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 Core Edge Devices Selection Guide

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Machine-to-Intelligence (M2I) Ensures Future Business Success

In the Industrial IoT era, companies are seeking solutions that can help them to utilize data analytics to raise service levels, create better products, and reduce operational costs. Ideally, the first step is the digitalization of assets. This means that increasingly more data need to be analyzed, and both the volume and diversity of such data from different equipment are also increasing. Equipment manufacturers, owners, and maintainers require an easy and reliable way to collect equipment data from field sites. Advantech WISE-PaaS/EdgeLink provides a solution for M2I. Without frequent on-site maintenance and service trips incurring time and financial costs, users will be able to monitor critical assets, track equipment performance, receive alarm notifications in the event of a problem, and perform system management and configuration using handheld devices. Thus, costs can be substantially reduced and field equipment and facilities can be better monitored and controlled.

Optimizing Efficiency with Connected Equipment

For industrial boilers, air compressors, chillers, power distribution cabinets, and other equipment, Advantech WISE-PaaS/EdgeLink serves as a hub for data acquisition, data storage, alarm notification, data reporting, and other functions, maximizing equipment efficiency with reliable data.

“Click-and-Go” Cloud Access Deployment

Advantech WISE-PaaS/EdgeLink Studio offers a “click-and-go” function for sending data to the cloud. Acquired data can be easily and effortlessly uploaded for analysis and visualization to serve as a more useful reference for management.

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Integrating Equipment Data into Cloud Middleware with Secure Data Conversion

In the industrial IoT era, the requirements for connecting equipment are becoming increasingly more diverse and complex. Advantech WISE-PaaS/EdgeLink Studio supports data conversion, which enables equipment used in mass production, such as programmable logic controllers (PLCs), sensors, inverters, and so on, to be directly integrated with SCADA, manufacturing execution systems (MESs), and ERP systems, thus facilitating equipment operation and maintenance.

Urban
- Air quality monitoring
- Flood control systems
- Levee monitoring
- Wastewater systems
- Hazardous materials control

Factory Environment
- Energy management
- Wastewater discharge
- Continuous emission monitoring systems
- Volatile organic compounds
Industrial IoT Data: From the Field to the Cloud

Before the data are ready for analysis, they must undergo several stages of processing. Without complicated and time-consuming programming, Advantech WISE-PaaS/EdgeLink organizes the acquired data for the cloud. The data need to be pretreated and sent to server/cloud securely and using specific protocols. Advantech WISE-PaaS/EdgeLink studio provides an efficient interface that allows you to perform this complex task with just several clicks.

Advantech WISE-PaaS/EdgeLink Runtime Kernel Architecture

Advantech WISE-PaaS/EdgeLink is equipped key functionalities for edge applications. With the integrated abilities of downlink for data acquisition and uplink with connectivity, security, and intelligent functionalities, sending field data to the cloud becomes an easy task.

Advantech WISE-PaaS/EdgeLink Studio

- Administer all gateways that support Advantech WISE-PaaS/EdgeLink
- Gateway status monitoring
- Event alert configuration
- Cloud access rights administration
- Custom integration
- Supports both 32- and 64-bit Windows
- No license required

Sensor Data
Handles I/O tags for data acquisition:
- Sensor voltage/current signals
- Limit switch ON/OFF status
- Alarms/buzzers
- Flow level
- Pressure
- Frequency
- Valve control
Security
Data encryption by AES-256 and access control
• Whitelist
• Web service encryption by SSL
• User authorization management

Connectivity
• Active connection
• Store and forward
• OpenVPN

Protocols
• Modbus
• DNP3
• RESTful
• MQTT
• IEC 61850-5-104
• WASCADA

Pretreatment
• Scaling/calculation
• Time stamp
• Data buffering
• Quality index for data protocols

Self-Diagnosis Information
System information can be easily accessed as system tags:
• CPU loading
• Memory and storage usage
• Serial/LAN ports quality index
• Location information (GPS)
• Cellular network quality
• Hardware operating status

Equipment Status
Acquire data using various communication protocols:
• Modbus RTU/ Modbus TCP
• PLC protocols for SIEMENS, Allen-Bradley, OMRON, etc.
• Open SDK for ASCII command
Remote Equipment Monitoring for Equipment Builders

### System Requirements

Equipment builders who thrive on improving equipment efficiency understand the importance of quality data in the analysis of component status. Given the high level of energy consumption for heating and cooling, being able to monitor and control heating, ventilation, and air conditioning (HVAC) systems can have a sizable effect on operation costs. Energy controllers can be used to monitor and control HVAC systems via a mobile or cloud system. With customizable software, they also accommodate customers who require customized functionality and input assemblies as well as cloud access.

### System Features

- Communication protocols: BACNet & Modbus
- Data time stamping and event logging
- Cloud solution with Microsoft Azure & MQTT
- Various I/O options

### Benefits

- Compact design and customized service
- Operational technology engineers can easily establish cloud access
- Scalable I/O & Comm. interface to different projects
**System Requirements**

The monitoring of a water pump station requires fully wireless connectivity with reliable data transmission to a surveillance center. Using PLCs to control and monitor pump stations can incur a high lifetime cost, and complex system integration procedures can be frustrating; hence, many customers prefer to use all-in-one devices for data collection and transmission as well as system monitoring and alarm reporting.

**System Features**

- Uplink with DNP3 & Modbus protocols
- Downlink to various PLC or meter protocols
- Various I/O options
- Store and forward to ensure data completeness
- EdgeLink data directly maps to SCADA (WebAccess)

**Benefits**

- Requires no programming, thus improving engineers’ working efficiency
- Cost-effective solution for monitoring one single site with one integrated platform for data acquisition, communication, and transmission
Digitalizing factory equipment is the first step for Industry 4.0. While the transformation covers assembly, machining, and rolling workshops, production lines, and more, the variety of equipment and machines increases the complexity of the project and diversity of protocols and communication ports that are required. In this MES transformation project, the equipment was scattered and there was limited space for installation. The need for distributed, compact, wireless, and multiprotocol gateways solution was clear. The customer needed to connect PLCs to their MES for data transmission to a host computer via Wi-Fi. Due to the space limitations, the customer required a compact wireless device for data acquisition.

**System Requirements**

- Uplink with ODBC
- Data time stamping and event logging
- Downlink to PLCs using various protocols
- Supports Wi-Fi and network diagnostics

**System Features**

- Easy access to the MES using ODBC
- Data tagged for easy reading and comprehension
- Cost-effective system integration solutions

**Benefits**
Application Scenario

Remote Facility Management Solution

System Requirements

The client required a solution that can support various types of protocols as well as event logging. To facilitate managing system problems, the customer also needed a remote terminal unit that can trigger alarm notifications via SMS or email. A system integrator will follow up this lead to provide a fully cost-effective turnkey solution that fulfills the client’s requirements.

System Features

- All-in-one device for handling multiple sensors
- 3G/LTE network communication with VPN access
- Event logging for acquiring action information from remote sites
- SMS/email notification for changes of state

Benefits

- Easy to install and manage according to client requirements
- Cost-effective for system integration and maintenance
- Integration solution from the edge to SCADA
## Model Name: ADAM-3600

<table>
<thead>
<tr>
<th>Description</th>
<th>Open Basis Intelligent RTU</th>
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</thead>
</table>

### System
- **CPU**: Cortex A8
- **Operating system**: Linux RT 3.12
- **Programming interface**: C (Linux) IEC-61131-3
- **Communication protocols**: Modbus/RTU, Modbus/TCP, DNP3
- **Wireless communication protocols**: GPRS, 3G, Wi-Fi, Zigbee
- **Special functions**: Monitoring (iCDManager), data identification, breakpoint transmission, initiative reporting

### Serial Port
- **Number of ports**: 3
- **Type**: 1 x RS-232/485, 2 x RS-485

### Network Port
- **Number of channels**: 2
- **Number of independent IP addresses**: 2
- **Speed**: 10/100 Mbps
- **IP specifications**: IPv4/IPv6

### I/O
- **Onboard I/O**: 8 analog inputs, 8 digital inputs, 4 digital outputs
- **Expansion slots**: 4
- **USB**: USB2.0
- **Display Interface**: VGA
- **LED**: System, serial, Ethernet, digital I/O, programmable
- **Storage Interface**: SD
- **Operating Temperature**: -40~70 °C
- **Certification**: CE/FCC
- **Part Number**: ADAM-3600-C2GL1A1E

### Expansion Module for ADAM-3600

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<th>Model</th>
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<th>Channel</th>
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<td>ADAM-3617-AE</td>
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<td>ADAM-3618</td>
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<td>ADAM-3624-AE</td>
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<td>ADAM-3651</td>
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<td>ADAM-3651-AE</td>
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<td>ADAM-3656</td>
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<td>ADAM-3613</td>
<td>Analog input module</td>
<td>4, RTD</td>
<td>ADAM-3613-AE</td>
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</table>

### Analog Input
- **Signal Input**: Differential
- **Sampling Rate**: 10 Hz
- **Voltage Input**: +/- 10 V, +/- 2.5 V
- **Input Current**: 0~20 mA, 4~20 mA
- **Sensor Input**: Thermocouple (type J, K, T, E, R, S, B) RTD (Pt100, Pt1000, Balco 500, Ni 518)
- **Resolution**: 16-bit

### Analog Output
- **Output Voltage**: 0~10 V
- **Output Current**: 0~20 mA, 4~20 mA
- **Resolution**: 12-bit

### Digital Input
- **Input Type**: Sink
- **Rated Voltage**: 12/24 VDC
- **Logic “0” Voltage**: 0~5 VDC
- **Logic “1” Voltage**: 11~30 VDC

### Digital Output
- **Output Type**: Open collect
- **Output Voltage**: 8~30 VDC @ max 200 mA

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**96PD-RYUW131**
Half-sized mini card, supports 802.11bgn

*1750006043* SMA(M) cable, 15 cm
*1750000318* 2-dBi antenna, 11 cm
<table>
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<tr>
<th>Model Name</th>
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<th>ECU-1251TL</th>
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<td>GRPS, 3G, LTE, Wi-Fi</td>
<td>GRPS, 3G, LTE, Wi-Fi</td>
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<td>Expansion slots</td>
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<td>1 x mini-pcie</td>
<td>2 x mini-pcie</td>
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<td>Storage Interface</td>
<td>SD</td>
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<tr>
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<tr>
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**EWM-C117FL Series**
6-band HSPA cellular module with SIM holder

- **Part Number**
  - 1750006264
  - SMA(F) cable, 15 cm
  - 1750008818-01
  - Dipole Ant. LTE 10x13.35 cm

**EWM-G108H01E**
GPS/GNSS half-sized mini PCIe card

- **Part Number**
  - 1750006264
  - SMA(F) cable, 15 cm
  - 1750006432
  - 4.5-dBi antenna, 5 m
### Regional Service & Customization Centers

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<th>Region</th>
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### Worldwide Offices

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#### Middle East and Africa

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- **Europe**: Germany, France, Italy, Benelux & Nordics, UK, Poland, Russia, Czech Republic, Ireland.
- **Americas**: North America, Brazil, Mexico, Middle East, Africa.

- **Customer Service**: China 86-10-6298-4346, Taiwan 886-2-2792-7818, USA 1-408-519-3898.
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