Cloud-Enabled Edge Gateways for Industrial IoT

Powering Edge Intelligence with Advantech WISE-PaaS/EdgeLink

⁄ **Utilizing Edge Computing Applications**

⁄ **Advantech WISE-PaaS/EdgeLink Introduction**

⁄ **Case Study**

⁄ **WISE-PaaS/EdgeLink Function List**

WISE-PaaS/ EdgeLink

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Transmit Data to the Cloud and Enable Edge Intelligence with WISE-PaaS/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 increasing amounts of data collected from different equipment must be analyzed. Equipment manufacturers, owners, and maintenance personnel require an easy and reliable method for collecting data from field-based equipment. Advantech's WISE-PaaS/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.

Advantages of WISE-PaaS/EdgeLink

Optimizing Efficiency with Connected Equipment

For industrial boilers, air compressors, chillers, power distribution cabinets, and other equipment, WISE-PaaS/EdgeLink serves as a hub for data acquisition, storage, and reports, as well as alarm notifications, maximizing equipment efficiency with the provision of accurate data.

Plug-and-Play Cloud Access for Rapid Deployment

Plug-and-play functionality for data transmissions to the cloud eliminates complex programming and configuration. This ensures data can be easily uploaded for analysis and visualization to provide a useful reference for operational optimization.

Secure Data Conversion for Integrating Data with Third-Party Systems

WISE-PaaS/EdgeLink supports data conversion, enabling equipment used for mass production, such as PLCs, sensors, and inverters, to be directly integrated with SCADA, MESs, and ERP systems for convenient operation and maintenance.

Fanless Embedded PC

Industrial Protocol Gateway

Machine-to-Intelligence
• Leasing equipment management
• Overall equipment efficiency
• Pump status monitoring
• Flow pressure monitoring
• HVAC system operating status analysis

Factory Environment
• Facility energy management
• Wastewater discharge
• Continuous emissions monitoring systems
• Volatile organic compounds monitoring
• Industrial park energy management

MindSphere

Microsoft Azure

CUMULOCITY IoT

aws

T··Systems·

ERICSSON

ADVANTECH
WISE-PaaS
IoT Edge Intelligence

LightweightM2M
specified at omo

MQTT
ORG

AMQP
Advanced Message Queuing Protocol

WISE-PaaS/ EdgeLink

Wireless Intelligent RTU

Industrial Communication Gateway

Urban Construction
• Air quality monitoring
• Flood control systems
• Levee monitoring
• Wastewater systems
• Hazardous materials control

Renewable Energy
• Solar power management
• Wind power management
• Geothermal energy management
• Weather station monitoring
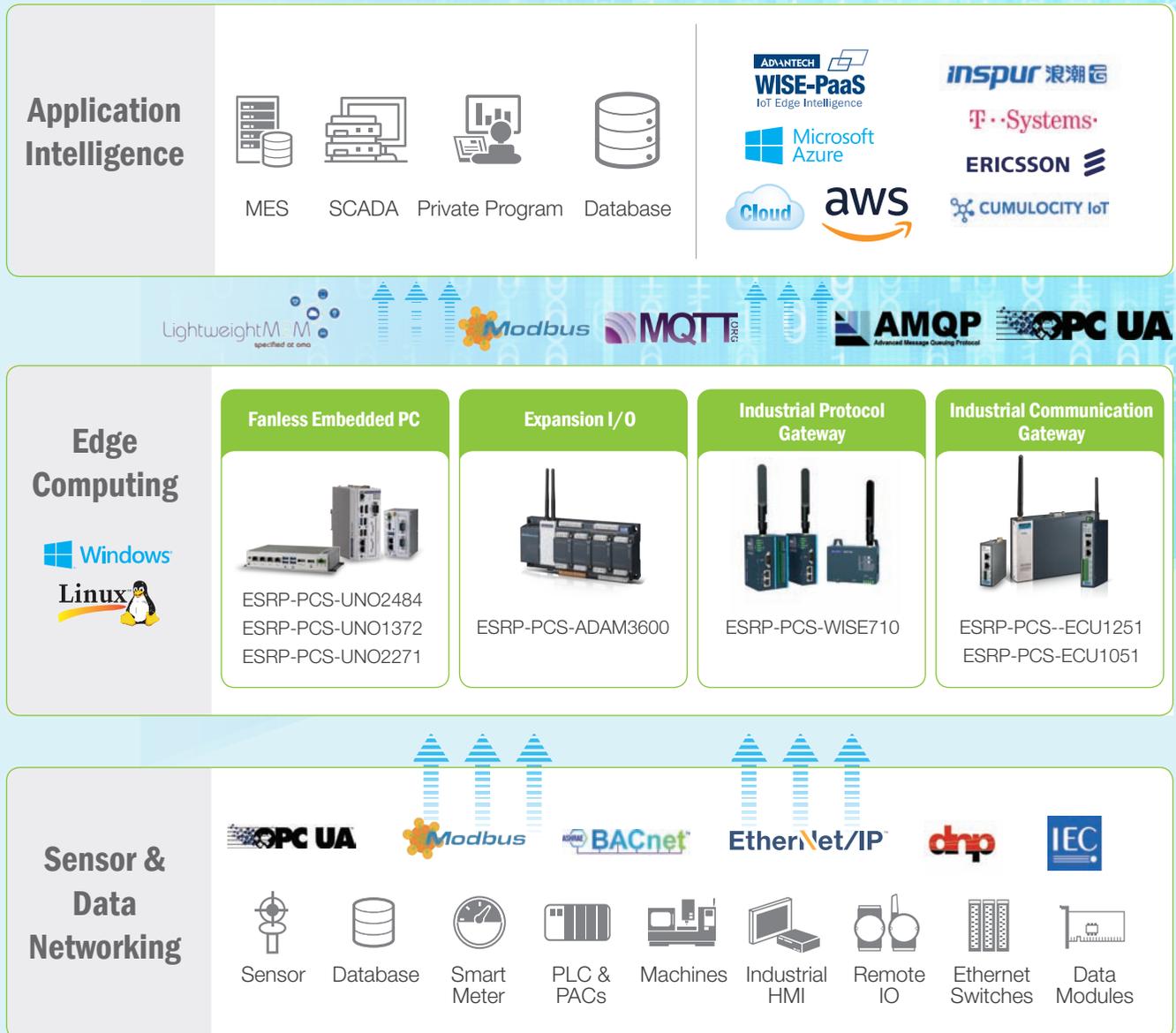• Power generation efficiency monitoring

Transmitting IoT Data from the Edge to the Cloud

Before data is ready for analysis, it must be preprocessed and transmitted to a server or the cloud using specific protocols. Advantech's WISE-PaaS/EdgeLink solutions are designed to convert and process acquired data without complex and time-consuming programming.

The WISE-PaaS/EdgeLink Studio software provides an efficient interface that allows users to preprocess data with just a few clicks of the mouse. After configuration, data can be downloaded to hardware equipped with WISE-PaaS/Edgelink Runtime. This software enables users to easily obtain and transmit equipment data to the cloud and third-party systems.

WISE-PaaS/ EdgeLink Architecture

Advantech's WISE-PaaS/EdgeLink is equipped with key functionalities aimed at edge applications. With downlink data acquisition capabilities integrated with uplink connectivity, security, and intelligence functions, transmitting field data to the cloud becomes an easy task.

Application Intelligence

MES SCADA Private Program Database

ADVANTECH WISE-PaaS IoT Edge Intelligence
Microsoft Azure
Cloud aws
inspur 浪潮
T··Systems·
ERICSSON
CUMULOCITY IoT

LightweightM2M specified at oma   Modbus   MQTT ORG   AMQP Advanced Message Queuing Protocol   OPC UA

Edge Computing

Windows
Linux

Fanless Embedded PC	Expansion I/O	Industrial Protocol Gateway	Industrial Communication Gateway
ESRP-PCS-UNO2484 ESRP-PCS-UNO1372 ESRP-PCS-UNO2271	ESRP-PCS-ADAM3600	ESRP-PCS-WISE710	ESRP-PCS--ECU1251 ESRP-PCS-ECU1051

Sensor & Data Networking

OPC UA   Modbus   BACnet   EtherNet/IP   dnp   IEC

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

WISE-PaaS/EdgeLink Benefits Data Management

Data Acquisition	Connectivity	Security	Intelligence

▪ I/O drivers
▪ WISE-PaaS/EdgeLink Benefits Data Management
▪ User tags
▪ System tags
	▪ Open VPN
	▪ Active connection to WebAccess
	▪ Store and forward
	▪ Protocol support
	  • MQTT/FTP/ODBC/AMQP
	  • WebService/RESTful
		▪ Project encryption
		▪ Whitelisting
		▪ SSL encryption
		▪ Data authority management
			▪ Event hub for SMS/email alerts
			▪ SoftLogic runtime
			▪ Data pretreatment
			
			• Event log • Time stamp
			• Data log • Tag quality

WISE-PaaS/ EdgeLink Components

Edgelink Studio
(for Windows)

▪ Project configuration

▪ Online device monitoring

▪ Device communication setup

▪ Data forwarding settings

▪ System settings

Windows 7   Windows 10   Windows Server

Download projects to the platform via a network

Configuration files

Edgelink Runtime
(for Linux and Windows)

▪ Connect end devices to network

▪ Data acquisition and transmission

▪ Supports 200+ device drivers

▪ Real-time/historical data log
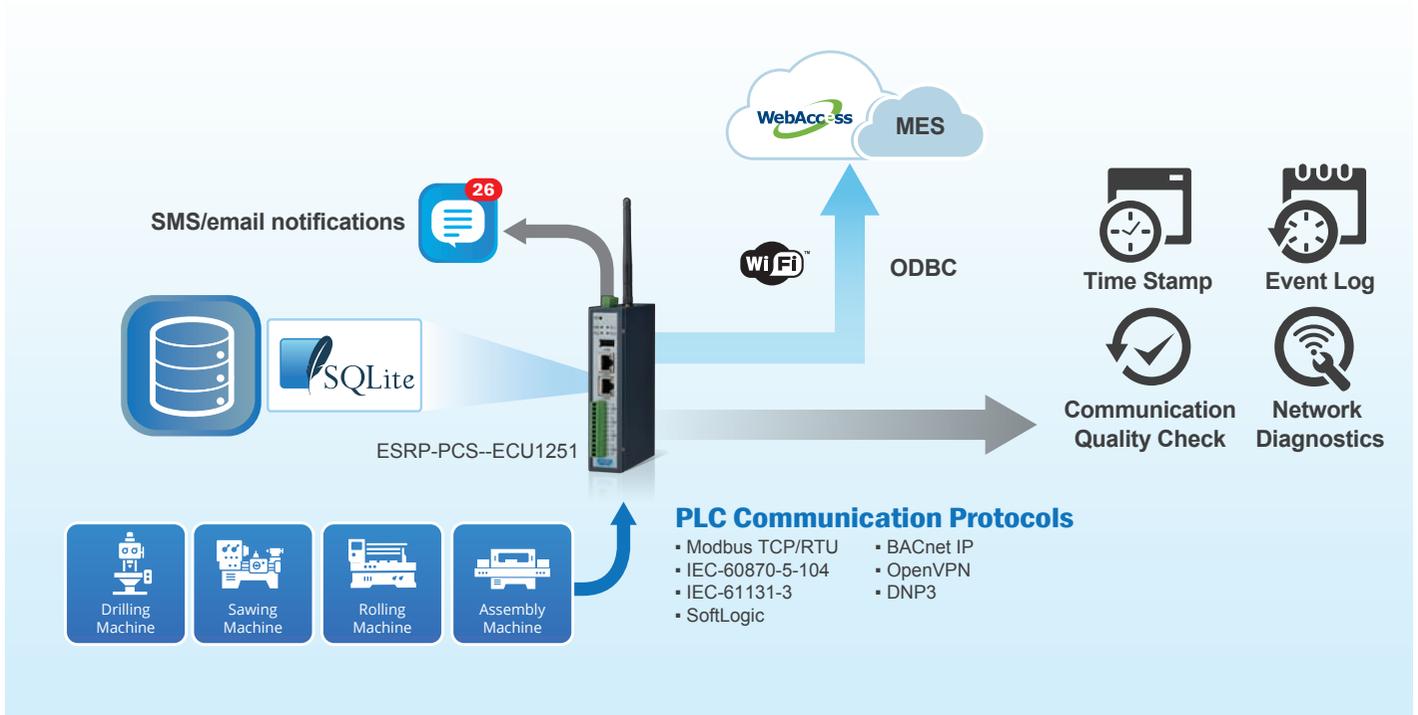
▪ Connectivity to the cloud and third-party systems

Connecting Machines and Equipment to the Cloud

▌ Requirements

Digitalizing factory equipment is the first step to realizing Industry 4.0. Because this transformation affects all aspects of assembly, machining, rolling workshops, and production line processes, a wide variety of equipment and machines are involved and diverse protocols and communication ports are required.

For this MES transformation project, the equipment was geographically dispersed and located in environments with limited space for installation. To allow the customer to connect PLCs to their MES for data transmissions to a host computer via Wi-Fi, a compact, distributed, wireless, multi-protocol gateway solution was required. Moreover, the environmental space limitations necessitated a compact wireless device for data acquisition.

MES

SMS/email notifications

WebAccess

26

SQLite

Wi-Fi

ODBC

Time Stamp

Event Log

Communication Quality Check

Network Diagnostics

ESRP-PCS--ECU1251

PLC Communication Protocols
- Modbus TCP/RTU
- IEC-60870-5-104
- IEC-61131-3
- SoftLogic
- BACnet IP
- OpenVPN
- DNP3

Drilling Machine

Sawing Machine
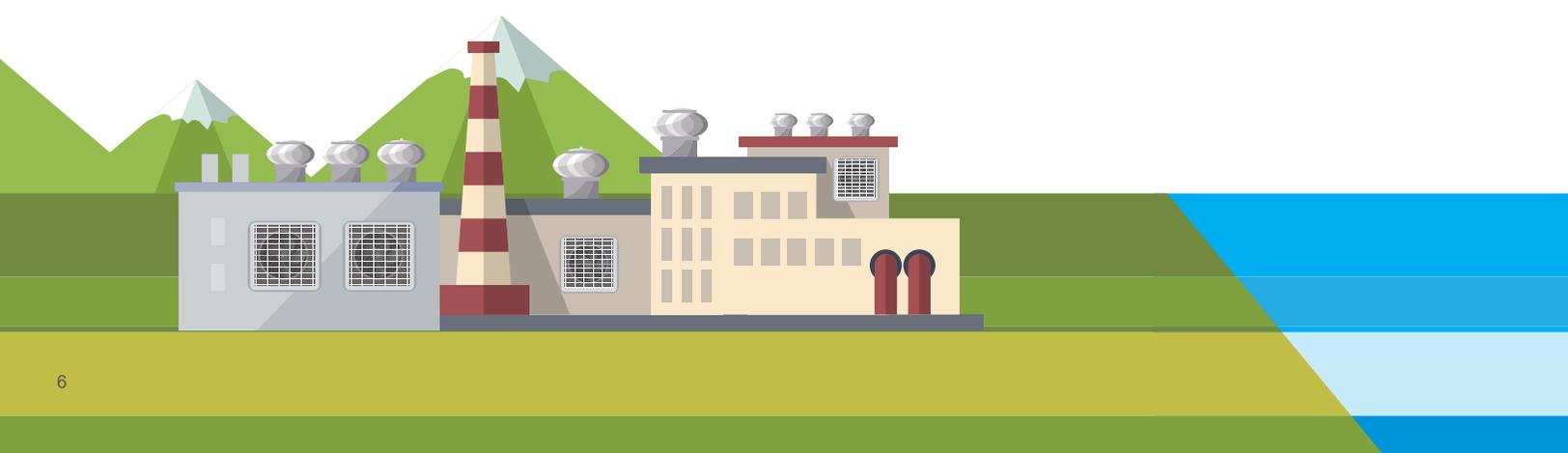
Rolling Machine

Assembly Machine

▌ Features

- Supports uplinking with ODBC
- Provides data time stamping and event logging
- Supports downlinking to PLCs using various protocols
- Wi-Fi and network diagnostics capabilities

▌ Benefits

- Provides easy access to MESs via ODBC
- Data tagging ensures readability and comprehension
- Cost-effective system integration solutions
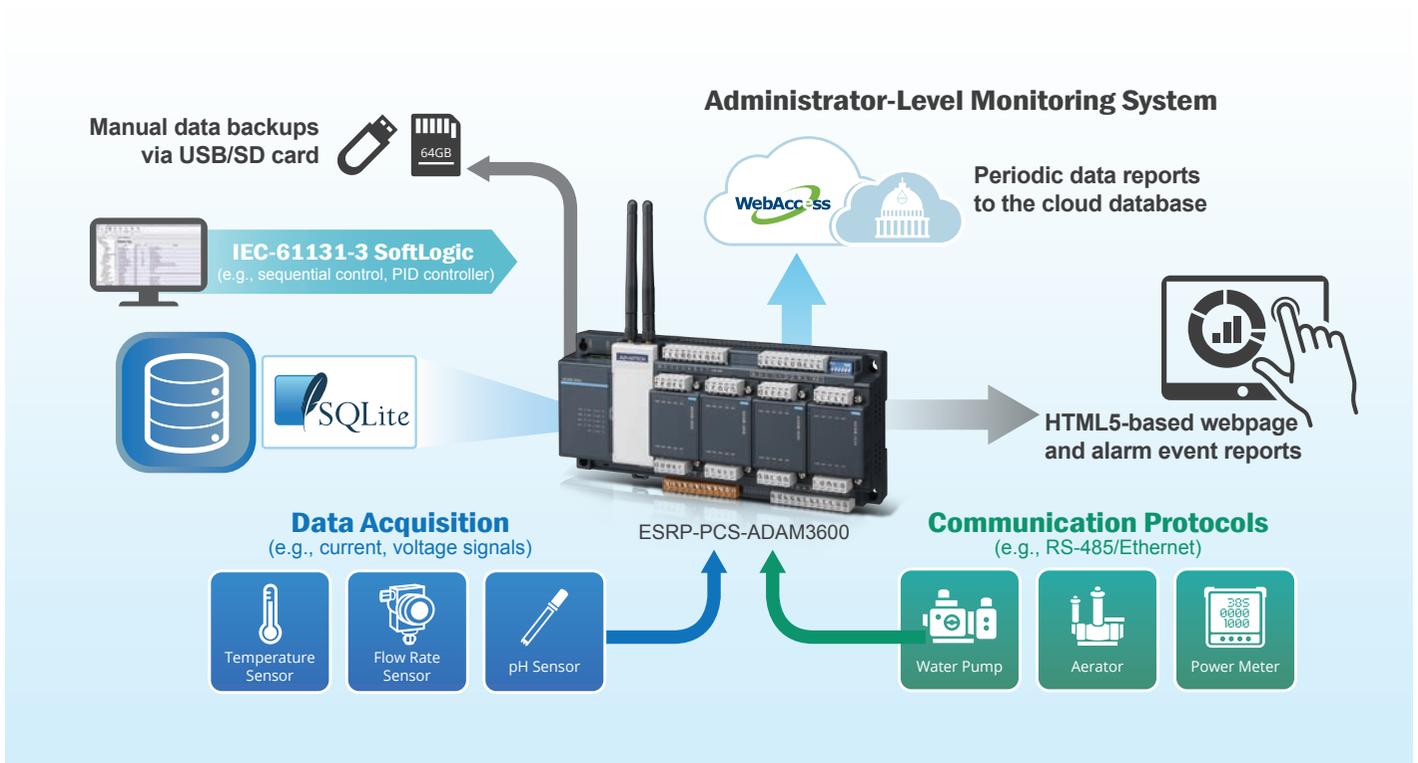- Enables convenient tracking of historical data

Monitoring System for Waste Water Treatment and Reclamation Infrastructure

▍Requirements

Wireless connectivity is required for monitoring a water pump station to enable reliable data transmissions to a surveillance center. The use of PLCs for monitoring and controlling pump stations is expensive and necessitates complex system integration procedures. Accordingly, many customers prefer to use all-in-one devices for data collection and transmission, as well as system monitoring and alarm reporting.

Manual data backups via USB/SD card

64GB

IEC-61131-3 SoftLogic
(e.g., sequential control, PID controller)

SQLite

Data Acquisition
(e.g., current, voltage signals)

Temperature Sensor

Flow Rate Sensor

pH Sensor

ESRP-PCS-ADAM3600

Administrator-Level Monitoring System

WebAccess

Periodic data reports to the cloud database

HTML5-based webpage and alarm event reports

Communication Protocols
(e.g., RS-485/Ethernet)

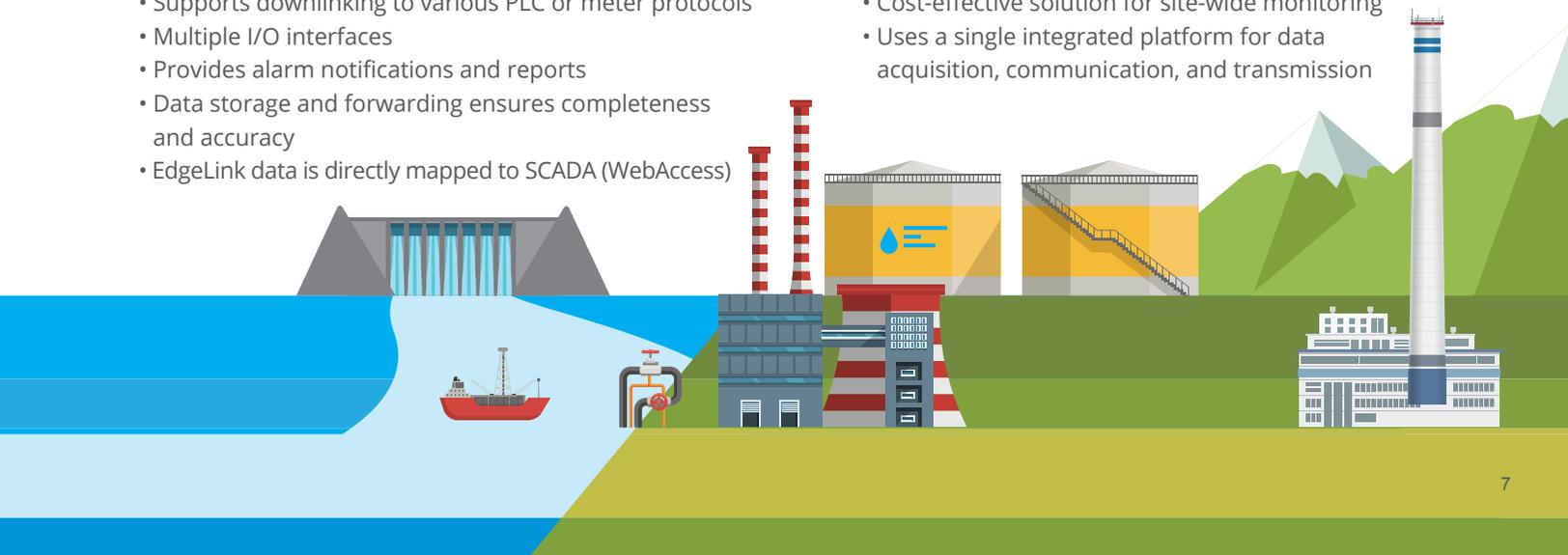Water Pump

Aerator

Power Meter

▍Features

- Supports uplinking with DNP3 and Modbus protocols
- Supports downlinking to various PLC or meter protocols
- Multiple I/O interfaces
- Provides alarm notifications and reports
- Data storage and forwarding ensures completeness and accuracy
- EdgeLink data is directly mapped to SCADA (WebAccess)

▍Benefits

- Eliminates programming for increased efficiency
- Cost-effective solution for site-wide monitoring
- Uses a single integrated platform for data acquisition, communication, and transmission
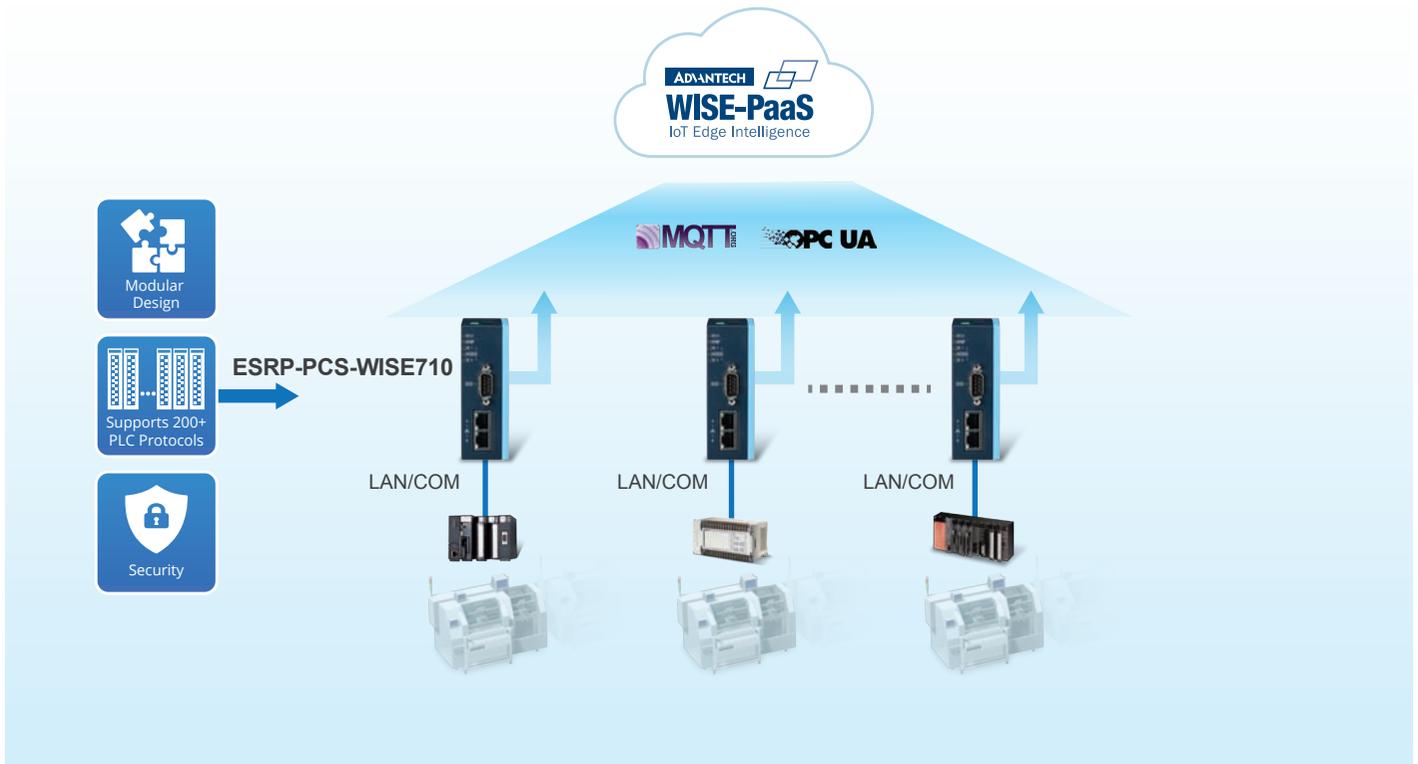
PLC-Controlled Equipment Data Conversion Solution

▌ Requirements

Data collection is a crucial aspect of modern manufacturing because it helps companies monitor and control costs and ensures smooth operations. However, data collected from legacy equipment and new machines can be difficult to integrate because of the different interfaces and communication protocols used. Advantech's WISE-710 protocol converter provides the ideal solution for collecting data from PLC-controlled equipment and performing protocol conversions that enable the data to be used for machine intelligence.

▌ Features

- Modular design for flexible configuration and customization
- Supports multiple PLC protocols for data conversion
- Compact size ensures easy installation

▌ Benefits

- Can be integrated with expansion modules to support multiple applications
- Offers enhanced cyber security with an embedded security chip
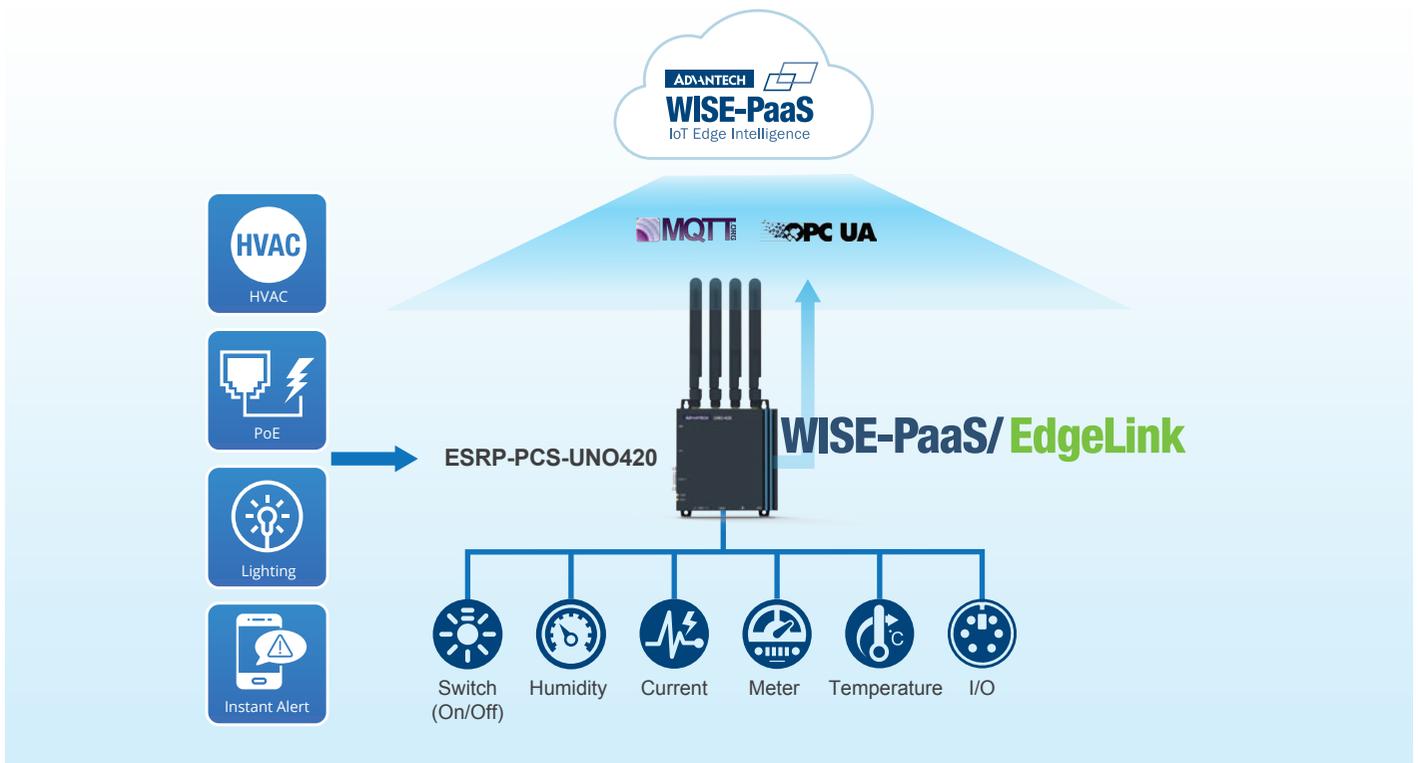- Reduces development time with EdgeLink software

PoE-Powered Sensing Gateway Solution

▌ Requirements

Sensing gateways act as a bridge between sensors/devices and the cloud. For industrial manufacturing applications, gateways are required to provide multiple I/O for data collection, enable remote monitoring, minimize wiring, and be able to withstand operation in harsh industrial environments. Advantech's rugged UNO-420 edge sensing gateway supports a wide operating temperature range and uses a single Ethernet cable for both power sourcing and data transmissions, making it suitable for data gateway applications in many industries.

▌ Features

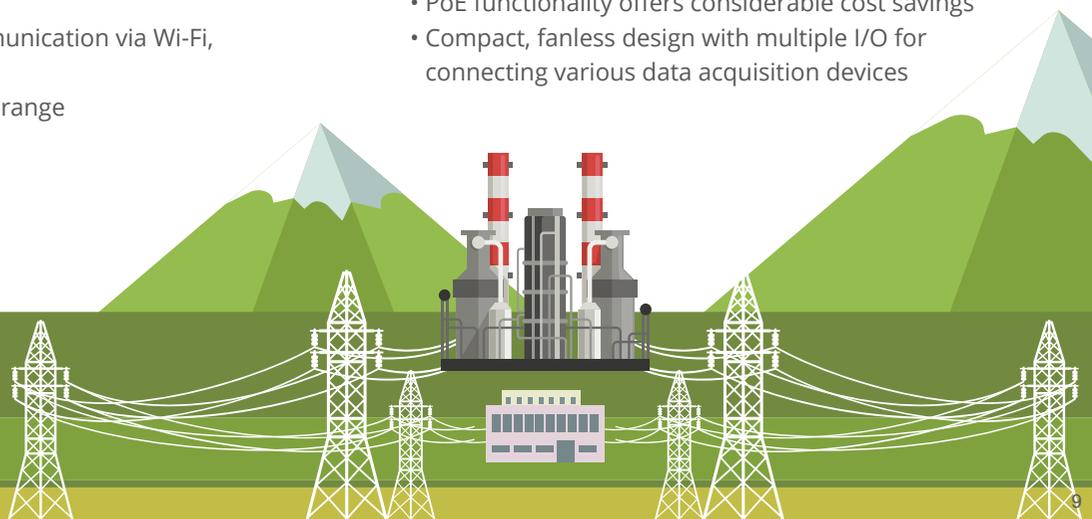- Programmable GPIO and selectable COM for flexible functionality
- Supports dual wireless communication via Wi-Fi, 3G, 4G, and GPS
- Wide operating temperature range (-20 ~ 60 ˚C/-40 ~ 140 ˚F)

▌ Benefits

- Easy installation with a combined power and data cable
- PoE functionality offers considerable cost savings
- Compact, fanless design with multiple I/O for connecting various data acquisition devices

WISE-PaaS／EdgeLink Function List For Supported Platform

		ESRP-PCS-ADAM3600	ESRP-PCS-ECU1051	ECU-1152TL-R11ABE	
Hardware Specifications					
CPU		A8 AM3352BZCZD60	TI Cortex A8, 600MHz	TI Cortex A8, 800MHz	
RAM		DDR3L 256 MB	DDR3L 256 MB	DDR3L 512 MB	
On-Board IO		8AI/8DI/4DO	-	-	
Slot		4 Expansion Slots	1x Micro SD slot	1x Micro SD slot	
Wireless Communication		Zigbee/WiFi/Cellular/NB-IOT	Zigbee/WiFi/Cellular/NB-IOT	Zigbee/WiFi/Cellular/NB-IOT	
Mini-PCIe		1 x Half-Size 1 x Full-Size	1x Full-size	1x Full-size	
SIM Card Slot		Single SIM card slot / Dual SIM card slot	Dual SIM card slot	Single SIM card slot	
LAN		2	2	2	
COM		2	2	6	
USB		1	1	1	
OS Version		Linux 3.12.10-rt15-ti2013.12.01 #9 PREEMPT RT			

EdgeLink Function List					
Data Center	Maximum number of IO Tag	3000	2000	2000	
	Device Model	√	√	√	
	Excel Import/Export	√	√	√	
	Data Logger	√	√	√	
	DataBackup				
Online Monitor	iCDManager	√	-	-	
	Device Search	√	√	√	
Data Forwarding Service	Modbus Server	√	√	√	
	IEC 60870-104 Server	√	√	√	
	DNP3 Outstation	√	-	-	
	WASCADA (WebAccess)	√	√	√	
	BACnet Server	√	√	√	
	OPC UA Server	√	√	√	
EventManager (SMS/eMail)		√	√	√	
IEC-61131-3 Softlogic		√	√	√	
OpenVPN		√	√	√	
Cloud Agent		SimpleMQTT / WebAccess / WISE-PaaS / ProudSmart /			
System Setting	Support IPv4/IPv6	√	√	√	
		-	√	-	
	LED Setting	√	√	-	
	Time Sync Setting (NTP/GPS)	√	√	√	
	GPS Setting	√	√	√	
SDK					

ESRP-PCS-ECU1251	ESRP-CSS-UN01372	ESRP-CSS-UN02271	ESRP-CSS-UN02484	ESRP-PCS-WISE710
TI Cortex A8, 800MHz	Intel® Celeron J1900, 2.0GHz processor	Intel® Atom™ E3825, 1.33GHz Processor	Intel® Core™ i5-7300U, 2.6GHz Processor	CPU Freescale i.MX 6 Dual Lite A9
DDR3L 256 MB	DDR3L 4GB	DDR3L 4GB	DDR4 8GB	DDR3 1GB
-	4DI/4DO			4DI/4DO
1x Micro SD slot				1x Micro SD slot
Zigbee/WiFi/Cellular/NB-IOT	3G/GPS/GPRS/Wi-Fi Communication by iDoor Technology	3G/GPS/GPRS/Wi-Fi Communication by iDoor Technology	3G/GPS/GPRS/Wi-Fi Communication by iDoor Technology	WiFi/3G/4G/NB-IoT
1x Full-size	2 x mPCIe	1 x mPCIe	1 x mPCIe	1x Mini-PCIe (Full-size)
Single SIM card slot	Single SIM card slot	Single SIM card slot	Single SIM card slot	
2	2	2	4	
4	2	2	4	
1	4	1	4	1x Micro USB2.0
				Linux imx6dl 4.1.15
2000	3000	5000	8000	3000
√	√	√	√	√
√	√	√	√	√
√	√	√	√	√
FTP/SQL Server				
-	-	-	-	-
√	√	√	√	√
√	√	√	√	√
√	√	√	√	√
-	-	-	-	-
√	√	√	√	√
√	√	√	√	-
√	√	√	√	√
√	√	√	√	√
√	-	-	-	-
√	√	√	√	√
AWS / Inspur / WLTX / T-System / OpenIoT / RootCloud / Azure / LwM2M				
√	√	√	√	√
-	-	-	-	-
√	-	-	-	-
√	√	√	√	√
√	-	-	-	√

DCTag SDK/DataLogger SDK/Board Resource SDK

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