporting Open Platform Communications Unified Architecture (OPC UA) which may help reduce the costs for engineering and maintaining an IoT network and enhance data security from the field to the cloud.

System Requirements

The implementation of a remote system overseeing the environment and equipment operations at a wastewater treatment facility has to face environmental challenges, as many processing units of wastewater treatment plant are located outdoors in a vast area, which poses difficulty in deploying data acquisition and transmission. Meanwhile, the control units and other legacy equipment in the indoor area may use different communication protocols that need to be unified to streamline data sharing.

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Project Implementation

WISE-EdgeLink

ADAM-6300
OPC UA Ethernet remote I/O module

ICR-2431
4G/LTE cellular router

ICR-4453
5G cellular router

ADAM-3600
All-in-one intelligent RTU supporting OPC UA

MIC-710AI
AI inference system based on NVIDIA® Jetson Nano™

ECU-1000 series
Industrial communication gateways

WISE-EdgeLink
IoT gateway software supporting the transfer of data from device to cloud

System Description

For the monitoring of outdoor installations, Advantech recommends ADAM-6300 series data acquisition I/O module, as it supports wireless communications via a cellular router such as ICR-2431 or ICR-4453 as well as daisy chain topology via Ethernet connection for easy installation reducing the need for extra switches. Built-in with a uniquely-designed MCU, ADAM-6300 is Modbus-ready and supports OPC protocol, so it can acquire parameter data from various field sensors and send the data directly to edge server(s) or to cloud SCADA system without the need for protocol gateways, thus minimizing the costs for deployment and maintenance. ADAM-6300 also features unparalleled data security with encryption and certificate sign-in provided by the OPC UA standard and an additional security chip built in the Advantech hardware.

Meanwhile, for the indoor area of the wastewater treatment plant, Advantech ADAM-3600 I/O system is an ideal option for iRTU to acquire data from PLCs and other legacy equipment and convert the data into OPC UA format for uploading to the cloud-based SCADA system and the AI-based edge server with reliable security. A concentrated I/O system, the ADAM-3600 is deployed with Arm-based processor and WISE-EdgeLink software delivering versatile protocol support including Modbus, PLC, MQTT and OPC UA.

If the user hopes to establish AI for their facilities, Advantech MIC-710AI is an ideal option for edge server to help develop AI applications enabling predictive maintenance and information insights for better operations.

System Diagram
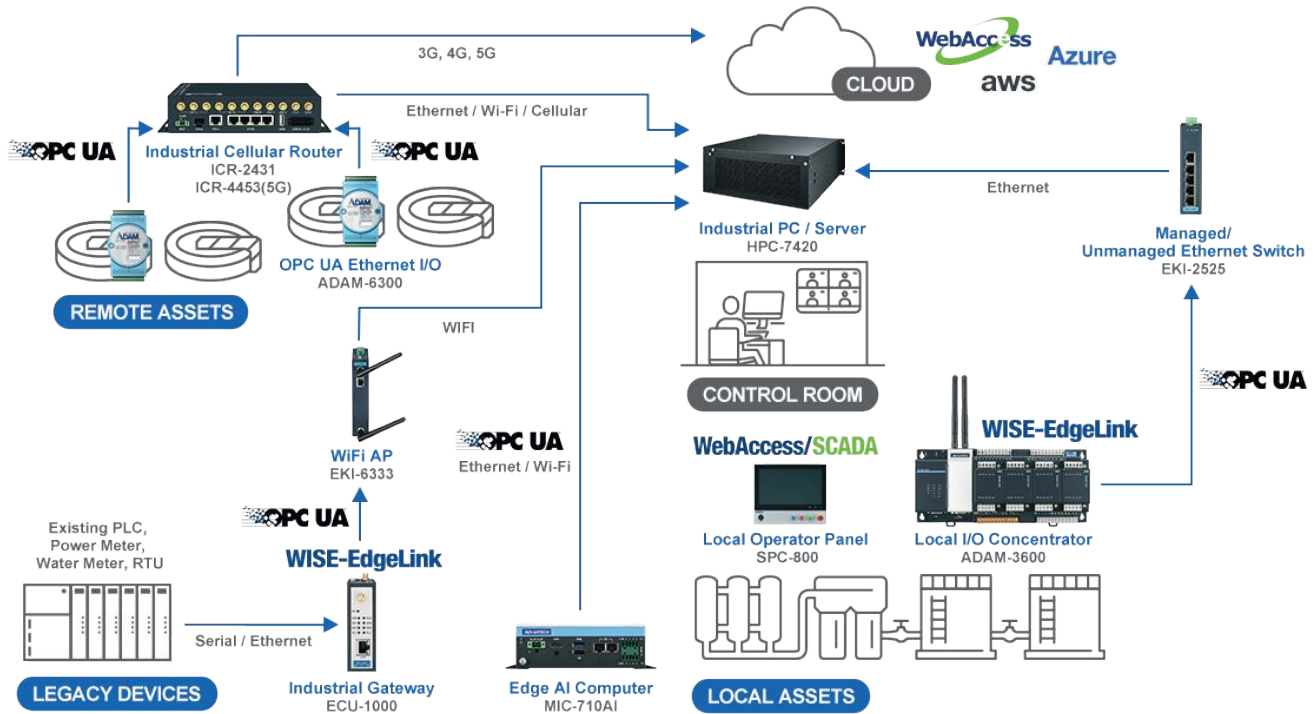
Summary - Why Advantech?

The OPC UA provides a unified platform for the system to connect with extensive cross-platform devices, enabling direct and secure communications between OT and IT, and has become a most economic solution for large scale deployment of environmental and equipment monitoring. As the world's leading automation manufacturer, Advantech provides an extensive hard- and software product array supporting OPC UA, which our ecosystem partners in various markets may choose to build their own SCADA solutions with maximized cost effectiveness, flexibility and scalability.

OPC UA Enabled SCADA Monitoring Solution for Gas Stations

Location: **Middle East**

Background

The operations of a gas station (or "petro station" in UK) involve many automated parts and sensors for filling tanks and cars. Any leaks of fuel into the air or the soil would not only undermine revenues but also harm the environment and the health of workers at the station, or worse, entail immediate safety issues. Today, many filling station chains have tried to oversee their remote assets and improve management by deploying a centralized Supervisory Control and Data Acquisition (SCADA) system providing intelligent features.

For example, an Advantech ecosystem partner in the Middle East has been awarded a contract to modernize the OT and IT infrastructure of some filling stations owned by a gas company, as part of the company's effort to build a SCADA system for monitoring the operations and the environmental conditions of their gas stations at real time. Our partner has used Advantech ADAM data acquisition I/O modules and an all-in-one intelligent remote terminal unit (iRTU) supporting Open Platform Communications Unified Architecture (OPC UA) to realize a most cost-effective solution delivering unparalleled data security.

System Requirements

Traditionally, the sensing and automatic control of gas station facility uses serial architecture for communications, for example, with RS-232 or RS-485 interface and Modbus protocol, due to cost benefits and easy deployment. However, Modbus technology is no guarantee of data security, and if we try to acquire data from the field and send it to the SCADA system on the cloud, we risk cybercriminal intrusions and the leaks of business secrets. Therefore, the customer needs a solution to effectively acquire data from the field and send the data to the SCADA system in IoT compliant and security-enhanced format.

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Project Implementation

ADAM-3600

All-in-one intelligent RTU supporting OPC UA

ADAM-4000

Serial I/O module

ADAM-6200

Ethernet I/O module

UNO-410

Explosion-proof computer

WISE-EdgeLink

WISE-EdgeLink

IoT gateway software supporting the transfer of data from device to cloud

System Description

Advantech ADAM-3600 combines the functions of a computer, a modular I/O system and an IoT gateway, and becomes an excellent all-in-one solution for Remote Terminal Unit (RTU) reducing deployment costs and difficulty with seamless integration. Installed with Advantech WISE-EdgeLink gateway software, ADAM-3600 delivers versatile support for various protocols, such as serial Modbus, Ethernet, PLCs, MQTT, and the newly added OPC UA.

In this case, Advantech recommended installing ADAM-4000 serial I/O modules to acquire data from sensors deployed at underground tanks for detecting gasoline leaks and possible contaminations of soil, which could be a most economic solution for field analog data acquisition. Meanwhile, Advantech also recommended adding ADAM-6200 series Ethernet I/O modules to the field for acquiring data detecting underground water contaminations and other types of environmental pollutions, as ADAM-6200 supports daisy chain topology ensuring easiest installation and highest scalability, with auto-bypass function delivering data transmission reliability.

The acquired environmental data, together with the operating data acquired from gasoline dispensers, will be sent to UNO-410 via Modbus. UNO-410 is a rugged computer featuring anti-explosion protection which is particularly ideal for gateway deployments for gas stations prone to environment hazards. The ADAM-3600 iRTU, deployed in the gas station office, will collect data from all sources, convert the data into OPC standard, and upload the data to the remote SCADA server with encryption and sign-in certificate—the innate security features provided by OPC UA.

System Diagram
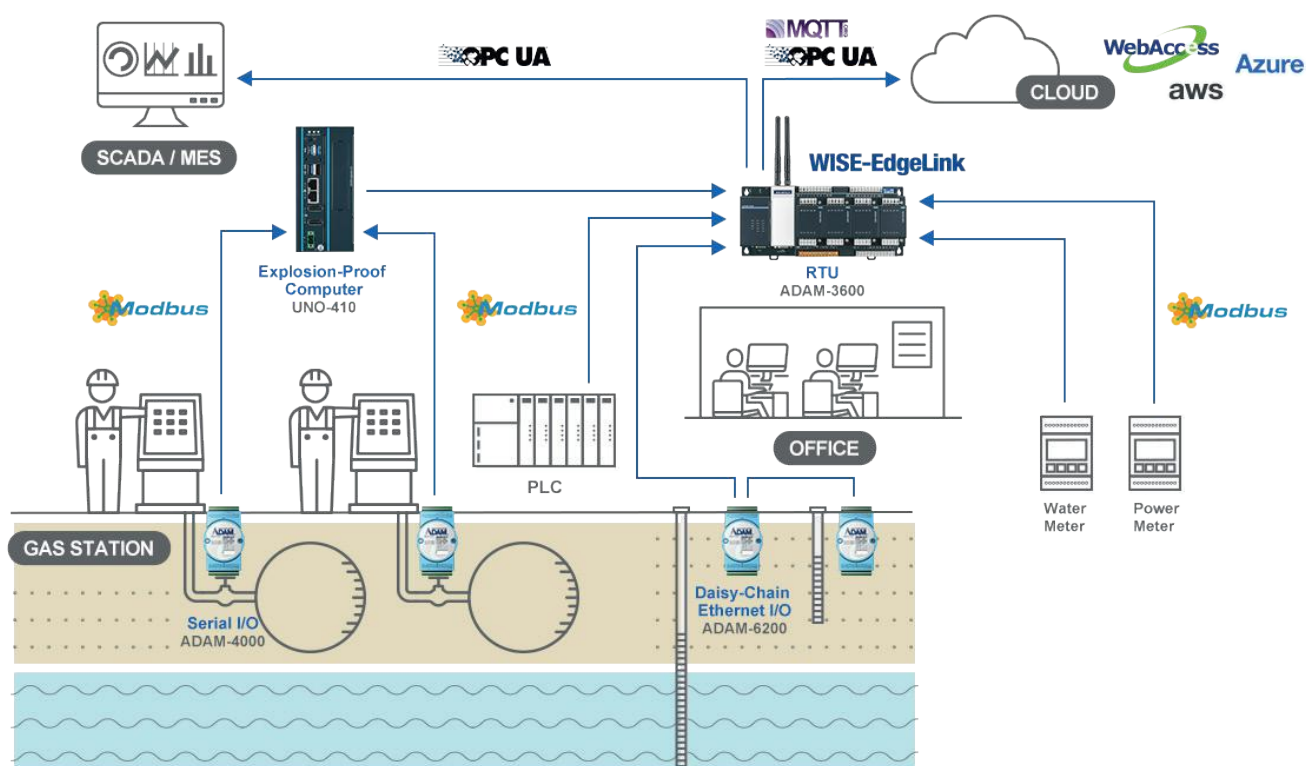
Summary - Why Advantech?

The operations of public utilities (e.g., water, power, gasoline and other necessities) often need to maintain a great number of remote and distributive assets. The OPC UA protocol is particularly suitable for these utility companies in developing SCADA for facility monitoring and IoT digitalization, as it is a standard that unifies and converges OT and IT communications with innate security features; the open platform architecture also provides an universal access for connecting with an extensive number of cross-platform devices, empowering high scalability; and, the timestamp feature of OPC is able to clearly mark the sequence of each data entry, which is helpful in data analysis.

Advantech, as the world's leading IoT expert, provides a most complete array of products supporting OPC UA and other protocols to allow our customers in different application scenarios to flexibly design and build most feasible and reliable solutions with fastest time-to-market, and push for digital transformation in many industries.

Energy Monitoring Solution Allows Italian Eyewear Manufacturing Factory to Effectively Reduce Energy Costs

Location: **Italy**

Background

Many countries continue to expand the use of renewable energy. And along with it comes the souring electricity bills. Take Italy as an example, since the promotion of non-nuclear applications began many years ago, more than 40% of the country's electricity now comes from renewable sources. As a result, its generation cost stays at a high level. Using a gateway device to collect energy consumption data and Supervisor Control and Data Acquisition (SCADA) data, manufacturers can carry out management efficiencies to improve energy generation and reduce energy consumption costs. Advantech provides a highly integrated solution for factory energy monitoring management. It enables system integrators to easily complete the bottom layer acquisition and upper layer integration through an open and flexible platform with complete communication protocol support to quickly develop energy monitoring systems.

System Requirements

Net Surfing is an Italian System Integrator specializing in providing enterprise asset management and IoT solutions. Over the years, the company has helped many manufacturing companies achieve efficient asset management and optimized energy management. Recently, Net Surfing was commissioned by a world-renowned eyewear manufacturer to implement an energy monitoring system for its main factory and five sub-factories in Italy. The manufacturer wanted set up a data center at the main factory and hoped to collect all energy consumption data (electricity, gas, water) from the six factories scattered in different locations and congregate it to the data center for unified monitoring. The manufacturer also had security concerns so requested a Virtual Private Network (VPN) to connect to the private Cloud.

In order to meet the needs of the eyewear manufacturer, Net Surfing intended to build a Computerized Maintenance Management System (CMMS) and self-develop an energy monitoring system called I4.0 Supervisor, so it was necessary to purchase gateway and SCADA software. The related products must meet the following conditions:

• Support Modbus protocol and provide Ethernet connection to collect and upload data.
• Support VPN allowing sub-factories to send data to the data center through a secure channel.
• Provide temporary data storage at local sites to avoid data loss caused by network interruption.
• Sufficient I/O tags to connect and add devices at any time.
• Flexible and open development platform to facilitate data collection and integration with CMMS.
• Support mobile devices allowing users to monitor at any time.

Project Implementation

WISE-EdgeLink

WebAccess/SCADA

ECU-1051TL

Industrial communication gateway

WISE-EdgeLink

IoT gateway software supporting the transfer of data from device to cloud

WebAccess/SCADA

IIoT application software platform

System Description

For this project, Advantech provided a distributed solution that could be quickly built and easily expanded, including an industrial communication gateway ECU-1051TL with protocol conversion software WISE-Edgelink as well as remote monitoring software WebAccess/SCADA.

WebAccess/SCADA software installed in the data center will visualize and display energy consumption data on the computer for the administrator to monitor in real time. Even if the administrator leaves the data center, they can access the system to retrieve data by mobile phone or tablet. WISE-EdgeLink supports a variety of communication protocols (Modbus, IEC 60870-104, DNP3, BACnet and OPC UA), so that ECU-1051TL can effortlessly collect underlying device data and securely upload it to the system. Currently they only needed to acquire electric meter data through Modbus, but in the future, if the factory adds new machinery or equipment that uses other communication protocols, they can still directly collect it through ECU-1051TL. The operation process is as follows: Each of the six factories installs an ECU-1051TL to acquire data from measurement devices, electric meters, and sensors through Ethernet and RS-485. The remote sub-factories upload data to the data center via WAN/VPN and the main factory sends data via LAN TCP/IP. The provision of 2000 I/O tags (equivalent to the collection of 500 electric meters of data) makes the deployment of data acquisition easy for the project without worrying about shortages. The data preprocessing function not only performs protocol conversion, but also encrypts the data, thereby enhancing the security of data transmission.

System Diagram
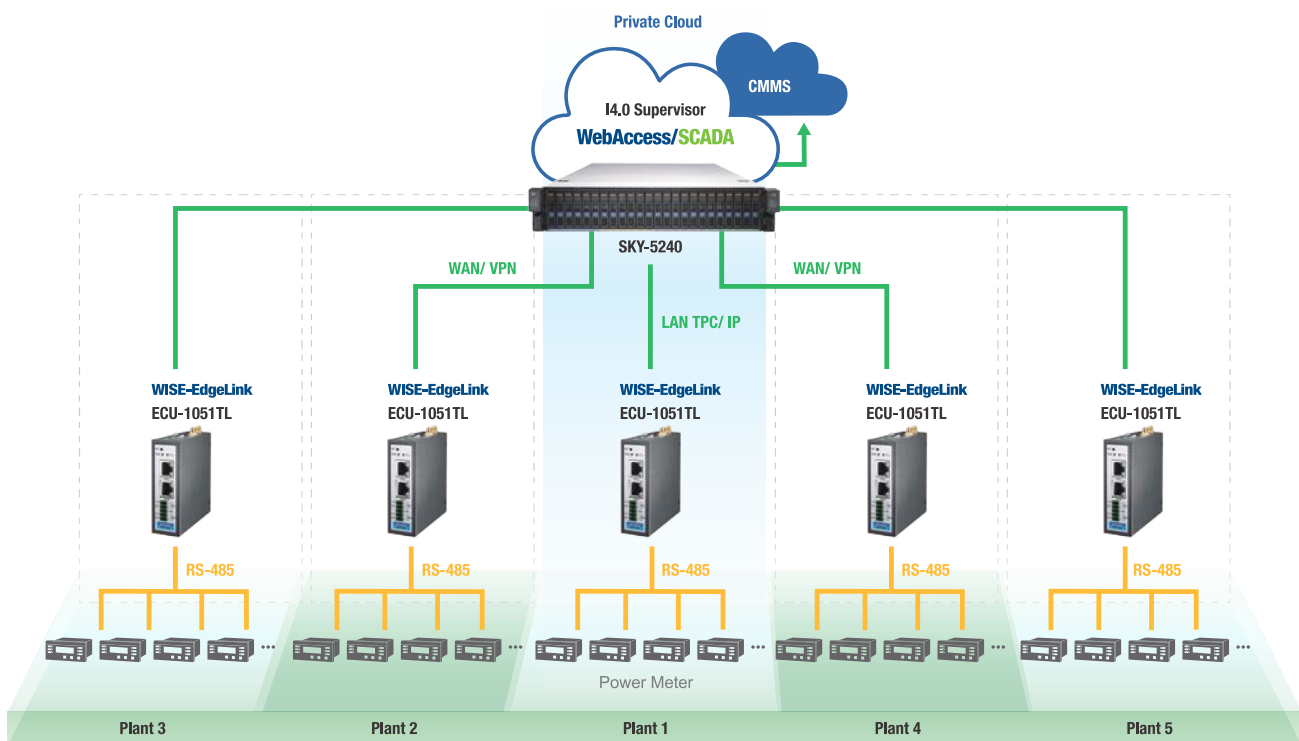
Summary - Why Advantech?

Controlling production costs is always a challenge for manufacturing. If manufacturers want to maintain high profitability and enhance market competitiveness, reducing energy consumption is definitely one of the necessary means to control costs. In the past, manufacturers received their electricity bills and paid on time, but they did not know which equipment was the power-hungry machine. Even if they wanted to save energy, they did not know where to start. Now, Advantech's cost-effective solution not only enables System Integrators to complete their project development in an efficient way, but also enables factories to permeate into the detail of energy management by using energy monitoring systems. The eyewear manufacturer of this project had made good use of the system for further in-depth analysis. By optimizing some lines in the factory and replacing the equipment with poor performance, energy costs have reduced by 10% to 15% within a few months. Such obvious implementation results are of course highly praised by users.

How an Automotive Manufacturer Successfully Deployed New IIoT Technologies for Product Process Data and Traceability

Background

A large-scale manufacturer of automotive components recently needed to implement new Industrial Internet of Things initiatives into its process due to customer requirements. Many large automobile companies are starting to require deeper levels of traceability, genealogy, and process data delivered with the products they integrate into today's vehicles.

Because customers were requiring these IoT features for more visibility, it helped create a strong sense of commitment in the organization to implement changes. The strong customer requirement helped open the door and greenlight the ability to bring in new Industry 4.0 technology approaches to the plant floor instead of keeping with the automation world status quo.

System Requirements

To achieve the goals of an IIoT upgrade, the manufacturer required status information from all production equipment throughout each manufacturing site. Some equipment was modern or PLC controlled, and some equipment dated back to the 1970s with no integrated data connectivity.

Project Implementation

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WISE-EdgeLink

BB-WSD2M06010

Wzzard industrial wireless sensor node - 6 Digital Inputs, M12

BB-SG30000525-42

SmartSwarm 342 gateway - 2 Ethernet, dust, international power supply

WISE-710

Industrial IoT edge gateway served as PLC-side protocol converter

WISE-EdgeLink

IoT gateway software supporting the transfer of data from device to cloud

System Description

To start the process of implementing and deploying IoT technologies into its processes, the manufacturer brought insome help. They created a proof of concept in one plant, utilizing Inductive Automation as a solution partner. Inductive Automation provides Ignition, a software platform that allows users to seamlessly collect data and help todesign industrial applications with ease. Advantech's intelligent hardware is compatible with numerous software solutions, including Ignition. Working with eco-partners, systems integrators and additional software providers, Advantech devices are ideal to work with Ignition Edge and Ignition Enterprise.

For the first proof of concept, the automotive manufacturer team deployed Ignition to complete basic OEE reporting from its assembly process in an effort to visualize data. From there, it only took a few days to have a full proof of concept to launch a pilot program on the assembly line—a process that can usually take up to six months or more.

The goal was to leverage modern IT technology to improve the way the company was building product on the shop floor. The pilot program was then rolled out to assembly lines across the company's many manufacturing sites. To avoid the common issues of "proof-of-concept purgatory," and get its IIoT initiative off the ground floor, the team kept with the following charges:

- Made sure to get buy-in from all levels of the organization, especially the operations system group.
- Formed an implementation and deployment team that included members from several different business groups—engineering, IT, operations, etc. Everyone's skills and expertise helped to leverage the right technology in the rightway.
- Aligned Key Performance Indicators (KPIs) with the whole team to make it easy for everyone to leverage the new collected data.
- Closely involved the engineering team so that as they're designing new products and specking new equipment, they are ready to plug into the ecosystem.
- Connected and worked closely with the right partners for both software and hardware solutions.

System Diagram
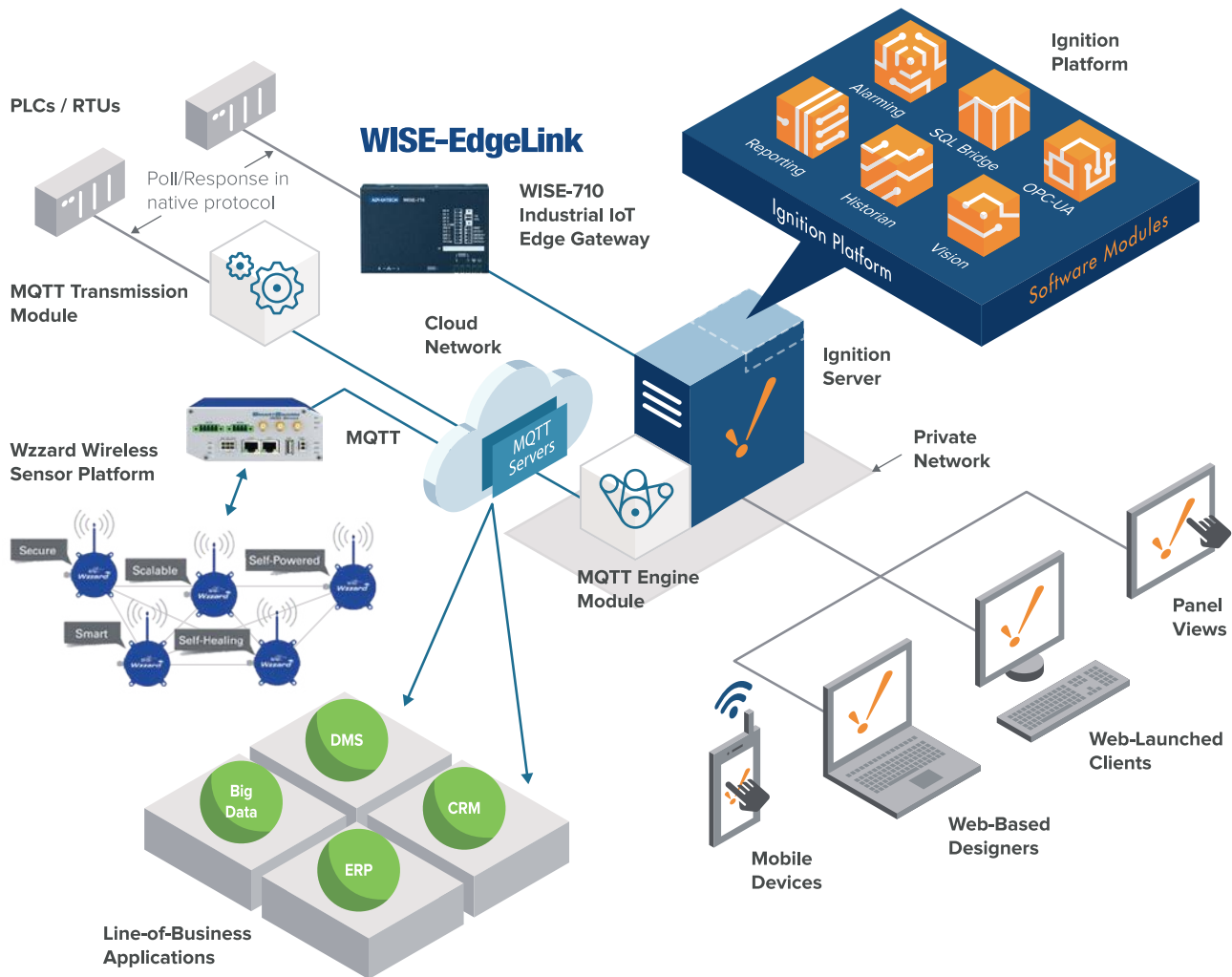
Summary - Why Advantech?

Several Advantech hardware solutions were included in the IIoT application for data visualization on the automotive shop floor. Advantech's Wzzard Wireless Mesh Sensing platform was used to gather data from legacy assets to create a basic OEE profile, which was not previously available.

Besides, Advantech gateways with WISE-EdgeLink were utilized to gather data from machines with fieldbus ports available. The gateways provide a local rules engine and publish the data of interest to Ignition using MQTT. As a lightweight gateway software, WISE-EdgeLink supports more than 200 PLC protocol drivers for collecting data from legacy devices, and features plug-and-play functionality to dramatically reduce software development time.

Universal Beijing Resort – Smart Reclaimed Water Monitoring System for Water World

Location: China

Background

Even though the largest theme park in the world is surrounded by water, Universal Beijing Resort is short of water. The reclaimed water system of Universal Beijing Resort not only undertakes the task of reclaiming and treating water, but it also shoulders the heavy responsibility of providing landscape water and water for leisure activities. It needs to do this at a sufficient scale and up to acceptable water quality standards — all at a low cost for daily operations. After completion of the park, the daily reclaimed water consumption reached 28,000 tons per day.

System Requirements

The whole reclaimed water system of the Universal Beijing Resort is not only huge in scale, but also extremely complex. The resort has imposed very high requirements on the real-time capability of its remote monitoring system. In particular, the valves in the reclaimed water underground pipeline corridor must function and operate reliably without fault.

Project Implementation

ADAM-3600
All-in-one intelligent RTU supporting OPC UA

EKI-7712E
8FE PoE and 4G SFP managed Ethernet switch

EKI-9612G
8GE+4G SFP L3 managed Ethernet switch

IPC-610-H
4U rackmount chassis with visual alarm notification

HPC-7442
4U rackmount/tower chassis for EATX/ATX motherboard with up to 8 SAS/SATA HDD trays

WISE-EdgeLink
IoT gateway software supporting the transfer of data from device to cloud

System Description

Advantech's remote monitoring system solution for the underground pipeline valves remotely monitor the reclaimed waters in all relevant areas of the resort in real time and quickly identify any problems or dangers that could cause pipeline accidents. Moreover, the highly integrated solution can also help the resort reduce operation and maintenance costs of the whole system. The open architecture also improves compatibility between systems and is designed for upgrades and maintenance according to requirements as time goes by.

Advantech's remote monitoring solution consists of complete software and hardware elements. The master control system adopts the ARM architecture and the network architecture is based on industrial optical fiber. The local controller is equipped with WISE-EdgeLink data acquisition management software and KW system kernel with real-time logic control and cloud computing. WebOP-107K is used as the human-computer interface and Advantech EKI-7712E wide-temperature industrial network management switch is used to build a stable industrial optical fiber ring network with 18-ring corridor monitoring stations. At the same time, management and cross-network data communication are handled by EKI-9612G, a third-layer switch, to ensure stable data transmission. The background monitoring system adopts Advantech IPC-610 industrial computer and HPC-7442 industrial server, and is equipped with SCADA systems and back-end platform software system for operations and maintenance.

System Diagram
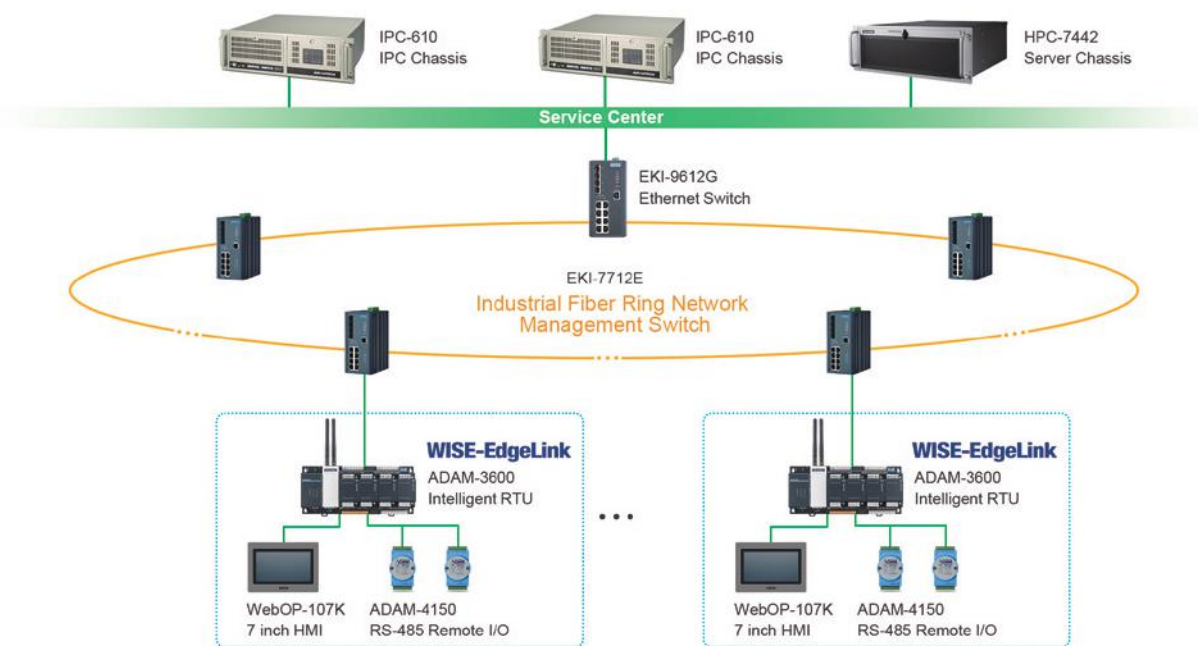
Summary - Why Advantech?

Yin Taotao, Sales Manager of IoT Business Group at Advantech, pointed out that, "Advantech solutions not only condense 30 years of Advantech's industrial experience in the field of automation, but also track development trends in digital, intelligent, and remote management for large scale public projects in the water treatment market. Advantech's integrated solution not only provide customers with highly stable and reliable services, but also effectively reduces the difficulty of system integration and operations and maintenance costs, thus maximizing the value of system construction. In addition, the open architecture of Advantech's solution also improves the compatibility and scalability of the whole system."

The Transformation of the Global Energy Begins with Smart Buildings

Location: China

Background

China's energy consumption is concentrated in three major areas: industry, transportation, and construction. Among them, carbon emissions from the construction industry account for about 20% of the whole, which is still low compared to other developed countries. In order for the construction industry to achieve their carbon emission goals before 2030, it is necessary to combine technologies and policies. Improvement of energy consumption in new projects, large-scale utilization of renewable energy in buildings, energy-saving renovation of existing buildings, and energy-saving of rural buildings, can all realize the goals of carbon reduction targets.

Established in 2017, Nanjing Nengkong has focused on becoming a leading information innovation service provider for construction engineering in China, taking green buildings as its core business, it is committed to providing smart energy management solutions for buildings using smart technologies.

System Requirements

A large part of the business in Nanjing Nengkong at present comes from the smart transformation of public building projects. The state attaches great importance to environmental protection, energy conservation, and emission reductions, and has made clear policies and guidelines to stress the issue. Local governments have also issued policies requiring central enterprises or state-owned enterprises in the region to encourage smart building construction when building new commercial offices.

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Project Implementation

WISE-EdgeLink

ECU-1051

Industrial communication gateway

WISE-EdgeLink

IoT gateway software supporting the transfer of data from device to cloud

System Description

In recent years, Nanjing Nengkong and Advantech have cooperated deeply at the technical level, and made use of Advantech's iBuilding smart building management platform to tailor make energy management solutions for customers.

iBuilding is a smart building management solution developed by Advantech through decades of experience. It is suitable for commercial parks, shopping centers, medical institutions, and more. Different building subsystems are integrated into the same interface to take advantage of artificial intelligence, digital twinning, remote operation and maintenance and other smart technologies, providing better operation and maintenance decision making for building managers and users.

For this building energy management solution, Nanjing Nengkong cooperated with Advantech to create a cloud-based end SRP solution, which can intelligently monitor and manage the newly-built 26-storey building of a people's court, including energy consumption analysis, fire control management, equipment asset management, HVAC management, computer room management and more.

For this solution, ECU-1051 Internet of Things gateway and edge software WISE-Edgelink are used to collect data from PLC through MODBUS/TCP protocol, and the data is transmitted to the cloud platform through the MQQT protocol in 4G mode, and HPC-7282 lightweight server is used to establish privatization, so that the data is safe and reliable. The equipment lifecycle management (ELM), BEMS building energy management, and smart security management systems are integrated through Advantech's iBuilding smart building management platform for real-time monitoring and management of power supply and distribution, HVAC systems, elevators, fire protection, water supply, and access control systems to reduce unnecessary energy costs.

System Diagram

Summary - Why Advantech?

From a long-term perspective, data-driven management has become an irreversible trend in the future development of various industries and the formation of smart cities is based on the integration of intelligent systems. Advantech hopes to build and provide basic underlying technical capabilities for developers, integrators and operators of smart buildings. WISE-PaaS industrial cloud platform helps build smart cities and helps integrate the whole smart energy ecology.

Remote Monitoring and Maintenance System for Water Pump Manufacturers

Location: **China**

Background

Whether its water supply for cities, or wastewater discharge from factories, pumps under long-term operation will inevitably produce structural damage or component wear. This could lead to major problems such as flooding after heavy rain, water shortages, and delays in production. Pump manufacturers need to regularly repair and maintain their pumps and used IoT technologies to introduce remote monitoring and maintenance to fully understand the status of their pumps across sites. This means they needed to change their traditional reactive fault finding methods to an active maintenance service that would enhance their commercial competitiveness.

Their remote monitoring and maintenance system is an active maintenance service, which includes data collection, wireless transmission, cloud integration and other technologies. Although there are many products with similar features in the market, not all of them are suitable for this simple cloud management application.

System Requirements

A pump manufacturer in China dedicated to the development and production of various industrial pumps, and whose products have been widely used in municipal water supply and drainage, improvement of urban sewage discharge efficiency, drainage of roads and communication channels, raw water intake, and secondary pressurized water supplies, felt that their current repair service does not provide the best value for customers, so they decided to introduce a remote monitoring system, hoping to centrally manage the water pumping stations scattered in various provinces and cities using a dedicated cloud platform. The new value-added after-sales service would help give their customers an additional competitive edge.

As most water pump stations are installed in remote areas, the remote monitoring and system needed to use a wireless solution with strong signals and wide coverage to ensure reliable data transmission. For cloud management, a public cloud provider offered both PaaS and SaaS services and customized its APP software to meet ease of use requirements.

As for the most critical end-to-cloud part, the company hoped to collect and upload water pump station data with minimal hardware configuration. However, due to the limited space within the system cabinets, products must be compact and easy to install and provide protection against the harsh environments in the pumping stations.

Project Implementation

ECU-1051

Industrial communication gateway

WISE-EdgeLink

WISE-EdgeLink software

IoT gateway software supporting the transfer of data from device to cloud

System Description

In close cooperation with China Telecom and a public cloud platform provider, Advantech provided an integrated end-to-cloud solution from data capture and network transmission, to cloud and storage processing. End customers can log in to the system with a special account on any computer and start monitoring and managing their equipment.

The solution used an Advantech ECU-1051 IoT edge intelligent gateway in the control cabinet and connected to a PLC for the water pump through RS-485 serial port to collect temperature and humidity, voltage, vibration, water level, and flow rate data. After preprocessing by the gateway, it is converted into MQTT communication protocol data. Through the wireless network service provided by China Telecom, the collected data is uploaded to the public cloud platform every half day. Managers can easily see the operational status of all water pump stations through a custom industry-specific APP.

ECU-1051 provides data retrieval, preprocessing and direct access to the cloud, and is the most suitable IoT gateway for the cloud management of distributed devices. Because it supports LTE communication technology, users only need to purchase SIM cards from telecom operators providing NB-IoT communication services to enjoy wide coverage, good stability, low power consumption, and low tariffs. In addition, through the VPN architecture supported by EdgeLink, it is more convenient for equipment vendors to carry out remote management.

In addition, ECU-1051, which supports the MQTT, can be easily integrated with other cloud platforms of various public and private cloud providers, so that users can easily manage the water pump stations. In terms of hardware specifications, the small ECU-1051 is the size of a smartphone, so it is easier to install. The wide operating temperature range (-40°C ~ 70°C) makes this gateway very robust and durable, even in harsh environments.

System Diagram
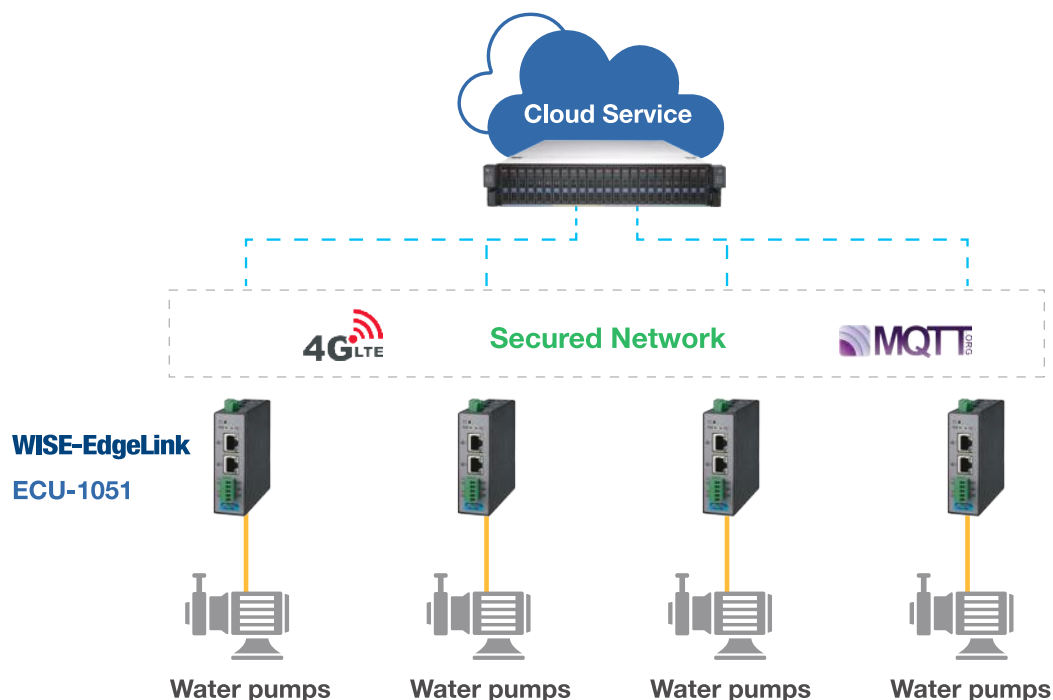
Summary - Why Advantech?

From a long-term perspective, data-driven management has become an irreversible trend, and the formation of smart cities is based on the integration of various smart systems. Advantech hopes to build and provide basic underlying technical capabilities for developers, integrators, and operators of smart buildings. Through its open and unified WISE-PaaS innovative industrial cloud platform, powerful smart building management can easily be attained.

Power Station Management Solution for Remote Monitoring of Equipment and Power Generation

Location: **Middle East**

Background

In recent years, the global photovoltaic industry has seen enormous growth with an installed capacity of 48gw in 2020, which represents a significant increase. The Photovoltaic Association predicts that the total global installed capacity will be 150-170gw, The overall automation and digitalization of power stations in middle east countries are insufficient to meet future demands and there is still a clear gap in the overall level of intelligent equipment within the industry, as a recent photovoltaic project implemented in one of the countries has highlighted.

System Requirements

For this project, several photovoltaic power stations are distributed in 12 factories across the country. The physical distance presents great difficulties to traditional operations. Maintenance inspections are difficult and problems are difficult to resolve, which not only affects power generation, but also increases operations and maintenance costs. To address this, Advantech put efforts on resolving large scale and decentralized operations and maintenance problems by means of automation, intelligent equipment, and digitalization. It created a set of remote power station management systems, which directly addressed all the issues and was able to be adapted to scale up in the future.

In the process of digital transformation and upgrading of power station systems, the biggest challenge lies in the technical requirements of IoT in the field side, that is, the different communication modes of equipment. Power stations use wide bandwidth hard wired communications, while distributed power stations are highly dispersed, which demands higher technical requirements for wireless performance. Specifically, there are areas where signal coverage is weak. At the same time, communications from various equipment in the power station needed to be re-entered, which further weakened the signal environment. Therefore, to ensure a reliable signal path from data acquisition to transmission outdoors was a core requirement for this project.

Project Implementation

WISE-EdgeLink

ADAM-4117

8AI Robust Modbus RS-485 Remote I/O

ADAM-4118

8-ch Thermocouple Modbus RS-485 Remote I/O

ADAM-4051

16DI Modbus RS-485 Remote I/O

ECU-1051/1251

Industrial communication gateway

WISE-EdgeLink

IoT gateway software supporting the transfer of data from device to cloud

System Description

Based on the WISE-PaaS industrial IoT data application platform, Advantech built a centralized control operation and maintenance cloud platform for the SPMS photovoltaic power station. The equipment was twinned and interconnected using IoT technology, forming a platform-based operation and maintenance process, from problem discovery, problem analysis, problem solving to problem archiving, it helps operators realize a refined, fully closed-loop, and continuous iterative operation and maintenance process.

For project analysis, the end power generation operator needed to comprehensively evaluate the efficiency of equipment and the health status of the photovoltaic equipment. The platform therefore provided tools such as analysis of power generation dispersion rates and equipment string dispersion rates, comparative analysis of theoretical and actual power generation, compound analysis combined with user behavior, efficiency (pr) analysis of photovoltaic power station, and more. Analysis of equipment was needed over different time periods, as well as details of shielding from external light conditions. Multi-dimensional analysis of the power station inefficiency helped to continuously improve the efficiency of power generation.

After deployment of the power station control system and cloud maintenance platform, real-time equipment data acquisition, remote monitoring, and online troubleshooting of faults, operators have seen significant benefits. What used to take 4-5 people days to troubleshoot and resolve equipment failures, now only takes one person an hour or so. The utilization rates and power generation efficiency of the photovoltaic power stations have improved by about 10%-20% and the overall economic benefits have increased by about 20%-30%.

System Diagram
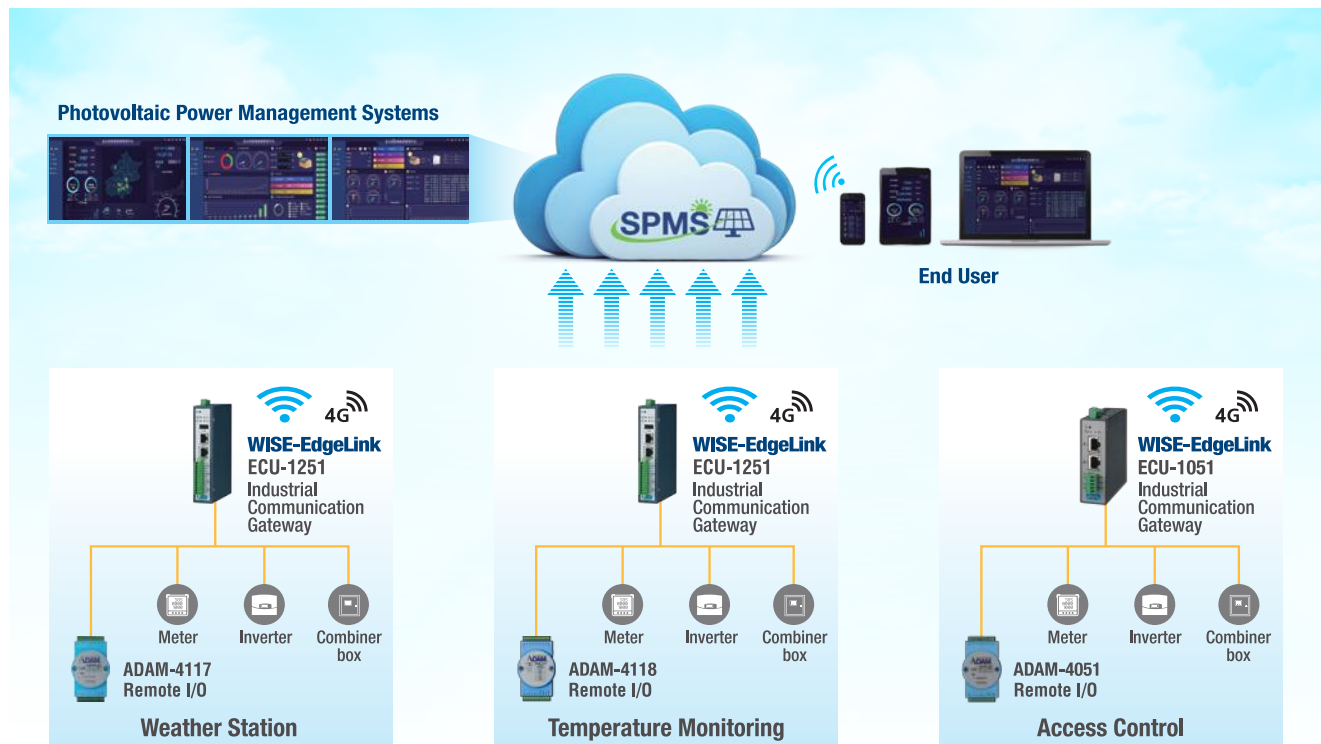
Summary - Why Advantech?

This project helped reduce costs and increased overall efficiency. The photovoltaic market is experiencing unprecedented growth opportunities and this project has benchmarked significant improvements. K.C. Liu, CEO of Advantech, stated that, "Advantech is rich in software and hardware products for the industrial field. Just like a supermarket may sell all the food you need, good produce still needs excellent cooks. Nowadays, in this photovoltaic industry, which is full of opportunities for global development and challenges for digital intelligence transformation, Advantech has cooked up an excellent meal using highly professional skills and fine ingredients selected.