Industrial IoT Sensor Node & Gateway Solutions

Enabling a Diverse Range of IoT Applications

✓ Sensor Nodes
✓ IoT Gateway
✓ Design-in Services
✓ IoT Software

ADVANTECH

Enabling an Intelligent Planet

Industrial Wireless Sensor Node Solutions

2

Embedded devices all around us are being transformed into "Interconnected Smart Devices." All these devices need communication bridges to pass raw data through the network to reach central servers for processing. For devices installed in remote, unattended and harsh environments, a stable and reliable communication bridge between the end device and the central server is a must.

The most important element in IoT solutions is data acquisition. To help System Integrators (SI) easily and quickly build wireless IoT environments, Advantech provides scalable sensor node solutions for data acquisition. Designed with a wide range of integrated wireless network management and cloud connectivity platforms, combined with our WISE-PaaS IoT software, Advantech products provide everything from sensors to cloud-based wireless IoT solutions.

Advantech Major Offering

WISE-1500 Series IoT Sensor Nodes

- LAN: WiFi, Bluetooth low energy, SmartMesh
- LPWAN: LoRa, SigFox, LTE-M, NB-IoT

WISE-1500 Series IoT Sensor Node Starter Kits

- WISE-1500 series module
- Development & debug boards
- Software development Kit
- Node to cloud integration
- WISE-PaaS trial services

WISE-3000 Series Wireless IoT Gateway

- LAN: WiFi, SmartMesh
- LPWAN: LoRa, SigFox
- Multi-connectivity
- Network management and security

Leading Technology Design & Services

1

Complete RF Design & Certification Ready
To simplify the development of wireless IoT applications, Advantech offers verified wireless gateway and node devices with software for IoT developers. With verified software services including BSP/SDK, WSN API and remote management APIs, IoT developers can quickly start their projects. Moreover, all Advantech wireless IoT solutions are certified for FCC, CE, CCC or TELEC.
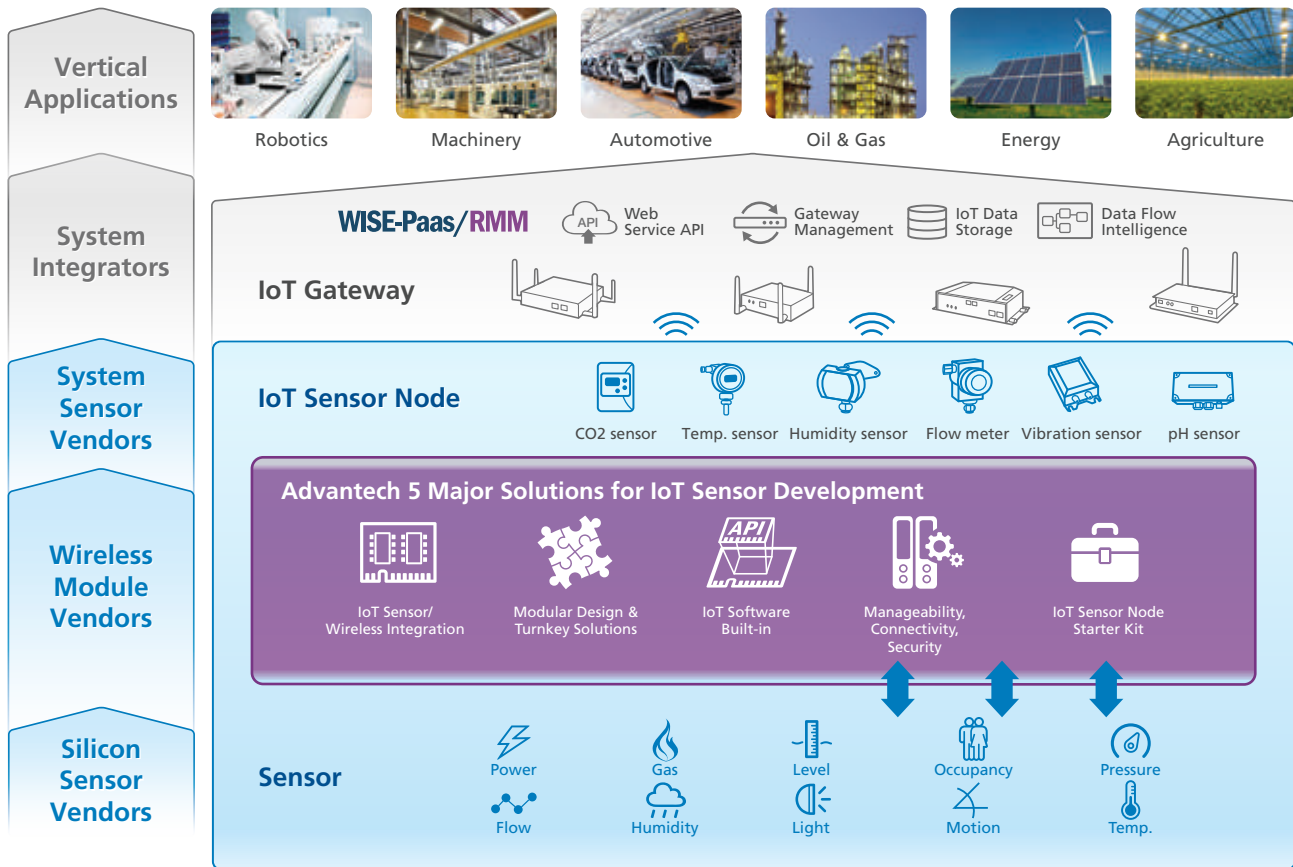
CE FC SRRC **TELEC**

2

Standard Modular Design –M2.COM IoT Sensor Node Solutions
Advantech wireless IoT solutions are designed to be modular for flexible communication and sensor carrier board integration. Advantech created a new open standard called M2.COM, a sensor platform using a simple module design to provision a solid standard platform for IoT nodes and sensors.

m2.COM
Open Standard for IoT Applications

Advantech IIoT Sensor Node Architecture

Vertical Applications
- Robotics
- Machinery
- Automotive
- Oil & Gas
- Energy
- Agriculture

System Integrators

WISE-Paas/RMM — Web Service API — Gateway Management — IoT Data Storage — Data Flow Intelligence

IoT Gateway

System Sensor Vendors

IoT Sensor Node
- CO2 sensor
- Temp. sensor
- Humidity sensor
- Flow meter
- Vibration sensor
- pH sensor

Advantech 5 Major Solutions for IoT Sensor Development
- IoT Sensor/ Wireless Integration
- Modular Design & Turnkey Solutions
- IoT Software Built-in
- Manageability, Connectivity, Security
- IoT Sensor Node Starter Kit

Wireless Module Vendors

Silicon Sensor Vendors

Sensor
- Power
- Gas
- Level
- Occupancy
- Pressure
- Flow
- Humidity
- Light
- Motion
- Temp.

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3 **Value-added IoT Software- Wireless Intelligent Sensor-to-Cloud Solutions**   WISE-Paas/RMM

Each IoT project needs to integrate wireless intelligent devices, seamlessly connect them to the cloud, receive data and take actions. All these functions require software, so Advantech WISE series incorporates WISE-PaaS/RMM IoT software platform to help build IoT applications quickly. WISE-PaaS integrated software service includes:
1) Easy wireless sensor integration; 2) Quick cloud connection; 3) Remote device management

4 **Wireless Sensor Node Design-in Services**

To help customers build their sensor solutions quickly, Advantech combines hardware, firmware, OS and programming tools to provide a comprehensive design-in service. From software development, sensor node design, test execution, system integration to trouble-shooting, customers can take advantage of our design-in service for rapid development.

5 **Cross-industrial Collaborative Partnership**

IoT applications require technology integration and cross industry collaboration. Advantech is building an alliance of strategic IP/Silicon, sensor, software, and system integrator partners made up of leaders in each of their respective areas of expertise. Together, these partners provide all the essential components for developing, verifying, integrating and building trusted IoT solutions to achieve faster time-to market solutions.

Industrial Sensor Node – M2.COM Open Standard

As an industrial leader, Advantech developed the M2.COM open standard to enable more IoT applications. M2.COM is a sensor platform based on a simple modular design that provides a solid, standardized solution for IoT sensor nodes and sensors.
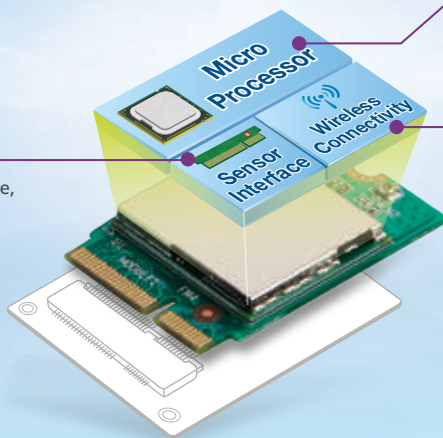
m2.com
Open Standard for IoT Applications

What is M2.COM?

The M2.COM concept is for a modularized and standardized form factor that combines sensor, embedded system, and networking capabilities. The modular design makes it flexible enough to support different applications and allows for expanded possibilities that can fulfill the changing demands of the IoT world.

M2.COM module integrates MCU, wireless and sensors to fulfill diverse IoT application development

Highly Integrated

Micro Processor

Sensor Interface

Wireless Connectivity

Programmable MCU (Micro Processor), we integrate:
- mbed/RTOS to enable I/O interface and programmable capacity.
- IoT-agent for IoT protocols and cloud connectivity.
- Data security with TLS/DTLS to provide guaranteed security.

Universal IoT Sensor I/O, we integrate:
- Standardized hardware defined for sensor node usage, such as ADC, GPIO, I2C, SPI, UART interfaces.
- Hardware and software design guide ready for ADC, GPIO, I2C, SPI, UART integration.

Diverse wireless connectivity technology, we integrate:
- Verified RF technologies such as Wi-Fi, Sub-1G, BT/BLE, LTE-M, Smartmesh for various applications.
- Configuration Web UI and WSN API to complete wireless settings.

Standardization
M.2 Connector

Modular Design
Flexible support for diverse sensor carrier boards

Advantech M2.COM Features

Certified Wireless Solutions
Proven M2.COM modules with RF certification

Built-in WISE-Agent
Compact IoT agent for handling cloud communication protocols

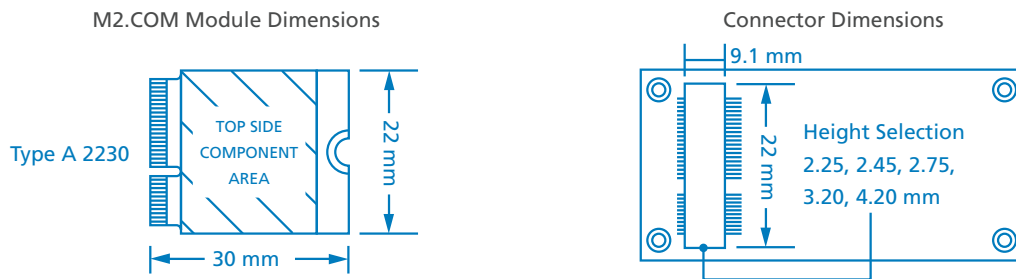**Sensor Starter Kit**
Comprehensive SDK and tools

Device Cloud Ready
Cloud services for device management and data analysis

WISE-PaaS

M2.COM Form Factor

M2.COM adopts the Type A 2230 M.2 form factor with a 75-position host interface connector. The compact size is 30mm in length and 22mm in width, which is very helpful for micro sensor implementation and system integration. In order to provide data collection and device control, the pin-out includes USB, PWM, SDIO, I²C, I²S, UART, GPIO, SPI, and ADC, all of which help build connections with IoT sensors and control end devices. It's very simple to connect various sensors to M2.COM by utilizing the rich I/O interfaces powered by the built-in MCU.

Signal	Purpose
USB	Interface defined for Host, Device or OTG features.
PWM	Motor control and power supply control.
SDIO	A common interface for extending storage through SD/MMC.
I²C	The most popular interface for sensors e.g., pressure, temperature, moisture, and lighting sensors.
I²S	Supports audio codecs for broadcasting and playing audio through external speakers.
UART	A commonly used protocol for device control, such as motors and electrical control units.
GPIO	Basic I/O control, such as indicator lights, alarms, and buzzers.
SPI	LCM support to display values collected from the sensor or transmitted by an external device.
ADC	Using common GPIO pins, the ADC transforms the analog signal from the sensor into a digital signal, making the data readable and meaningful to the data analyzer.

M2.COM Module Dimensions

Connector Dimensions

Type A 2230

TOP SIDE COMPONENT AREA

22 mm

30 mm

9.1 mm

22 mm

Height Selection
2.25, 2.45, 2.75,
3.20, 4.20 mm

## Why is M2.COM open standard? How it can help you to develop IoT Sensor devices?

• Proven hardware certification
• Unified connectivity module for sensor maker
• Minimized time-to-market

Learn more M2.COM features and specifications @ **www.M2COM-standard.org**

Wireless IoT Sensor Node- WISE-1500 Series

6

Advantech's WISE-1500 Series sensor-node modules are integrated with different IoT wireless solutions, such as low-power Wi-Fi, LoRa, BLE and LTE-M for a variety of IoT application requirements.

### Advantech Wireless IoT Sensore Node Module Technology Roadmap
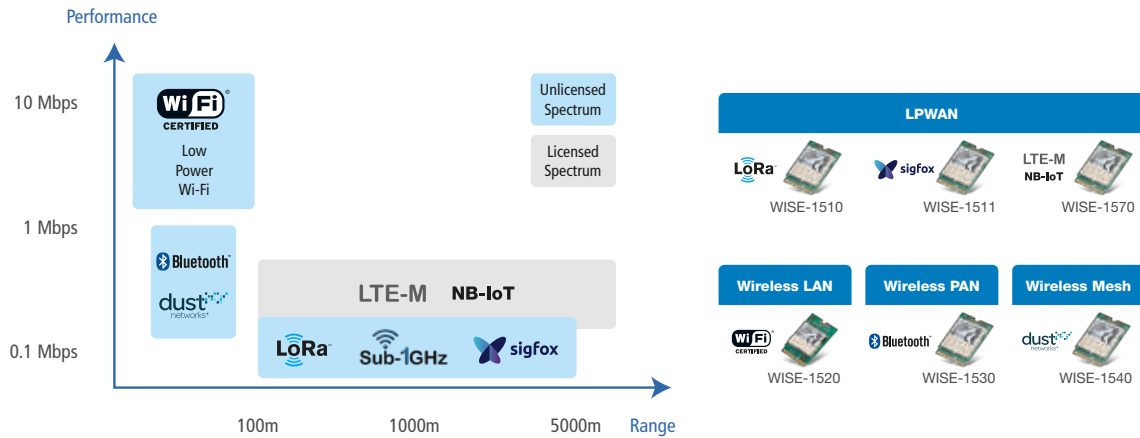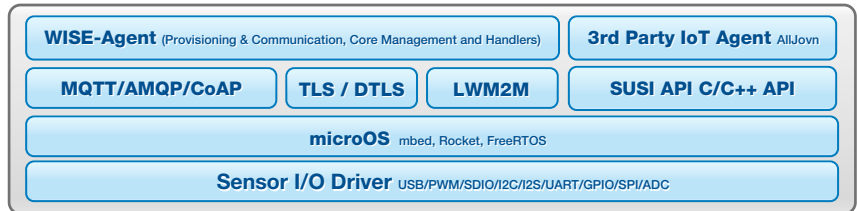

IoT Sensor Node Starter Kits

The starter kit provides a complete development environment and technical document so customers can optimize their resources and meet the demands for ever faster times-to-market.

The package includes:
• WISE-1500 series sensor node modules
• WISE-DB1500 development board
• Debug board
• Development SDK and user guide
• Account for free trial WISE-PaaS
• Accessories: cable, antenna, adapter

Application Ready
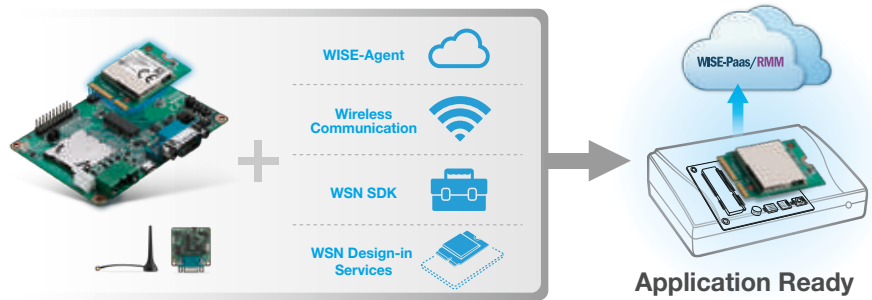
Advantech WISE-1500 series support all the necessary software stacks to build up IoT sensor devices. The ARM mbed or RTOS forms the foundation of the embedded microprocessor operating system, with supporting multiple IoT communication protocols including LWM2M, OSGI, AllJoyn and MQTT. Data can be quickly and easily acquired and transformed into different formats to communicate with WISE-PaaS or other cloud services.

| WISE-Agent (Provisioning & Communication, Core Management and Handlers)		3rd Party IoT Agent AllJovn
MQTT/AMQP/CoAP	TLS / DTLS | LWM2M	SUSI API C/C++ API
microOS mbed, Rocket, FreeRTOS		
Sensor I/O Driver USB/PWM/SDIO/I2C/I2S/UART/GPIO/SPI/ADC		

Wireless IoT Gateway- WISE-3000 Series

Leveraging wireless sensor technology, Advantech WISE-3000 series can aggregate both wireless sensor networks (WSN), and wired sensors, and tie them together into an IP network. With modular slot design, WISE-3000 series can adapt to a variety of wireless technologies at regional RF bands and wireless communication protocols to quickly go to market.

Solution Features
• Modular design
• Multiple wireless connectives
• Packets path hardware acceleration
• Encryption VPN tunnel for security guarantee
• WSN node management
• Advantech WISE-PaaS cloud support
• End-to-end application ready solution

Wireless Design-in Services

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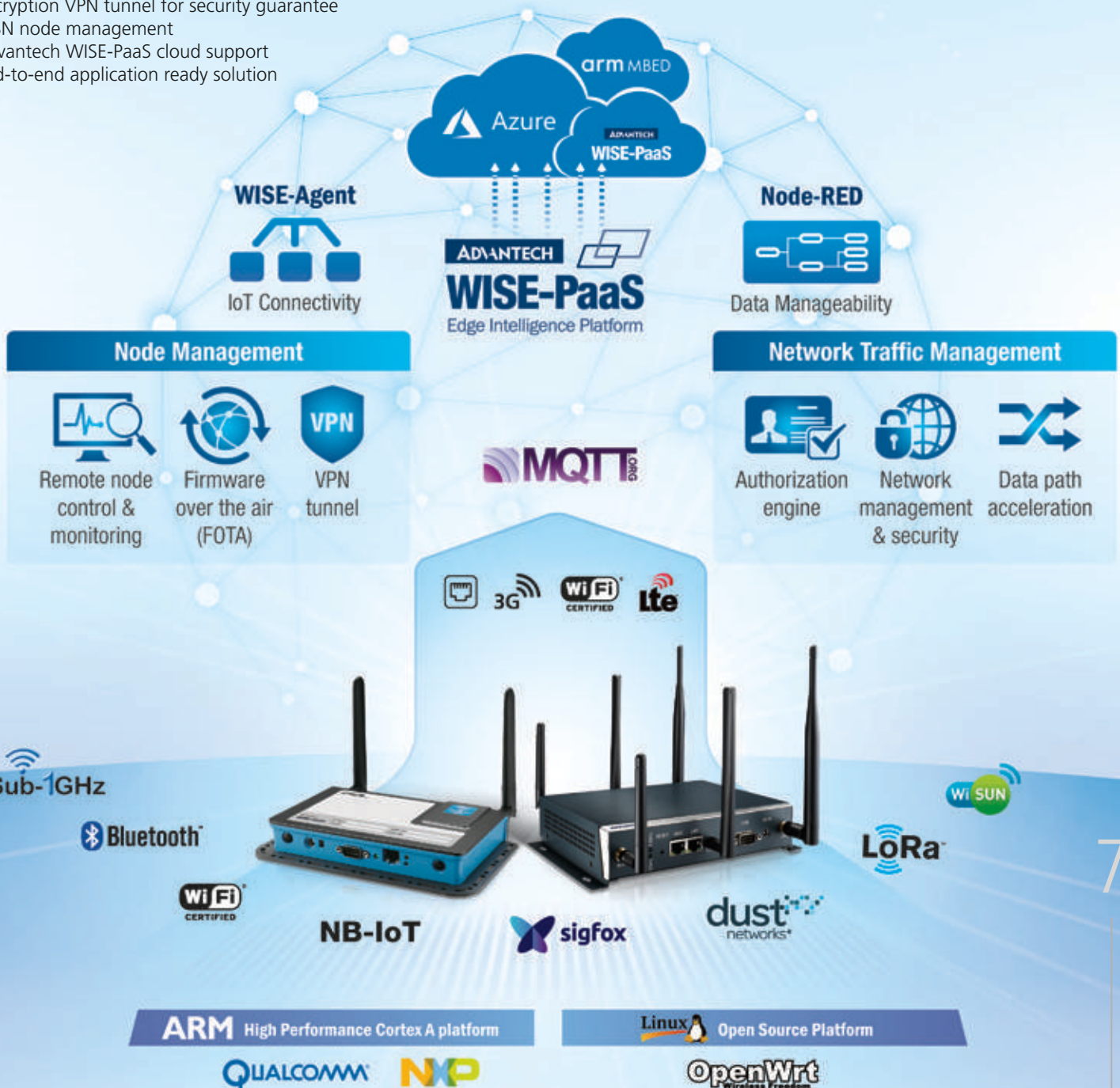
Advantech Wireless design-in service provides design and integration assistance from concept to final production, helping customers achieve faster time to market with lower development complexity and minimal integration cost.

1 Concept:
Advantech offers a wide range of wireless services to help customers' vertical markets applications. With starter kit and SDK, customers can quickly build proof of concept products to verify their application.
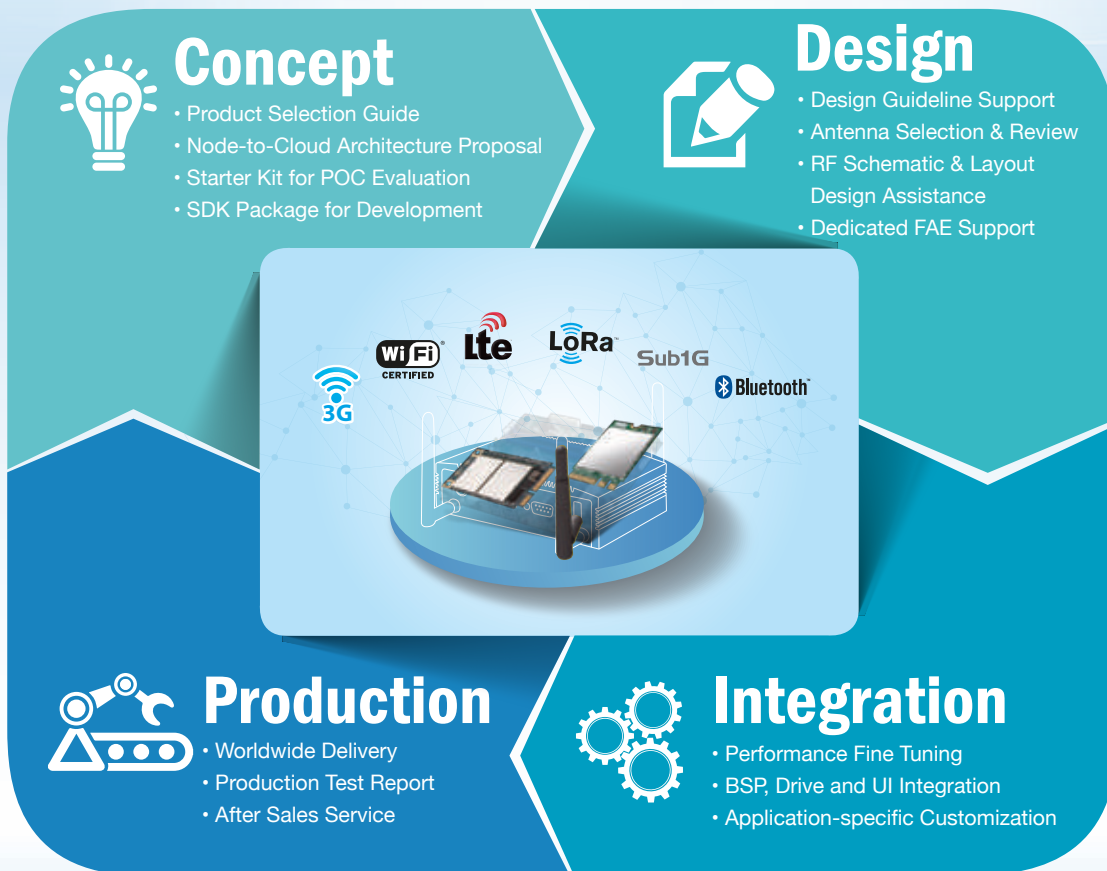
2 Design:
After the validation of PoC products, Advantech provides customers with design guidelines and antenna selections. Once the design is completed, Advantech offers technical reviews to improve the schematics and RF design so customers benefit from the reduced risk of new product launches.

3 Integration:
Advantech also offers customization services based on your specific application requirements.

4 Production:
Advantech offers worldwide delivery and after sales service.

Concept
- Product Selection Guide
- Node-to-Cloud Architecture Proposal
- Starter Kit for POC Evaluation
- SDK Package for Development

Design
- Design Guideline Support
- Antenna Selection & Review
- RF Schematic & Layout Design Assistance
- Dedicated FAE Support

Production
- Worldwide Delivery
- Production Test Report
- After Sales Service

Integration
- Performance Fine Tuning
- BSP, Drive and UI Integration
- Application-specific Customization

WiFi CERTIFIED · 3G · Lte · LoRa · Sub1G · Bluetooth

Fast Time to Market | **Lower Development Complexity** | **Minimize Integration Cost**

Case Studies

Smart Parking
Long Range Lower Power Wireless Node with Sensor Integration

Introduction

All vehicles are required to have parking lots, so it becomes important to know the available spaces. However, it's inefficient to build parking sensors with wires over on street parking so long-range Low Power Wireless technology can help to solve the deployment of on-street smart parking.

Requirements and Solution

A magnetic sensor company was looking for a LPWAN wireless solution to detect the presence or absence of vehicles in the parking spaces. The sensor company had great knowledge of magnetic sensors and algorithms, but they lacked in wireless technology experience to complete the smart parking solution.

Advantech WISE-1510 LoRa IoT Sensor Node offers long range and low power features based on the LoRaWAN standard, so the sensor company was able to build smart parking sensors which adopted sensor algorithms on the microprocessor of WISE-1510. The current WISE-3610 LoRa IoT Gateway is bundled with WISE-PaaS/RMM to support the demands of the private LoRa eco-system.

Benefits

- Easy installation with LoRa wireless technology
- Years of battery life to lower maintenance costs on smart parking solutions
- Collected big data on smart parking to improve the efficiency of parking systems

LoRa Gateway
WISE-3610

LoRa Node
WISE-1510

Smart Agriculture
Broad Range Coverage of Environment Monitoring on Cultivated Land

Introduction

The UN's FAO predicts enormous challenges to feed 9.6 billion people by 2050, so food production needs to increase by 70%. Increasing the quality and quantity of agricultural production will become essential and sensing technology will make farms more "intelligent" and more connected through what is known as 'Smart Agriculture'.

Requirements and Solution

A planet technology company uses sensing equipment with 3G modules to collect sensing data from rice fields. The company collects the data to the cloud via cellular network to improve the productivity of rice production, but it's costly and power-consuming so they are looking for better coverage, lower energy consumption and cost.

Advantech offered the WISE-1510 LoRa Sensor Node to replace a 3G module on the sensing equipment, and WISE-3610 LoRa IoT Gateway bundled with WISE-PaaS/RMM, so the planet technology company can collect sensing data and weather forecasting to the cloud via LoRa wireless technology.

Benefits

- Years of battery life to lower maintenance costs on sensing equipment
- Great distance to support hundreds of sensor nodes
- Helps build data science technology for smart agriculture to improve the productivity

LoRa Gateway
WISE-3610

LoRa Node
WISE-1510

9

Case Studies

10

Smart Metering
Communicate Daily Back to Cloud for Monitoring and Billing

Introduction

Smart metering is an electronic device that records consumption of electrical energy usage in intervals of an hour or less and communicates that information at least daily back to the utility for monitoring and billing.

Requirements and Solution

A smart meter company in China was looking for an automatic, secured, wireless, and cost effective solution. Advantech provided a complete SDK and design-in service to help the customer with fast integration and deployment. The solution included WISE-3610 LoRa gateway with secured wireless encryption engine, and WISE-1510 LoRa sensor nodes. Moreover, the built-in WISE-PaaS/RMM cloud platform was used for data analysis and real-time monitoring.

Benefits

- Free charge of unlicensed LoRa (Sub-Ghz) secured band
- More accurate bills
- Innovative energy tariffs with better understanding usage
- Remote device monitoring by LoRa total solution from node, to gateway to cloud

LoRa Gateway
WISE-3610

LoRa Node
WISE-1510

Smart Factory

Introduction

In this competitive, globalized world, the challenges faced by industrial manufacturers are constant, and keeping processes and plants operating efficiently is essential to production. Deploying wireless Acoustic Emission (AE) sensors for the inspection of manufactured products and monitoring the safety of infrastructure is a crucial part of keeping everything running smoothly 24/7.

Requirements and Solution

An AE sensor solution provider in Japan was planning to develop a remote monitoring and control system based on a large scale wireless design. The wireless network needed to be of the highest quality, with powerful computing capacity and flexible interface for easy integration. They chose Advantech's low power WISE-1520 Wi-Fi module, which is designed with rich I/O interface including ADC, DIO, I2C, SPI, UART and USB for diverse sensor integration. WISE-1520 passed crucial industrial-level tests to ensure reliable sensor integration. By built-in IoT WISE-PaaS/RMM software platform, the customer was able to quickly develop and deploy their AE sensor solution.

Benefits

- Low maintenance for remote management and large scale WSN management
- Optimized resources and focus on machine failure prediction
- Remote device management by WISE-PaaS/RMM

Low-power Wi-Fi node
WISE-1520

Product Selection

WISE-PaaS IoT Software Platform Built-in in whole series.

ADVANTECH
WISE-PaaS
Edge Intelligence Platform

WISE-Agent
IoT Connectivity

IoT Sensor Node Modules

ARM Cortex-M

LoRa™ WISE-1510
- Flexible to support LoRaWAN and private LoRa network
- Band support for EU, NA, JP, China (Q2) and Korea (Q3)
- Supports 1 UART, 1 I2C, 1 SPI, 8 GPIO, 1 PWM, 4 ADC, 1 USB I/O

-40 °C / 85 °C

sigfox WISE-1511
- Sigfox certification ready
- RCZ1 (EU)/ RCZ2 (US)/ RCZ3 (Q4) region support
- Supports 1 UART, 1 I2C, 1 SPI, 8 GPIO, 1 PWM, 4 ADC, 1 USB I/O

-40 °C / 85 °C

Wi-Fi CERTIFIED WISE-1520
- Built-in low-power Wi-Fi 802.11 b/g/n with AES 128 encryption
- TI RTOS support
- Supports 1 UART, 1 I2C, 1 SPI, 2 GPIO, 2 PWM, 2 ADC

Bluetooth™ WISE-1530
- RAM 256 KB memory/ 1MB Flash
- Integrated with 802.11 b/g/n and Bluetooth 4.1
- Supports 1 UART, 1 I2C, 1 SPI, 3 GPIO, 1 I2S, 4 ADC I/O

dust networks® WISE-1540
- IEEE 802.15.4e standard with self-healing mesh network
- 99.999% data reliability and power optimization
- Supports 1 UART, 1 I2C, 1 SPI, 8 GPIO, 1 PWM, 4 ADC, 1 USB I/O

-40 °C / 85 °C

NB-IoT WISE-1570 `2018 Q2`
- Compliant with 3GPP R13 NB-IOT standard
- Supports Multiple RF Bands
- Rich interface for sensor and I/O control

-40 °C / 85 °C

IoT Sensor Node Starter Kits

WISE-DK1510
LoRa™
- Development kit for WISE-1510
- RAM 64 KB memory / 256 KB serial Flash
- Supports 1 UART, 1 I2C, 1 SPI, 8 GPIO, 1 PWM, 4 ADC

WISE-DK1511
sigfox
- Development kit for WISE-1511
- RAM 64 KB memory / 256 KB serial flash
- Supports 1 UART, 1 I2C, 1 SPI, 8 GPIO, 1 PWM, 4 ADC

WISE-DK1520
Wi-Fi CERTIFIED
- Development kit for WISE-1520
- RAM 256 KB memory / 1MB serial flash
- Supports 1 UART, 1 I2C, 1 SPI, 2 GPIO, 2 PWM, 2 ADC

* Build-in temperature and humidity sensor

Wireless IoT Gateway

ARM Cortex-A

LoRa™ WISE-3610
- AC1200 dual-band Wi-Fi
- WISE-Link LoRa private support up to 500 nodes
- Optional mini-PCIe module for 3G/ LTE card

Wi-Fi CERTIFIED WISE-3620 `2018 Q2`
- AC1200 dual-band Wi-Fi
- MU-MIMO supports modularization
- Optional mini-PCIe module for 3G/ LTE card

dust networks® WISE-3310
- WSN mesh self-forming
- Reliability WSN MESH network
- Supports MESH network up to 200 nodes

11

IoT Sensor Node Solutions for Smart Cities

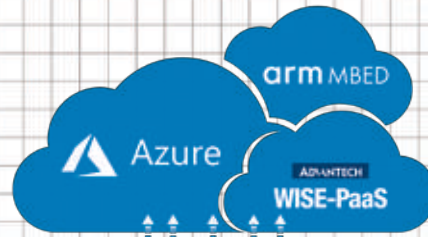## Device Cloud Ready
WISE-PaaS/RMM
Cloud services for device management and data analysis

Built-in WISE-Agent
WISE-Agent
Compact IoT agent for cloud communication

Certified Wireless Solutions
Proven wireless modules with RF certification

Software Development Kit
- WSN SDK
- Sensor driver API
- Web-based configuration

WSN Design-in Services
- Sensor carrier board schematic review
- RF design and verification
- Antenna selection guide

arm MBED · Azure · ADVANTECH WISE-PaaS

NB-IoT · LTE-M · sigfox · LoRa

Smart Fleet Management · Smart Parking · Smart Building · Smart Metering

Go AOnline

Please key in model name such as **WISE-1520, WISE-DK1520,** etc to find products.

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