

Server Controller Software



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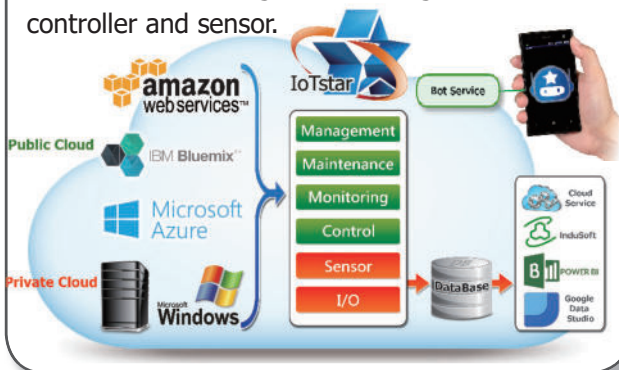
IIoT₁ Software, Controller/Server Overview

Industrial Internet of Things (IIoT) is the new cloud trend, and the IoT technology which makes all the devices communicated with each other is the first jigsaw puzzle of the entire cloud vision. To meet the demand for industry, ICP DAS offers software, controllers, Servers, etc. Our goal is to take the data to the cloud and make the whole system very easy to monitor, manage and maintain.

Software

1 IoTstar Cloud Software

The IIoT cloud management software for the remote monitoring and management of the controller and sensor.



2 AVEVA Edge SCADA Software

The develop software to for SCADA, HMI systems, and embedded instrumentation and control applications.



3 ExoWISE Monitoring Solution

ExoWISE is composed of ICP DAS WISE series IIoT controllers and their peripheral accessories combined with Exosite's ExoSense IoT remote monitoring system.



Controller/Server

1 WISE Edge Controller

Built-in edge computing mechanism, Instant message notification, cloud system connection and other functions.



2 UA Communication Sever

The IIoT communication servers connect IT with OT, upgrade the devices to the Cloud.



3 BRK MQTT Broker Server

The MQTT Broker communication server provides Cluster, Bridge, Load Balancing, and High Availability functions. The BRK products can achieve the multi-redundant system.



Chapter 1. IIoT Software

1

1-1 IIoT Cloud Management Software : IoTstar

IIoT Software

Introduction

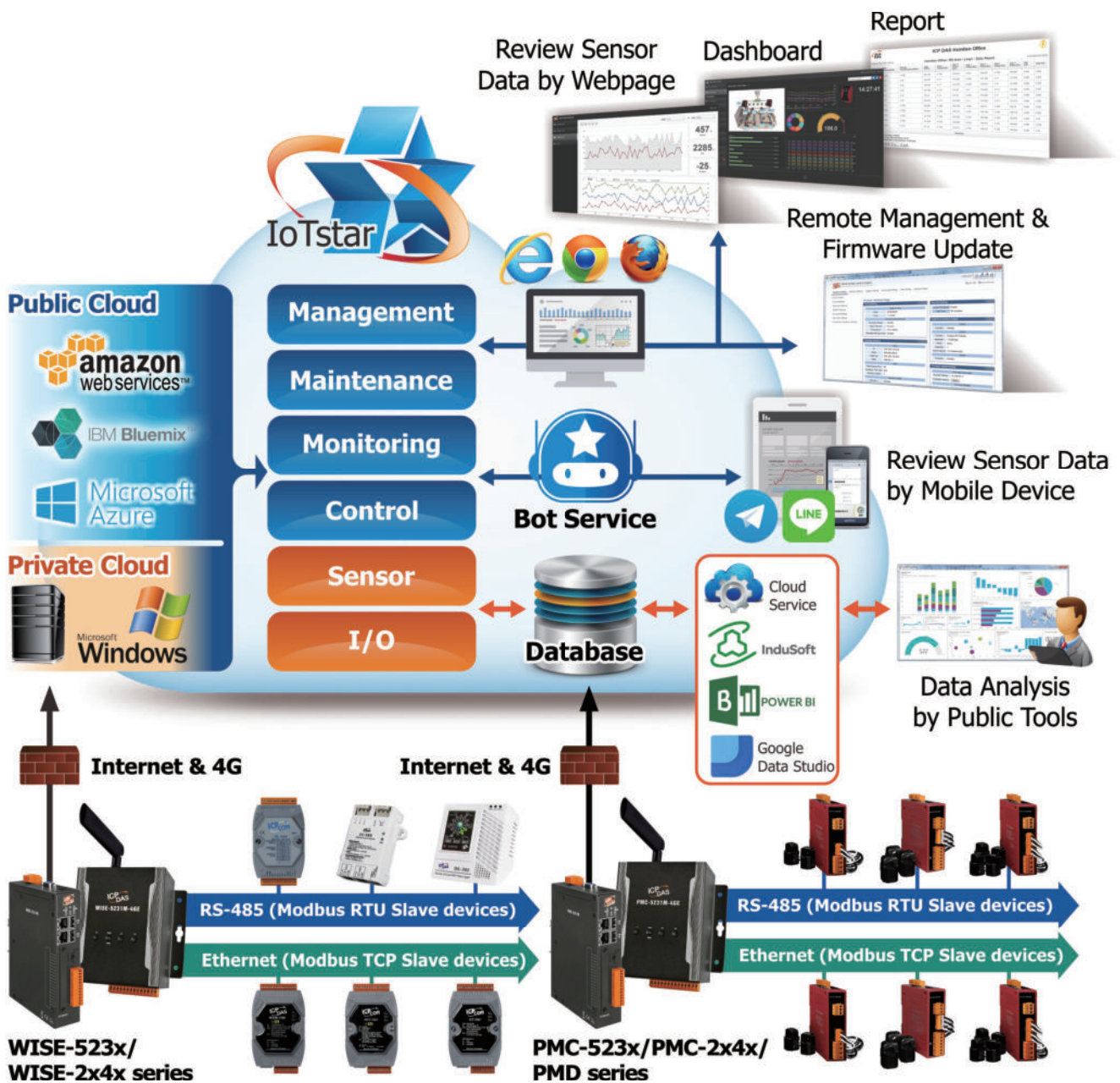
IoTstar is a software developed by ICP DAS for WISE/PMC/PMD controllers in a variety of Industrial IoT applications. IoTstar can be installed on a general PC platform and works as a Private IoT Cloud system, or on the VM (Virtual Machine) platform of Microsoft Azure, IBM Bluemix, Google Cloud or Amazon AWS, etc. and works as a Public IoT Cloud system.

Using IoTstar to build the IoT Cloud system, it can provide the following services:



During the IoT Cloud system development, there is no-programming-required, and the system setting can be completed through the web interface. In addition, through the SQL command, IoTstar can be quickly integrated with the Cloud platforms, data analysis tools (Power BI, Google Data Studio or SCADA system etc.) to help users quickly build the "IoT + Big Data" Cloud application and significantly reduce the time and cost in implementing the "IoT + Big Data" Cloud application.

System Architecture



Features

1

IIoT Software

Support Flexible installation environment to quickly set up IoT Cloud system

According to the needs of the field site, the installation environment can be flexibly selected.

IoTstar can be installed on the VM (Virtual Machine) platform of the Public Cloud platform such as: Microsoft Azure, IBM Bluemix, Google Cloud or Amazon AWS to implement the Public IoT Cloud system on WISE/PMC/PMD controllers. It can reduce the loading for maintaining the IoT Cloud operating environment.



If the user concerns about the environment of the system operation or data storage, the IoTstar can also be installed on a private Windows PC (Windows 7/8/10, Windows Server) to implement the Private IoT Cloud solutions on the WISE/PMC/PMD controllers, and then the user can manage the environment by himself.

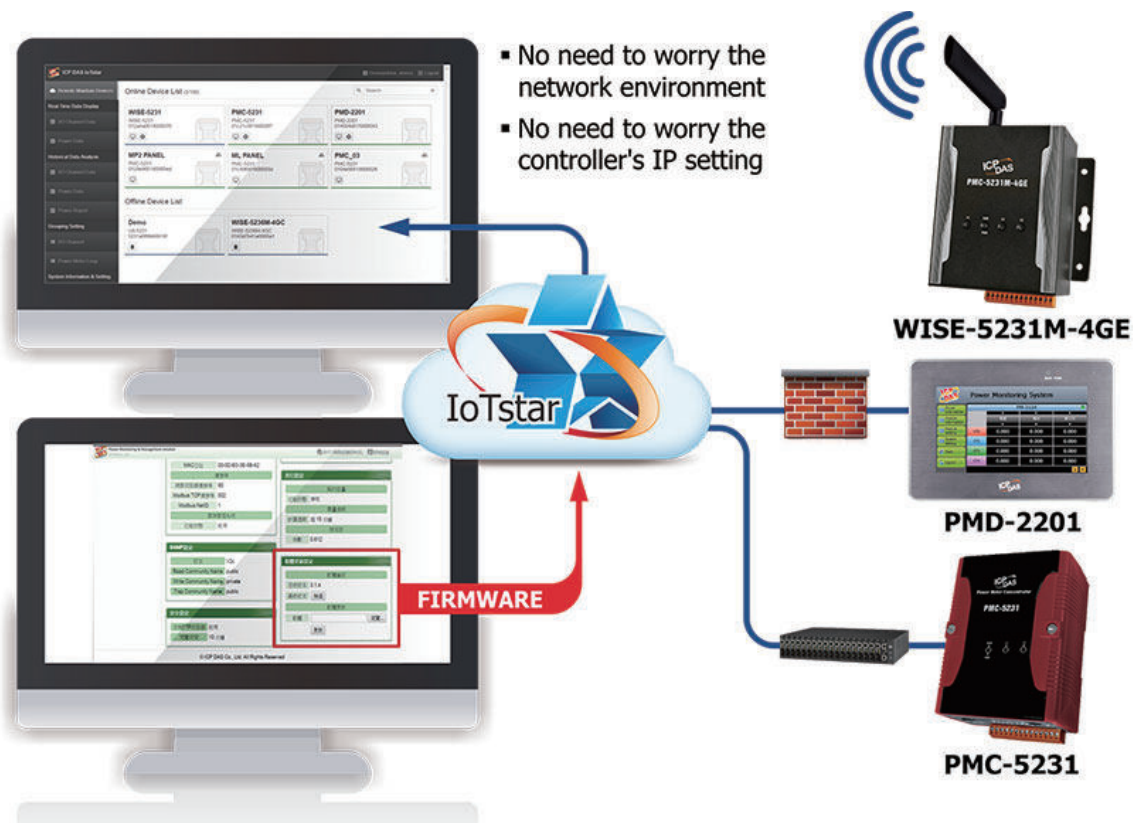
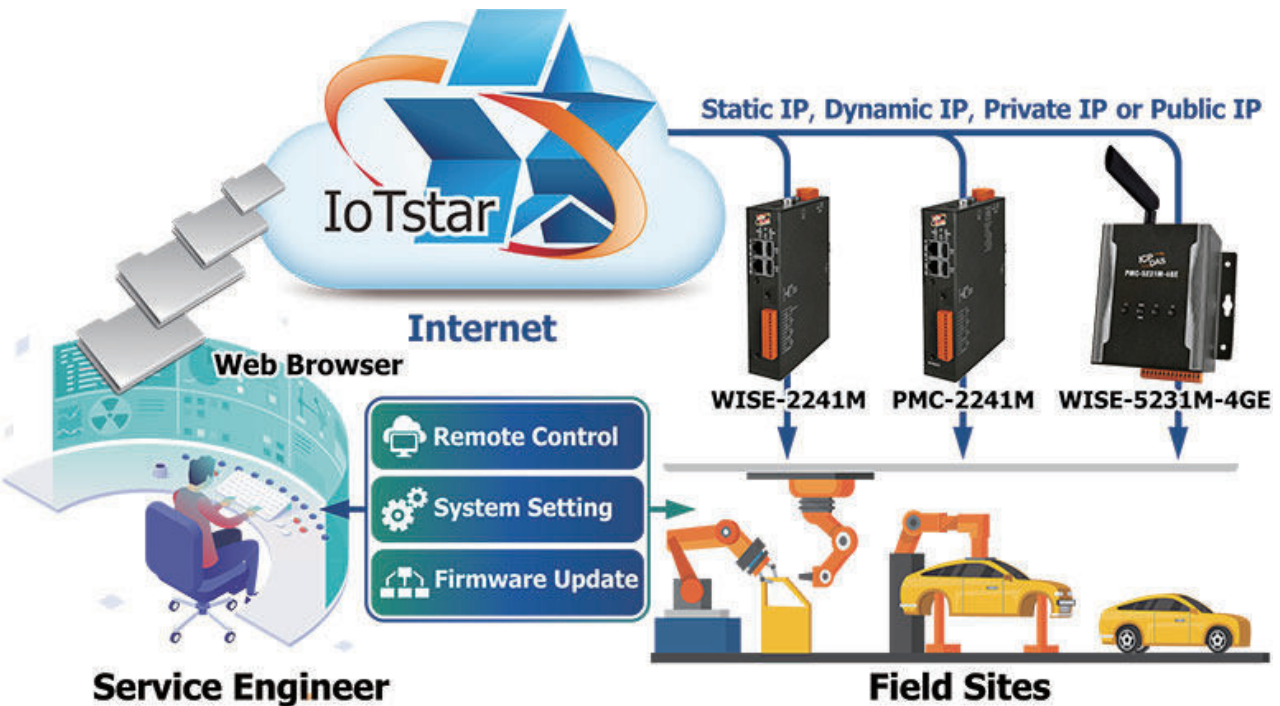
No more programming! Use a Browser to set up the IoT Cloud system

Only by a few clicks on Web page of IoTstar and WISE/PMC/PMD controller to complete the setting of IoT Cloud system.



■ Controller Remote Access/Maintenance Service

With IoTstar, users do not need to worry about the network environment of the WISE/PMC/ PMD controller, whether the controller uses the static IP, dynamic IP, virtual IP or physical IP, the user can perform the status monitoring, system setting adjusting, and update the firmware of the controllers through the web interface provided by IoTstar. It can reduce the time and cost of personnel travel due to performing the maintenance operations of controllers.



■ Sensor Data Collection Service

With IoTstar, the Sensor Data Collection Service can be performed to collect the Historical and Real-Time sensor data (and/or Power data) from the WISE/PMC/PMD controllers, and import the data to the Database in the Cloud. The users can quickly setup the Data Lake for the IoT and Big Data applications. The users can also modify the data in the database to change the status of the DO/AO channel of the sensor connected to controllers through the SQL command.



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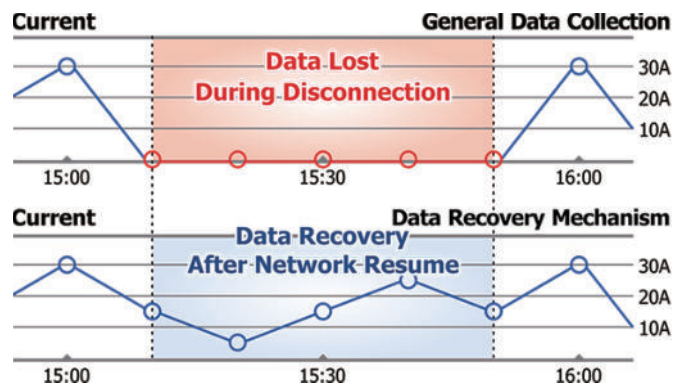
IIoT Software



With the support of SQL command interface, the sensor data stored by IoTstar can be connected easily with the third-party data analysis tools (such as: Power BI, Google Data Studio, SCADA system), and ERP/MES systems. It can assist user to integrate the OT(Operational Technology) and IT(Information Technology) systems quickly and seamlessly, so that comprehensive and complete information regarding system operations can be collected with ease.

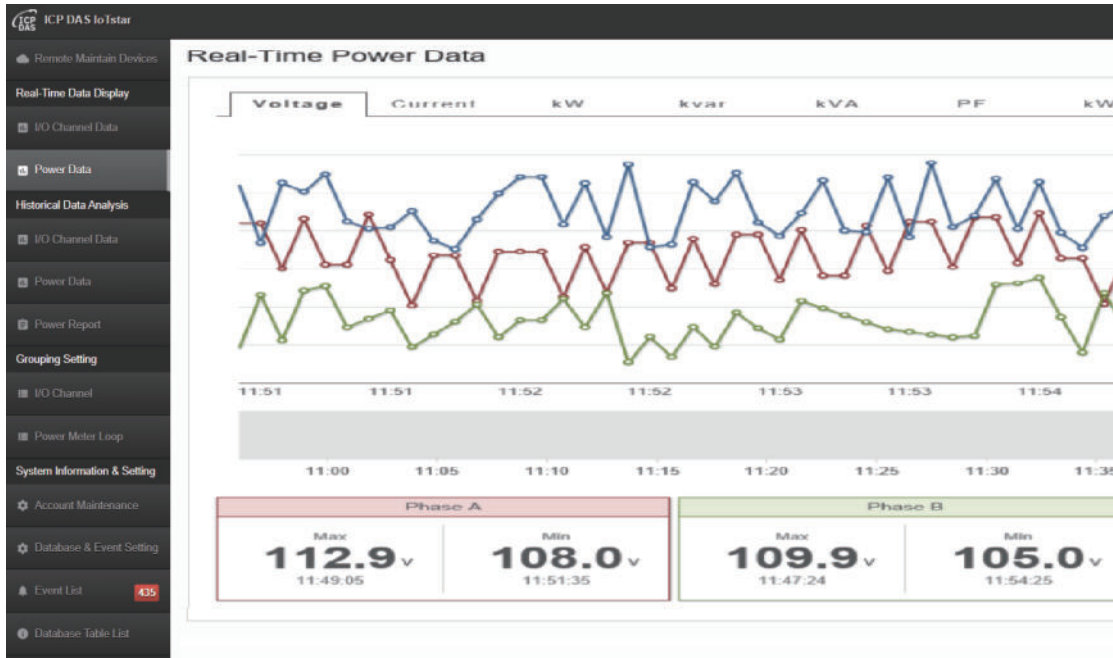
■ Sensor Data Recovery Mechanism

For general data collection, the sensor data will be sent to the control center and imported into the Database at cloud. But when the network experience a disconnection, the data transmitted during the disconnection period will be lost. "IoTstar (with WISE/PMC/PMD)" supports the Sensor Data Recovery Mechanism. When experiences network disconnection, all data will be stored in the SD cards in WISE/PMC/PMD. And when the network return to normal status, the data stored in SD card will be re-sent to IoTstar, and imported into Database to ensure the integrity of historical data.



■ Sensor Data Visualization Service

With the built-in standard web page of IoTstar, user can directly query and review the real-time or historical sensor data (and/or Power data) collected from the WISE/PMC/PMD controllers.



IoTstar also provides IoTstar Dashboard Service package. Through the Dashboard editor and a variety of Widget components provided by IoTstar, user can quickly setup the Dashboard page for the Real-Time sensor data (and Power data) collected from the WISE/PMC/PMD controllers according to their needs to review the operation status of the application system in real time.



■ Sensor Data Report Service

IoTstar features IoTstar Report Service which provides statistic report service for the sensors connected to WISE/PMC/PMD controllers. By using IoTstar Report Service, the data measured by the sensors can be converted into valuable statistical reports, so that the statistical reports of the operation status of the machines, equipment and facilities monitored by WISE/PMC/PMD controllers can be provided as the basis for making decisions, avoid biases and blind spots in decision-making.

Power meter loop report PMC-5231(Xndian office) / PM-4324-MTCP(Power meter of Area A) / Loop1(wall socket 1)

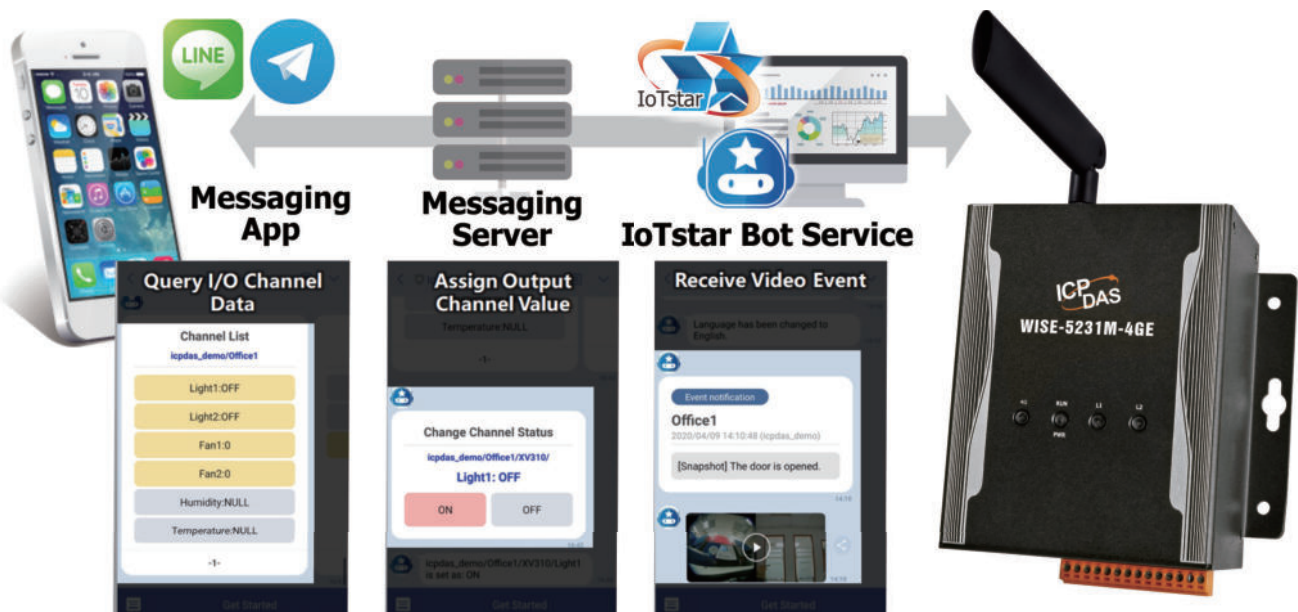
Time	Max. Demand(kW)	Energy Consumption(kWh)	Avg. PF(%)	Avg. I Phase A(A)	Avg. V Phase A(V)	Avg. I Phase B(A)	Avg. V Phase B(V)	Avg. I Phase C(A)	Avg. V Phase C(V)	Avg. kVA	Avg. kvar
0	0.05	0.05	89.713	0.169	110.354	0.169	110.35	0.17	110.358	0.055	0.024
1	0.05	0.05	89.566	0.169	110.557	0.168	110.553	0.169	110.562	0.056	0.025
2	0.05	0.05	89.562	0.169	110.776	0.169	110.771	0.17	110.78	0.056	0.025
3	0.05	0.05	89.628	0.17	110.975	0.17	110.972	0.17	110.982	0.056	0.025
4	0.051	0.05	89.375	0.17	111.112	0.169	111.108	0.17	111.118	0.056	0.025

Summary

Daily Highest Usage: 0.051kW
 Occurrence Time: 2021-10-19 04:59:00
 Daily Total Electricity Consumption: 0.41kWh

■ Bot Service on Controller by using Mobile Device

IoTstar provides IoTstar Bot Service package for two-way message interactions between the WISE/PMC/PMD controller managed by IoTstar and LINE/Telegram chat rooms. Users can query the real-time sensor data (and/or Power data) collected from the WISE/PMC/PMD controllers and be able to change the value of DO/AO output channels anytime and anywhere by LINE/Telegram App. In addition, with the ICP DAS iCAM IP Camera, it can also receive the video recording events on the application site, so that the users can review the operating status of the equipment through their mobile phones even they are not close by.



■ Software package support (Optional package for IoTstar, 90 days free trial)

■ IoTstar Dashboard Service

IoTstar Dashboard Service is an optional software package for IoTstar that provides users the Dashboard editor and a variety of Widget components. Based on the functions the IoTstar Dashboard Service provides, users can setup the Dashboard pages to review the real-time sensor data (or Power data) from the Sensor and Power Meter connected to WISE/PMC/PMD controllers, and it can also change the values of the DO/AO output channels of the Sensor (or power meters) connected to WISE/PMC/PMD controllers immediately.



Features

- Provide Dashboard editor for user to edit a specific Dashboard pages flexibly.
- Provide a variety of built-in Widgets to display the sensor data (or power data) in different formats.
- Display the sensor data (or power data) in real-time, and the status of output channels also can be changed.
- Support "Dark Mode" to turn the browser to dark for better visibility during night time.
- Receive on-site snapshots or video files sent by the controller. User can browse and review the snapshots or video files received by IoTstar (For the sending of on-site snapshots or video files, please use WISE with iCAM IP camera).
- Provide Rich Content Widget (WYSIWYG editor), and allow user to edit the content of the Widget by himself (Such as import HTML code, text, Webpage, image, video file, etc.).

Examples of Dashboard



Example of Air quality monitoring (Using Line Chart, Gauge, Plot Bar, Value Table, Value Label Overlay widgets).

Example of Power monitoring (Using Line Chart, Value, Value Output and Rich Content widgets).

Widget provided:



Line Chart



Bar Chart



Pie Chart



Gauge



Plot Bar



Value



Value Table



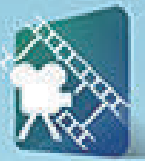
Value Label
Overlay



Value Output
(Slider)



Value Output
(Button)



Video Event
List



Time Clock



Countdown
Timer



Map



Rich Content



Example of Environmental monitoring
(Using Line Chart, Value, Value
Output, Map and Video Event List
widgets).

IoTstar Bot Service

IoTstar Bot Service is an optional software package for IoTstar that provides users two-way message interactions between the WISE/PMC/PMD controller managed by IoTstar and LINE/Telegram chat rooms. IoTstar Bot Service provides an easier and convenient mechanism for user to manage his/her remote controllers with LINE/Telegram App. It does not like the traditional Chatbot which get the information or service by entering the text message; it provides a friendly user interface that includes buttons and dialogue menu to perform the monitoring of remote controllers in an easy way.

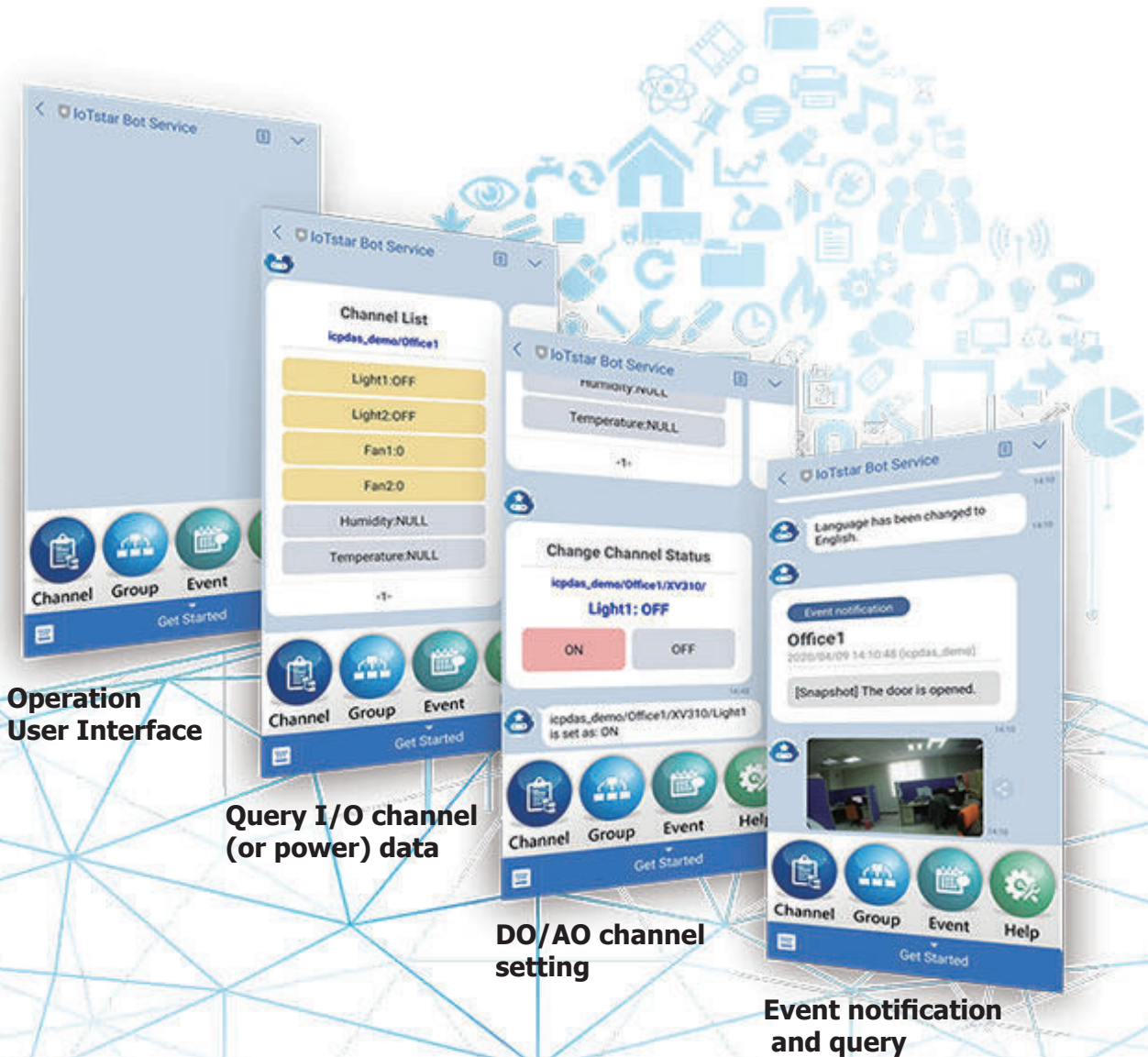
With IoTstar Bot Service, users can query the real-time I/O Channel data (or power data) of the on-site I/O modules or power meters and be able to change the value of DO/AO output channels anytime and anywhere. IoTstar Bot Service also provides functions to receive, store, and query the event messages. The controllers can be triggered to send event messages to IoTstar Bot Service by IF-THEN-ELSE rules. After IoTstar Bot Service receive these event messages, it would process and send them to relative LINE/Telegram users for real-time alarm notification.



Features

- Monitor WISE/PMC/PMD controllers anytime and anywhere by LINE/Telegram App.
- Query real-time I/O channel (power meter) data and change output channels.
- Receive real-time event messages with text, pictures or videos (WISE can work with the iCAM IP camera to send the picture or video files).
- Review and query the historical event messages.
- Secure and reliable communication mechanism between LINE/Telegram and controllers.
- Easy to Maintain; only need the upgrade of LINE/Telegram App.

***The interface below displays using LINE App.



IoTstar Report Service

IoTstar Report Service is an optional software package for IoTstar that provides statistic report service for the sensors connected to WISE/PMC/PMD controllers. By using IoTstar Report Service, the data measured by the sensors can be converted into valuable statistical reports, so that the statistical reports of the operation status of the machines, equipment and facilities monitored by WISE/PMC/PMD can be provided as basis for making decisions, avoid biases and blind spots in decision-making.

Features

- Provide a variety types of statistical reports for sensors and power meters.
- In addition to the report for single I/O channel (or power meter loop), it also provides the report for group of I/O channels (or power meter loops).
- Support the query of the "Daily/Weekly/Monthly/Quarterly/Yearly" statistical report with customized date.
- Provide data comparison function for comparing values of I/O channel (or power meter loop).
- Built-in editor for users to flexibly edit the report content (header and footer) to create desired report format.
- PDF & Excel file format supported for report output.

Examples of the function provided:

Power meter loop report PMC-5231(Xindian office) / PM-4324-MTCP(Power meter of Area A) / Loop1(wall socket 1)

Day	Week	Month	Quarter	Year	>	Single Mode	>	Today	2021/10/19	>	Data Shown	Template Management	Download PDF	Download Excel
Time	Max. Demand(kW)	Energy Consumption(kWh)	Avg. PF(%)	Avg. I Phase A(A)	Avg. V Phase A(V)	Avg. I Phase B(A)	Avg. V Phase B(V)	Avg. I Phase C(A)	Avg. V Phase C(V)	Avg. kVA	Avg. kvar			
0	0.05	0.05	89.713	0.169	110.354	0.169	110.35	0.17	110.358	0.055	0.024			
1	0.05	0.05	89.566	0.169	110.557	0.168	110.553	0.169	110.562	0.056	0.025			
2	0.05	0.05	89.562	0.169	110.776	0.169	110.771	0.17	110.78	0.056	0.025			
3	0.05	0.05	89.628	0.17	110.975	0.17	110.972	0.17	110.982	0.056	0.025			
4	0.051	0.05	89.375	0.17	111.112	0.169	111.108	0.17	111.118	0.056	0.025			
Summary														
Daily Highest Usage: 0.051kW Occurrence Time: 2021-10-19 04:59:00 Daily Total Electricity Consumption: 0.41kWh														

▲ Report for "Power Meter Loop"

Power meter loop group report PM Group

Day	Week	Month	Quarter	Year	>	Today	2021/10/19	>	Loop Comparison	>	Max. Demand(kW)	Template Management	Download PDF	Download Excel
Time	Xindian office Power meter of Area B Loop1	Xindian office Power meter of Area A Loop2	Xindian office Power meter of Area A Loop3	Xindian office Power meter of Area A Loop5	Xindian office Power meter of Area A Loop6	Xindian office Power meter of Area A Loop7								
0	0	0	0	0	0	0.05								
1	0	0	0	0	0	0.05								
2	0	0	0	0	0	0.05								
3	0	0	0	0	0	0.051								
4	0	0	0	0	0	0.051								
Summary														
Daily electricity consumption of each loop	0	0	0	0	0	0.416								
Daily Total Electricity Consumption	0.416													

▲ Report for "Power Meter Loop Group (Loop Comparison mode)"

I/O Channel report PMC-5231(Xindian office) / DL-1023(Air quality for factory) / AI2(PM2.5)

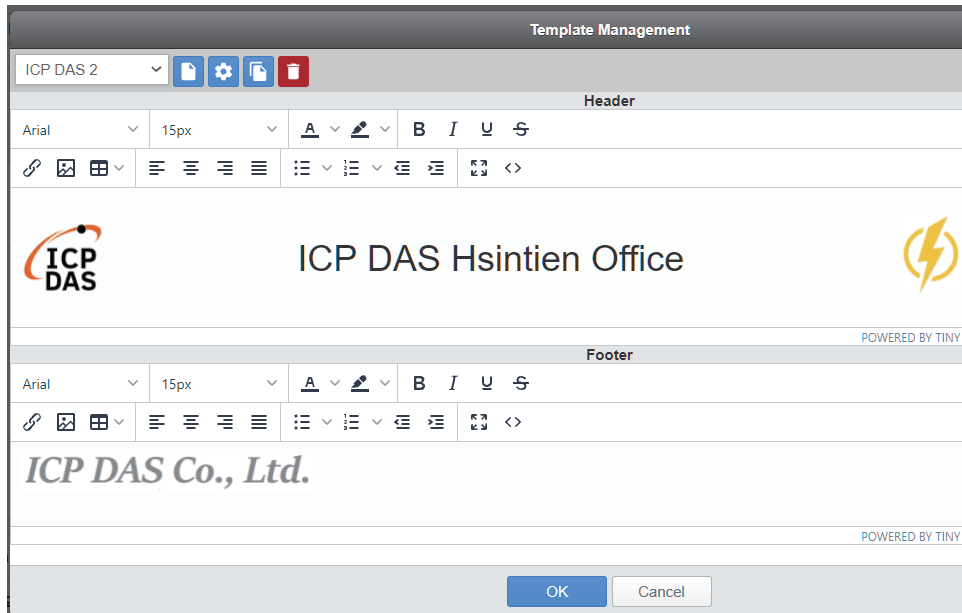
Day Week Month Quarter Year > Single Mode > Today 2021/10/19 > Data Shown > [Template Management](#) [Download PDF](#) [Download Excel](#)

Time	Maximum(ug/m3)	Minimum(ug/m3)	Average(ug/m3)	Final Value(ug/m3)	Total Value(ug/m3)
0	1	0	0.283	0	17
1	1	0	0.116	0	7
2	1	0	0.118	1	7
3	1	0	0.066	0	4
4	1	0	0.083	0	5

Summary

Daily maximum: 1 ug/m3 Daily minimum: 0 ug/m3 Daily average: 0.098 ug/m3
 Time of maximum daily value occurs: 2021-10-19 00:01:00 Time of minimum daily value occurs: 2021-10-19 00:00:00 Daily total value: 49 ug/m3

▲ Report for "I/O Channel"



▲ "Template Management (Editing for Report header and footer)" of Report

ICP DAS		ICP DAS Hsintien Office										⚡
Report Date:2021/09/29		Hsintien Office / RD Area / Loop1 - Daily Report								Print Date:2021/09/29		
Time	Max. Demand(kW)	Energy Consumption(kWh)	Avg. PF(%)	Avg. I Phase A(A)	Avg. V Phase A(V)	Avg. I Phase B(A)	Avg. V Phase B(V)	Avg. I Phase C(A)	Avg. V Phase C(V)	Avg. kVA	Avg. kvar	
0	0.049	0.049	89.708	0.167	109.391	0.167	109.387	0.168	109.397	0.055	0.024	
1	0.05	0.05	89.397	0.17	110.203	0.169	110.199	0.17	110.209	0.056	0.025	
2	0.05	0.05	89.244	0.17	110.278	0.169	110.274	0.17	110.284	0.056	0.025	
3	0.05	0.05	89.196	0.171	110.45	0.17	110.446	0.171	110.456	0.056	0.025	

Summary

Daily Highest Usage: 0.05kW
 Occurrence Time: 2021-09-29 03:18:00
 Daily Total Electricity Consumption: 0.527kWh

ICP DAS Co., Ltd.

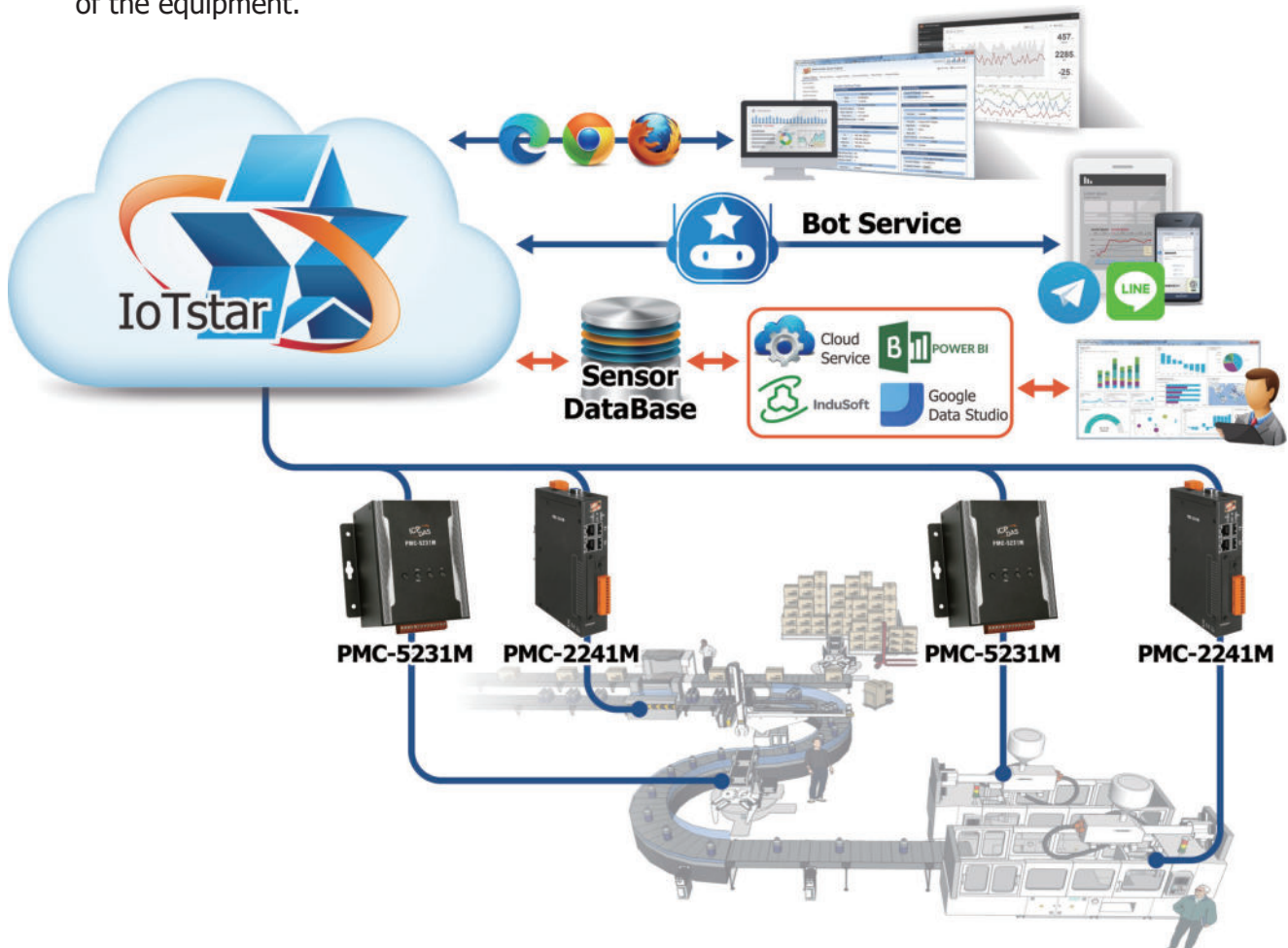
▲ Report Download (PDF file format)

Applications

Cloud-based Power Monitoring Application for Factory

Using ICP DAS "IoTstar + PMC/PMD" solution, user can quickly build a cloud-based power monitoring system for factory. In the solution, PMC/PMD power meter concentrator can connect with ICP DAS power meters to collect, organize and record the power consumption information of the factory equipment. In addition to sending the collected power information back to IoTstar, PMC/PMD can also perform the power demand management for the equipment, monitor the operation of equipment to perform the corresponding actions, and immediately send LINE/Telegram/WeChat/Email/SMS alarm message according to the pre-set edge computing mechanism (IF-THEN-ELSE logic rules). After IoTstar receives the power information sent by PMC/PMD, it can provide services such as: "Controller Remote Access Service", "Sensor Data Collection Service", "Sensor Data Visualization Service", "Sensor Data Report Service" and "Bot Service with Mobile Phone", as well as the following benefits:

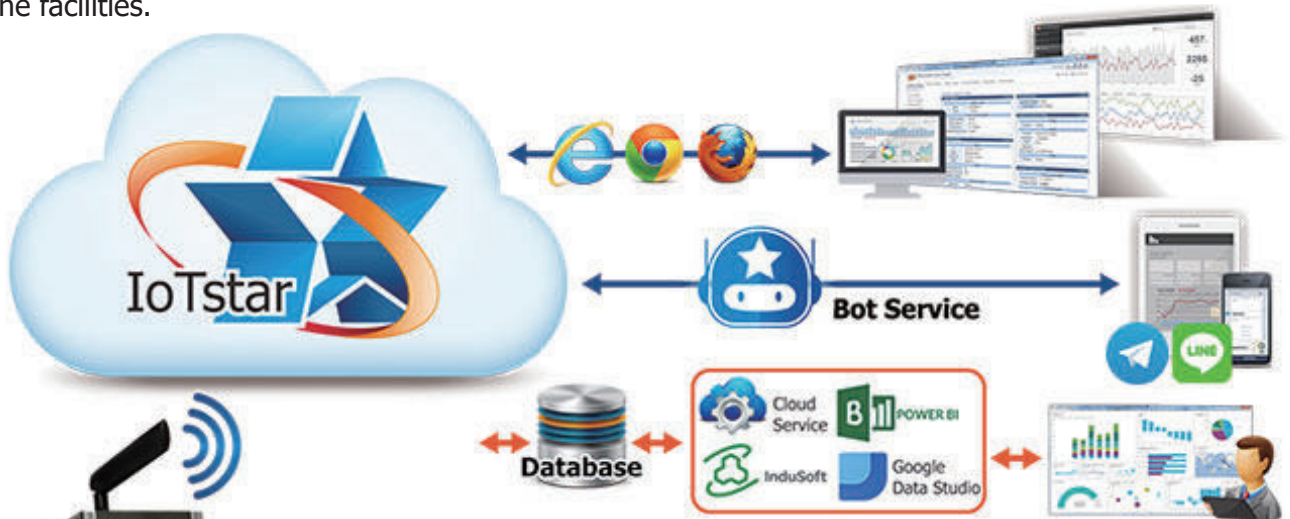
- No need to write programs in the whole process, power information can be collected and stored in the cloud database automatically.
- Through SQL Database interface, quickly integrate the IT system to understand the trend and change of the power usage status of the factory equipment comprehensively.
- Perform remote monitoring and maintenance of the factory equipment, take corresponding actions proactively to ensure operational optimization.
- Provide status monitoring, system setting and firmware update for the PMC/PMD controllers from Cloud. It can reduce the time and cost of personnel travel due to performing maintenance of the equipment.



■ Cloud-based Environment Monitoring Application

Using ICP DAS "IoTstar + WISE" solution, user can quickly build a Cloud-based environment monitoring system. In the solution, WISE IIoT edge controller can connect with the Modbus TCP/RTU sensors to collect, organize and record the information of the environment. In addition to sending the collected environment information back to IoTstar, WISE can also monitor the operation of environment facilities to perform the corresponding actions, and immediately send LINE/Telegram/WeChat/Email/SMS alarm message according to the pre-set edge computing mechanism (IF-THEN-ELSE logic rules). After IoTstar receives the environment information sent by WISE, it can provide services such as: "Controller Remote Access Service", "Sensor Data Collection Service", "Sensor Data Visualization Service", "Sensor Data Report Service" and "Bot Service with Mobile Phone" services, as well as the following benefits:

- No need to write programs in the whole process, environment information can be collected and stored in the cloud database automatically.
- Through SQL Database interface, quickly integrate the IT system to understand the trend and change of the environment status comprehensively.
- Perform remote monitoring and maintenance of the environment facilities, take corresponding actions proactively to ensure operational optimization.
- Provide status monitoring, system setting and firmware update for the WISE controllers from Cloud. It can reduce the time and cost of personnel travel due to performing maintenance of the facilities.



Urban Water Drainage System

WISE-5231M-4GE

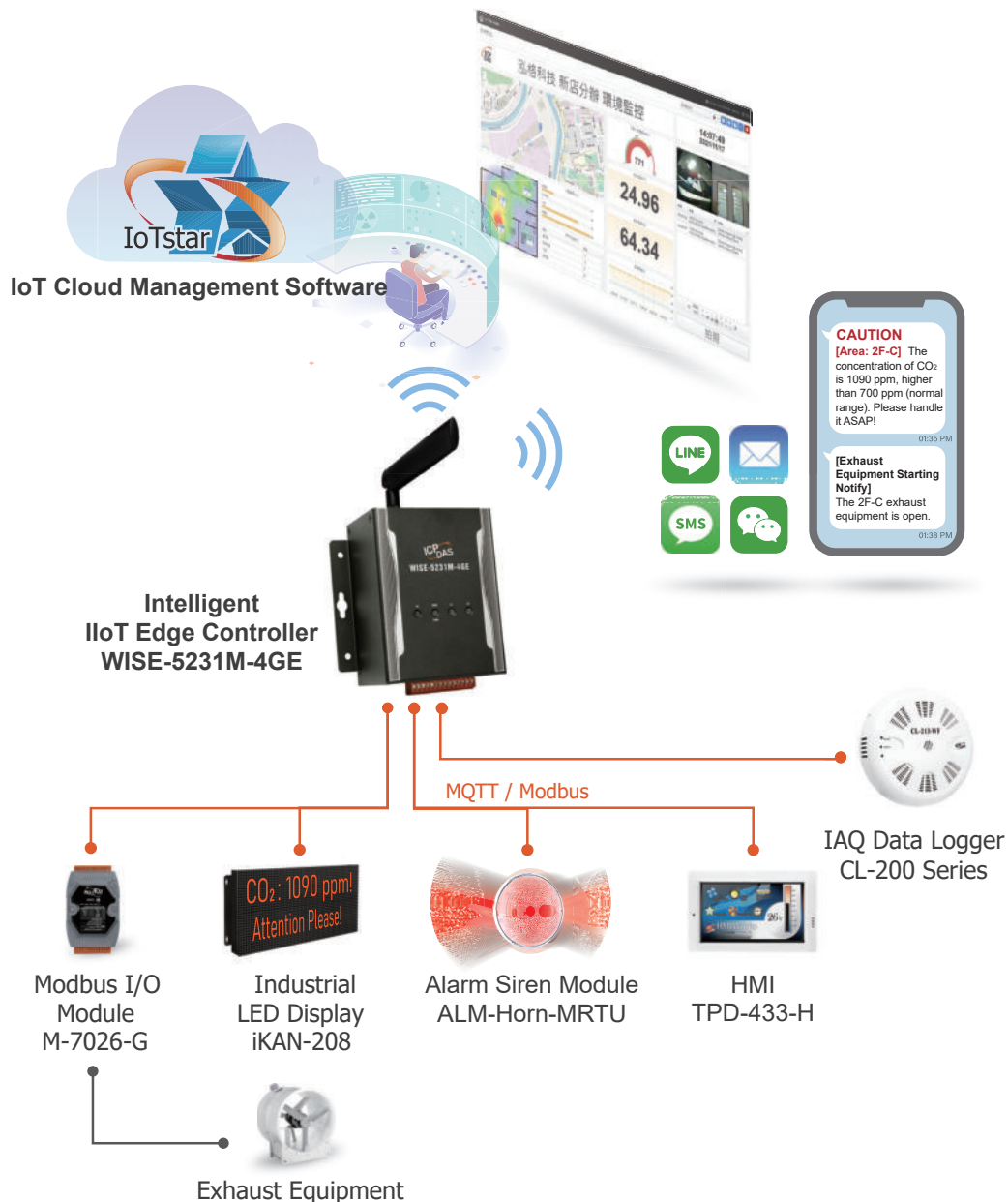
Vibration
 Temperature
 Flow Level

Pump Station



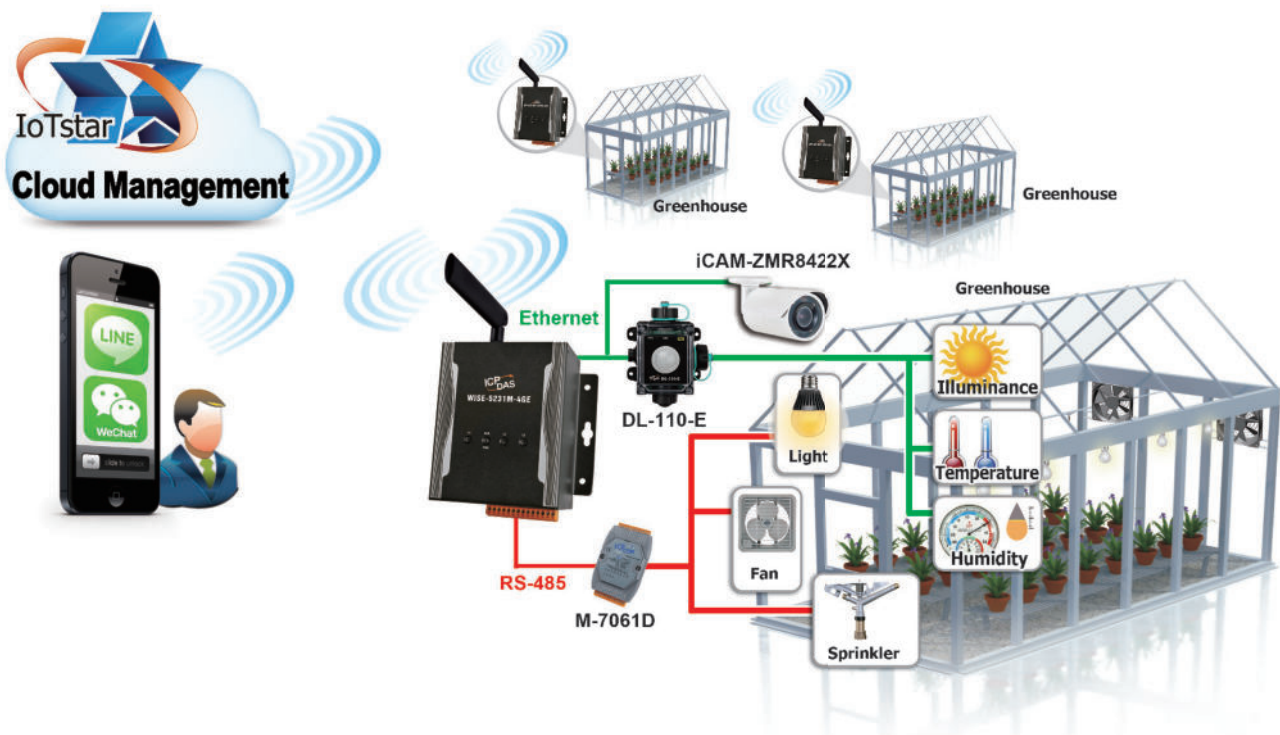
Cloud-based Indoor Air Quality Monitoring Application

Using ICP DAS "IoTstar+WISE+DL/CL module" solution, user can quickly build a Cloud-based air quality monitoring system. In the solution, DL/CL series modules can be used to measure the concentration of aerosols in the air (Such as: PM2.5, PM1, PM10 and the number of particles (0.3µm, 0.5µm, 1µm, 2.5µm, 5µm, 10µm), as well as the fume concentrations related to human health (Such as: CO/CO2/HCHO/NH3/H2S/TVOC), and then transmit the measurement of air quality information to WISE IIoT edge controller. WISE is used to collect the air quality information from DL/CL modules and send back the information to the IoTstar. To response to any unusual situation and to maintain the safety of personnel in the field, WISE also can take the corresponding actions (Such as: turn on the exhaust fan and warning light, activate the access control equipment, send LINE/Telegram/WeChat/Email/SMS alarm messages, etc.) automatically in real time according to the status of the air quality by the pre-set edge computing mechanism (IF-THEN-ELSE logic rules). After IoTstar receives the air quality information sent by WISE, it can provide services such as: "Controller Remote Access Service", "Sensor Data Collection Service", "Sensor Data Visualization Service", "Sensor Data Report Service" and "Bot Service with Mobile Phone" services, and help users quickly build a Cloud-based air quality monitoring system.



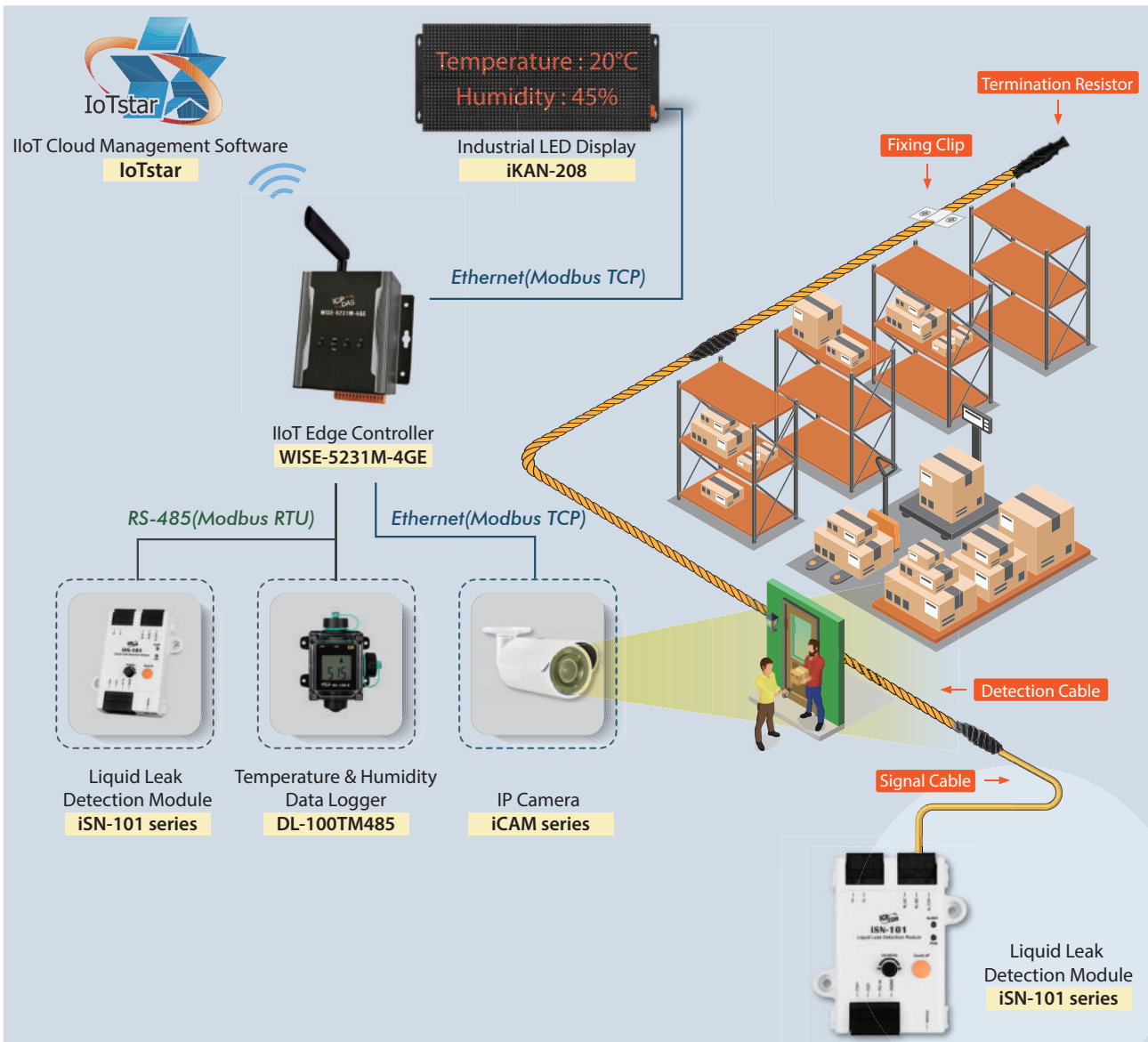
■ Cloud-based Greenhouse Monitoring Application

In the development trend of agricultural refinement and technology, intelligent greenhouse planting has always played an important role. The ICP DAS "IoTstar+WISE+DL module" solution work as an automated intelligent greenhouse monitoring system, it can perform real-time cloud monitoring of illuminance/temperature/humidity for the greenhouse, and automatically execute the corresponding scheduled tasks (such as: turning on the air conditioner, adjusting lighting, activating sprinklers, fertilizing etc.), or send LINE/Telegram/WeChat/Email/SMS alarm messages to related personnel to take immediate actions in response to abnormal status notification. WISE can also connect to ICP DAS iCAM series IP cameras to perform real-time video monitoring of the greenhouse. When an unusual intrusion is detected, WISE will automatically send text and video messages to the security personnel through LINE/Telegram/WeChat to take immediate actions. In addition, with the services provided by IoTstar such as "Controller Remote Access Service", "Sensor Data Collection Service", "Sensor Data Visualization Service", "Sensor Data Report Service" and "Bot Service with Mobile Phone", user can easily build a cloud-based greenhouse monitoring system to grasp the environmental status of each greenhouse anytime, anywhere and take actions accordingly, so as to move towards the era of intelligent agriculture with high efficiency, high productivity, safety and low operating risks.



■ Cloud-based Building, Warehouse, Factory Monitoring Application

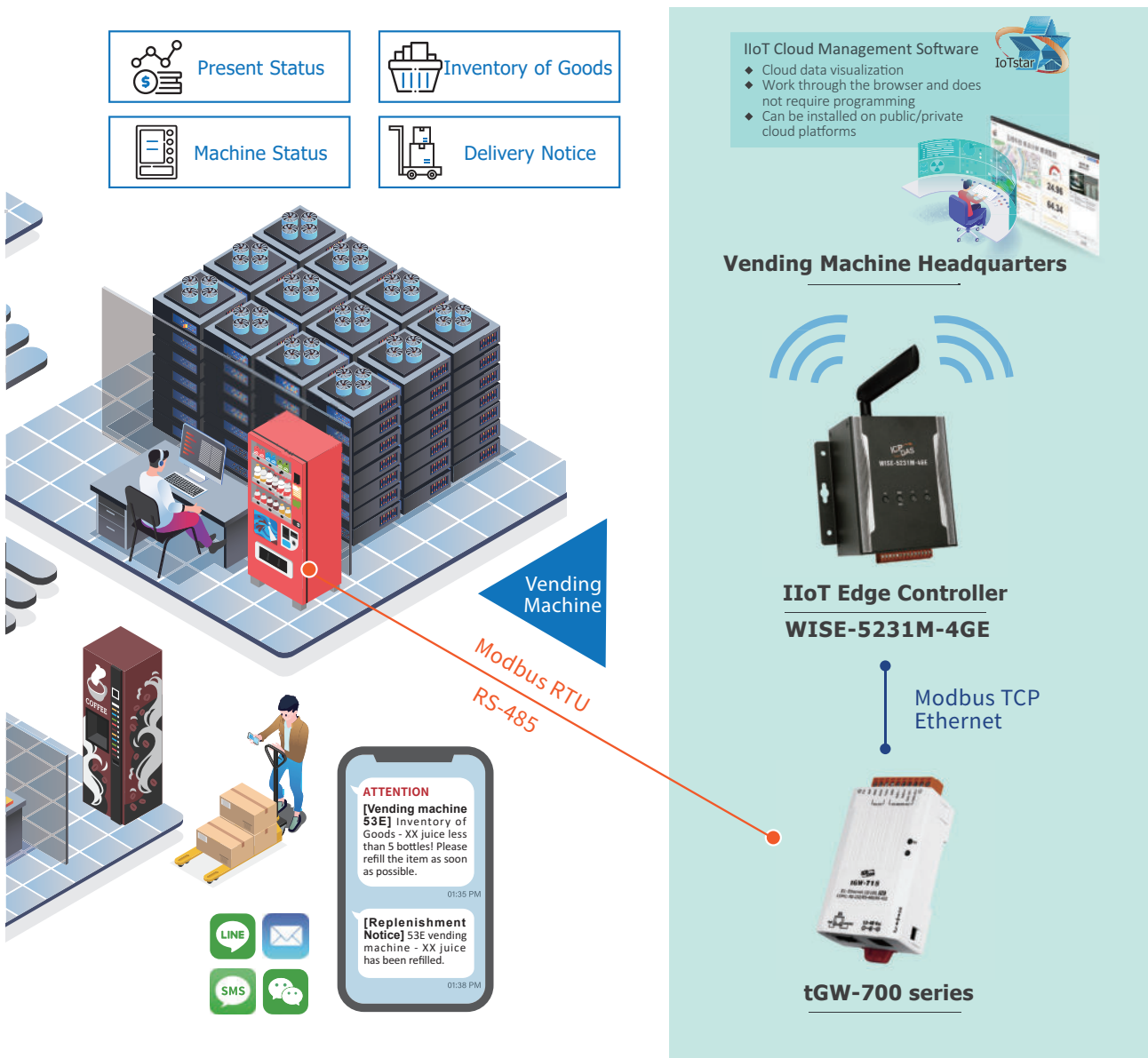
Using ICP DAS "IoTstar+WISE+iSN/DL/CL module" solution, it can help enterprises quickly establish a Cloud-based monitoring system for Building, Warehouse, and Factory facilities. The iSN modules can assist in the detection of liquid leakage, and the DL modules can measure the temperature and humidity data of the environment. After the iSN and DL modules transmit the measured data to the WISE IIoT edge controller for sorting and recording, WISE can transmit the collected data to IoTstar, and perform the preset edge computing mechanism (IF -THEN-ELSE logic rules), and then automatically take real-time actions in response to status of liquid leakage/temperature/humidity in the environment (such: turn on the exhaust fan, turn on the warning light). It can also send LINE/Telegram/WeChat/Email/SMS alarm messages to related personnel for the unusual status notification, and work as an automated intelligent warehouse monitoring system. WISE can also connect with ICP DAS iCAM series IP cameras to perform real-time video monitoring of the warehouse. When an unusual intrusion is detected, WISE will automatically send text and video messages to the security personnel through LINE/Telegram/WeChat, to take immediate actions. In addition, with the services provided by IoTstar such as "Controller Remote Access Service", "Sensor Data Collection Service", "Sensor Data Visualization Service", "Sensor Data Report Service" and "Bot Service with Mobile Phone", user can easily build a cloud-based warehouse monitoring system to grasp the environmental status of each warehouse anytime, anywhere and take actions accordingly.



■ Cloud-based Monitoring Application for Traditional Devices

Using ICP DAS "IoTstar+WISE+tGW module" solution, it can assist users to quickly build an Cloud-based IoT monitoring system for traditional devices that cannot connect to Network. Users can use tGW-700(Modbus RTU/ASCII to TCP converter) to connect to traditional devices via RS-485 interface, and convert the Modbus RTU/ASCII protocol on the traditional devices to Modbus TCP protocol, and the device status can be sent to WISE IIoT edge controller through Ethernet for data sorting and recording, and then send back to IoTstar to quickly build the cloud-based IoT monitoring system for the traditional equipment.

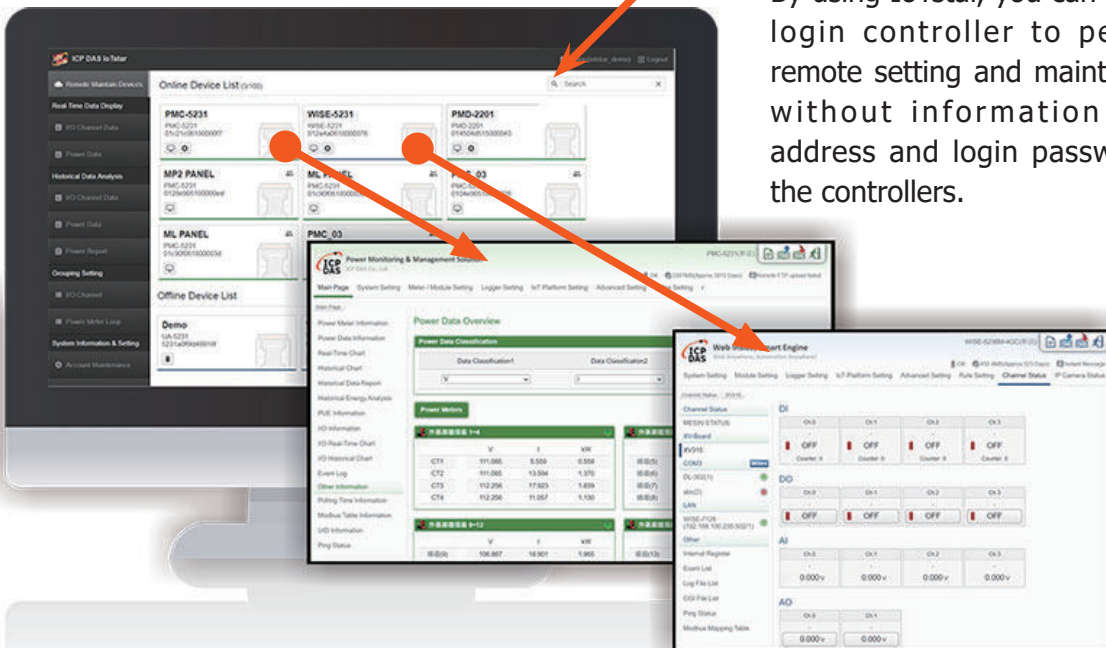
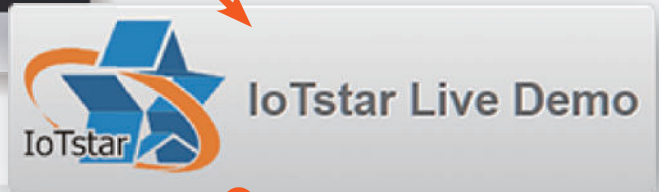
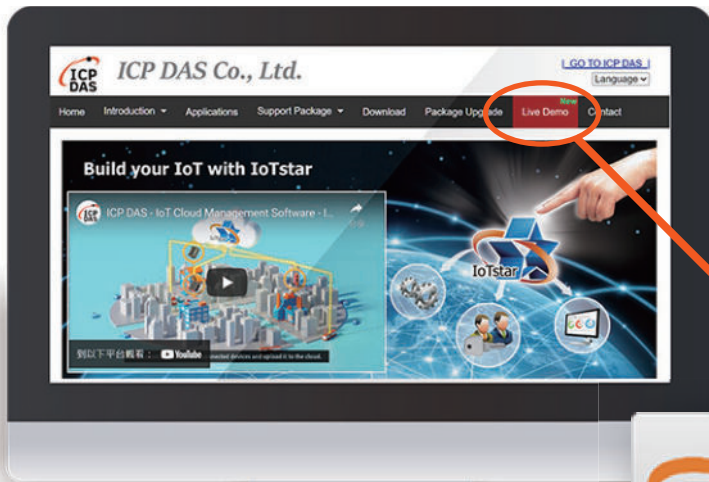
Take the traditional vending machines that are common on the street as an example, for these device lack the networking capability, the replenishment and equipment maintenance operations usually need to rely on inspection (replenishment) personnel to check regularly according to a fixed route. It is time-consuming, labor-intensive and causes additional cost. Through the solution provided by ICP DAS, information such as inventory and device status in the vending machine can be sent to the headquarter in real time for statistical analysis, and headquarter can timely dispatch the inspection (replenishment) personnel to the vending machine in need to adjust the device status of the vending machine so that the burden of inspection (replenishment) personnel can be reduced and then the manpower and transportation costs can be saved.



IoTstar Live Demo (iotstar.icpdas.com)

IoTstar Live Demo allows users to fully experience the function of IoTstar, such as:

- Provide Sensor data visualization dashboard.
- Real-Time and Historical sensor data query and display.
- Provide Sensor data Statistical report
- Query and display video/image event
- Remote setting and maintenance for controller.



By using IoTstar, you can directly login controller to perform remote setting and maintenance without information of IP address and login password of the controllers.

Installation Platform Requirement

	Specification Suggestions
CPU	64-bit (x64); 3.0 GHz or higher GHz Processor
RAM	Minimum 8 GB for RAM. When the number of controllers or sensors, or the size of Database is increased, upgrade the RAM space as needed to ensure the best performance of the system.
Hard Disk	Minimum 64GB for Hard Disk space. When the number of controllers or sensors, or the size of Database is increased, upgrade the Hard Disk space as needed to ensure the best performance of the system.
OS System	Windows 7, Windows 8, Windows 10, Windows Server 2012 or later OS system (64-bit Windows required).
Notes	<ul style="list-style-type: none"> Support WISE-523x/2x4x, PMC-523x/2x4x and PMD controllers. Need to work with IIS Web Server. Need to work with Database system such as Microsoft SQL Server, MySQL Server or Oracle Database. (For detailed version information, please refer to IoTstar user manual)

Ordering Information

IoTstar

Model	Description
IoTstar-RC050	IoTstar - IoT Cloud Management Software (Max. 50 controllers can be connected.)
IoTstar-RC200	IoTstar - IoT Cloud Management Software (Max. 200 controllers can be connected.)
IoTstar-RC500	IoTstar - IoT Cloud Management Software (Max. 500 controllers can be connected.)

IoTstar Upgrade Package (Optional package for IoTstar)

Model	Description
IoTstar-UC050-200	IoTstar Upgrade Package (Upgrade the maximum number of controllers connected to IoTstar from 50 to 200.)
IoTstar-UC200-500	IoTstar Upgrade Package (Upgrade the maximum number of controllers connected to IoTstar from 200 to 500.)

IoTstar Bot Service (Optional package for IoTstar; Support Bot Service)

Model	Description
IoTstar Bot Service-RC050-L	IoTstar Bot Service Package (Used with IoTstar-RC050; Support LINE App)
IoTstar Bot Service-RC200-L	IoTstar Bot Service Package (Used with IoTstar-RC200; Support LINE App)
IoTstar Bot Service-RC500-L	IoTstar Bot Service Package (Used with IoTstar-RC500; Support LINE App)
IoTstar Bot Service-RC050-T	IoTstar Bot Service Package (Used with IoTstar-RC050; Support Telegram App)
IoTstar Bot Service-RC200-T	IoTstar Bot Service Package (Used with IoTstar-RC200; Support Telegram App)
IoTstar Bot Service-RC500-T	IoTstar Bot Service Package (Used with IoTstar-RC500; Support Telegram App)

IoTstar Dashboard Service (Optional package for IoTstar; Support Dashboard Service)

Model	Description
IoTstar Dashboard Service-RC050	IoTstar Dashboard Service (Used with IoTstar-RC050)
IoTstar Dashboard Service-RC200	IoTstar Dashboard Service (Used with IoTstar-RC200)
IoTstar Dashboard Service-RC500	IoTstar Dashboard Service (Used with IoTstar-RC500)

IoTstar Report Service (Optional package for IoTstar; Support Report service)

Model	Description
IoTstar Report Service-RC050	IoTstar Report Service (Used with IoTstar-RC050)
IoTstar Report Service-RC200	IoTstar Report Service (Used with IoTstar-RC200)
IoTstar Report Service-RC500	IoTstar Report Service (Used with IoTstar-RC500)

1-2 SCADA System Software: AVEVA Edge

AVEVA™ Edge

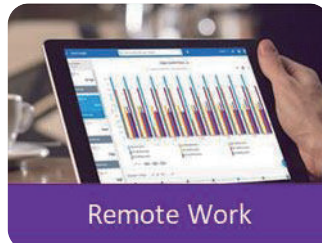
SCADA, HMI and IoT Edge Solution for OEMs,
System Integrators and End Users

AVEVA Edge is a comprehensive platform that includes all the tools you'll need to make SCADA and HMI applications that have real power behind them. The development environment allows you to develop once and deploy anywhere. AVEVA Edge supports all Windows runtime platforms (including 32 and 64 bit), ranging from Windows Embedded Compact, Windows Embedded Standard, Windows 8.1/10 and Windows Server Editions, along with built-in support for local or remote (web) based visualization.

- ▶ **AVEVA™ Edge Studio** is a development system of AVEVA Edge on Windows. It provides a complete development environment, allowing designing once and deploying anywhere.
- ▶ **AVEVA™ Edge SCADA** – The full Windows based runtime offers all the tools you need for advanced SCADA applications.
- ▶ **AVEVA™ Edge HMI** – AVEVA Edge for embedded systems such as Windows Embedded operating systems. The small footprint makes AVEVA Edge HMI ideal for embedded and edge machines.
- ▶ **AVEVA™ Edge Compact HMI** – Compact HMI is designed especially for Windows CE operating systems.



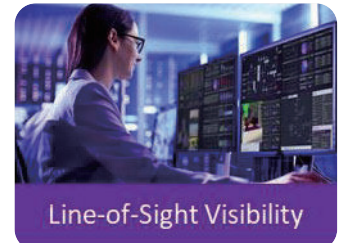
Collaboration



Remote Work



Standardization



Line-of-Sight Visibility

AVEVA Edge Creates Advantages For You

1. Combining message and automation to increase productivity
2. Studio Mobile Access implements IoT
3. Complete integration of embedded platforms
4. Real-time and rapid technical supports

AVEVA Edge Features

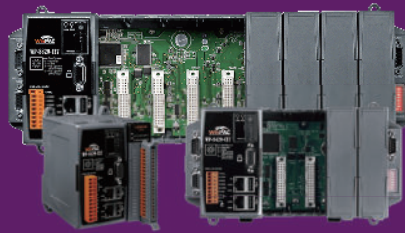
- ★ SCADA/HMI and templates
- ★ Easy communication and integration
- ★ Protection of development cost
- ★ Design once - Deploy anywhere
- ★ Graphic design tools shorten the development time
- ★ Advanced alarm system controls the on-site status in real-time.
- ★ FDA traceability
- ★ Redundant mechanism
- ★ Database
- ★ Recipes and reports
- ★ Trend chart
- ★ Drivers and OPC
- ★ Solid security
- ★ Perfect development tool

AVEVA™ Edge

Easy Step to Meet Your Satisfaction



ViewPAC



WinPAC



XPAC

AVEVA Edge builds powerful graphical displays and takes advantage of the 250+ available communication drivers for all major PLC products. AVEVA Edge includes OPC UA and OPC Classic (HDA and DA), trends, alarms, reports, recipes and built-in SQL database support as standard features.

AVEVA Edge Controllers

AVEVA™ Edge Compact HMI and **AVEVA™ Edge HMI** can integrate with ICP DAS's professional PACs, including WinPAC, ViewPAC, and XPAC-IoT.

	Product Features
AE-WinPAC	A Stable and cost-effective compact SCADA system. Builds a graphic monitoring system of I/O rapidly and easily.
AEV-PAC	Provides HMI/ SCADA system solution with an all-in-one touch panel. Suitable for machine control systems with a narrow space.
AE-XPAC-IoT	XPAC-IoT is a PAC based on Windows 10 IoT Enterprise. It integrates operation, I/O, and operator interface, providing a perfect solution for combining HMI, data acquisition and control into one PAC.

Features of PAC equipped with AVEVA Edge

- Graphic interface as an operation tool
- Supports various ICP DAS's I/O modules with slots
- Saves physical spaces for implementing a system
- Real-time and history alarm/ incidents and trend charts
- Various communication protocols (DCON, Modbus, OPC, TCP/IP...)
- Remote Web monitoring and security
- Redundant system application
- Others (VBScript, E-mail, FTP...)



Application of the Railway Signal Monitoring System

1

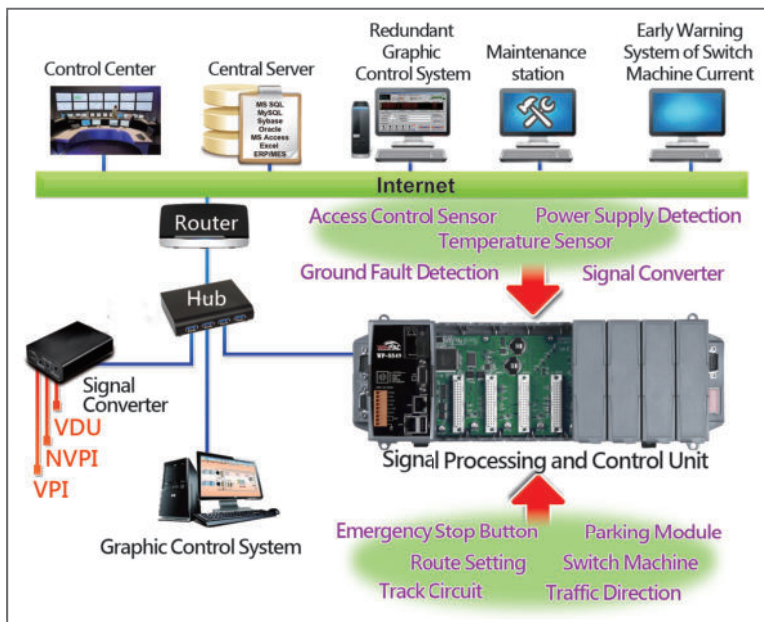
IIoT Software

With the help of the Internet, hardware and software, controlled by the graphic control system, users can efficiently collect and manage important data, analyze the causes of failures, thereby improving the quality of maintenance, increasing efficiency, and reducing the number of equipment failures.

Effective use of the railway signal monitoring system and maintenance mechanism can reduce the troubleshooting time of signaling equipment, ensure road safety, and achieve the goal of punctuality in rail transport, thereby enhancing the reliability and stability of signaling equipment.

The railway signal monitoring system is divided into three parts:

1. Signal converter
2. Signal processing and control unit
3. AVEVA™ Edge graphic control system



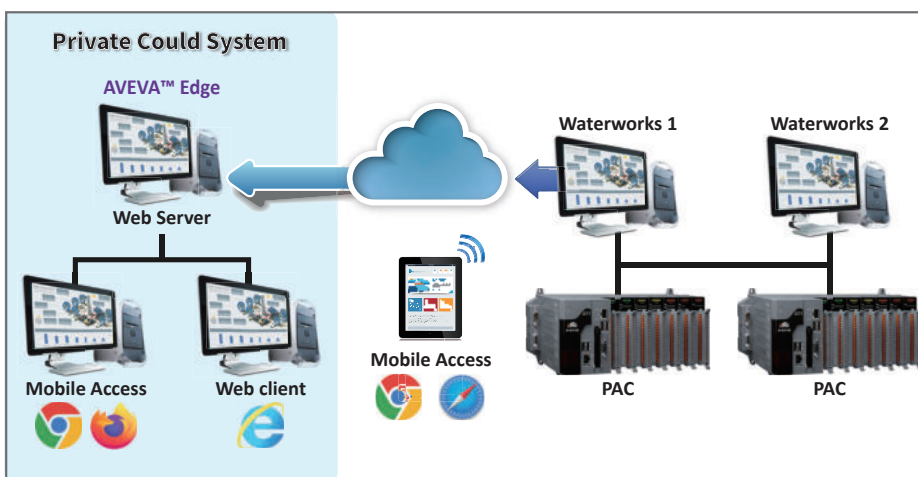
AVEVA™ Edge uses graphics to display the signal converter and the signal control unit. There are three main categories: real-time data screen, accumulated data screen, and graph analytics chart. Other pages include alarm management (real-time and historical data query), statistics and analysis reports, threshold parameter settings, database management, setting modification of system operation parameters, and the track operation replay. With the access control function, management personnel can use the AVEVA™ Edge graphic control system in the control room at the station, or use it remotely. The real-time data display shows the following information on the route chart: real-time connectivity status of individual stations, real-time status of monitoring points at each station, speed of track circuit, operating current of track circuit, and switch taming current of each track circuit.

Application of Water Plant Monitoring System

Users can adopt AVEVA Edge as the major data integration platform to collect data and provide a complete database. In addition to the central monitoring system in the control center, other sites can also use AVEVA Edge as an on-site graphic control interface.

Major Features on the sites

- ★ Collects information for all sites
- ★ Provides redundant system for major sites
- ★ Provides web page and mobile user interface for all sites
- ★ Provides automatic data recovery function



Benefits of the Monitoring System

AVEVA Edge provides a perfect system structure to connect the control center and the other sites seamlessly.

Major sites can adopt dual modular redundancy to avoid a single system missing important information due to external factors.

The communication between a single site and the control center may be interrupted due to external factors. AVEVA Edge is capable of conducting data recovery after the communication recovers.

It sends all the on-site data to the cloud system, allowing the management personnel of a water plant to browse all the information, thereby conducting analysis and making decisions.

Application of Gas Pressure Regulation Station Monitoring

Users can integrate information about pressure, flow, leakage, temperature, earthquake, access control, and on-site image at gas pressure regulation stations via wire or wireless communication, and send the data back to the control center instantaneously for management. When an anomaly occurs, the control center can remotely activate an emergency shut-off valve to stop the gas supply, thereby avoiding accidents occurring.

Conducting remote unified monitoring for all gas equipment can increase the benefits of overall gas monitoring system, reduce labor and time costs of gas providers, and ensure people's safety.

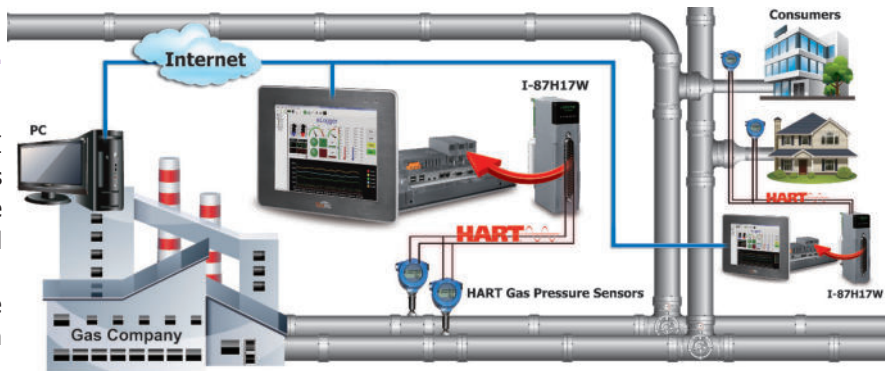
Gas Pressure Regulation Station Monitoring System in Taiwan- AVEVA™ Edge Solution

Overall Monitoring System Structure

About twenty pressure regulation stations in total. Every station requires to monitor pressure and switch status of the control valves of gas lines, and on-site real-time images.

Pressure regulation stations- Monitoring system structure

Users can use a PAC controller, together with AI/DI modules, to monitor pressure of on-site gas lines and the switch status of control valves, and use the graphic control software AVEVA Edge to display and record the data of a pressure regulation station. Together with the seismograph for earthquake detection, when an earthquake occurs, users can immediately stop the gas supply remotely.



Control center- Structure of the monitoring system

AVEVA Edge, a graphic control software running on the monitoring server, can exchange and integrate information of gas pressure rapidly with the tag variables of the pressure regulation stations through TCP/IP worksheet. The exchanged data includes the real-time information, (for example, inlet/outlet pressure, differential pressure across filters, earthquake monitoring,) the gas pipeline map with gas pressure in each section of pipeline, and the real-time image display on the site.

AVEVA Edge is equipped with the warning function. When the alarm is triggered, it will flash and make a warning sound to notify the management personnel in the control center. AVEVA Edge can be used in conjunction with the GTM-201 modem to send SMS to inform related personnel about the on-site status. Managers being granted permission can remotely monitor the real-time information of equipment at the pressure regulation station through the browser of a computer or smartphone. All the monitoring values will be saved in the database of a server for data analysis or report.

Overall benefits of the monitoring system

Combining AVEVA™ Edge and ICP DAS' s PAC controller and I/O modules in the gas pressure regulation station monitoring system can rapidly achieve the goal of data integration at the pressure regulation station.

The overall benefits of the monitoring system are as follows:

1. Control Center Monitoring:

Users can monitor pressure regulation stations distributed in different places through the Internet, tremendously lowering the difficulties of management.

2. Traceability:

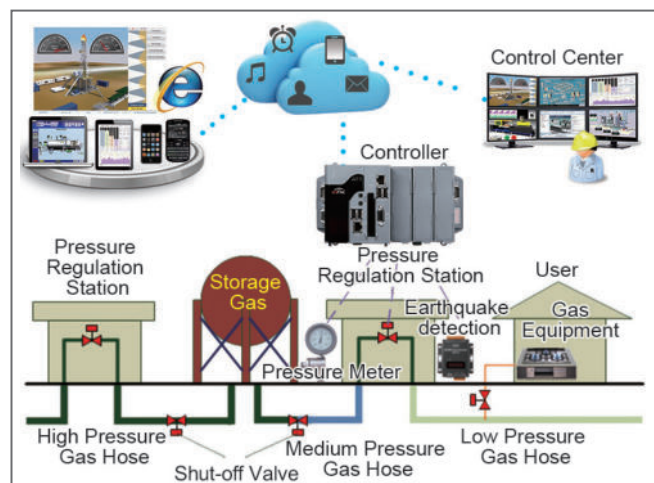
AVEVA Edge can record messages in its database, which allows the management personnel to track the trigger time for an alarm, find out the cause of the problem, and clarify the responsibility.

3. Real-time Data Redundancy:

In the event of Internet outage, all the pressure regulation stations can still operate. Messages will be stored in the on-site controller without causing data loss or the idle time of pressure regulation stations.

4. Real-time Information Monitoring:

Real-time on-site information and image display. In the event of an alarm occurring, users can obtain the cause for the alarm through warning messages, thereby saving the troubleshooting time. The system can be combined with a modem, allowing management personnel to obtain firsthand information immediately. AVEVA Edge provides a remote monitoring function. Via browser and handheld devices, users won't miss the warning messages, and can monitor the pressure status of pressure regulation stations remotely.



1-3 Condition Monitoring Solution : ExoWISE

1

IIoT Software



ICP DAS cooperates with Exosite on the ExoWISE IIoT solution, which is a perfect solution that combines the ICP DAS WISE series IIoT Edge controllers and peripheral devices with Exosite's ExoSense IoT remote monitoring system.

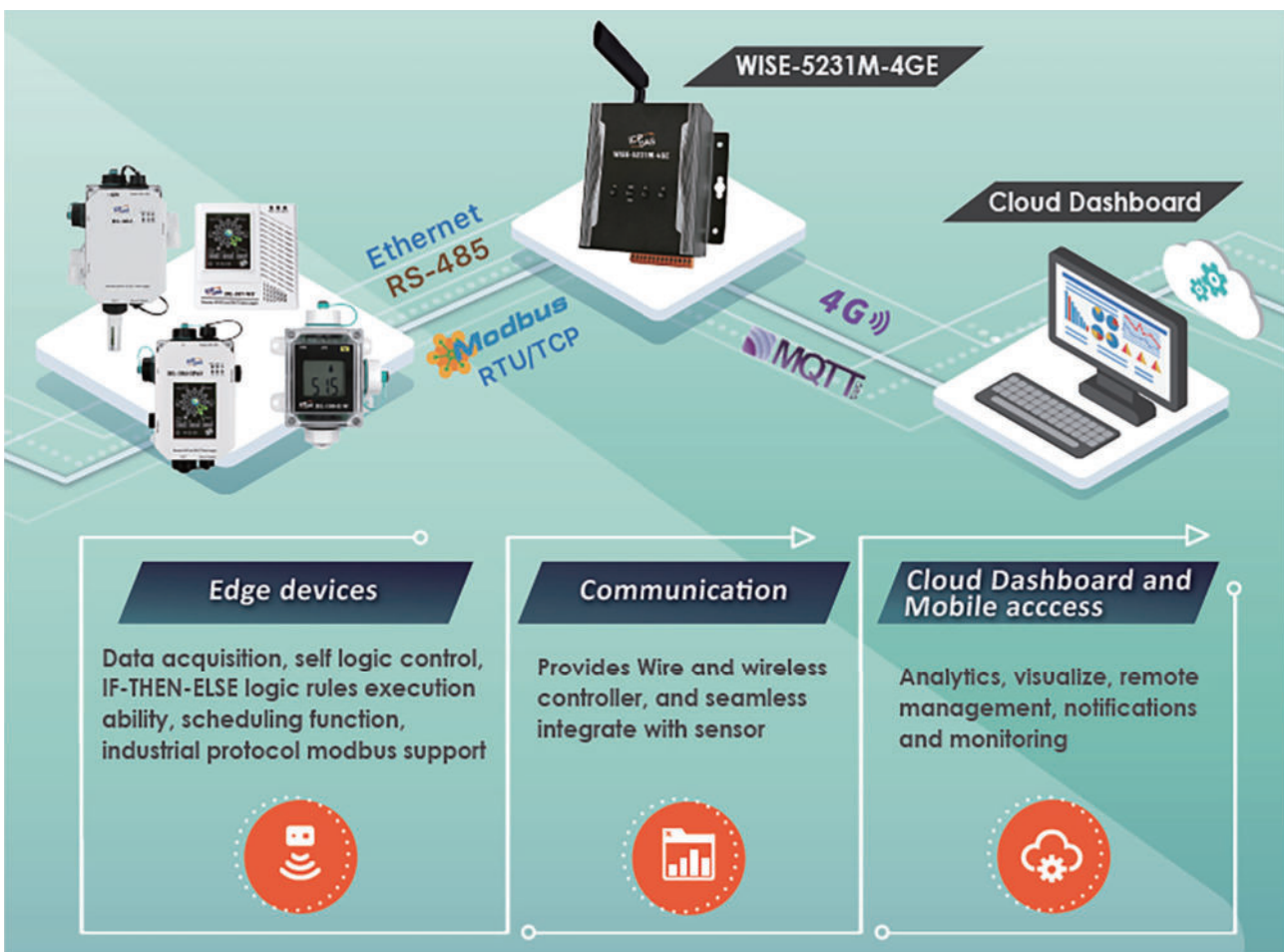
Advantages:

The advantages of the ExoWISE solution include easy connecting, no need for coding, and no need for the software development team. It can save a lot of investment and shorten the development time. Due to the rapid development of IIoT technology, ICP DAS provides customers with easy-to-use solutions to help customers expand their IT infrastructure and achieve OT data connections for industrial applications. ExoWISE proposes the latest solutions to connect IIoT, Cloud, and Edge technologies.



System Structure:

Any device using the standard Modbus protocol can connect to the ExoWISE solution via ICP DAS IIoT Edge Controller WISE-5231. Once connected, WISE-5231 can immediately send data to the cloud platform, remotely control and monitor various industrial applications so that users can see real-time data and device status through the dashboard, receive notifications, manage user access and generate reports, Achieve real-time remote device monitoring, data calculation, and asset reporting. The warning function allows users to receive instant warnings of specific assets, and the collected data can be analyzed and insight. The main function of WISE-5231 is to connect edge devices to the Internet and become the link between devices and the cloud. These capabilities are vastly superior to standard SCADA systems.

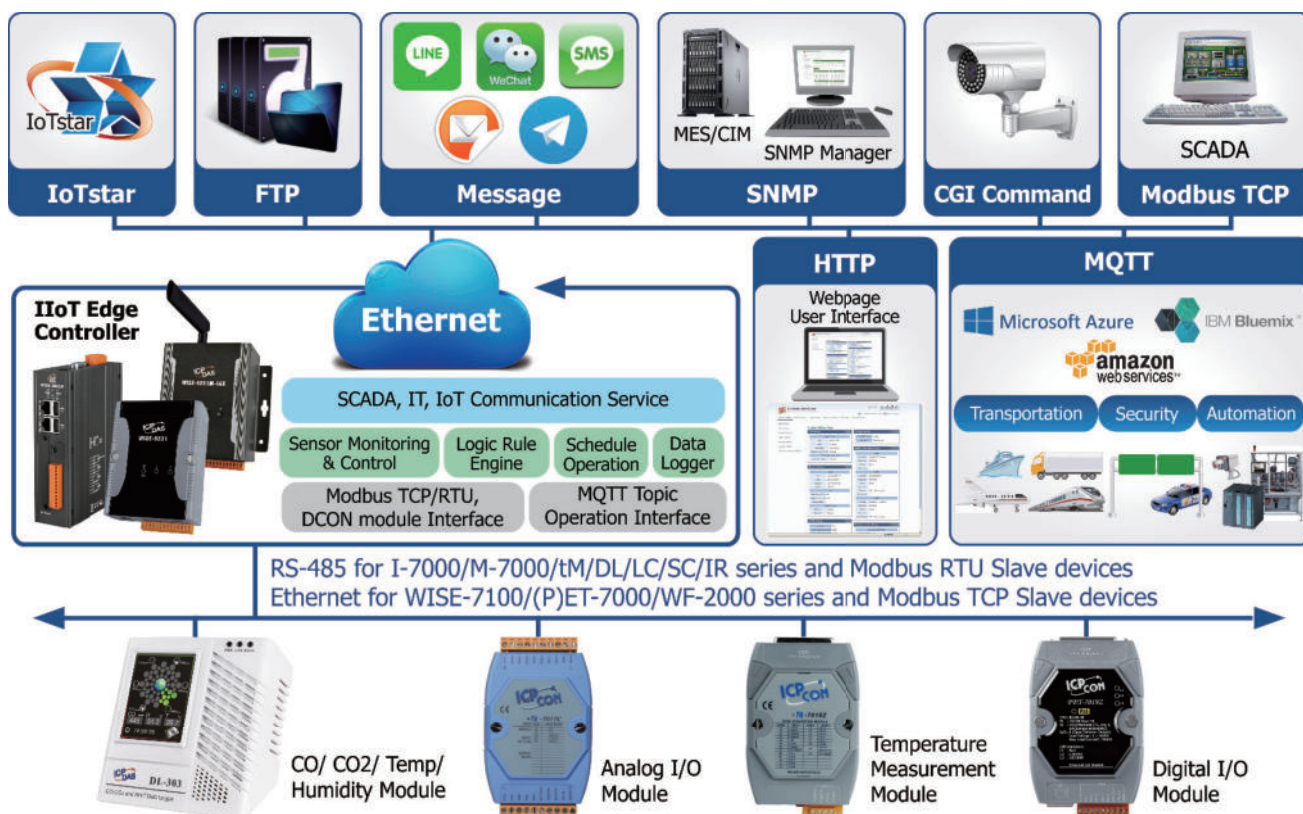


Chapter 2. IIoT Controller/Server

2-1 IIoT Edge Controller: WISE Series

WISE (Web Inside, Smart Engine) is a product series developed by ICP DAS. WISE offers a user-friendly and intuitive web site interface that allows users to implement IF-THEN-ELSE control logic on controllers just a few clicks away; no programming is required. With its powerful and easy-to-use features, it will minimize the learning curve, shorten time to market and dramatically reduce the labor and cost spent on IIoT system development.

WISE Architecture



Based on the built-in Edge Computing Engine WISE provide, users can access Web server on WISE through browser to perform the tasks such as logic rule edition, download and execution to meet the requirement of real-time Edge Computing operation at the field site.

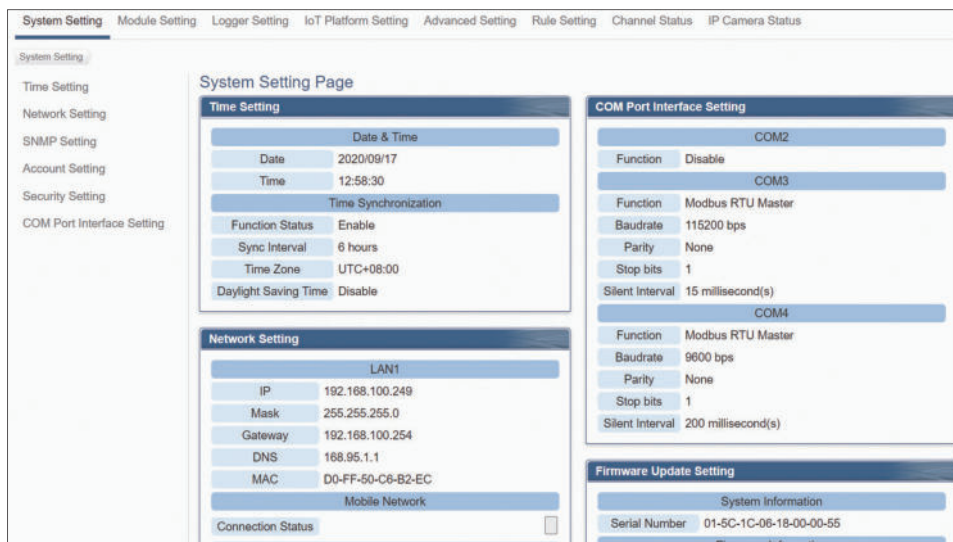
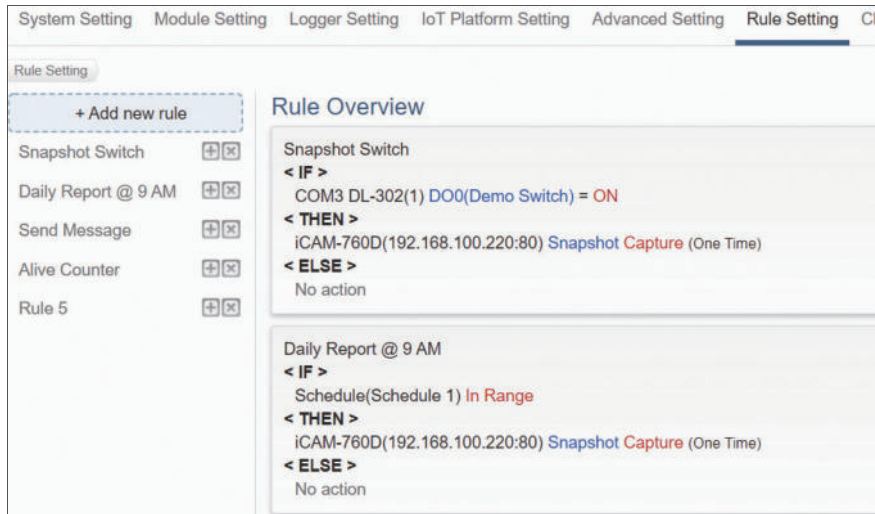
WISE-523x/WISE-2x4xM provides more supports in I/O functions. It allows to connect to a wide range of ICP DAS remote I/O modules and Modbus TCP/RTU slave modules; the users can freely choose the most suitable I/O modules for applications. With the microSD card, it provides Data Logger function to real-time record the I/O channel data of the controller and allows to send the data log files to the control center by FTP (or Email) for further administration management or data analysis.

WISE-523x/WISE-2x4xM supports a variety of IoT/SCADA communication protocols (Modbus, MQTT, SNMP, CGI, FTP), which can be quickly integrated with various IoT/IT/SCADA systems. WISE-523x/WISE-2x4xM also can connect to a public IoT Cloud platform (such as Microsoft Azure, IBM Bluemix, or Amazon Web Services) and ICP DAS IoTstar IoT cloud management software. Through the functions of "Well-thought-out sensor data collection", "Real-Time Edge Computing operation", and "Easy integration with IoT/SCADA system", WISE-523x/WISE-2x4xM is not only a controller of IIoT edge computing for the field-side sensors but also a IoT Gateway for uploading the sensor data to the IoT cloud system. It is definitely your best choice for building your IoT applications!

Features

Simple, easy-to-use, no-programming-required for system development

WISE provides user-friendly Web UI pages for editing control logic on the controllers. To edit control logic, it only requires a browser to connect to the Web server on WISE. No extra software tool installation is needed. WISE enables implementation of logic edition by a few clicks on the mouse to set up and deploy logic rules without writing a single line of code.



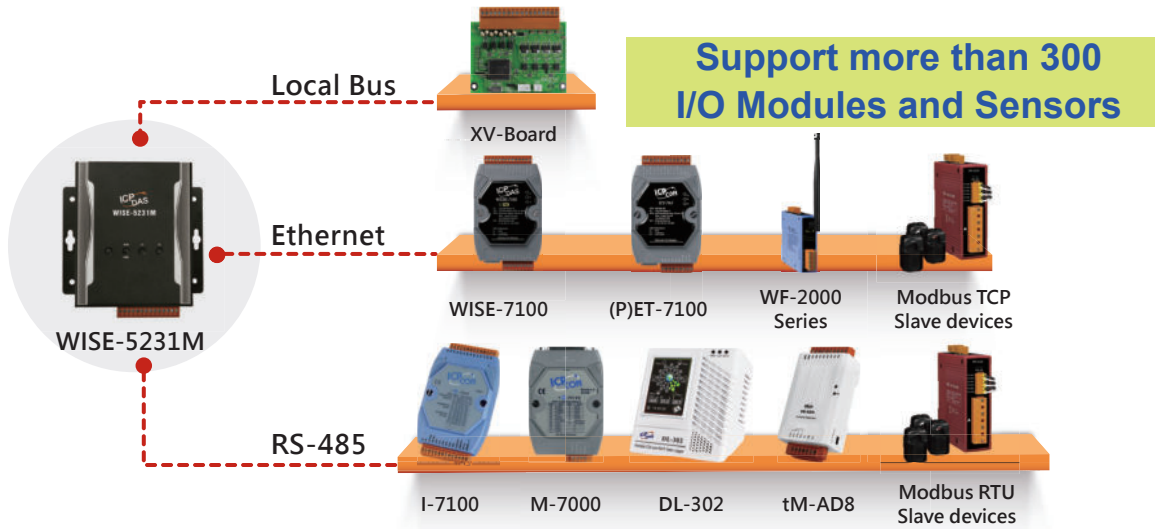
IF-THEN-ELSE logic rules execution ability

WISE controller features an IF-THEN-ELSE logic rule engine; it offers IF-THEN-ELSE rules for users to set up the logic content. After completing rule edition and downloading rules to the WISE, the rule engine will loop execute the rules in accordance with the execution order under specific conditions.

IF Condition	THEN/ELSE Action
Add a new condition: Set up a condition ▼	Add a new action: Set up an action ▼
<input type="radio"/> AI Value	<input type="radio"/> Assign AO Value
<input type="radio"/> DI Status	<input type="radio"/> Assign DO Value
<input type="radio"/> DI Counter Value	<input type="radio"/> Assign Internal Register Value
<input type="radio"/> Internal Register Value	<input type="radio"/> Change Timer Operation
<input type="radio"/> Motion Detection Status of Camera	<input type="radio"/> Record Video/Snapshot by Camera
<input type="radio"/> Timer Status	<input type="radio"/> Data Log
<input type="radio"/> Schedule Status	<input type="radio"/> Reboot System
<input type="radio"/> I/O Module Connection Status	<input type="radio"/> Assign Rule Status
<input type="radio"/> SD Card Status	<input type="radio"/> Send Email
<input type="radio"/> Receive MQTT Message	<input type="radio"/> Send SMS Message
<input type="radio"/> Receive AWS/Azure/Bluemix Message	<input type="radio"/> Send MQTT Message
<input type="radio"/> Receive CGI Command	<input type="radio"/> Send AWS/Azure/Bluemix Message
<input type="radio"/> Mobile Network Signal Strength	<input type="radio"/> Send CGI Command
	<input type="radio"/> Send SNMP Trap
	<input checked="" type="radio"/> Send LINE Message
	<input checked="" type="radio"/> Send WeChat Message
	<input checked="" type="radio"/> Send Telegram Message

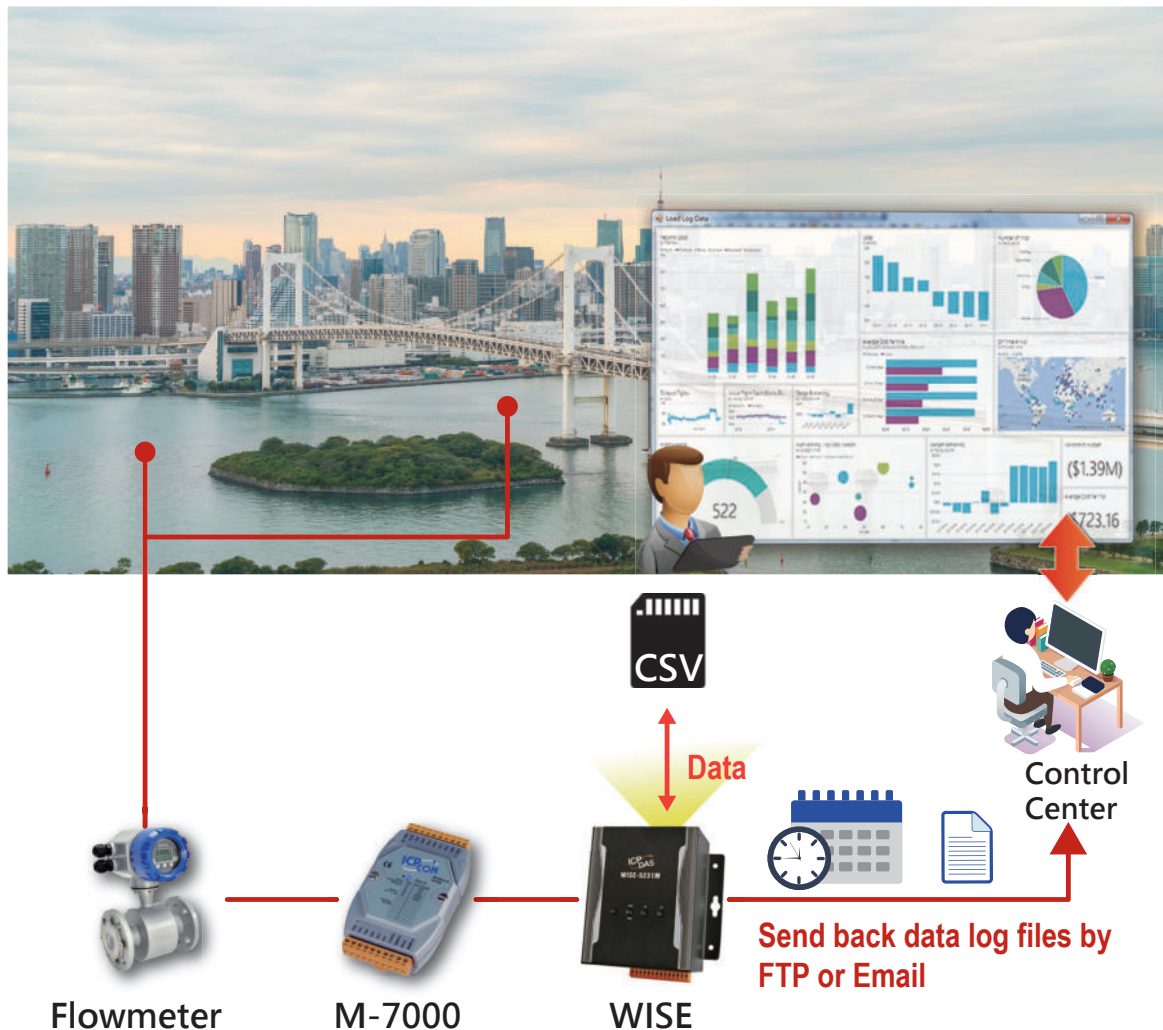
Connection ability to a variety of sensors and devices

WISE Controller allows to connect with sensors and devices that support Modbus TCP/RTU protocol for I/O monitoring. The ability to connect with Modbus TCP/RTU slave devices enables the flexibility and scalability for system implementation and allows to meet various requirements of the applications from the clients.



Data Logger operation

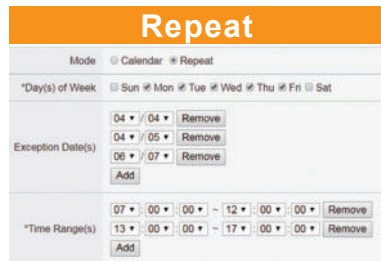
With the microSD card, WISE provides Data Logger function to real-time record the I/O channel data of the controller and sends the data files automatically by FTP (or Email) to the control center for further administration management or data analysis.



Provide Timer and Schedule operation

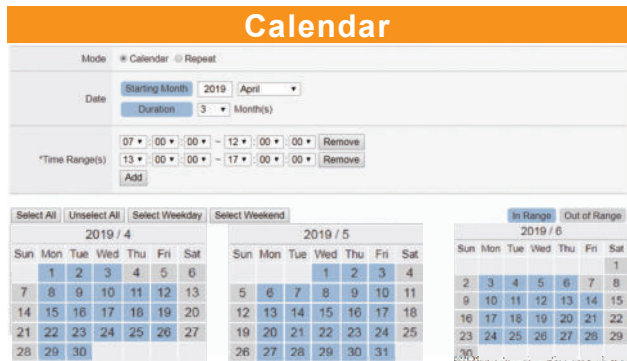
WISE features Timer function. It allows to perform the timing delay of the working logic rule. In addition, WISE also provides Schedule function to perform the prescheduled routine tasks. Through the two setting interfaces of the Calendar and Repeat (weekly) provided by the Schedule function, the administrator can quickly assign the weekly schedule operation, or flexibly arrange the annual schedule operation for the on-site equipment.

The Schedule function will be helpful to user to handle the applications such as factories or schools that require specific equipment scheduling management mechanism.



Repeat Mode of Schedule

- **Weekday:** Mon. to Fri.
- **Time Range:** 07:00 - 12:00
13:00 - 17:00

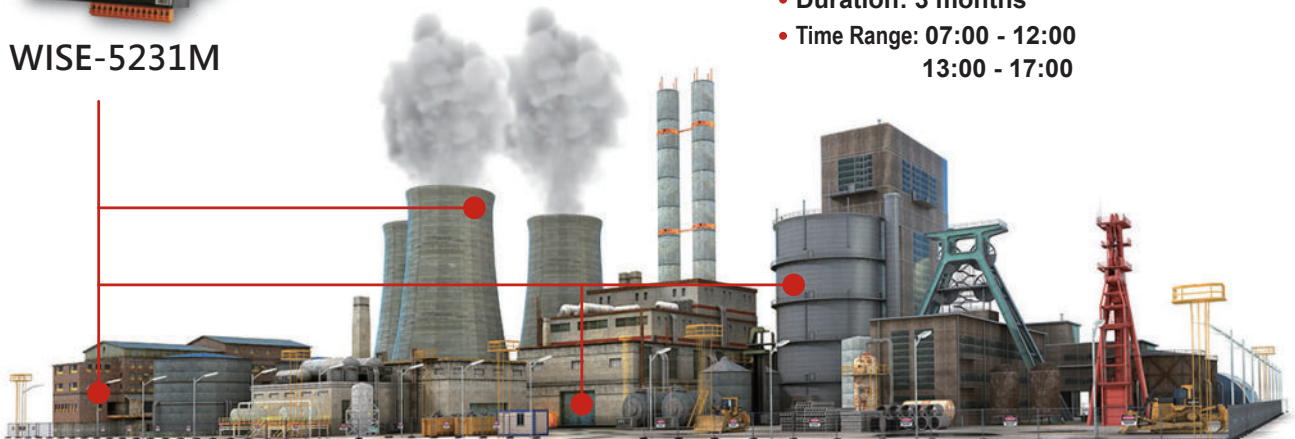


Calendar Mode of Schedule

- **Starting Date:** 2020/04
- **Duration:** 3 months
- **Time Range:** 07:00 - 12:00
13:00 - 17:00

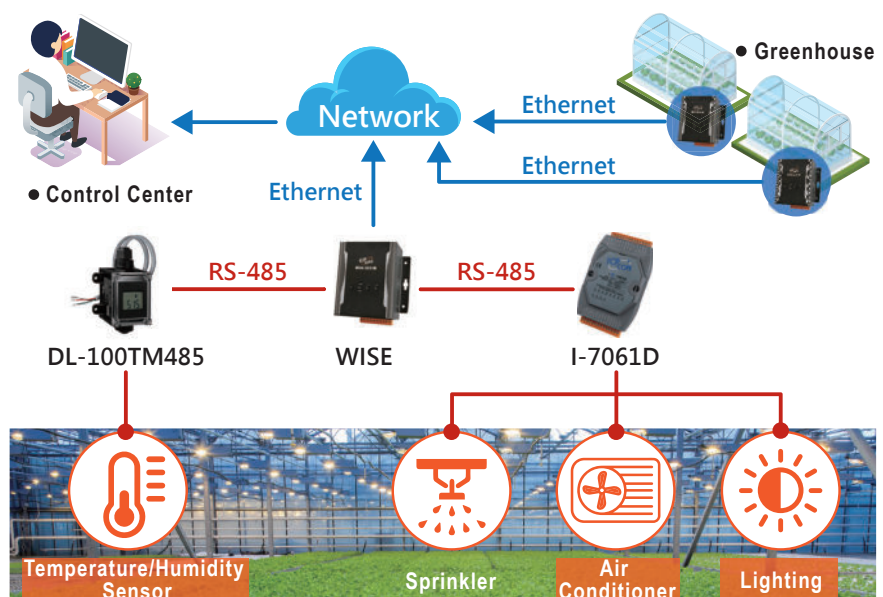


WISE-5231M



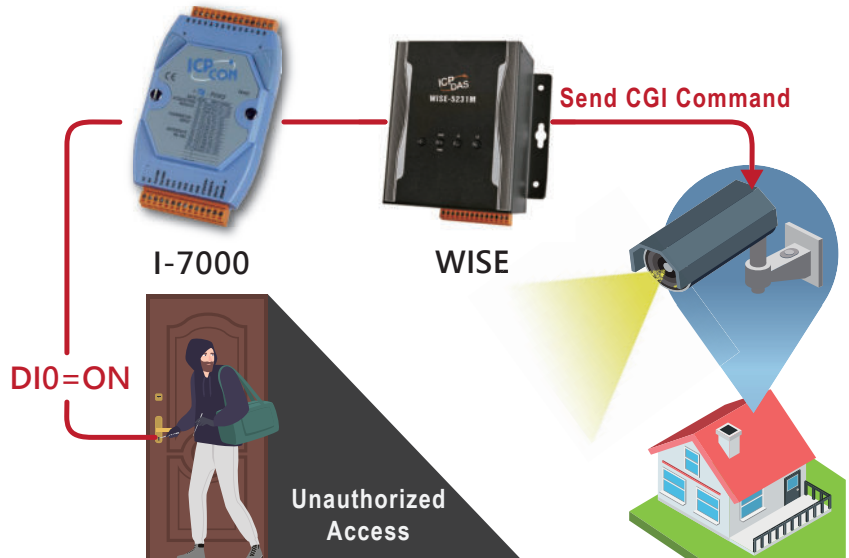
Active I/O sending mechanism

In addition to the Modbus TCP/RTU slave function that enables SCADA to poll the I/O data of the WISE, WISE also provides "Active I/O sending" mechanism (Modbus TCP master, SNMP Trap and MQTT publish). Based on the "Active I/O sending", WISE allows to send the I/O data of the controller actively to SCADA/IT/IoT system by event trigger (change of the I/O channel data) or periodic cycle. This function will improve the efficiency of the data communication between WISE and SCADA/IT/IoT system.



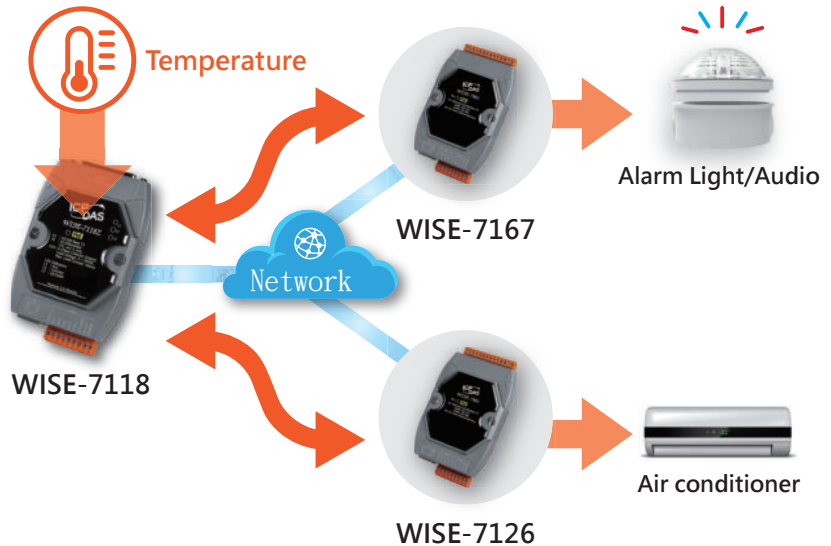
CGI Command sending & receiving for surveillance system integration

WISE supports full CGI command operations - CGI command sending and CGI command receiving. The CGI command sending action can be added to the logic rule as part of logic control in response to specific events. The CGI command receiving function enables WISE to receive the CGI commands from others network devices. The content of CGI command received can be used in IF condition statements to trigger the THEN/ ELSE actions.



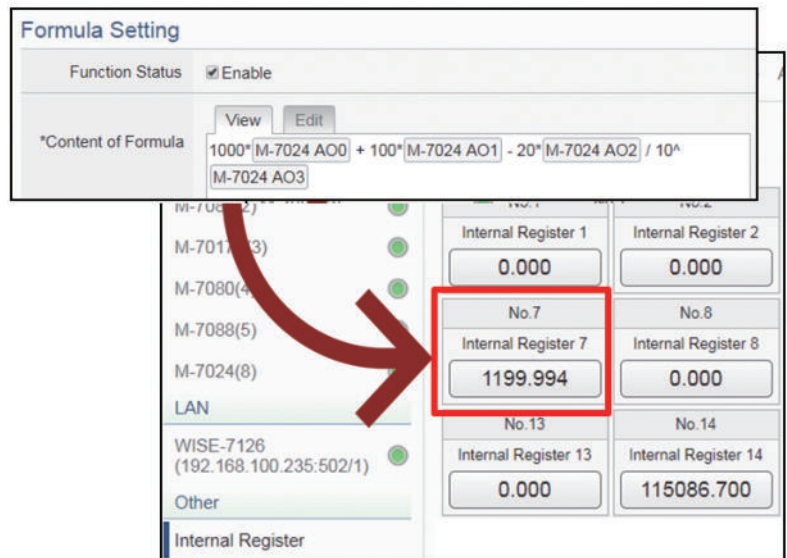
Advanced P2P function between WISE I/O Modules

WISE-7xxx offers P2P function that enables WISE-7xxx modules to directly communicate with other remote WISE-7xxx modules on networks. The modules can freely share the information such as I/O channel value, DI/DO counter and Internal Register to each other. The P2P operations can be incorporated into WISE logic rules as condition statements or action statements for condition evaluation criteria or action executions.



Support math formula editing function

WISE-523x/WISE-2x4x support math formula editing function in Internal Register. This function supports to insert I/O channels to be the variables, and use the operators such as plus "+", minus "-", times "*", divide "/", power "^", left parenthesis "(" and right parenthesis ")" to complete the editing of formula. Users can edit different formula in each Internal Register. WISE will calculate the results of all formulas repeatedly, and save the results into the corresponding Internal Registers for IF-THEN-ELSE rule checking or data logging.



Support Instant Message sending functions

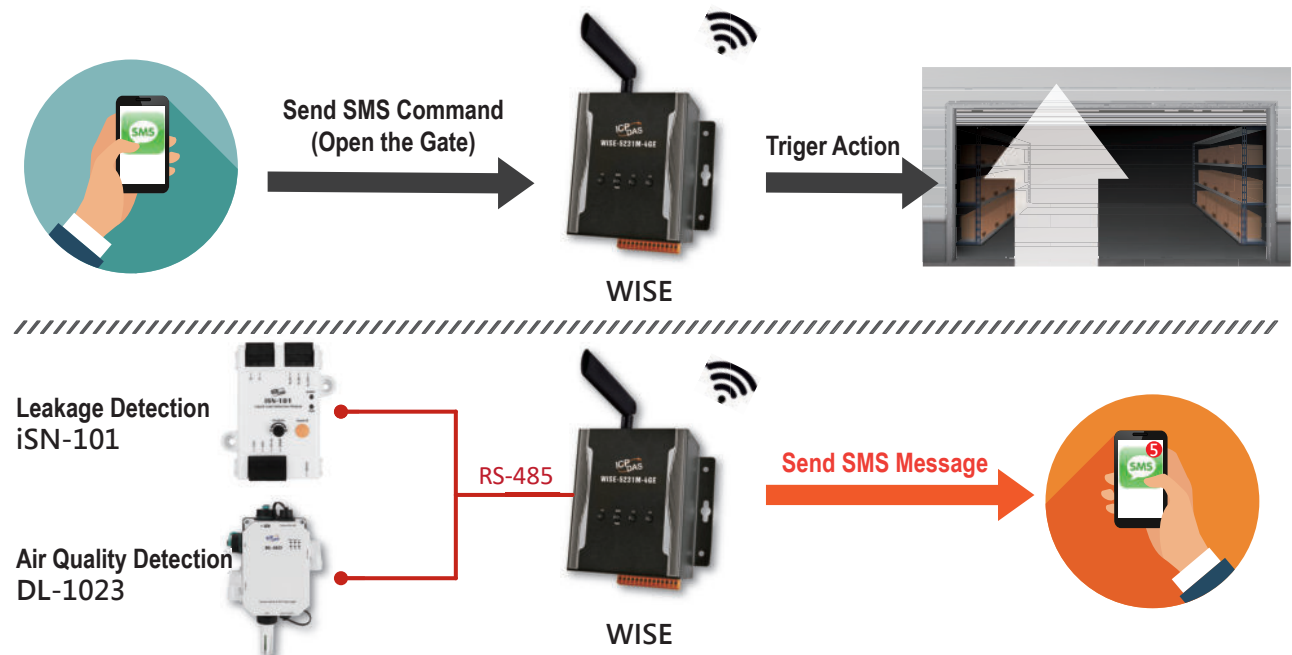
WISE supports LINE, WeChat, SMS, and Email sending function for real-time message notification. The message sending action can be added to the logic rule as part of logic control to provide real-time message notification to the related personnel when an event occurs. In addition, when WISE connects with ICP DAS iCAM series IP cameras, WISE can send the pictures and videos to the manager by LINE and WeChat.

Please note: WISE-284xM also supports Telegram.



Support SMS command receiving function

The 3G/4G version of WISE-523x/WISE-2x4xM is equipped with SMS alarm message notification function. It allows to include SMS alarm sending action into logic rules to send a pre-set SMS message to related personnel when an event occurs. In addition, The WISE controller also allows to receive the SMS commands sending by specific phones numbers to perform tasks such as real-time I/O channel status monitoring, DO/AO channel value modification and logic rules execution (triggered by SMS), etc.

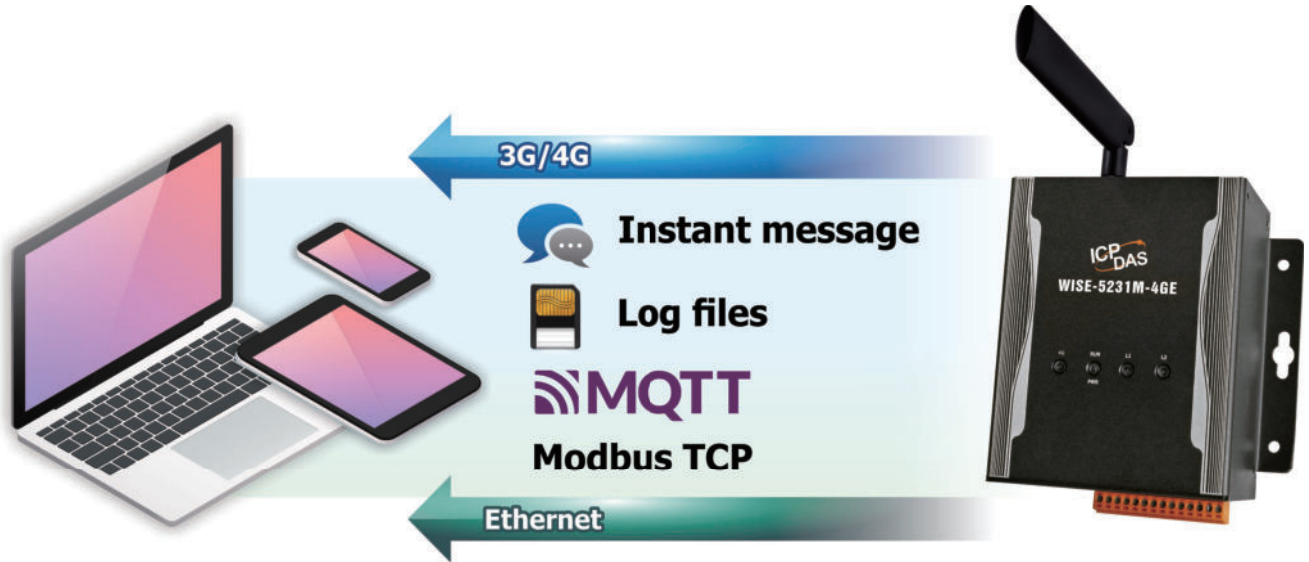


■ Support 4G/3G mobile network communication

In addition to Ethernet communication, WISE-523xM-3GWA/4GE/4GC & WISE-2x4xM(X)-4GE/4GC also supports 4G/3G mobile network communication. It can send the real-time I/O data of sensors and modules, data logger files and alarm messages back to the control center by 4G/3G mobile network.

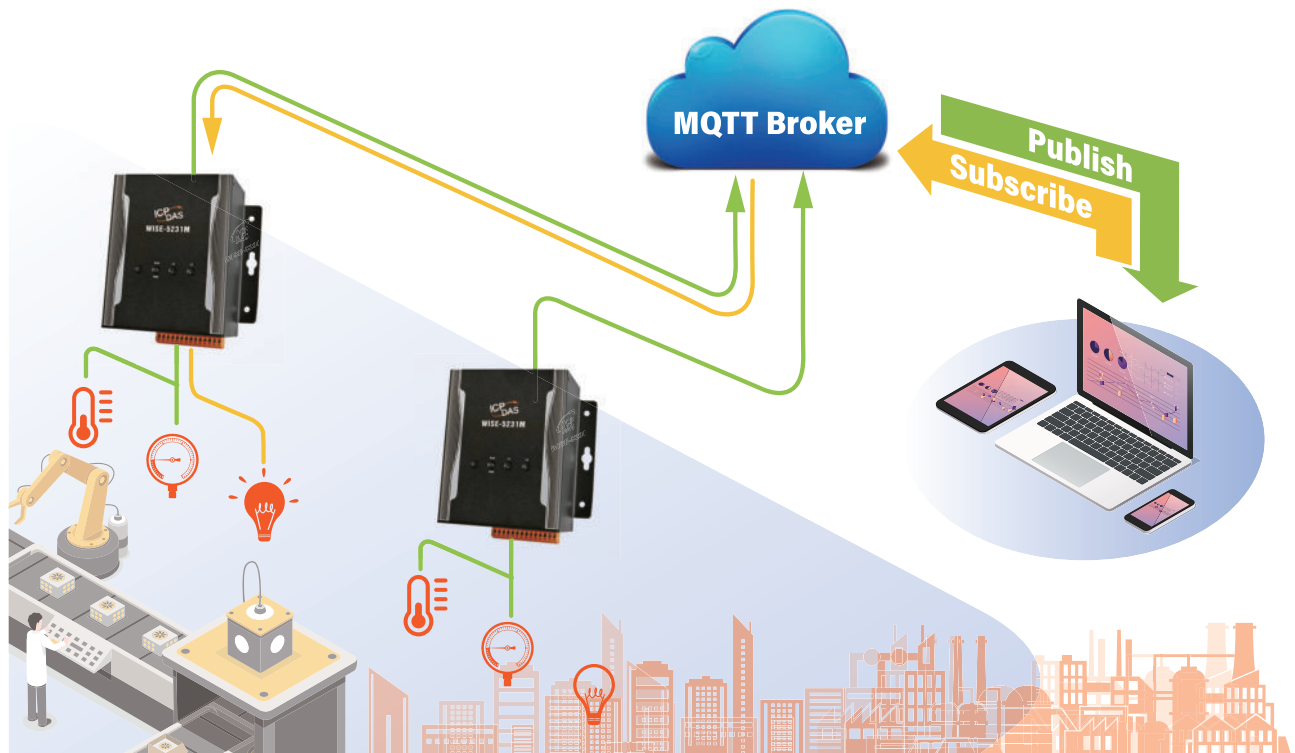
2

IIoT Controller/Server



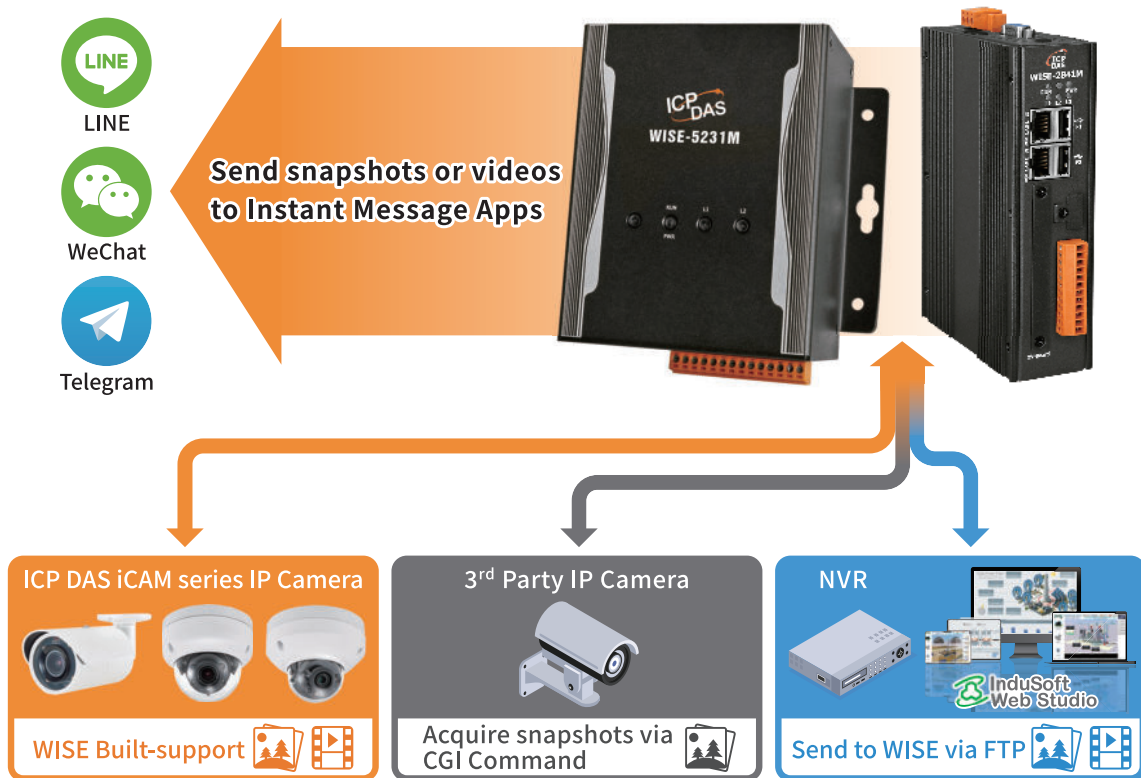
■ MQTT Message Publish/Subscribe operation

WISE-523x/WISE-2x4xM supports the MQTT protocol. It can publish the I/O data of the I/O modules (connected to WISE-523x/WISE-2x4xM) to the MQTT broker, and it can also receive the message content of the Subscribe MQTT Topics published by others MQTT device for the data logging operation or use it in the IF-THEN-ELSE logic rule.



Provide image forwarding operation with Instant Message sending

WISE-523x/WISE-2x4xM supports the forwarding operation of image/video files captured by other devices, and send them with the text messages to the LINE/WeChat/Telegram apps. The image forwarding function enables WISE being a real-time message transmitter in a monitoring system. It can send text messages with the images/videos automatically to the LINE/WeChat/Telegram accounts. With the rich media like images & videos added, it will greatly enhance the alarm notification efficiency and user experience.



Sensor data upload operation with Security mechanism

In the era of IoT and Cloud computing, sensor data transmission between the Sensor and Cloud platform is a prerequisite for maintaining an effective operation of the IoT Cloud system. And how to make the operation of "Upload Sensor data to Cloud" to be protected by the Security mechanism is also the primary task of building a IoT Cloud system.

To ensure the operations of sensor data uploading from WISE to Cloud platform to meet the requirements of Security mechanism, WISE-523x/2x4xM supports Security mechanism such as "MQTT with SSL/TLS" to perform the encryption of real-time Sensor data during the data transmission operation. In addition, WISE-284xM also supports the Security mechanism such as VPN Client (Virtual Private Network), SNMP agent v3 (Enhanced security for SNMP protocol), SFTP(Secure File Transfer Protocol), FTPS(FTP over SSL) and HTTPS. With a variety of Security mechanism and protocols provided by WISE, it can meet the requirements of information Security when building an IoT Cloud system.

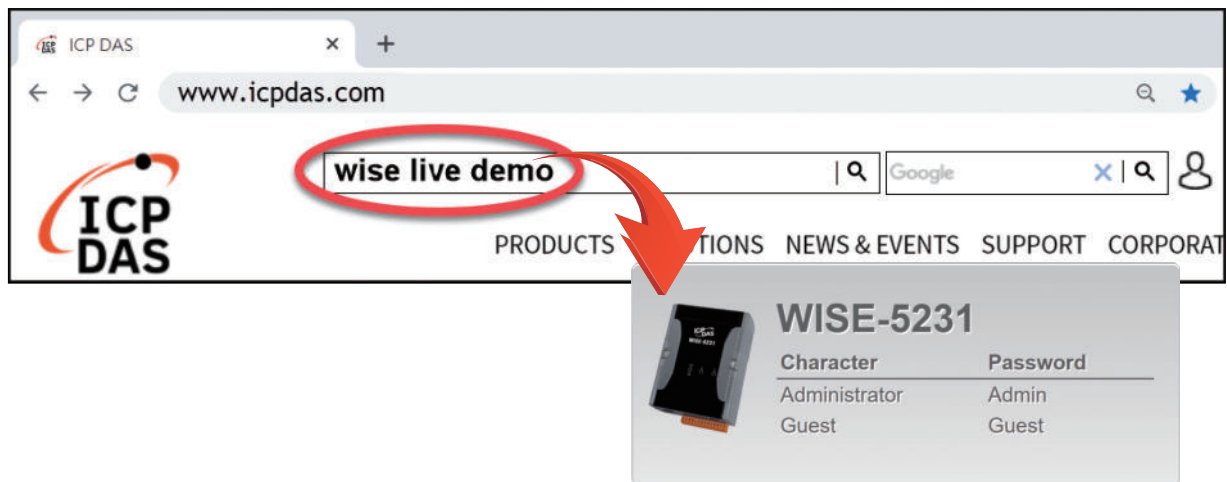


Connection with IoT Cloud Platform and ICP DAS IoTstar

WISE-523x/WISE-2x4xM supports the connection ability with the IoT Cloud Platform as Microsoft Azure, IBM Bluemix, etc. It work as the concentrator in the IoT application to connect with sensors, collect and transfer the sensor data to the cloud platform for future data analysis. WISE also can receive the message which is published from the cloud platform for the corresponding actions at the field side. And besides, WISE supports to connect with ICP DAS IoTstar cloud management software. IoTstar enables the Controller Remote Access Service, Sensor Data Collection Service, Sensor Data Visualization Service, Sensor Data Report Service, Bot Service with Mobile Phone on WISE.



WISE Demo Site



Comparison Table



Hardware Specification

Model	WISE-284xM	WISE-224xM	WISE-523x	WISE-523xM
System				
CPU	Quad-core ARM CPU, 1.6 GHz/Core		ARM CPU, 1.0 GHz	
SDRAM/Flash	DDR3 2 GB / 8 GB		DDR3 512 MB / 256 MB	
microSD	Built-in one 4 GB microSD card (support up to 32 GB microSD card or 2 TB microSDXC card(WISE-284xM Only))			
Communication Interface & IO Module Expansion				
Ethernet	10/100/1000 Base-TX * 2		10/100/1000 Base-TX * 1	
Serial Port	2 x RS-232 / 2 x RS-485 (2 x isolated)		2 x RS-232 / 2 x RS-485 (1 x isolated)	
I/O Module Expansion	XV-board, RS-485, Ethernet			
Mechanical/Power/Environmental				
Casing	Metal	Metal	Plastic	Metal
Dimension (W x L x H; mm)	42 x 164 x 129	35 x 167 x 119	91 x 132 x 52	117 x 126 x 58
Installation	Wall/DIN-Rail mounting (optional)		DIN-Rail mounting	Wall/DIN-Rail mounting
Temperature/Humidity	Operating Temperature: -25°C to +75°C ; Storage Temperature: -40°C to +80°C ; 10 to 90% RH, Non-condensing			
Input Range/Consumption	+12 to +48 VDC (Ethernet: 4.8 W; -4GE/4GC/3GWA: 6.5 W)			
Wireless Communication (Applied to 3G/4G version WISE-523xM, WISE-224xM & WISE-284xM series controllers)				
3G System (-3GWA)	WCDMA: 850/900/1900/2100 MHz			
3G/4G System (-4GE)	FDD LTE: B1/B3/B5/B7/B8/B20 bands (Frequency Band for EMEA, Korea, Thailand, India and Taiwan) WCDMA: 850/900/2100 MHz			
3G/4G System (-4GC)	FDD LTE: B1/B3/B8 bands (Frequency Band for China) TDD LTE: B38/B39/B40/B41 bands (Frequency Band for China) WCDMA: 900/2100 MHz, TD-SCDMA 1900/2100 MHz, CDMA2000 (BC0) 800 MHz			

Software Function

Model	WISE-284xM Series	WISE-224xM Series	WISE-523x(M) Series
Web Page Interface	Yes		
IF-THEN-ELSE Logic Rule	Yes (Unlimited sets)		
I/O Channel Monitoring	Yes		
Timer Operation	Yes (Unlimited sets)		
Schedule Operation	Yes (Support Calender and Weekly modes; Unlimited sets)		
Internal Register	Yes (Support "Retain Variable" operation)		
Data Logger	Yes		
Communication Protocol	Modbus TCP/RTU, FTP Client/ Server, CGI sending/receiving, SNMP & MQTT (non-SSL & SSL)		
Information Security Enhancement	Yes		-
Instant Message Sending	SSL/TLS Email, LINE Notify, WeChat(WISE-284xM, WISE-2246M/5236), Telegram(WISE-284xM), SMS (3G/4G version of WISE-523xM/224xM/284xM)		
Cloud System Connection	Yes (Microsoft Azure · IBM Bluemix, Amazon Web Service(WISE-284xM Only))		

Product Specification

IIoT Edge Controller : WISE-284xM/224xM/523x

Advanced IIoT Edge Controller: WISE-284xM



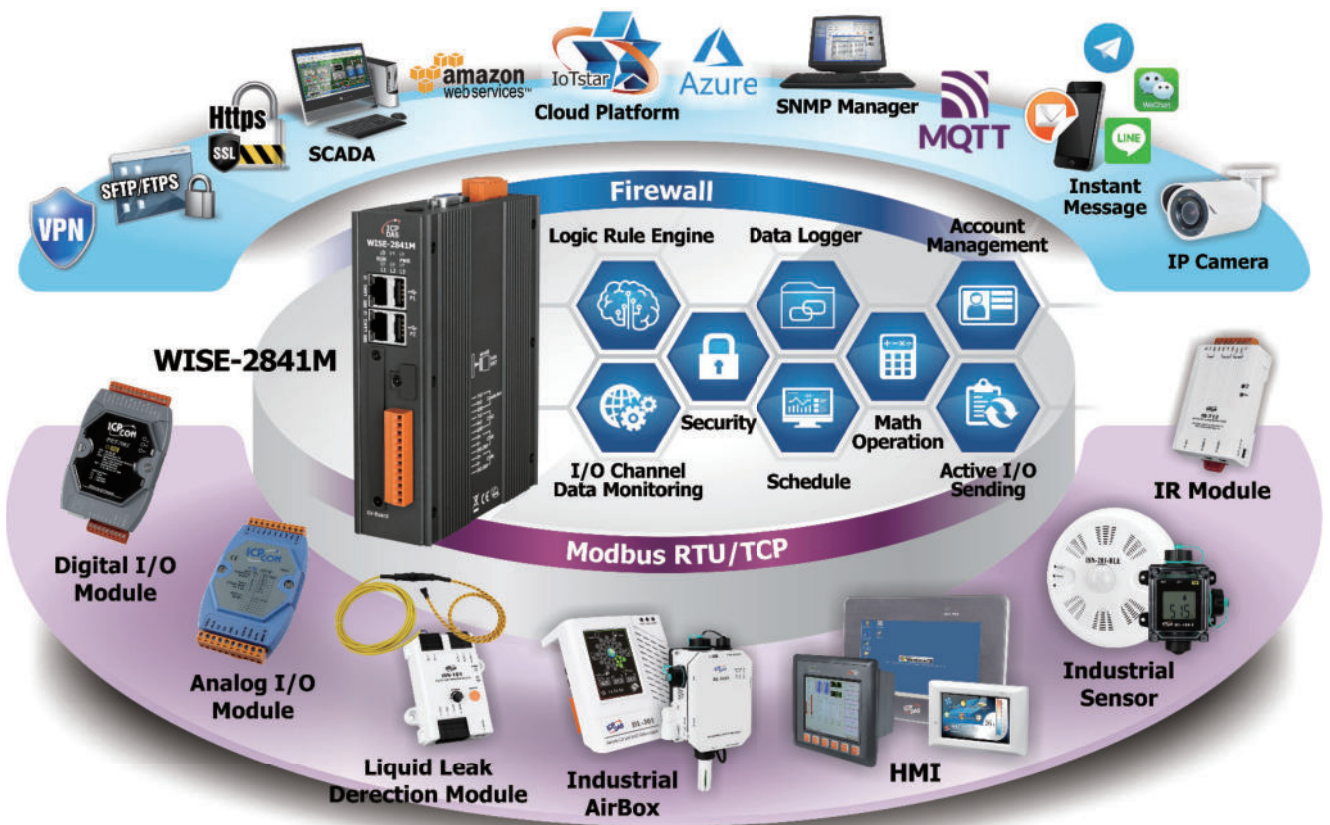
WISE-284xM

Features

- No more programming, Web pages provided for system and logic rule setting
- Support XV-board, DCON, & Modbus TCP/RTU Slave modules
- IF-THEN-ELSE logic rules execution ability
- Data logger and data files send back function supported
- Timer and Schedule functions supported
- Support Line, Telegram, WeChat, SMS and Email message notification
- Support Modbus TCP/RTU, SNMP, MQTT, FTP and CGI protocols
- Support connection with IoT Cloud Platform (Microsoft Azure, IBM Bluemix, Amazon Web Services) and IoTstar Cloud Management Software
- Support 4G wireless data communication
- Complete information security protection mechanism - HTTPS, VPN, SNMP v3, SFTP, FTPS, and Blacklist/Whitelist



System Architecture



Advanced

IIoT Edge Controller

A comprehensive upgrade of information security mechanism



HTTPS



VPN



SNMPv3



SFTP



FTPS



LISTING



WISE-2841M

I/O Module

**Industrial
AirBox**

**Liquid Leak
Detection Module**

IP Camera

In the era of Internet of things, information security has become the key point of the IIoT system that cannot be ignored. In the past, people frequently assume "Hackers will not target devices within industrial networks, they are only interested in attacking PCs and enterprise networks", "The industrial equipment is old, so it is relatively safe". However, with the increasing demand of networking connection capability for industrial equipment, old industrial equipment may be vulnerable once being connected to the network. When a hacker penetrates and takes over the industrial system, it may be subjected to a huge amount of extortion, or the system will be shut down and data will be destroyed. Therefore, improving the overall information security of the industrial system and strengthen the reliability of cloud connections are the core in building an industrial IIoT system.

In order to meet the high level requirements of information security for the Industrial IIoT system, ICP DAS has launched the Advanced IIoT Edge Controller: WISE-284xM series. It supports a variety of information security functions and encrypted data communication protocols, and provides the following information security mechanism according to the different levels of protection requirements:

2

IIoT Controller / Server

■ Network Security

WISE-284xM series features the VPN communication function (supports 4 VPN protocols : PPTP, L2TP, OpenVPN and SoftEther), which allows users to set up a secure communication tunnel between WISE and the internet, and the security of the network through VPN can also prevent the WISE and its connected I/O modules from being invaded by external threats.



■ System Security

WISE-284xM series uses web interface for system configuration and sensor monitoring, therefore the web interface is the entry point for the entire system operation, and its security needs to be strengthened. WISE-284xM supports the HTTPS encrypted communication protocol, which can encrypt the communication content between the browser and WISE to protect the settings and operations performed on WISE from being interpreted. SNMP v3 encryption communication protocol and the authentication mechanism of user management are also provided to ensure the security of connections between WISE and IT system to ensure the security.

■ Data Security

WISE-284xM is equipped with a microSD card, which can be used to perform the periodic or event-driven data log operations for the I/O modules connected to WISE. The data log files can be automatically sent back to back-office through the FTPS protocol, or actively downloaded by user through SFTP, FTPS or web protocols. The transmission of data log files is protected by TLS encryption to ensure the data log files not being captured or tampered during the transmission process.



Identity Authentication Security

WISE-284xM features the mechanism of password authentication for each communication connection interface. Administrator is required to enter accurate password before setting up the operations of WISE. In addition, WISE-284xM also supports the function of Blacklist/Whitelist, which allows users to filter and exclude the accessible domains. It can also perform the dynamic blacklist function to automatically add the IP address with too many wrong login attempts to WISE to blacklist to protect WISE from the brute force password attacks.



Cloud Backup Mechanism

However, no matter how robust the security mechanism is, the threat of being breached is always exist. Therefore, in addition to the security mechanism, the system recovery function is also indispensable, so that the original system setting can be quickly restored to WISE after being damaged by the network attack. WISE-284xM can connect to the IoT Cloud Management Software-IoTstar launched by ICP DAS. In addition to collecting the sensor data sent by WISE, and importing them to Database, IoTstar can also perform the system setting backup operation automatically for the WISE controllers connect to IoTstar. In this way, even if WISE-284xM is attacked and damaged, as long as a new WISE is replaced, the original system setting can be restored to the new WISE, so that the operations on WISE will return to normal immediately without worrying about the loss of downtime caused by system damage.



The Advanced IIoT Edge Controller - WISE-284xM inherits the features of the original WISE series controllers: perform system setting and monitoring by browser, powerful IF-THEN-ELSE logic operation capability, connection ability to a variety of I/O modules, support data computing and real-time message notification functions. Now it also features greatly improved information security mechanism. The WISE-284xM is perfect to serve as the operational core of the industrial IoT system.

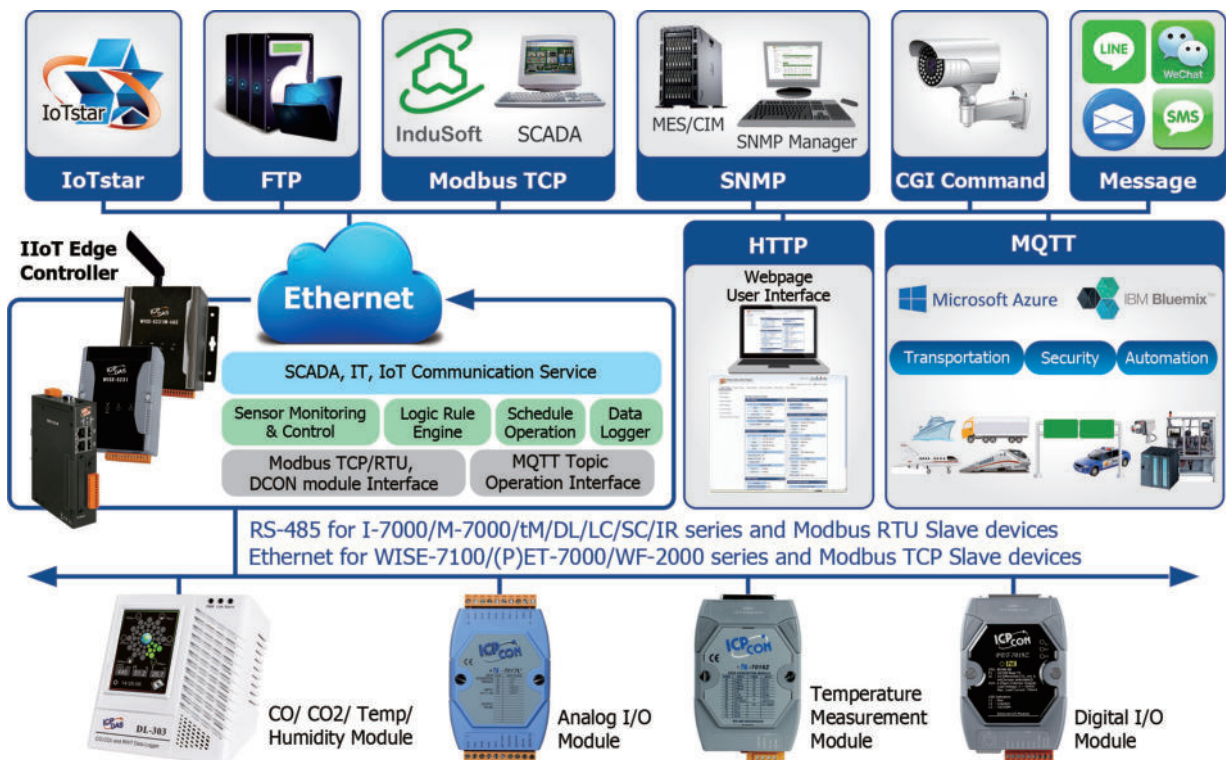
IIoT Edge Controller: WISE-224xM/WISE-523x



Features

- No more programming, Web pages provided for system and logic rule setting
- Support XV-board, DCON, & Modbus TCP/RTU Slave modules
- IF-THEN-ELSE logic rules execution ability
- Data logger and data files send back function support
- Timer and Schedule functions supported
- Support Line, WeChat, SMS and Email message notification
- Support Modbus TCP/RTU, SNMP, MQTT, FTP and CGI protocols
- Support connection with IoT Cloud Platform (Microsoft Azure, IBM Bluemix) and IoTstar Cloud Management Software
- Support 4G/3G wireless data communication

System Architecture



Ordering Information

IIoT Edge Controller

Module	Description
Standard Function	
WISE-5231 CR	IIoT Edge Controller (Plastic casing)
WISE-5231M CR	IIoT Edge Controller (Metal casing)
WISE-5231M-3GWA CR	IIoT Edge Controller (Metal casing; Built-in 3G Wireless module)
WISE-5231M-4GE CR	IIoT Edge Controller (Metal casing; Built-in 4G Wireless module; Frequency Band for EMEA, Korea, Thailand, India and Taiwan)
WISE-5231M-4GC CR	IIoT Edge Controller (Metal casing; Built-in 4G Wireless module; Frequency Band for China)
WISE-2241M CR	IIoT Edge Controller (Metal casing)
WISE-2241M-4GE CR	IIoT Edge Controller (Metal casing; Built-in 4G Wireless module; Frequency Band for EMEA, Korea, Thailand, India and Taiwan; Asia only)
WISE-2241M-4GC CR	IIoT Edge Controller (Metal casing; Built-in 4G Wireless module; Frequency Band for China; Asia only)
Standard Function + WeChat Message Sending	
WISE-5236 CR	IIoT Edge Controller (Plastic casing; China only)
WISE-5236M CR	IIoT Edge Controller (Metal casing; China only)
WISE-5236M-4GC CR	IIoT Edge Controller (Metal casing; Built-in 4G Wireless module; Frequency Band for China; China only)
WISE-2246M CR	IIoT Edge Controller (Metal casing; China only)
WISE-2246M-4GC CR	IIoT Edge Controller (Metal casing; Built-in 4G Wireless module; Frequency Band for China; China only)

Please note: An Enterprise WeChat account in China is required for WISE to send the messages to the members under the enterprise WeChat account.

Advanced IIoT Edge Controller

Module	Description
Standard Function + WeChat Message Sending + Information Security Protection Mechanism	
WISE-2841M CR	Advanced IIoT Edge Controller (Metal casing)
WISE-2841M-4GE CR	Advanced IIoT Edge Controller (Metal casing; Built-in 4G Wireless module;; Frequency Band for EMEA, Korea, Thailand, India and Taiwan; Asia only)
WISE-2841M-4GC CR	Advanced IIoT Edge Controller (Metal casing; Built-in 4G Wireless module; Frequency Band for China; Asia only)

Please note: An Enterprise WeChat account in China is required for WISE to send the messages to the members under the enterprise WeChat account.

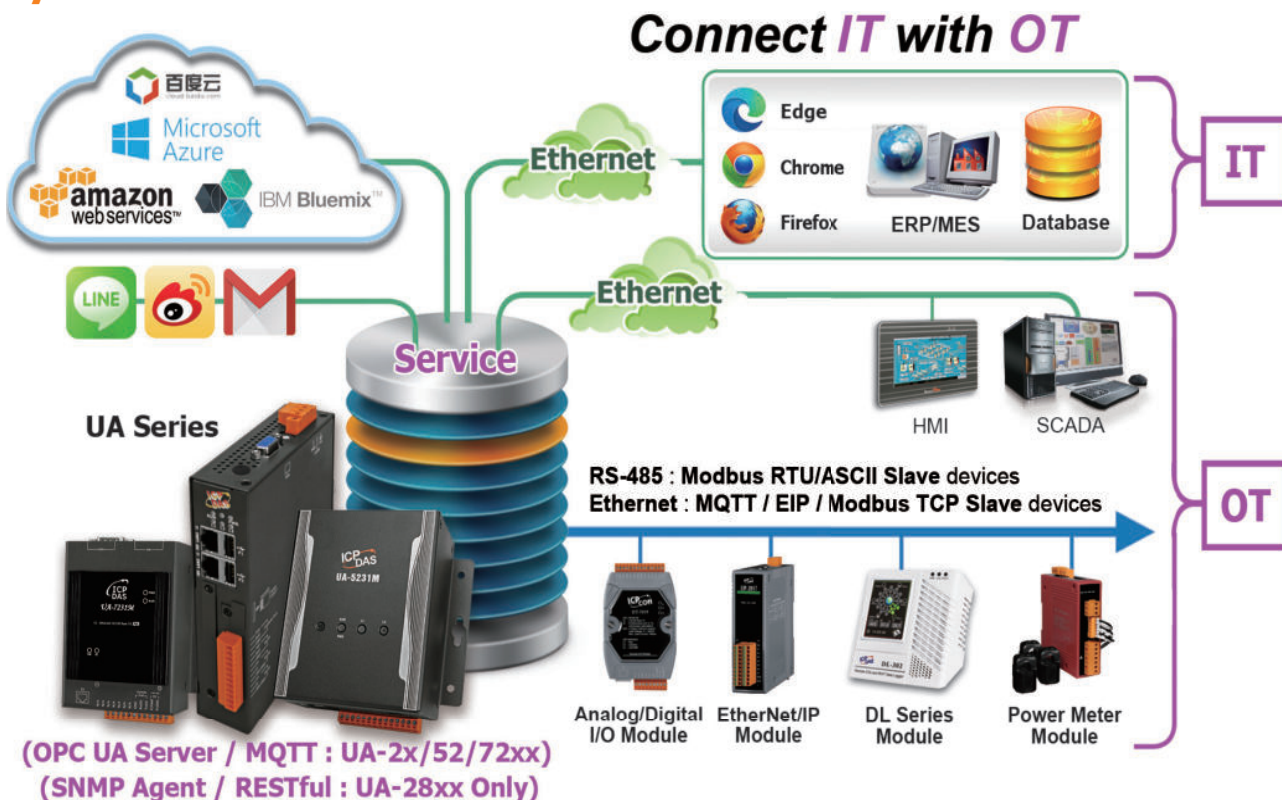
Accessories

ANT-Base-01 5 dBi 4G External Antenna Base (1.5 Meter) 	3S001-2 RG58A/U (1 Meter; SMA male to SMA Female) 
EC25-E 4G IoT LTE Category 4 Module ; Frequency Band for EMEA, Korea, Thailand, India and Taiwan 	EC20-CE 4G IoT LTE Category 4 Module; Frequency Band for China 

2-2 IIoT Communication Server: UA Series

UA-2000/UA-5000/UA-7000

System Architecture:

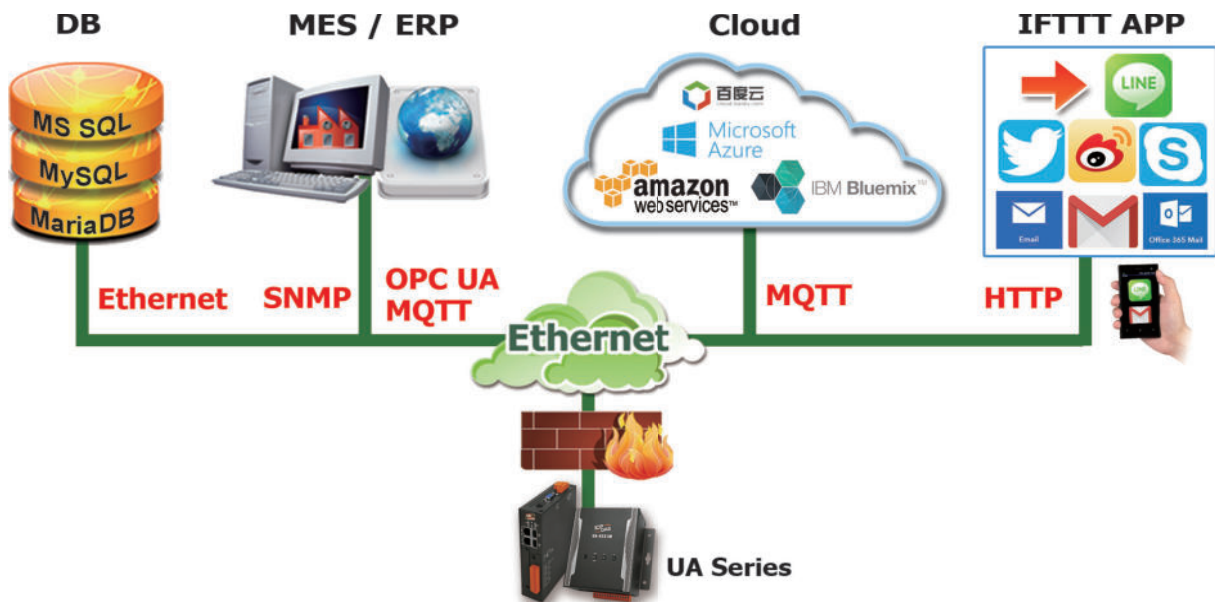


UA Series IIoT Communication Server: Connect IT with OT, Integrate Cloud and Web APPs

The IIoT Cloud Solution of ICP DAS provides UA series of IIoT Communication Server to upgrade the front-end devices to the Cloud, connect IT with OT, link Cloud and Web APPs, and integrate the IIoT Cloud solution.

- Built-in **OPC UA**, the industrial communication standard
- Built-in **MQTT**, the active IoT transmission technology
- Provide **RESTful API** service interface
- Support to execute OPC UA, MQTT and RESTful API communication at the same time
- Support **Modbus RTU/TCP/ASCII, MQTT, EtherNet/IP** device communication protocol
- Provide **SNMP Agent** function: **SNMP** protocol.
- Support **Data Logger / Trmote Database** (CSV log file) / (MS SQL, MySQL, MariaDB)
- Support **IoT Cloud Platforms**: Amazon AWS, MS Azure, Baidu...
- Support **IFTTT for Cloud logic control**: event notifications to LINE, Twitter, Mail, etc.
- Provide **Wizard** function wizard
- Provide **Internal Module** that can create virtual variables as an intermediary for reading, writing, or data exchange:

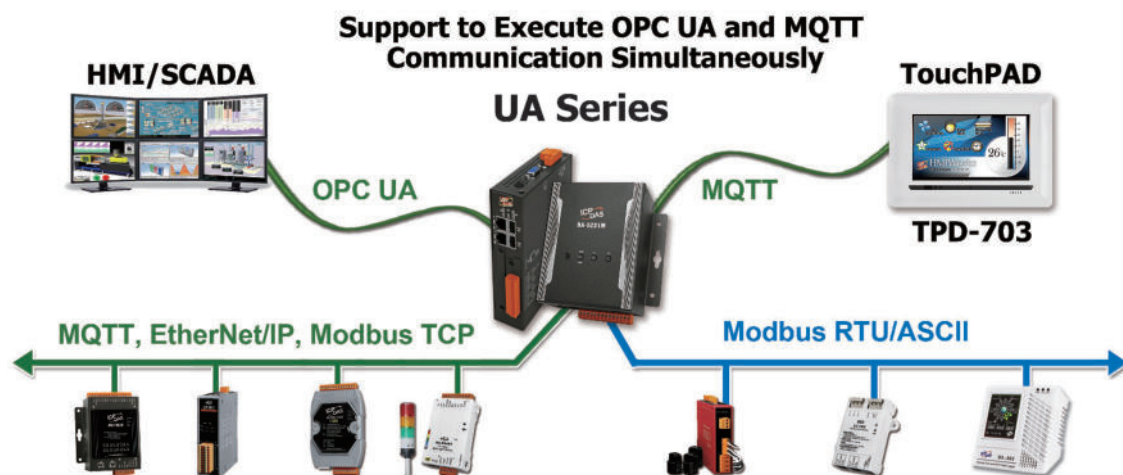
IT Integration Technology:



Technology:

- **OPC UA** : The **Industrial Communication Standard**
- **MQTT** : The **IoT Active Transmission Technology**
- **Data Logger** : I/O data save directly to **Local LOG file** or **Remote Database**
- **IFTTT** : The **Cloud Logic Control (IF This Then That)**
- **Cloud** : The **IIoT Cloud Platform Connection Technology**
- **SNMP Agent** : **SNMP** Simple **Network Management Protocol** Real-time monitoring device data

OT Integration Technology:



Technology:

- **OPC UA** : The **Industrial Communication Standard**
- **MQTT** : The **IoT Active Transmission Technology**
- **Modbus** : A **protocol** widely used within **Industrial Automation Systems**
- **EtherNet/IP** : **Industrial Ethernet protocol**, based on **TCP/IP** protocol and compatible with **factory and enterprise networks**

Selection Guide:



■ Hardware

Model	UA-2841M	UA-2641M	UA-2241M UA-2241MX-4GE UA-2241MX-4GC	UA-5231/UA-5231M UA-5231M-3GWA UA-5231M-4GE/4GC	UA-7231M
System / Module					
OS	Linux Kernel 4.1.15		Linux Kernel 3.2.14		
CPU	Quad Core ARM, 1.6 GHz	Quad Core ARM, 1.0 GHz	ARM, 1.0 GHz		
SDRAM	DDR3 1 GB		DDR3 512 MB		
Flash	8 GB		512 MB	8 GB	
Expansion Memory	4 GB microSD Card, Max. 32 GB microSDHC or 2 TB microSDXC Card		4 GB microSD Card, Max. 32 GB microSDHC		
Communication Ports / Expansion					
Ethernet	2		1	1 PoE	
USB	2 x 2.0 host		1 x 2.0 host		-
Serial Port	4 (2 x RS-232, and 2 x RS-485 isolated 2500 VDC)				1 (isolated RS-232/485)
Port Expansion	One optional XV-board		-	-	
Mechanical / Environmental / Power					
Temperature	Operating: -25 ~ +75°C / Storage: -40 ~ +80°C				
Humidity	10 ~ 90% RH				5 ~ 90% RH
	Non-condensing				
Input Range	+12 ~ +48 VDC				
Consumption	10 W	Ethernet: 4.8 W -4GE/4GC/3GWA: 6.5 W		3.5 W	
Dimensions	35 x 167 x 119 (mm)			117 x 126 x 58	97x 120 x 42

[Advantages of each series]

- UA-2841M/2641M : High specifications, fast speed, and multiple support functions.
- UA-7231M : Compact size, high cost performance, and provides PoE power supply, it is more suitable for installation in a small environment or where it is difficult to configure a power supply.

■ Wireless Communication

Model	UA-2241MX-4GE UA-2241MX-4GC	UA-5231M-3GWA UA-5231M-4GE UA-5231M-4GC
Wireless Communication (Only For UA-2x41MX-4GE/4GC, UA-5231M-4GE/4GC/3GWA)		
4G System	-4GE	FDD LTE: B1/B3/B5/B7/B8/B20 bands (Asia Only, Except China)
	-4GC	FDD LTE: B1/B3/B8 bands (For China only) TDD LTE: B38/B39/B40/B41 bands (For China only)
3G System	-3GWA	WCDMA: 850/900/1900/2100 MHz
	-4GE	WCDMA: 850/900/2100 MHz
	-4GC	WCDMA: 900/2100 MHz, TD-SCDMA 1900/2100 MHz, CDMA2000 (BC0) 800 MHz

■ Software

Series	UA-2841M Series	UA-2641M Series	UA-2241M Series	UA-5231 Series	UA-7231 Series
Protocol (Note1, Note2)					
OPC UA Server	Max. Numbers of Client Sessions and Max. Tags				
	Max. 50 Sessions Max. 8000 Tags	Max. 40 Sessions Max. 8000 Tags		Max. 20 Sessions Max. 8000 Tags	
MQTT Broker	Connections of non-SSL & SSL / WebSocket				
	Max. 2100	Max. 1800		Max. 400	
MQTT Client	Connections of non-SSL & SSL				
	Max. 500	Max. 400		Max. 200	
Modbus RTU/ ASCII Master	32 * 3 Ports = 96 Devices				32 * 1 Ports = 32 Devices
Modbus TCP Master	Max. 250 Devices	Max. 200 Devices		Max. 100 Devices	
EtherNet/IP	Max. 125 Devices	Max. 100 Devices		Max. 50 Devices	
SNMP v3 Agent	Max. 10 Read / 10 Write			-	
RESTful	Max. 20 Read / 1 Write			-	
Firewall					
Dynamic Blocklist	Set conditions to monitor the connection status of the service port. When the external IP connections exceed the condition setting value, the dynamic blocklist will automatically block the subsequent connection of the IP to avoid a large number of abnormal connections from blocking network services and protect system stability.				
Data Storage (Note2)					
MS SQL / My SQL Data log	1 Databases per Time, Max. 1000 Tags	Max. 2 Databases per Time, Max. 1000 Tags		Max. 3 Databases per Time, Max. 1000 Tags	
Local Data log	Stored in the local MicroSD card or SSD (CSV format)	Stored in the local MicroSD card (CSV format)			
Function (Note2)					
Internal	Can create virtual variables as an intermediary for reading, writing, or data exchange for OPC UA Client to Client.				
PID	Combine the remote I/O devices for the PID logic control system.				
IoT Cloud Platforms and Function (Note2)					
MQTT JSON Function	Microsoft Azure Amazon Web Services IBM Bluemix				
MQTT Custom Function	ThingSpeak				
IFTTT Condition Trigger Function	IFTTT Logic Trigger APP (Line, Twitter, Gmail ...)				

Note 1: The specifications are the maximum number of connections or usage when using a single Protocol.

Note 2: When using multiple protocols or functions, the user must adjust the actual usage to control the CPU Usage below 80%. Please refer to the CPU data on the UA web interface.

Features:

Built-in OPC UA Server

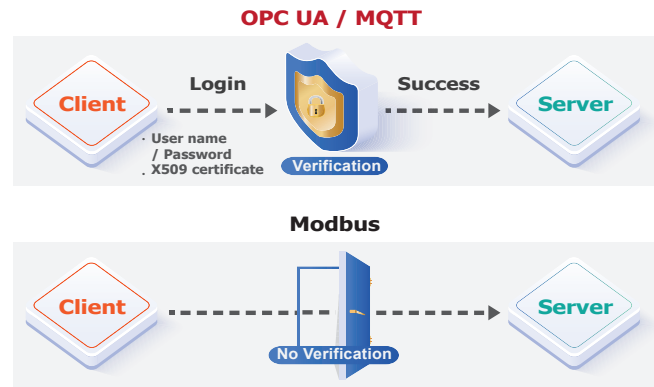
Compliance with IEC 62541 Standard. Provides functions of Active Transmission, Transmission Security Encryption(SSL/TLS), User Authentication (X.509 Certificates/Account password), Communication Error Detection and Recovery, etc. to connect SCADA or OPC UA Clients.

Support MQTT Broker/Client

Build-in MQTT Broker (Compliance with MQTT V.3.1.1 protocol) and provide MQTT Client Service. Provides functions of IoT Active M2M Transmission, QoS Quality Service, Retains Mechanism, Identity Authentication, Encryption, Last Will, etc.

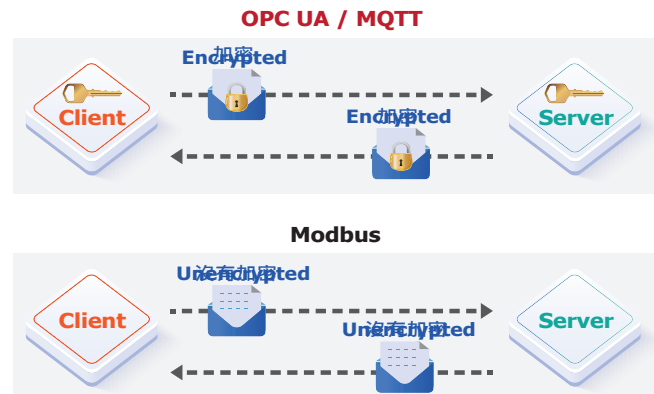
Support Identity Authentication

Identity Authentication			
ICP DAS UA Solution	OPC UA	ID/Password, Anonymous, Certificate	Yes ✓
	MQTT	ID/Password, Anonymous, Certificate	
Traditional	Modbus	None	



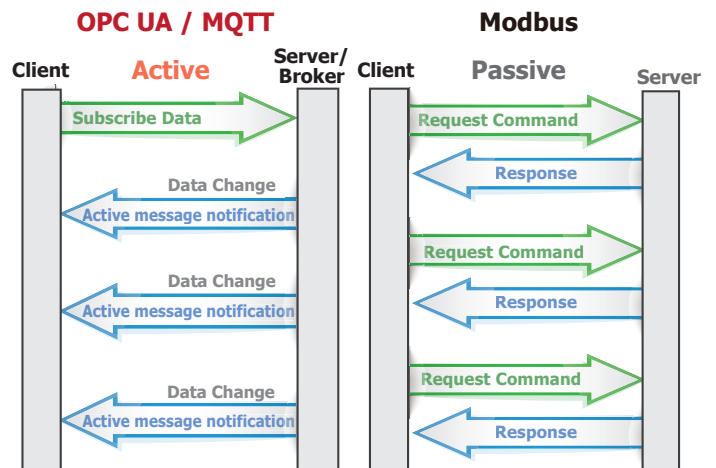
Support Data Encryption

Data Encryption			
ICP DAS UA Solution	OPC UA	SSL/TLS Encryption	Yes ✓
	MQTT	SSL/TLS Encryption	
Traditional	Modbus	None	



Active Data Transmission

Data Transmission			
ICP DAS UA Solution	OPC UA	Active (Server sends Data to the Client)	Active ✓
	MQTT	Active (Client publishes Data to Broker, and the Broker sends Data to other Clients)	
Traditional	Modbus	Passive Request/Response (Wait for Master to poll the Data)	



■ Sensor Data Upload with Information Security

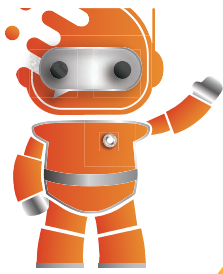
In the era of cloud IoT, data transfer between sensors and cloud or graphical control platforms is a prerequisite for the operation of the IoT system, And enabling "sensor data upload" to be protected by security mechanisms is the priority of IoT systems. The HTTPS of the UA series protects web data from leakage while the "MQTT with SSL/TLS" and OPC UA Server features that the sensor's real-time data upload is transmitted through encryption to prevent theft and use by anyone. In addition, the UA-2841M supports SNMP (V3) agent (Enhanced security for SNMP protocol) information security protocol.

Through the Firewall protection and Protocol data encryption mechanism provided by UA, it can meet the user's needs when building the IoT system.

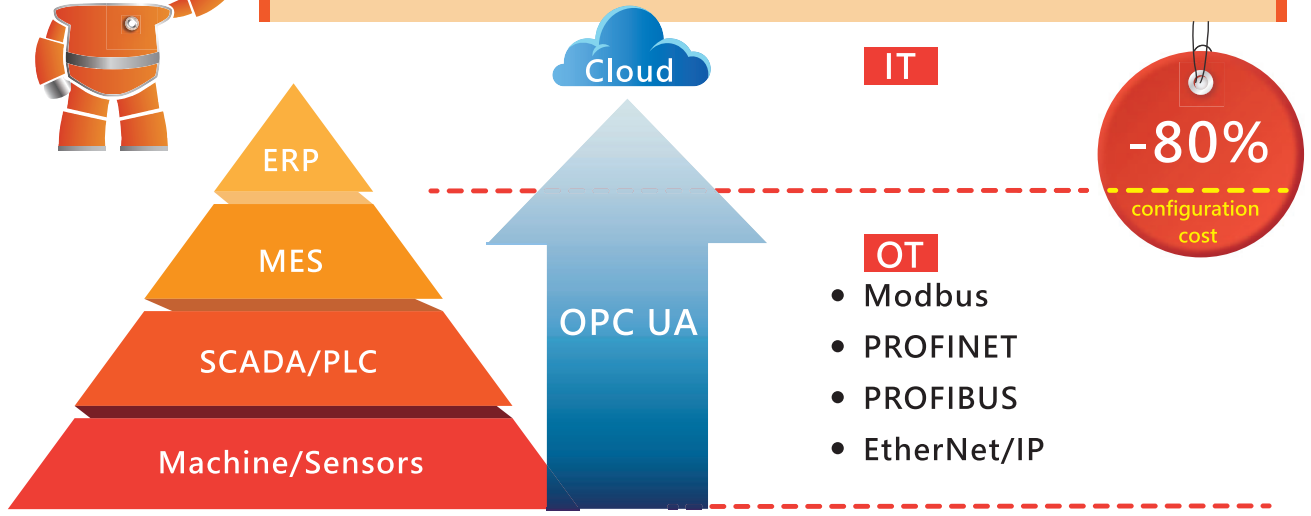
Security	UA-2841	UA-2241	UA-5231	UA-7231
Firewall				
Dynamic Blacklist	Set conditions to put abnormal IPs into the dynamic blacklist			
Protocol				
HTTPS	Enable https and provide X.509 certificate and key upload for verification use			
OPC UA Server	Authentication: Username/Password, X.509 Certificate Security Policy: > Basic128Rsa15 (Sign / Sign & Encrypt) > Basic256 (Sign / Sign & Encrypt)			
MQTT Client	Provides SSL and TLS version 1.2 encryption verification can be checked through Microsoft Azure, Amazon Web Services,etc.			
MQTT Broker	Provides SSL and TLS (ver. 1.2) encryption and security authentication			
SNMP(V3) Agent	TLS authentication	None	None	None



Easy Project Building



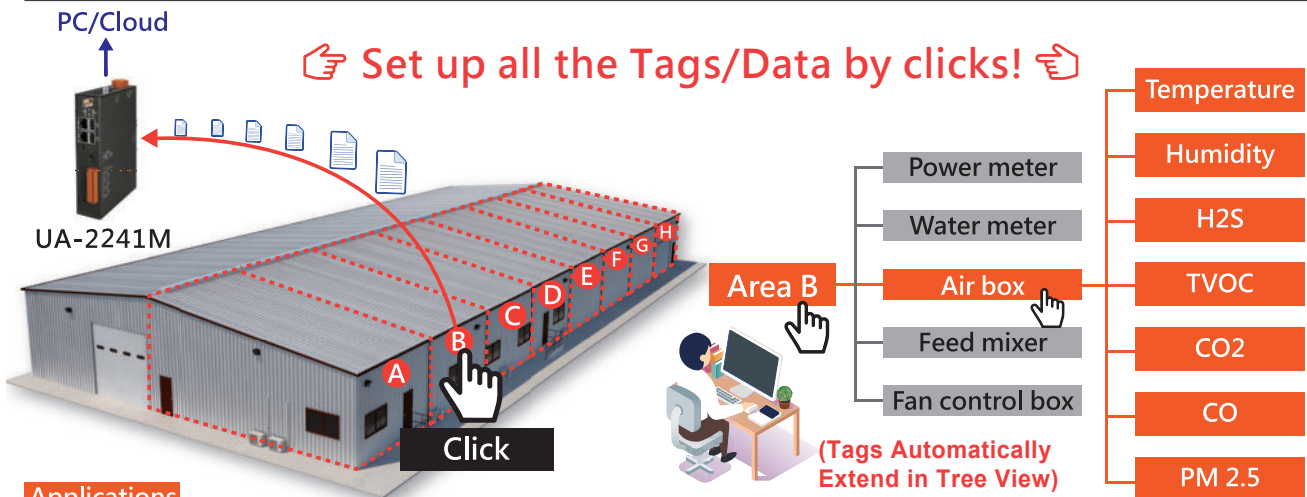
development engineers **save 80% configuration cost** which is far in advance of competitors.



OPC UA (Easy)	Modbus (Hard)
STEP1 : Get the OPC UA Server URL Address	STEP1: Query the device IP table and get the linked device IP
STEP2 : Connect to the Server via the Client	STEP2: Set Modbus Master SW and make an IP connection
STEP3 : Browse/Subscribe Tags/Data in Server	STEP3: Search Tag Table and get the type and address range
	STEP4: Set Modbus Master SW and get device data
	STEP5: Set SW Tags table and assign recognizable names
	STEP6: Convert the device data to the actual value for the tag

2

IIoT Controller/Server



Applications

Modern pig farms



- Temperature
- Humidity
- H2S/TVOC
- CO2/CO
- Water supply
- Food supply
- Fan control

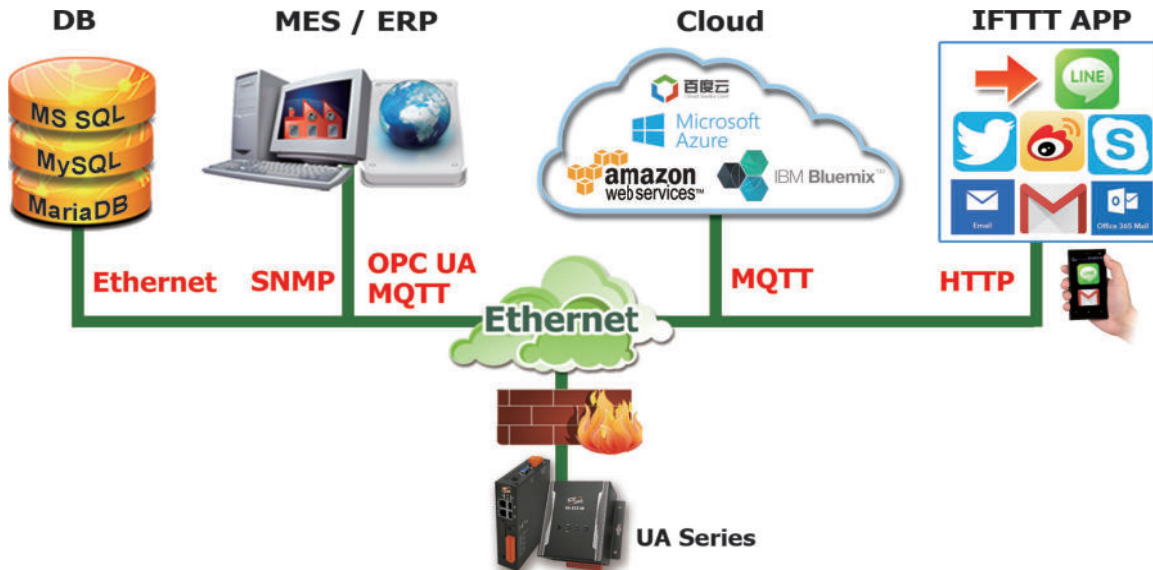
Chemical plant



- Temperature
- Humidity
- Air quality sensor
- Power management
- Access control
- Liquidity monitoring
- Related I/O

Support Logic Control IFTTT To Send Event Messages To LINE... APPS

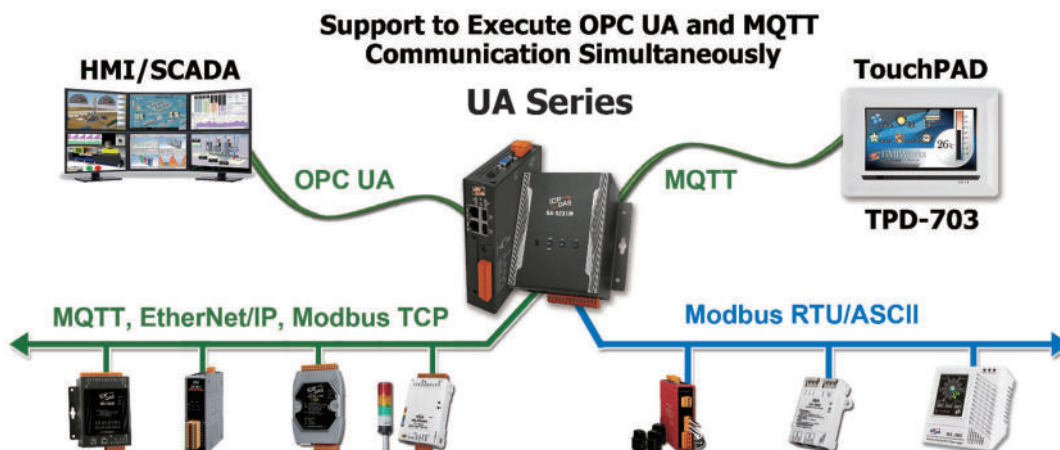
UA can combine the IFTTT cloud platform functions and send messages to more than 500 **Web APPs** (such as LINE, Twitter, Calendar, Mail, Sina Weibo... etc.) when the special events occur. The device I/O change can be set to trigger the event of the IFTTT cloud service, and then the preset "That" Web Service (**e.g. LINE**) will do the action follow the IFTTT (If This, Then That) logic control, for example, the LINE will send a message to the specific user or group to handle the event immediately.



Support Ethernet and Serial Communication Modules

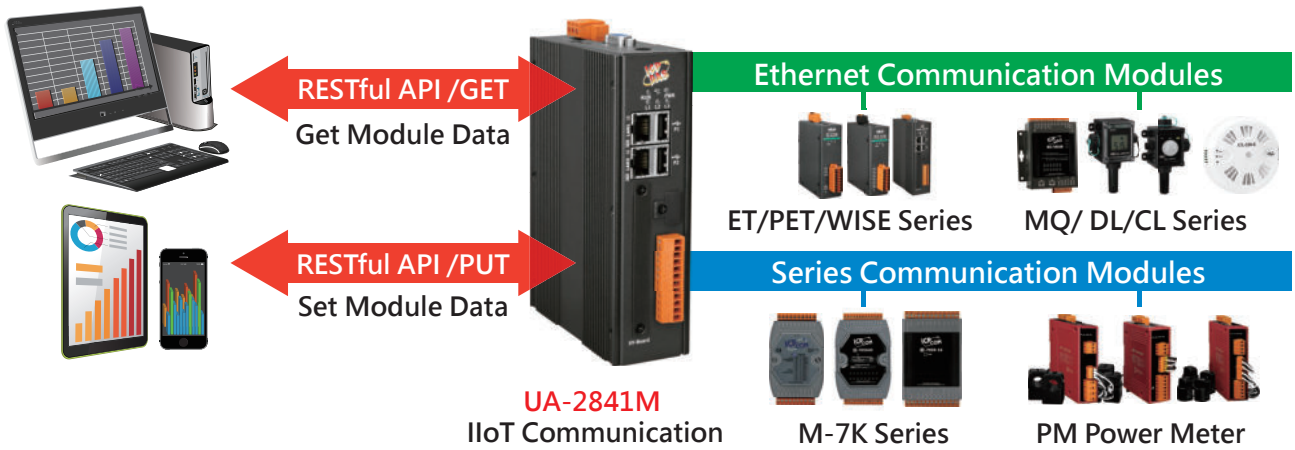
- **Ethernet** : UA supports **MQTT, Modbus TCP, and ICP DAS EtherNet/IP** modules
- **Serial** : UA supports **Modbus RTU/ASCII** modules (Max. 3 Serial ports)
- **UA Web UI**: users can quickly set up the modules and display the **real-time I/O status**.
- **Max. modules** supported by each connection:

Communication UA Series	Ethernet			Serial
	MQTT	Modbus TCP	EtherNet/IP	Modbus RTU/ASCII
UA-2800	500	250	125	32 x 3(ports)
UA-2200/5200	200	100	50	32 x 3(ports)
UA-7200	200	100	50	32 x 1(port)



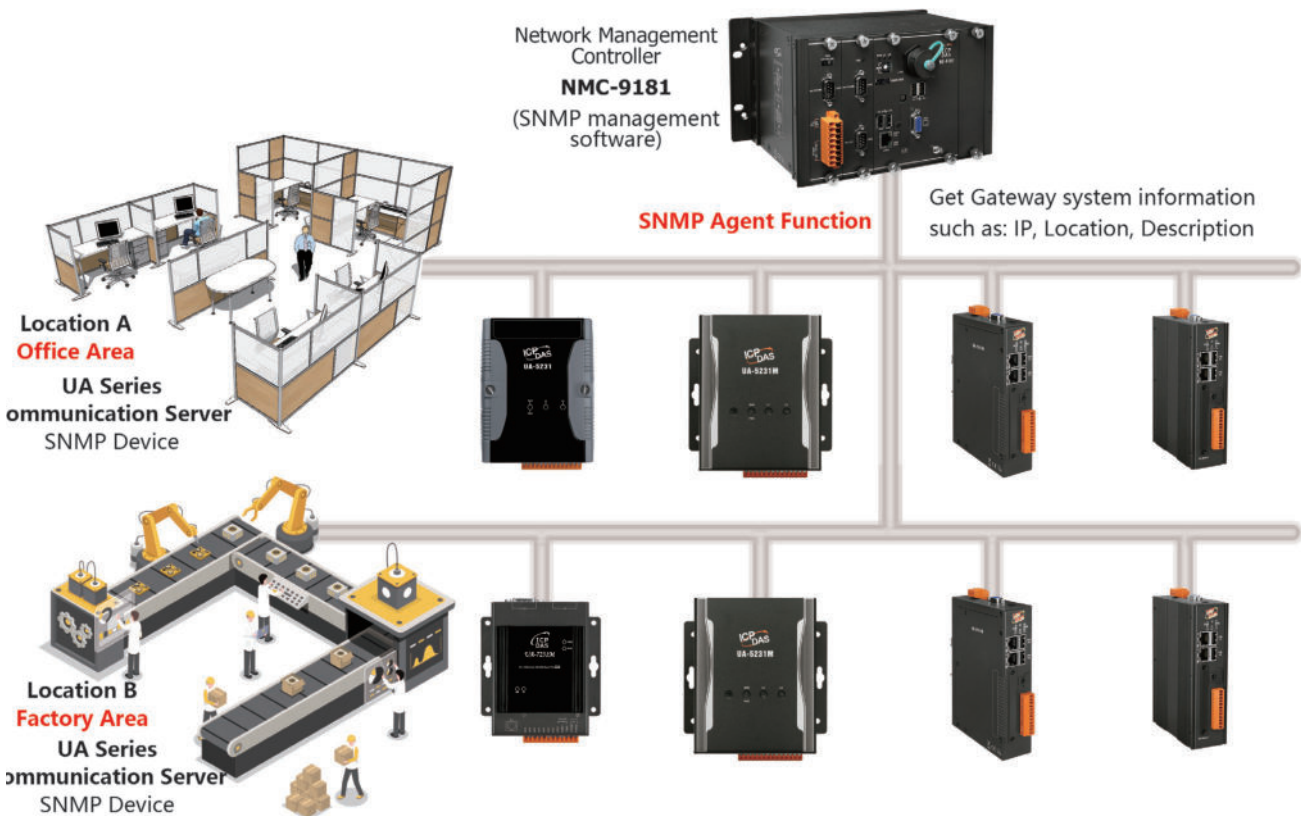
Provide RESTful API service interface (For UA-2600/2800)

Provide the device data in JSON format, letting the user access it from the outside through the HTTP protocol. And UA support to execute OPC UA, MQTT and RESTful API communication at the same time.



Provide SNMP Agent function

UA-2841M series products allow IT practitioners to manage various workplaces through ICP DAS NMC-9181 or third-party SNMP software.

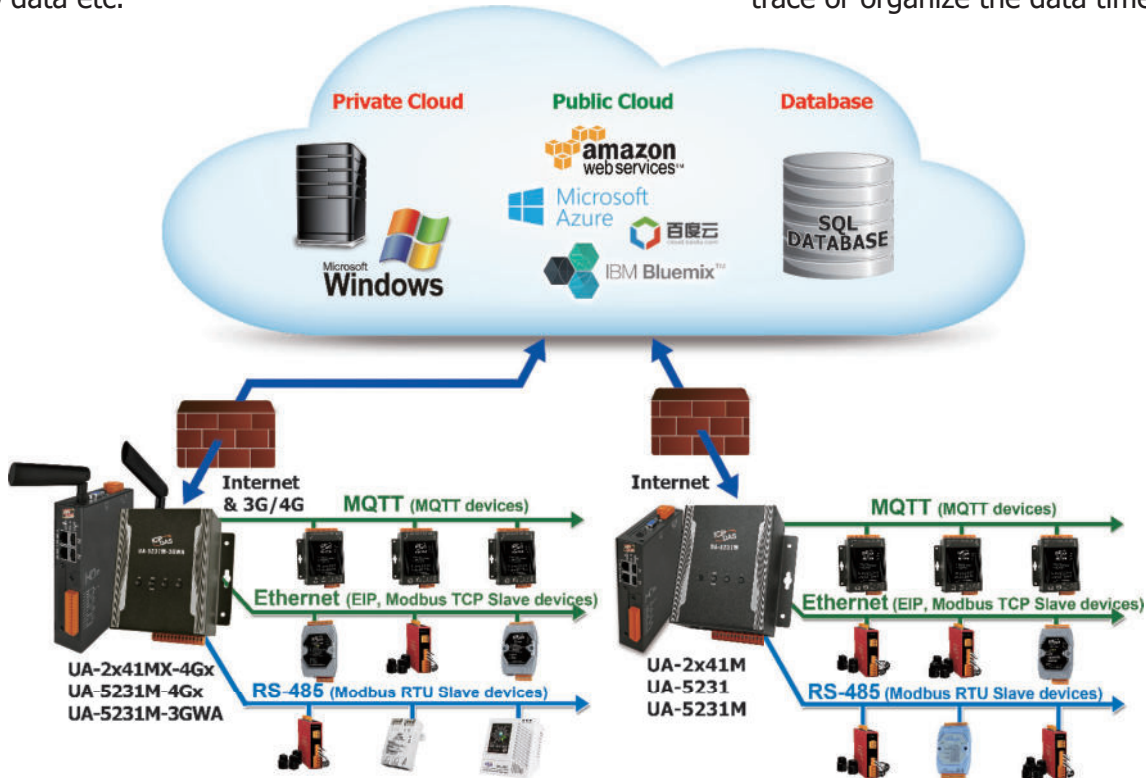


Support Cloud Platforms Connection

UA can actively connect to Amazon AWS, Microsoft Azure, IBM Bluemix, or Baidu Cloud... IoT platforms to send over the I/O data etc.

Provide Timestamp Function

All UA communications, such as MQTT Client, OPC UA, and database connection, include timestamp data or fields for convenience to trace or organize the data time series.



Save I/O Data Directly into Remote Database & Local Side LOG File

UA series can collect devices I/O status and then directly save into remote side SQL Database (MS SQL, MySQL and MariaDB). UA series can also save I/O data into a CSV log file on the local side. Furthermore, users can set the time interval of which CSV file to generate and divide on the local side.



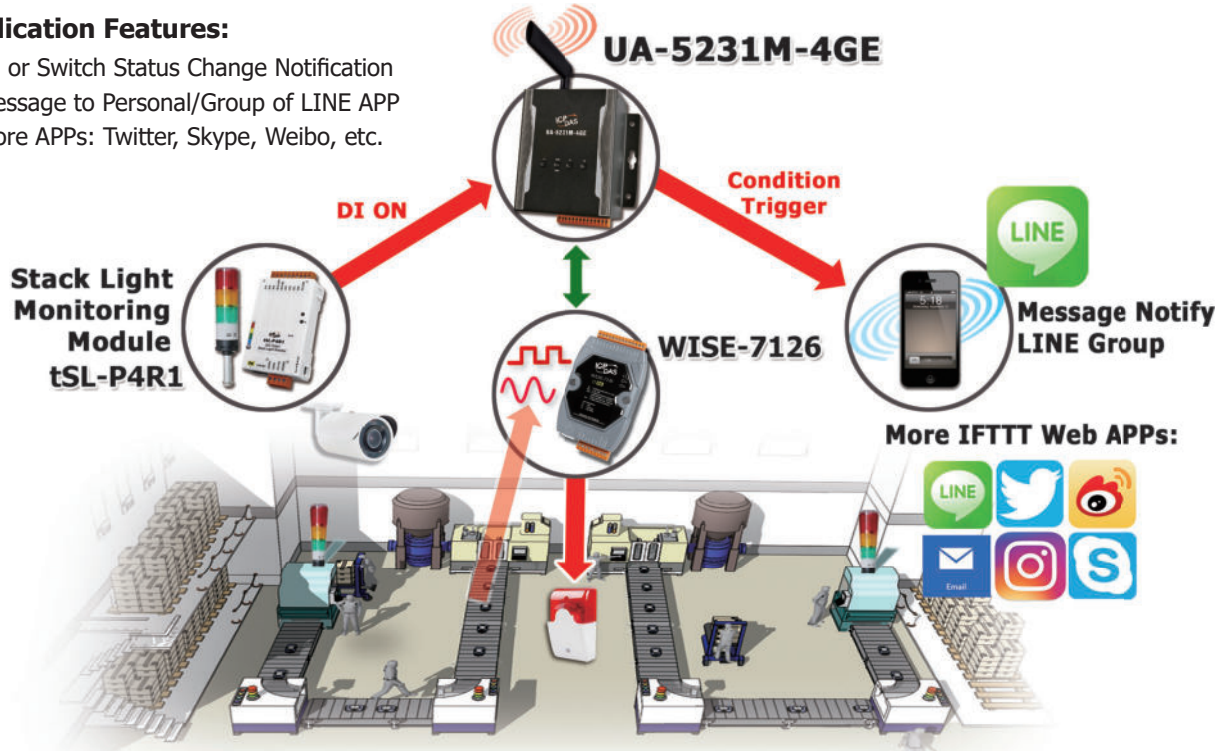
Applications:

Alert Message Notify LINE Group Application

This security application provides active and non-active signal triggers for buildings, factories, etc. Through the IFTTT platform, it can send the message notification to the user-favorite APPS and instantly master the device information.

Application Features:

- DI or Switch Status Change Notification
- Message to Personal/Group of LINE APP
- More APPs: Twitter, Skype, Weibo, etc.



CO2 Concentration Monitoring & Notification Application

This application for indoor air quality management combines with LED displays, fresh air equipment, etc. When the CO2 concentration exceeds the limit, the system will display information on the LED display, force to ventilation, and sends notifications via IFTTT platform to pre-assigned web software, such as Gmail, e-mail, Office 365 Mail, etc.

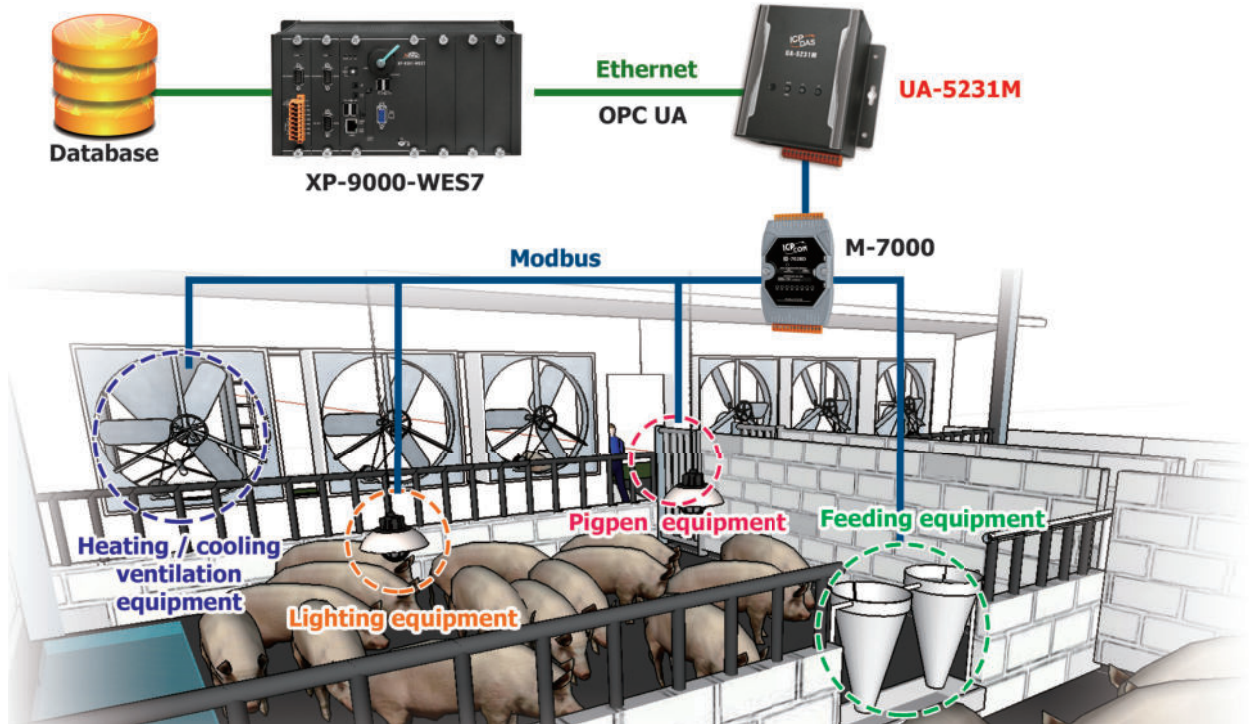
Application Features:

- Dead Band Boundary Trigger
 - High: Danger Alert
 - Low: Safety Notification
- PC/Mobile Mail Notification
 - Gmail
 - e-mail
 - Office 365 Mail
 - Dropbox



Farm Automation Solution

The farm automation solution controls the on-site cooling/heating/ventilation environmental equipment, lighting equipment, feeding equipment, and pigpen equipment through UA-5231M and the connected M-7000 modules. The upper controller XP-9000 manages daily feeding and drinking equipment of every pigpen and integrates the data of the water supply, feed volume and diet to the database, and then analyzes the data and adjusts the application to plan the best breeding solution.

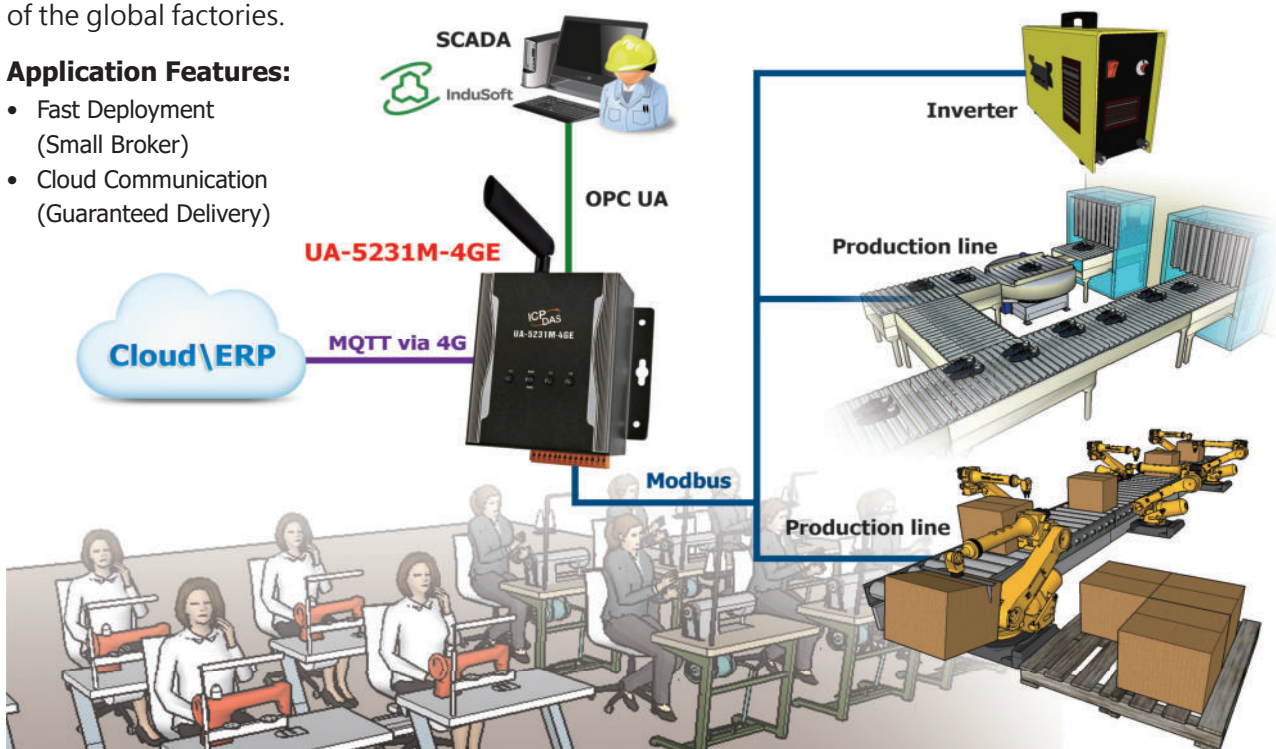


Factory Automatic Solution

The factory automatic solution uses the UA controller to obtain the information such as the safety status of the production line and the temperature, voltage and current status of the inverter, then transmits them to the SCADA control system for real-time factory management. Besides, the 4G wireless can help to integrate the machine status, temperature, product yield, production parameters, electricity consumption, etc. into the ERP system via the MQTT protocol for managing the production of the global factories.

Application Features:

- Fast Deployment (Small Broker)
- Cloud Communication (Guaranteed Delivery)

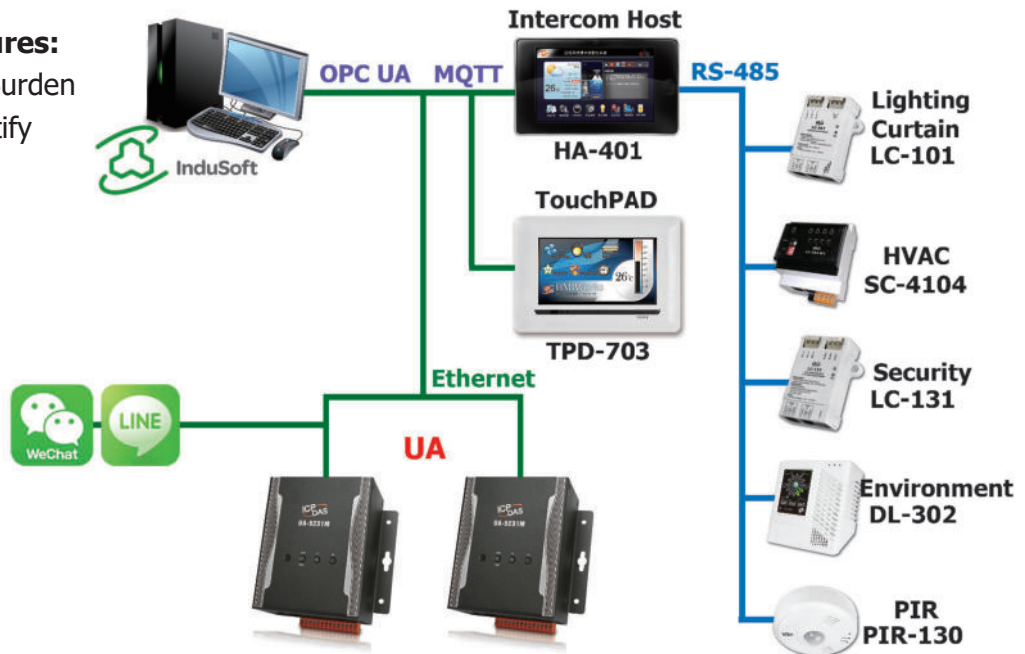


■ BA Smart Building IoT Application

This IoT application mainly combines the video intercom indoor host HA-401 with the lighting control, air conditioning, security, temperature, humidity, PM2.5, CH4, HCHO, and other harmful substance sense devices to create a safe and comfortable environment. When there is a special situation happens, UA can quickly trigger the event, send a notify to the Web App (ex: LINE, Weibo, Twitter, etc.). The dual UA architecture can reduce the system burden.

Application Features:

- Reduce System Burden
- APP Message Notify

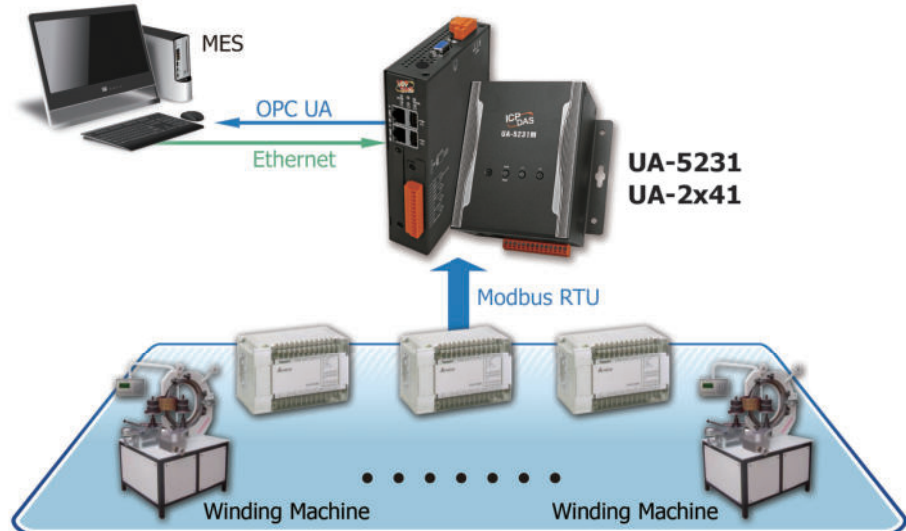


■ IIoT Factory Application of MES

The Manufacturing Execution System (MES) communicates the factory equipment via OPC UA Client, and the OPC UA Service of the UA-5200 series can seamlessly integrate the system and equipment. The MES is the main solution for today's factory system, and the UA-5200 series IIoT Communication Server is the best choice for the IIoT factory solution.

Application Features:

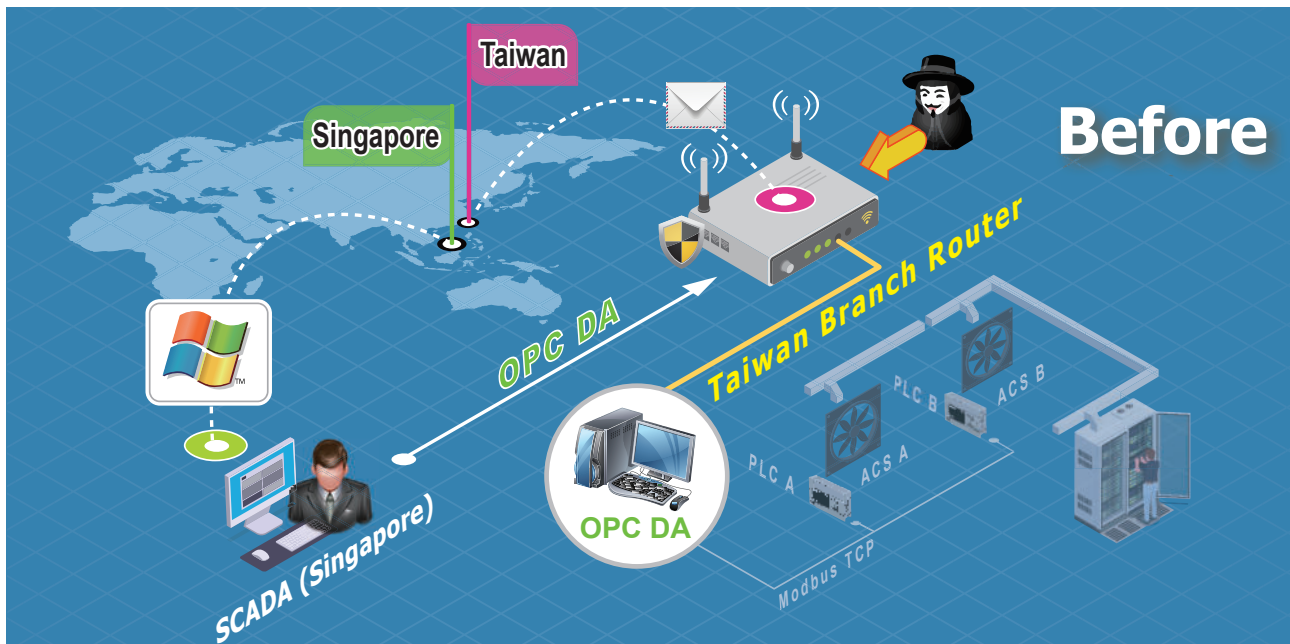
- Convenient for System Integration
- Unified Access Interface



UA-5231 Cross-country Server Room Monitoring Applications

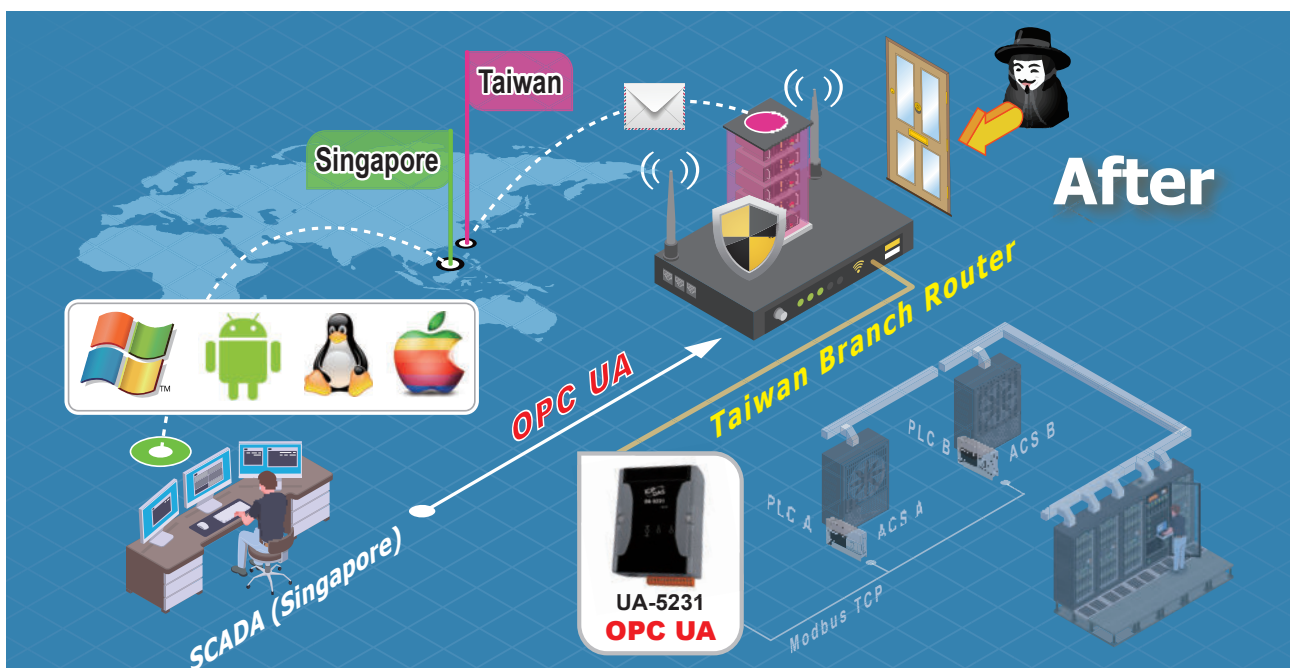
This case is a solution for a multinational technology company. There was a computer with an OPC Server in the server room of the Taipei branch. The Singapore head office uses the Modbus protocol to monitor the air conditioner of PLC with the graphic control system remotely.

The new solution replaces the PC with UA-5231 in the server room of the Taipei branch. This change gets many UA-5231 advantages (see the below list). The owner's graphical control system supports classic OPC DA and new OPC UA. So change to OPC UA is an upgraded method with minimal changes.



UA-5231 Advantages: use OPC UA to replace OPC Classic DA

1. Smaller size, less heat dissipation, and long-term operation than a PC
2. Cross-platform, highly flexible multiple data types
3. SSL/TLS encryption communication security capabilities



UA I/O Module: U-7000 Series

U-7500 Series



Features:

- Support OPC UA Server and MQTT Client Protocol
- Support RESTful API via HTTP and HTTPS
- Support to Execute OPC UA, MQTT and RESTful API Simultaneously
- Support Scaling For Analog Signal Converting
- Support Logic Function Rule Setting: IF, THEN, ELSE
- Support Schedule: to Execute the Set Rules at a Specific Time.
- Support Event Log: Record the I/O Change for Device Tracking
- Built-in Web Server to Provide the Web User Interface
- Built-in I/O Channels (DI, DO, AI, AO)
- Dual-port Ethernet Switch for Daisy-Chain Topology
- IEEE 802.3af-compliant Power over Ethernet (PoE)

Intruduction

UA I/O Module, also called UA I/O or U-7500 Series, is a series of Ethernet I/O modules with built-in OPC UA Server and MQTT Client. It has a built-in dual-port Ethernet switch to implement daisy-chain topology. The cabling is much easy and can reduce the total cable and switch cost. It follows IEEE 802.3af (Class 2) compliant Power over Ethernet (PoE) specification. It allows receiving power from PoE enabled network by Ethernet pairs. This feature provides greater flexibility and efficiency to simplify system design, save space, and reduce wirings and power sockets.

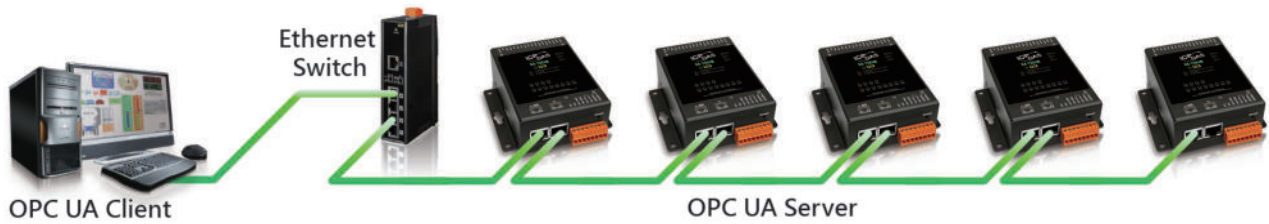
In industrial communication, UA I/O provides OPC UA Server, MQTT Client and RESTful API protocols (can execute all communications at the same time.). Users can choose the networking mode according to their cases. And to transmit the values of the built-in I/O channels to the Cloud IT system or field control system for reading and writing. Support Scaling. Let the analog signal be converted into a more readable value. Support logic function Rule Setting IF, THEN, ELSE, can set up logical condition/action for I/O and virtual point; Provide schedule function to execute the set rules at a specific time; support RESTful API function, can read/write I/O and virtual point through HTTP or HTTPS.

We provide the following functions to enhance the I/O networking security respectively:

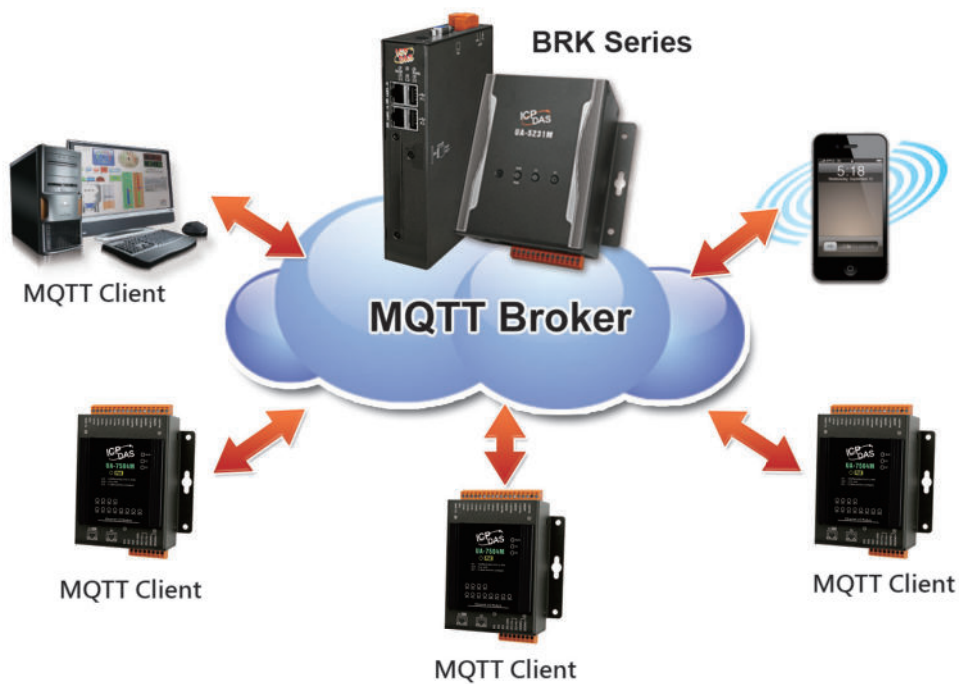
Connectivity for various platforms	OPC UA, MQTT, RESTful API can be used simultaneously
Connect to Cloud	OPC UA, MQTT
Connect to SCADA	OPC UA, MQTT
Connect to MES	OPC UA
Connect to IT	MQTT, RESTful API (HTTP, HTTPS)

Security	I/O Networking Security Functions
Information Security	HTTPS, Port Binding, Allowlist, ICMP drop
Data Security	Certificate (X.509), Communication Encryption (SSL/TLS)

OPC UA Architecture:



MQTT Architecture:



Comparison: ICP DAS UA I/O Module v.s. Traditional I/O Module

Item	ICP DAS UA I/O Module		Traditional I/O Module
	OPC UA Server	MQTT Client	Modbus TCP Slave
Identity Authentication	Account ID/Password, Anonymous, Certificate Verification	Account ID/Password, Anonymous, Certificate Verification	None
Encryption	SSL/TLS, Anonymous	SSL/TLS, Anonymous	None
Data Transmission	Active (Actively sends Data to the Client)	Active (Actively publishes Data to Broker, and the Broker sends Data to other Clients)	Passive (Wait for Master to poll the Data: Query/Response)
Project Building	Via browse the Server Content	Via subscribe Topic from Broker	Manually assign an ID and define the Data address and type.

Features:

Protocol	
OPC UA Server	<ul style="list-style-type: none"> ● OPC Unified Architecture: 1.02 ● Core Server Facet ● Data Access Server Facet ● Method Server Facet ● UA-TCP UA-SC UA Binary ● User Authentication: <ul style="list-style-type: none"> - Anonymous - Username/Password - X.509 Certificate ● Security Policy: <ul style="list-style-type: none"> - None - Basic128Rsa15 (Sign, Sign & Encrypt) - Basic256 (Sign, Sign & Encrypt) ● Max. Session Connections: 3 ● Can Execute with MQTT and RESTful API Communication Simultaneously
MQTT Client	<ul style="list-style-type: none"> ● Connect to the MQTT Broker to read or control the I/O channel value by the publish/subscribe messaging mechanism. (MQTT Ver. 3.1.1; TLS Ver. 1.2)
RESTful API	<ul style="list-style-type: none"> ● User can read/write the I/O & Virtual points through HTTP and HTTPS.

Function	
Web Interface for Configuration	<ul style="list-style-type: none"> ● The system operation can be performed through the browser without installing software tools. ● Use AES 256 encryption algorithm to encrypt web page setting data for general communication. ● HTTPS upgrades the security of web communication.
Scaling	<ul style="list-style-type: none"> ● Convert the analog signal to a more readable value. ● Function is only available for modules with AI/O.
Security	<ul style="list-style-type: none"> ● Information Security: Provide HTTPS, Port Binding, Allowlist, ICMP drop functions. ● Data security: Provide Certificate (X.509), Communication Encryption (SSL/TLS) functions.
Rule Setting	<ul style="list-style-type: none"> ● Provide simple logic condition rule setting, let UAI/O do automatic condition judgment and action control, to achieve simple intelligentization.
Schedule	<ul style="list-style-type: none"> ● Provide schedule function to execute the set rules at a specific time.
Event Log	<ul style="list-style-type: none"> ● When the I/O value changes, record the current I/O value for easy device tracking in the future.
IoTstar Setting	<ul style="list-style-type: none"> ● Support IoTstar cloud management software developed by ICP DAS.

Selection Guide:

Module Name	AI		AO		DI		DO	
	Ch.	Type	Ch.	Type	Ch.	Type	Ch.	Type
U-7502M	3	±150 mV, ±500 mV, ±1 V, ±5 V, ±10 V, +0 mA ~ +20 mA, ±20 mA, 4 ~ 20 mA	-	-	6	Wet (Sink/Source)	3	Power Relay Form A (SPST N.O.)
U-7504M	4	±500mV, ±1V, ±5V, ±10V, 0~20mA, ±20mA, 4~20mA	4	0~5V, ±5V, 0~10V, ±10V, 0~20mA, 4~20mA	4	Dry (Source), Wet (Sink)	-	-
U-7515M	7	Pt100, Pt1000, Ni120, Cu100, Cu1000	-	-	-	-	-	-
U-7517M	8	±150 mV, ±500 mV, ±1 V, ±5 V, ±10 V, ±20 mA, 0 ~ 20 mA, 4 ~ 20 mA	-	-	-	-	4	Open Collector (Sink)
U-7517M-10	10 / 20	±150mV, ±500mV, ±1V, ±5V, ±10V, ±20mA, 0~20mA, 4~20mA	-	-	-	-	-	-
U-7518ZM/S	10	±15 mV, ±50 mV, ±100 mV, ±500 mV, ±1 V, ±2.5 V, ±20 mA, 0 ~ 20 mA, 4 ~ 20 mA Thermocouple: J, K, T, E, R, S, B, N, C, L, M, LDIN43710	-	-	-	-	3	Open Collector (Sink)
U-7518ZM/S2								
U-7519ZM/S	10	±150mV, ±500mV, ±1V, ±5V, ±10V, ±20mA, 0~20mA, 4~20mA Thermocouple: J, K, T, E, R, S, B, N, C, L, M, LDIN43710	-	-	-	-	3	Open Collector (Sink)
U-7519ZM/S2								
U-7524M	-	-	4	0~5V, ±5V, 0~10V, ±10V, 0~20mA, 4~20mA	5	Dry (Source), Wet (Sink Source)	5	Open Collector (Sink)
U-7526M	6	±500 mV, ±1V, ±5V, ±10V, 0~20mA, ±20mA, 4~20mA	2	0~5V, ±5V, 0~10V, ±10V, 0~20mA, 4~20mA	2	Dry (Source), Wet (Sink,Source)	2	Open Collector
U-7528M	-	-	8	0~5V, ±5V, 0~10V, ±10V, 0~20mA, 4~20mA	-	-	-	-
U-7542M	-	-	-	-	-	-	16	Open Collector (Sink)
U-7544M	-	-	-	-	8	Wet (Sink,Source)	8	Open Collector (Sink)
U-7545M	-	-	-	-	-	-	16	Open Collector (Source)
U-7550AM	-	-	-	-	12	Dry (Source) Wet (Sink)	6	Open Collector (Sink)
U-7551M	-	-	-	-	16	Wet (Sink,Source)	-	-
U-7552M	-	-	-	-	8	Wet (Sink,Source)	8	Open Collector (Source)
U-7553M	-	-	-	-	16	Wet (Sink,Source)	-	-
U-7555M	-	-	-	-	8	Dry (Source), Wet (Sink,Source)	8	Open Collector (Sink)
U-7558M	-	-	-	-	8	Wet (Sink/Source)	-	-
U-7559M	-	-	-	-	6	Wet (Sink/Source)	-	-
U-7560M	-	-	-	-	6	Wet (Sink/Source)	6	Power Relay Form A (SPST N.O.)
U-7561M	-	-	-	-	-	-	11	Power Relay Form A (SPST N.O.)
U-7567M	-	-	-	-	-	-	8	Power Relay Form A (SPST N.O.)

Applications:

■ UA I/O Module Motor Monitoring Applications

[Customer Needs]

1. Monitoring the motor special-output current in the factory
2. High security data transmission
3. Monitor the factory through wireless according to the client's needs

• 1. Designed to monitor the special-output current motor in the factory

The input of the electric meter is 50 / 60 Hz, and the output of the motor in the field is 50 / 6000 Hz, the precision is not enough to use an electric meter for motor monitoring, therefore, a high-frequency CT is used to monitor the motor output current.

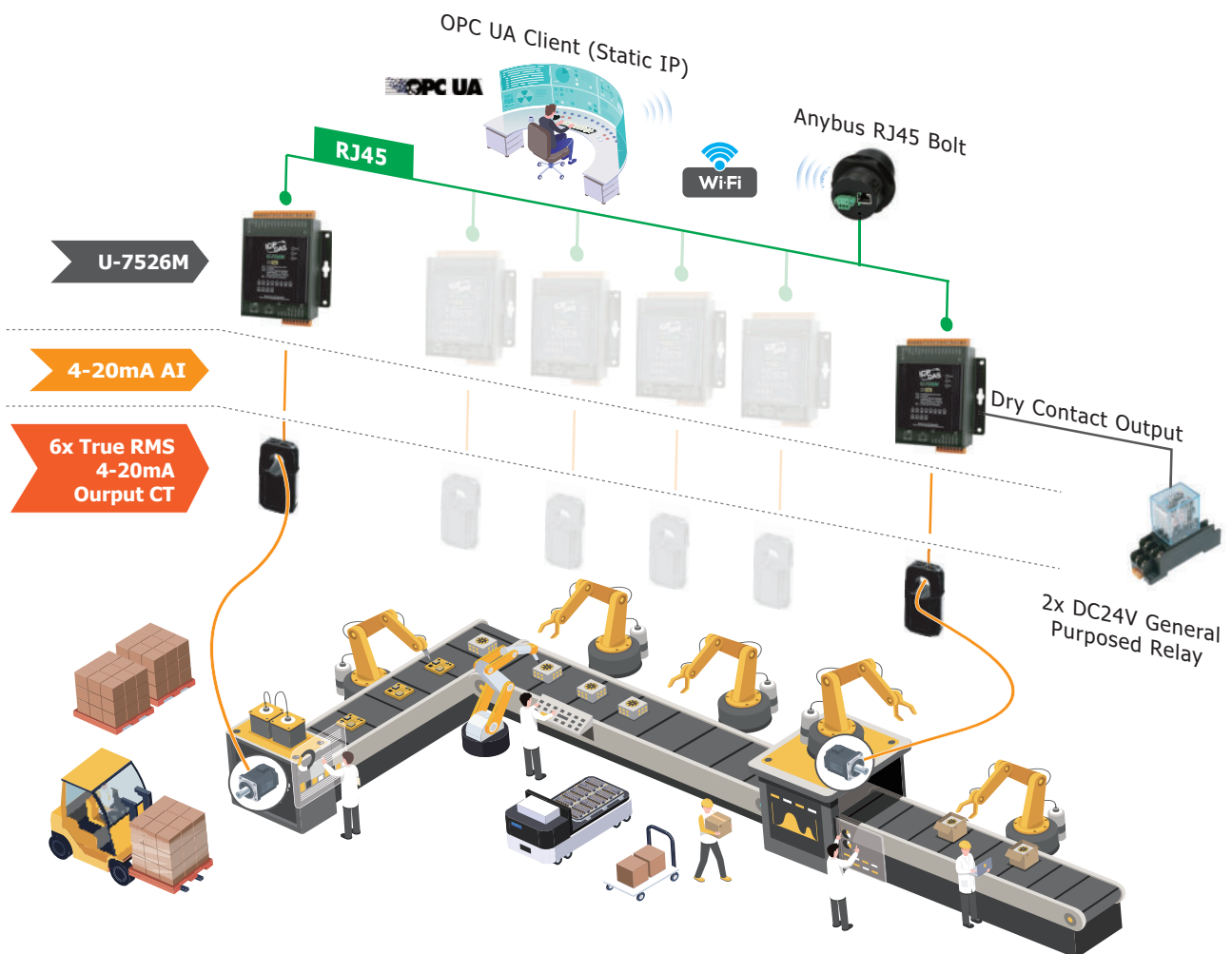
• 2. Enhanced data transmission with high security

The U-7500 series modules transfer the motor= streaming data through OPC UA and MQTT protocols with high security, so the information security of the factory can be improved.

• 3. Monitoring the client's factory via wireless

Through the RJ45 to Wi-Fi adapter, the wired signal in the factory is converted to wireless signal transmission, allowing customers to monitor the factory.

• [UA I/O Module Motor Monitoring Framework] :



■ Environmental Monitoring and Maintenance Applications

Using ICP DAS IoTstar with UA I/O solution can bring many benefits. In this case, the customer uses IoTstar cloud management software combined with UA I/O module series to set up a cloud IoT monitoring system, and the manager can get the following benefits.

** Support IoTstar cloud management software

- **1. No programming is required**

Collect environmental parameters and store them in the cloud database, the system can be set up through the web interface without writing programs.

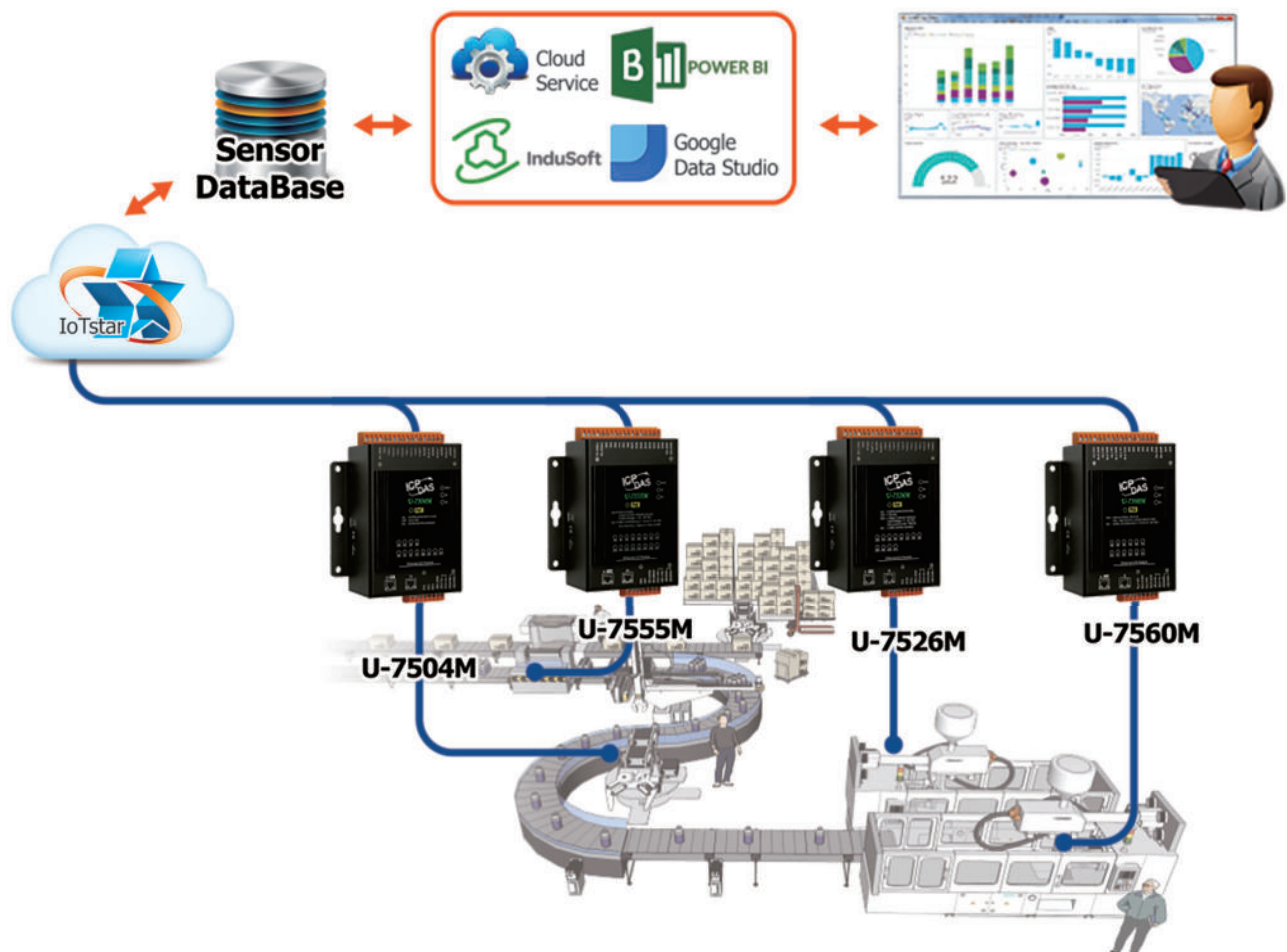
- **2. Collection and monitoring of production line information**

Check environment parameters of the site in real-time via IoTstar Dashboard Service, information on the production line can be collected and monitored completely.

- **3. Reduce the cost of equipment maintenance**

Through IoTstar Remote Access Service, cloud monitoring, setting adjustment, and firmware updates can be performed, reducing the time and cost of personnel movement due to equipment maintenance.

- **[IoTstar with UA I/O Module Environmental Monitoring Framework] :**



2-3 MQTT Communication Server: BRK Series



BRK-2000 Series

BRK Series IIoT MQTT Communication Server

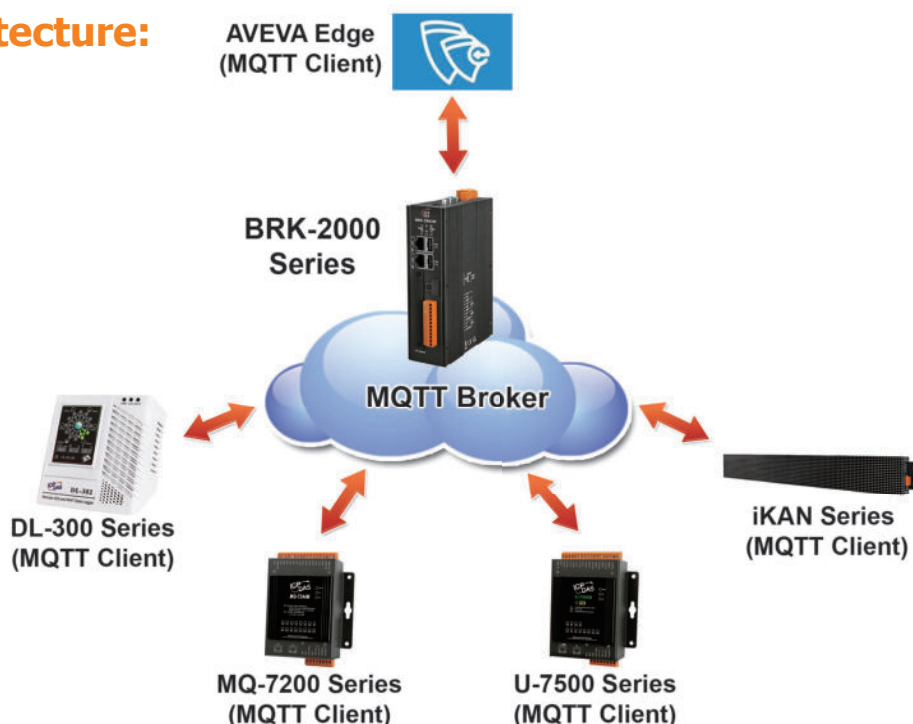
Features

- MQTT Broker Inside:
 - Bridge Function
 - Cluster Function
 - QoS Message Quality Mechanism
 - Retains Mechanism
 - Identity/Password Authentication
 - Communication Encryption
 - Last Message (Last Will)
- Support Load Balancing Function
- Support High Availability Architecture

Introduction :

BRK Series is an Communication Server that specially provides Broker function of MQTT protocol for MQTT message distribution and concentrator in M2M and Industrial Internet of Things environments. The BRK Series is compatible with the MQTT version V.3.1, V.3.1.1 and V.5.0 protocol. It supports many functions such as QoS message quality mechanism, retains mechanism, identity authentication, communication encryption, last message (Last Will), and bridge. The method of Web UI settings can quickly set up BRK functions. This reduce the burden of setting up the broker by user oneself and the maintenance cost. Besides, BRK Series provides Bridge, Cluster, Load Balancer, and High Availability functions. By forming multiple BRK Series a group to a better Redundancy system can prevent field systems from stopping services due to hardware or network failures.

System Architecture:



Advantages/Features:

■ Provide Bridge and Cluster functions, which allows excellent scalability

The Bridge and Cluster can expand the service limit and data sources for MQTT Broker application:

■ Bridge function

Allows BRK series to forward/subscribe the messages to other BRK series or third-party MQTT Brokers. By forwarding messages, it can direct the message to other BRK series service side. By subscribing to the remote brokers, it can increase the data sources.

■ Cluster function

Allows BRK series in the same group to share data to others with lower resources. When the number of connections and messages exceeds the limit of a BRK, using the cluster function can increase the number of connections to meet the needs.

■ Support High Availability architecture

When there are more than two BRK devices in the same site, they can be set as backup between each other. When the BRK device that is providing services fails or goes offline, other BRK device can detect and take over in a short time to ensure that the service will not be interrupted for a long time.

■ Support Load Balancer function, which can effectively configure tasks and optimize MQTT communication

The BRK load balancing function can be used in conjunction with the MQTT bridging or clustering function. A BRK device in this group provides a single fixed IP and communication port to connect other BRK clients in the group, which can be effectively allocated to the BRK devices in the group for MQTT communication services. This function simplifies user configuration and maximizes the overall system service capacity: when a single or a small number of devices in the group fail, the connection can be redistributed to other BRK devices to continue to provide communication services.

■ Support Redundancy System

Based on the High Availability architecture and Load Balancing function. This redundancy is hardware backup. In the entire MQTT Broker group, if one of the BRKs fails or disconnects, the other BRKs with normal functions will take over to provide MQTT services, and users do not need to perform other related settings.

Selection Guide:

Model	BRK-2841M	
Hardware		
CPU	ARM Quad Core CPU 1.6 GHZ	
RAM	1 GB	
Ethernet		
Ports	2 x RJ-45 10/100/1000 Based-Tx Auto	
Power		
Input Range	+12 ~ +48 VDC	
Consumption	10 W	
Environmental		
Operating Temperature	-25 ~ +75 ° C	
Storage Temperature	-40 ~ +80 ° C	
Humidity	10 ~ 90% RH,Non-condensing	
Software		
MQTT Client Connection Numbers	Max. 100000	
MQTT Broker	Basic Features	
	Bridge Function	Support
	Cluster Function	Support
	QoS (Quality of Service)	Support QoS0, QoS1, QoS2
	MQTT Protocol	Support V3.1 / V3.1.1 / V5.0
	Retained Message	Support
	Last Will Message	Support
	System Topic(\$SYS/#)	Support
	Delay Publish	Available Soon
	Topic Alias	Available Soon
	Supported Protocol	
	TCP/SSL	Support
	Websocket (SSL)	Available Soon
	STOMP	Available Soon
	MQTT-SN	Available Soon
	CoAP	Available Soon
	LwM2M	Available Soon
	Identity Authentication	
	Client ID	Available Soon
	User Account & Password	Available Soon
IP Address	Available Soon	
Load Balancing Function	Available Soon	
High Availability Architecture	Available Soon	

2

IIoT Controller/Server

Applications:

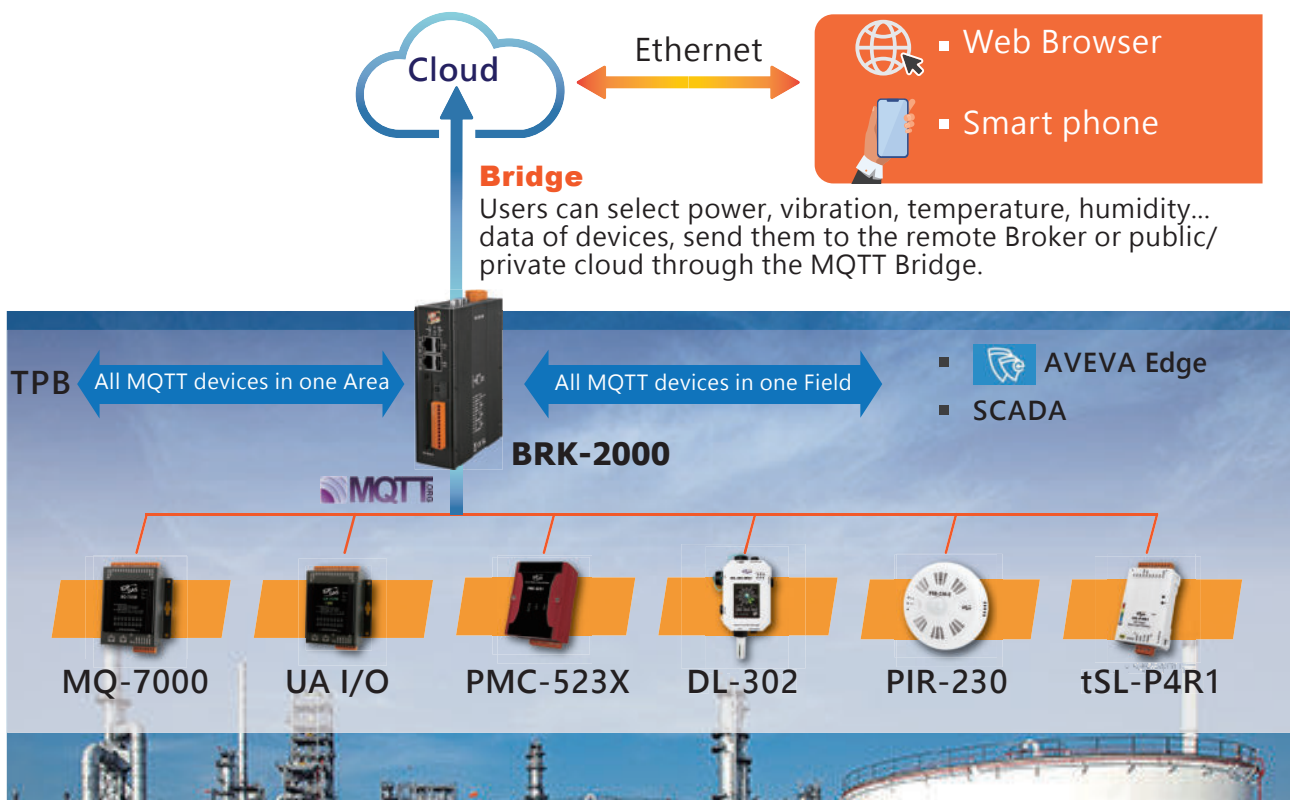
BRK Bridge Architecture Application

Many corporations have large factories, ex: manufacturing, and some areas (ex: confidential data areas or clean rooms) require access control, which causes inconvenience in entering and exiting that takes longer when need troubleshoot. The corporations often take remote control systems to solve the problem. However, the remote control will expose the devices to the external network environment. As long as any device in the system has a data security vulnerability, the entire system may be attacked or even paralyzed.

ICP DAS provides BRK-2000 Series MQTT Bridge Architecture. Through the MQTT Bridge mechanism, only the Topics and permissions that are authorized to be transmitted will send to the Remote Broker in the Bridge Architecture. And the built-in MQTT connection authentication methods such as Account/Password, Client ID, Certificates, etc., to increase the security of the communication to protect data. When doing the remote control, the operations are only to the Remote Broker. The equipment network in the factory can separate from the external network. If the external network communication is abnormal, the internal factory system can still operate without external influence.

Why Choose MQTT Bridge?

- **Safety:**
 - Separate Monitor/Control
 - ➔ Improve Data Security
- **Management:**
 - Separate Areas
 - ➔ Classify Information Security Management



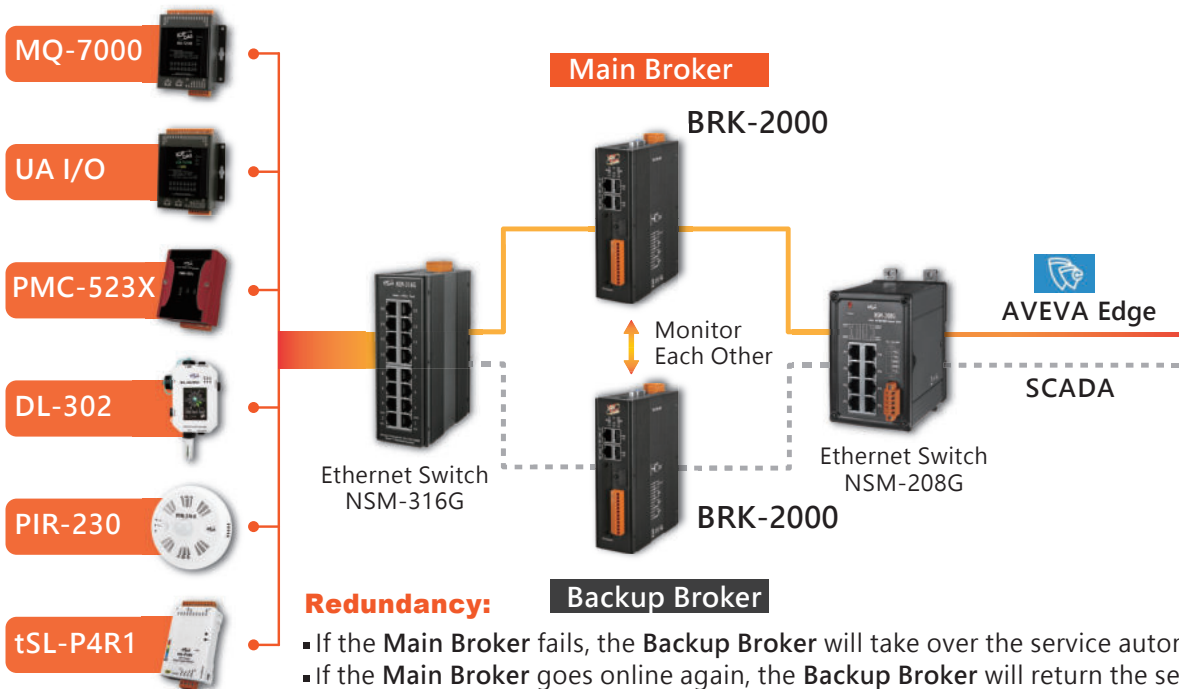
BRK Redundancy Architecture Application

With the development of the Internet of Things, more companies widely use Machine-to-Machine communication to track on-site producing processes, machine operating conditions, report errors, and issue service alerts in real-time. Under the needs, how to protect data from natural disasters and man disasters that damage the system or data has always been the main topic.

ICP DAS provides the BRK Redundancy Architecture for a solution that uses two BRK-2000 Series, one BRK-2000 (Main Broker) provides the MQTT services, and the other is used as a standby backup (Backup Broker) monitor the Main Broker at any time. Once the Main Broker is abnormal (such as shutdown without warning), the standby Backup Broker will take over in time. The MQTT service will not be interrupted, the system manager will have more time to deal with the problem, and the entire system will continue work.

Why Choose MQTT Redundancy?

- **Non-Stop Service:** About 5 sec. to switch, no time stamp.
- **Load Balancer Function:** Effectively allocate CONN. and COMM.



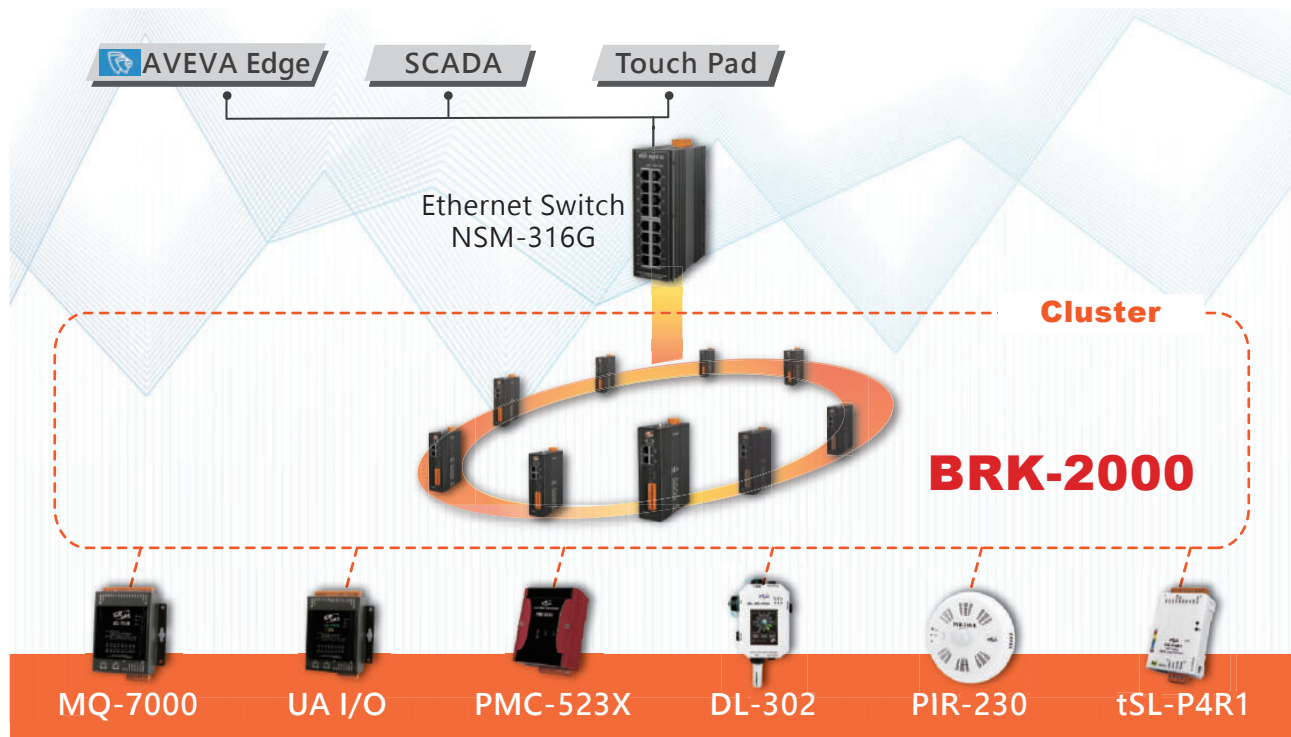
BRK Cluster Architecture Application

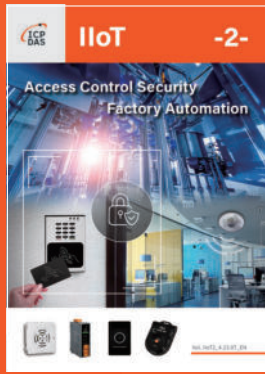
The manufacturing industry often deploys sensors to collect the machine status of the production process, parameters, etc. to improve production efficiency, control quality, and reduce the production line shut down due to equipment failure. The sensors send these data to the control center to perform calculations and visualization so that the on-site person can instantly get the status of the production process. However, during the data collection process, the control center may not get the field devices data due to the failure of the network traffic.

To solve this problem, ICP DAS provides the BRK-2000 Series Cluster Architecture that uses two and more BRK-2000 to form a High Availability Cluster. The BRK devices in the Cluster share to do the MQTT services. Since the BRK devices in the Cluster can complete the same tasks, if one BRK fails, other BRK devices can continue to work, thus ensuring the nonstop of MQTT services. BRK-2000 has a built-in Load Balancer function, which allows connection services to be equally distributed in the Cluster, making full use of the processing capabilities of each Broker in the Cluster and improving the processing efficiency of tasks.

Why Choose MQTT Cluster?

- **Hot-Add:**
Non-Stop Expansion.
- **High Availability:**
Non-Interrupted System.

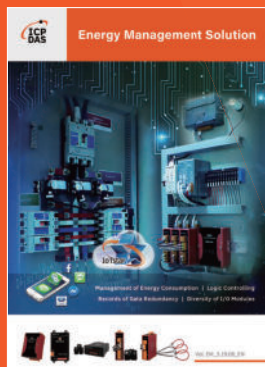




- IloT 2**
Access Control Security / Factory Automation
- WISE Surveillance Solution
 - IP Camera iCAM Series
 - Smart Access Control
 - IloT and Smart Phone Integration
 - MQTT I/O Module MQ Series
 - Stack Light Monitoring Module
 - Emergency Voice/Visual Alert Module
 - Industrial LED Message Display
 - Bluetooth LE Gauge Master
 - Temperature Data Logger
 - Signal Conditioning Modules
 - No-touch Infrared Sensor Switch



- IloT 3**
Environmental Monitoring / Mini Weather Station
- Smart Environmental Monitoring: CL Series
 - Air Box: DL Series
 - Mini Weather StationMotion: DLW Series
 - Detector: PIR Series
 - Industrial Sensor Network Detection: iSN Series
 - Wireless Environmental Solution: iWSN/iXN/iSOS Series



- Energy Management Solution**
- InduSoft SCADA Software
 - Smart Power Meter Concentrator
 - Smart Power Meter
 - True RMS Input Module
 - TouchPAD Devices - VPD Series



- Industrial Fieldbus Product**
- RS-485
 - Industrial Ethernet
 - Profinet
 - CAN bus
 - CANopen
 - Devicenet
 - J1939
 - PROFIBUS
 - HART
 - Ethernet/IP
 - BACnet



- ZigBee Wireless Product Solutions**
- ZigBee Wireless Network
 - Applications
 - ZigBee Converters
 - ZigBee Repeater
 - ZigBee Bridge
 - ZigBee I/O Group Module
 - ZigBee I/O Module
 - ZigBee Modbus Data Concentrator
 - Accessories



- UA Series / BRK Series: IloT Cloud Solution**
- IloT Cloud Solution Products
 - IloT Communication Server: UA-2000 /5000/7000 Series Support Logic Control IFTTT
 - MQTT Communication Server: BRK-2000 Series
 - OPC UA I/O Module: U-7000 Series



- WISE - Intelligent IloT Edge Controller & I/O Module**
- WISE IloT Edge Controller & I/O Module
 - Cloud Management
 - Applications
 - Product Specification
 - Solution Integration



- Smart Building, Smart Home Automation**
- Video Intercom & Access Control
 - Touch HMI - TouchPAD Series
 - Smart Lighting Control
 - Energy Saving - PM/PMC Series
 - Environmental - DL/CL Series
 - Motion Detector - PIR Series
 - Wi-Fi Wireless - WF Series
 - Infrared Wireless - IR Series
 - ZigBee Wireless - ZT Series
 - IloT Server & Concentrator
 - LED Display - iKAN Series

