NyWISE-PaaS

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Edge[#]Solutions Enabling the Future of AloT



Unleash the Full Potential of Edge Intelligence with AI, 5G, and the Cloud

Gartner's research suggest that 75% of data will be processed at the edge by 2025. The launch of AI and 5G technologies have made edge computing more flexible, intelligent, and connected. AI helps unleash new opportunities for various AIoT applications. Advantech provides Edge+ solutions that incorporate domain-focused software, AI, wireless connectivity, and cloud integration into edge computing platforms. As a result, customers can enjoy shortened development time while benefiting from digital transformation.



Edge Cloud Solution

- EIS-S230 • Scalable on-premises platform • Built-in Kubernetes and
- on-demand microservices



Edge Computer ARK-3531

- Powerful computing power with 24+ I/O connections
- Built-in remote kiosk management software



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Signage CMS

Edge Intelligence Server EIS-D210

- Built-in data integration and intelligent edge management software
- Pre-configured Microsoft Azure IoT Edge and AWS Greengrass

Edge Visualization Solution DS-082

- Supports four UHD/FHD displays
- Built-in content management software



Device0n

ePaper

Edge Al System

AIR-101

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Enabling an Intelligent Planet

- Built-in visual AI with two Intel[®] Movidius™ VPUs
- Preloaded with Edge AI Suite and Intel[®] OpenVINO toolkit[™]

ePaper Controller WISE-3240

- Linux OS/OpenWRT
- Massive device remote management with DeviceOn/ePaper

Simplifying Edge & Al Application Deployment to Shorten Time to Business

Due to the rapid growth IoT technologies, cloud computing, and artificial intelligence, many businesses have acquired massive amounts of data from many systems and devices that drive their automated processes. According to IDC forecasts, the number of IoT connections worldwide is expected to grow to 27 billion in 2025, and the number of IoT devices such as sensor nodes, gateways, and edge computing devices will also reach 100 billion. What's more, by year 2025, the market size of edge computing is expected to grow to more than \$65 billion. The convergence of IoT and artificial intelligence means that huge amounts of data can now be analyzed and processed at the network edge instead of a data center. To utilize edge AI and turn regular devices into smart AIoT devices is where Advantech and its ecosystem partners excel.

In line with global technology trends, the theme of this issue of My WISE-PaaS magazine is Edge Intelligence. We explore the use of edge and AI applications that showcase the joint effort between Advantech and ecosystem partners, not only on hardware platforms but also on edge software, industrial apps, and cloud development. We also elicit the opinions of industry and academia professionals who have shared their views and analysis covering the practical aspects of application development.

We interview Stephen Huang, AVP of Embedded IoT at Advantech so readers can get a fuller picture of Advantech's R&D effort transitioning from IoT, AIoT, to Edge AI. In the Power Insight column, Mr. Steen Graham, General Manager of IoT Ecosystem & Channels at Intel Corporation points out that collaboration across the Intel ecosystem brings together a range of expertise and abilities, which allow Advantech and Intel to offer a robust set of edge AI technologies to partners and customers around the world.

This issue also features eight insightful case studies concerning smart applications that utilize cutting edge technologies such as edge AI, computer vision, medical electrode sensors, and more. We describe how the medical IoT team at National Chiao Tung University and Heroic-Faith Medical Science integrated Advantech's edge intelligence solutions to improve respiratory monitoring and treatment processes, as well as cardiology services. In addition, we cover how Advantech's FaceView App and thermal imaging helped a Taiwanese system integrator overcome several technical disadvantages to offer schools accurate virus control and prevention at very reasonable cost.

In the customer partnership section, Advantech's partnership with the well-established automated electronics manufacturing equipment supplier, Symtek Automation Asia, contributed to the digital transformation of their customers business to Industry 4.0 standards.

Advantech has been a key leader in IoT right from the beginning and has been a deep contributor in the transformation from IoT, AIoT to edge AI. As technologies continue to evolve, it is Advantech's long-term strategy to evolve and innovate these technologies so that domainfocused system integrators and equipment manufacturers around the world can obtain and effortlessly deploy the latest solutions.

Edge Intelligence Platforms Empower AloT Innovation and Business Growth

Advantech leverages its industry experience, and that of domain-focused system integrators (DFSIs), to develop hardware platforms and edge AI solutions that are easier for customers to duplicate and deploy. This will help build a better world using AloT.

Photos provided by Advantech Interview with Stephen Huang, AVP of Embedded IoT, Advantech

Due to multiple factors, the focus of technological innovation has evolved quickly – from IoT to AIoT, then from AI to edge AI, and finally to artificial intelligence. As AI requires extensive computing power, many advances have been made in easily deployed complex deep learning models – made possible by the computational power of today's GPUs. With a vision toward accelerating IoT implementation and providing practical solutions to the market, Advantech's Edge Intelligence Group designs and develops edge computers, IoT device management software, edge AI inferencing systems, wireless connectivity solutions, and ultra-low power ePaper displays. These solutions deliver a widerange of futureproof systems to customers.

Acquiring and analyzing data

Stephen Huang, AVP of Embedded IoT said, "During the past few years, we have come across many customers who are very keen to step into the world of AIoT but don't know how or where to start. This has motivated us to help make things easier for them."

Simplifying the IoT application development procedure has become Advantech's Edge Intelligence Group's mission. Their integrated solutions make it easy and convenient for business owners to acquire and analyze big data collected from edge devices, without having to invest extra effort in software development. Solutions come pre-loaded with Edge IoT software and industrial App products that facilitate data visualization, remote monitoring, alarm notifications, and asset management – at any time from any location.

"Customers tend to have applications that work, but they work separately," explained Mr. Huang. "Once we help customers connect them into a unified grid, we advise them that the next step is to phase-in AI inferencing systems so that they can realize real-time intelligence at the edge."

Advantech's AIR series of edge AI inference systems enables customers to deploy their trained models for deep learning inferencing easily. The VEGA-300 series, for instance, has built-in AI modules and an integrated PCIe x16 GPU slot. This demonstrates that AIR AI systems are simultaneously lightweight and capable of meeting high-performance AI computing requirements. Being preloaded with the Edge AI Suite helps Advantech's AIR-100/101/200 systems accelerate inferencing deployment and realize heterogeneous hardware acceleration and real-time device monitoring in various applications, such as defect inspection, AGV, smart retail, roadside monitoring, and robotics.

FaceView and ePaper solutions: helping create the "new normal"

When discussing the "new normal" brought about by the COVID-19 pandemic, Mr. Huang detailed how Advantech's FaceView iApp is applicable to daily life.



"When compared to the last 50 years, 2020 has yielded unprecedented global circumstances," observed Mr. Huang. "To respond to rapidly emerging needs in contactless and remote access services, our FaceView AI facial iApp can be used in a whole range of applications, such as building visitor identification, retail customer management, and access control in both private and public systems, contributing to a safer environment for people to live, work, and commute in."

Advantech's Wireless ePaper display solutions minimize human contact and save energy. Although this technology has been widely used for some time in the e-reader market, it is only just now starting to gain traction in industrial fields. "Imagine how much paper, how much power, and most importantly, how many human errors could be saved or avoided if a hospital or a warehouse used ePaper solutions to automatically display public information, categorize parts, or dispense medicine," Mr. Huang reflected.

Advantech's ePaper devices range from 2.9 to 32 inches. This range of sizes gives users the ability to view whatever content they need to facilitate whatever work they are doing, all with ultra-low power consumption. The biggest advantage of adopting the wireless ePaper display solutions is that there's no extra effort for users to develop management software: the built-in ePaper Manager software allows them to simply connect to their own systems via Advantench's RESTful APIs.

Empower IoT devices with 24/7 remote operation management

Equipment management is an important factor in collecting and visualizing data from edge devices. "WISE-

DeviceOn is designed specifically for handling 24/7 remote operation management," pointed out Mr. Huang. It gives users a transformational plug-and-play experience. Beginning with onboarding devices, the fast and simple setup helps achieve instant intelligent edge connectivity, data acquisition, and status visualization. WISE-DeviceOn is designed to ensure maximum efficiency for IoT device operations and management.

Mr. Huang furthered explained that, "WISE-DeviceOn integrates the perception layer and communication layer downward, as well as the private cloud platform or public cloud platform of the enterprise upward—for example, Microsoft Azure, Alibaba Cloud, and Amazon AWS. Most importantly, it is highly user friendly for both general customers and system integrators."

Focusing on localization and co-creation with ecopartners

The future is still full of uncertainty, but Mr. Huang believes challenges always bring more opportunities than crisis. "If we co-work with the whole eco-system in every part of the world, we can leverage the collective wisdom of the industry to help each other get through difficult times. Advantech's Edge Intelligence Group will continue to develop its software and hardware solution offerings by focusing on innovative technology research that addresses general industry needs. Only through working closely with DFSIs in different countries can Advantech provide tangible services to our customers. "We believe through our development experience over the past decades and the knowledge our partners provide, can we generate an extremely positive business synergy to co-create a better world with AIoT," concluded Mr Huang.

A New Smart Frontier: Al-driven Decision Making at the Edge

To increase the value of services, organizations are demanding greater capabilities at the point of service or care. This usually consists of a node at the network edge. Many decisions can be made from the massive volumes of data generated daily. Artificial intelligence can serve as a smart assistant that enables organizations to make faster better decisions without human intervention.

Photos provided by Intel Interview with Mr. Steen Graham, General Manager of Edge.AI Scale, Intel Corporation

According to Gartner, around 10% of enterprisegenerated data is created and processed outside traditional centralized data centers or clouds. Conversely, this figure is expected to reach 75% by 2025. Edge AI allows enterprises to capture large amounts of data and act upon its insights close to the source. AI and deep learning tap the expertise of data scientists and combine it with knowledge from all data sources to efficiently react or make forecasts in real time as data is being acquired.

The current COVID-19 pandemic has accelerated the adoption of AI applications across sectors such as retail, industry, health, and smart cities. To meet the fast-growing demand for edge AI applications, Intel® offers a wide range of processors and development tools to speed up the process from conceptual development to prototyping, stress testing, and pilot runs.

Powerful tools to fast-track edge AI application development

Mr. Steen Graham, General Manager of Edge. AI Scale at Intel Corporation, pointed out that AI is becoming embedded in the fabric of computing and pervasive across all industries. For example, healthcare leverages AI for imaging-based diagnosis. This allows GE Healthcare to offer radiologists



intelligent pneumothorax detection at the point-ofcare in just a few seconds. By leveraging advances in AI, healthcare providers can enhance medical image analytics in ways that may help improve accuracy in diagnoses and imaging processing time. Industrial manufacturing uses robotics for defect detection, equipment monitoring, and real-time inventory assessments. Cities and transit points adopt AI to enforce face mask regulations and conduct body temperature monitoring. Safer shopping experiences are made possible by natural language processors (NLP), which enable contactless vending and payment, as well as spatial distancing.

Mr. Graham elaborated on their offers to developers. The range of AI applications and deployment locations requires a broad array of choice regarding performance, power, and total cost of ownership (TCO) envelopes. Intel's technologies include processors, accelerators, and programmable devices, such as the Gen 3 Intel® Movidius[™] Vision Processing Unit (VPU)−codenamed Keem Bay-which is purpose built for edge AI and computer vision. It boasts more than 10x the deep learning inference performance of the Movidius[™] Myriad[™] X VPU while consuming comparable amounts of power. Introduced in November 2019, the newest generation VPU achieves great performance and is a power efficiency achievement. Mr. Graham pointed out that it delivers noticeable performance-per-watt among AI accelerators such as GPUs. Efficiency is becoming an important benchmark for power-constrained applications at the network edge. The VPU architecture was designed to offer performance-per-watt efficiency advantage via minimized data movement on the chip. (Readers can find more information at https://intel.com/vpu).

To help develop algorithms, the Intel® Distribution of Open Visual Inference and Neural Network Optimization (OpenVINOTM) toolkit allows developers to quickly build solutions that emulate human vision and scale across multiple architectures simultaneously such as VPU, CPU, and GPUs. OpenVINOTM toolkit also enables performance optimization to reduce the inference time of computer vision models. For instance, an existing Advantech platform with an available PCIe slot and an Advantech VEGA card powered by Intel® MovidiusTM MyriadTM X VPU can be used to accelerate AI and utilize the host

CPU processor, providing scalable performance for edge applications requiring multiple cameras.

To enable developers to design their solution faster and move quickly from prototype to production, Intel® DevCloud for the Edge offers full access to hardware platforms hosted in Intel's cloud environment designed specifically for deep learning. Developers can deploy and test AI model performance using the Intel® Distribution of OpenVINO[™] toolkit, as well as across Atom®, Core[™], Xeon®, and VPU technologies, allowing them to optimize before they buy.

Ecosystem that leverages expertise and bridges technologies

Building a complete ecosystem means incorporating compelling hardware, software, and solutions purpose built and optimized for industry-specific use. Mr. Graham added that "with decades of partnership with Advantech and others, Intel has built an unparalleled ecosystem of specific-use edge hardware." Collaboration across the Intel ecosystem brings together a range of expertise and abilities, not only speeding up the development of edge AI solutions but also shortening time to concrete business outcomes. Intel also boasts over 300 marketready solutions, such as autonomous mobile robots to manage inventory, cold chain monitoring solutions.

Advantech and Intel are working closely to deploy the latest edge AI technology on three fronts. First, Advantech and Intel collaborate through the early access program on Atom®, Core™, Xeon®, and Movidius VPUs to offer a diverse range of form factors that meet industryspecific needs. Second, close collaboration enables developers using solutions like the OpenVINOTM toolkit and WISE-PaaS platform to get the best performance from Intel's hardware solutions. Third, Intel showcases industry-specific solutions driving business outcomes for end users through many initiatives including Intel's market-ready solutions; Advantech has a comprehensive portfolio of products and solutions ranging from intelligent retail to equipment monitoring and machine vision, and much more.

Together, Advantech and Intel offer a robust set of edge AI technologies that enable industrial transformation, help provide important healthcare solutions, and deliver accelerated business outcomes.

Advantech IoT Device Management Software Enables Lights-Out Manufacturer to Conduct Smart Manufacturing

A well-known Taiwanese electronics company adopted Advantech's WISE-DeviceOn software for the establishment of a lights-out manufacturing facility. Using Advantech's solution, they achieved remote monitoring and control, smart/predictive maintenance, remote application updates, and enhanced information security. As a result, the company was able to bolster its IoT device management capability while greatly expanding the use of smart technology.

Photos provided by Advantech Interview with Yeh Jih-sheng, Senior Software Manager, Advantech;Hung Chien-ya, Sales Manager, Advantech

AI and 5G are accelerating the growth and development of IoT applications, which are on the increase. A report by the research firm Gartner demonstrated that the number of IoT devices reached 5.8 billion in 2020. This number is expected to grow to 75 billion by 2025. This suggests numerous vertical industries are adopting IoT to create smart applications – a trend that will become more evident in the future. Software solutions that can manage thousands, or even tens of thousands, of IoT devices are therefore of utmost importance.

Yeh Jih-sheng, Senior Software Manager at Advantech, elaborated on the electronic company's decision to establish a lights-out factory. To implement lights-out production, the company had to quickly adopt large amounts of IoT equipment and gain an accurate understanding of how such equipment increases production line utilization. This presented many IoT device management and maintenance challenges. The company decided to adopt a factory control system embedded with Advantech's WISE-DeviceOn IoT device management software to meet these challenges. This ensured that the factory would run smoothly without staff on site and avoid financial losses associated with production halts.

Five key functions empower factory IoT device management Advantech Sales Manager Hung Chien-ya stated



that the electronics company initially only wanted to perform diagnostics on the IoT devices in its factory. However, the company discovered some of the more useful core functions of the WISE-DeviceOn solution including, over-the-air (OTA) remote software updates, the ability to bring devices online quickly, remote power on/off, and remote debugging. As these functions offered the company a chance to create smart processes in all aspects of its lights-out factory, it decided to adopt WISE-DeviceOn as a complete, one-stop solution. The company was thereby able to strengthen lifecycle management and the safety mechanisms of its factory equipment.

According to Yeh, the remote monitoring function helps users get an overview of system CPU and memory status while monitoring important indexes such as temperature, fans, and peripheral data. Similarly, the smart prediction and analysis function enables monitoring and control of key IoT hardware parameters. If the hardware experiences issues, such as unstable voltage or malfunctioning hard disk drives, the system will identify the problem before it occurs using the builtin edge intelligent algorithms. IT staff are thus able to conduct predictive maintenance and updates for the equipment. The third key function is remote control, which covers power on/off and debugging mechanisms. When the system crashes or experiences other problems, IT staff can solve these issues remotely. This greatly reduces staff management workloads.

The fourth key function is OTA updates, which allows IT staff to perform remote software and configuration updates. When key production processes in the factory require updates, the system can install software remotely over the air, eliminating the cumbersome process of installing software in-person for individual pieces of equipment. Strengthening information security is the fifth key function. To this end, WISE-DeviceOn integrates third-party security software – McAfee & Acronis – with a whitelist feature to ensure that the equipment





only runs secure software. Any unauthorized software is considered a malicious attack. If threats do arise, such as the encryption of data by ransomware, the system can quickly detect and restore data through backup files, thereby preventing the loss of important production data.

Yeh stressed that with these functions, WISE-DeviceOn can help the company expand to thousands of IoT devices and achieve IoT device management across different factory sites. WISE-DeviceOn enables the quick installation of new IoT devices and optimizes management tasks.

Meets diverse requirements via support for multiple cloud platforms

WISE-DeviceOn has been widely adopted in a range of vertical industries. For example, some of Taiwan's world leading companies are using WISE-DeviceOn for preventive maintenance and data security protection in semiconductor manufacturing to empower packaging, testing, and high-precision processes. WISE-DeviceOn has been widely adopted to manage equipment and conduct data aggregation and analysis in traditional industries such as CNC (computer numerical control) machining and injection molding. In these cases, it sends data to the cloud for smart applications. Likewise, there are demands for the accelerated mass deployment of IoT devices in smart city applications. One example is the installation of smart street lamps. These often require over ten thousand devices that make the remote monitoring and OTA functions on WISE-DeviceOn increasingly important. Many enterprises in the retail and transportation sectors are focused on multi-location IoT device management. WISE-DeviceOn can help retail chains that operate numerous domestic and international stores conduct remote monitoring and control.

Hung added that IoT device management across locations requires a high level of integration with cloud platforms. To meet customer demand for different types of cloud models, WISE-DeviceOn operates on the WISE-PaaS platform and supports customers' private clouds. It even works with public cloud platforms like Microsoft Azure, Amazon Web Services, and Alibaba Cloud.

As IoT edge devices play a critical role in creating smart environments, IoT device management, predictive maintenance, and information security are key priorities for vertical industries seeking to deploy smart applications. The constant innovation of functions and services offered through the WISE-DeviceOn software helps industries deploy smart applications that operate smoothly.

Edge⁺Software Solutions **Empowers Edge to Cloud Applications**



Enabled Manageability, Real-time Remote Access and Efficient Operations

In response to the growth of the edge devices market, the market demand of remote device management has grown exponentially. Advantech's full series of plug-and-play edge computing platforms with integrated WISE-DeviceOn IoT remote management software meet these trends by delivering real-time device and data management capabilities. This series eases business integration for software application management and cloud platforms. Advantech has also developed a series of WISE-DeviceOn industrial apps for specific domain requirements — these include DeviceOn/iEdge for data and edge management, DeviceOn/CommBridge for equipment protocol conversion, DeviceOn/Kiosk+ for remote kiosk management, and DeviceOn/ePaper, DeviceOn/Display, and DeviceOn/SQ Manager for the remote control and management of related peripheral modules. These functions help customers manage connected IoT devices while building edge-to-cloud applications.



Total Management

Software & Peripherals

Open APIs for Integration

Devices & Hardware



Remote Access Real-time Monitoring **Remote Controls** Troubleshooting



Efficient Operations OTA Update Batch Controls Setup Booster

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Enabling an Intelligent Planet

Amita Technologies and Advantech Build a Smart Energy Storage System

Amita Technologies and Advantech combined their respective strengths in battery hardware manufacturing and IoT open cloud software development to create a smart energy storage system. This jointly built system delivers green energy management and conservation to the global manufacturing industry.

Photos provided by Advantech

Interview with Hou qi Chen, Product Manager, Amita Technologies [;] Wei-zhe Ding, System Integration Engineer, Amita Technologies

The Taiwanese battery manufacturer Amita Technologies Inc. has a factory in Taoyuan with an innovative energy storage system. This system uses a set of smart energy storage applications aimed at helping administrators effectively calculate factory power consumption. Using these calculations, managers can develop power usage strategies aimed at energy conservation. This power storage system – that utilizes Advantech's smart IoT solution – will be promoted globally through Amita Technologies and Advantech's extensive marketing resources. This power management system promotes environmental protection and sustainability within the global manufacturing industry.

Advantech EIS equipped with DeviceOn/iEdge

Since its establishment in 2000, Amita Technologies Inc. has remained committed to the research and development of lithium battery technology, and has 18 years of experience in battery cell design. Amita Technologies has also developed battery modules and energy storage systems to augment competitive strength in battery manufacturing. They have successfully expanded power storage systems in a myriad of application fields and countries.



Product Manager for Amita Technologies Inc., Hou-qi Chen, stated that in order to meet further smart power management requirements in factories, Amita Technologies sought cloud platform and software development partners. Advantech's open IoT cloud platform and innovative industrial application software capabilities made it a natural choice. They cooperated with Advantech to integrate their Edge Intelligence Server (EIS), equipped with WISE-PaaS DeviceOn/iEdge I.App, into Amita Technologies' Energy Storage System thus enabling intelligent energy management in factories.

Hou-qi Chen added, "In the process of energy storage system implementation, Amita Technologies found that different factories have different IT environments. This makes it difficult to deploy similar energy storage systems. In this regard, Advantech EIS, which supports Modbus, OPC, and MQTT communication protocols, helped overcome the differences." Similarly, DeviceOn/iEdge supports private cloud and public cloud architectures such as AWS and Microsoft Azure. EIS enables rapid integration via its open architecture, and greatly reduces the implementation barriers of smart energy storage systems for factories.

Managing smart energy storage systems with visualized UI

After reviewing the application of smart energy storage systems in different factories, Amita Technologies' System Integration Engineer, Wei-zhe Ding, explained that traditional energy storage management systems provide information regarding voltage, current, and power during charging and discharging. Despite this, it is difficult for administrators to decipher complex figures and comprehend factory power consumption. Advantech's DeviceOn/iEdge helps address these issues. Using this system, administrators can remotely monitor and analyze power consumption in real time, thereby improving its management.

Using the ODBC plug-in in DeviceOn/iEdge, storage system consumption data is displayed in graphs. Additionally, data and configuration parameters are obtained using DeviceOn/iEdge's GET/SET API. At present, factory power managers can fully understand their power usage during peak/off-peak hours. Likewise, they can now tailor their energy storage system to the utilities' service agreement. This includes charging during off hours to avoid exceeding electricity limitations set in the agreement. This helps reduce consumption and



saves money. For example, after implementing the smart energy storage system, Amita's Taoyuan factory reduced electricity costs by 15~20% when compared to the same period in the previous year. Once the government passes relevant laws and regulations, these clients will be able to sell extra electricity from their systems to Taiwan Power Company and create new green energy opportunities.

Expanding the global market through collaboration with Advantech

Taiwan's comparatively low electricity prices have not incentivized the adoption of smart energy storage systems in manufacturing industry. To address the issue, Amita Technologies will start the global distribution of its smart energy storage systems going forward. Wei-zhe Ding said, "Combining Advantech's global distribution network and local DFSI partners with Amita Technologies' cultivation of smart energy storage systems will ease the adoption of smart energy storage systems in more overseas application fields."

Wei-zhe Ding, when looking towards the future, emphasized that energy storage systems range from large-scale systems for factories to small/mediumsized systems for commercial and home use. Amita Technologies will continue to work closely with Advantech on other product lines to create more innovative strategies.



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NCTU's Real-Time Wireless ECG Solution Improves Cardiology Services

Advantech collaborated with National Chiao Tung University (NCTU)'s medical IoT team to create a real-time 12-lead wireless ECG solution using the WISE-PaaS IoT software platform. Successful clinical trials at Shin Kong Wu Ho-Su Memorial Hospital demonstrated that the system improved the cardiology ward's efficiency, services, and safety while reducing operational costs.

Photos provided by Shutterstock]Interview with Sau-Hsuan Wu, Professor of Electrical Engineering department, NTCU

Data from a UN World Population Prospect study suggests one in six people will be older than 65 (16% of total projected population) in 2050 – up from one in eleven (9%) in 2019. Analogously, cardiovascular disease (CVD) is the leading cause of death for individuals older than 65, and is subject to increasing treatment costs. This inflating number of CVD patients is causing medical resource and personnel shortages in many hospitals. To address the issue, recent advancements in IoT technologies and sensor design have enabled precision telemedicine and efficient telehealth. These advancements improve patients' quality of life while reducing workload and financial liabilities accrued by hospitals that provide CVD treatment.

Advantech helps implement medical IoT solutions

CVD conditions comprise arrhythmia, heart attack/ failure, and coronary artery disease. CVDs which do not require surgical procedures are treatable through lifestyle changes, pharmaceuticals, or nonsurgical procedures. Coronary care units and cardiology wards provide postsurgery and intervention care, as well as rehabilitation after a heart attack or before patient discharge. These inpatient services require medical personnel capable of using costly vital sign monitoring machines and stress Electrocardiogram (ECG) testing machines. This yields substantial financial and human resource burdens for hospitals. Accidents or symptoms – including chest pain, abnormal ECG, or low heart rate – often arise after surgery. Despite this, there are no fail-proof 24/7 patient health monitoring solutions.

Under the patronage of the Ministry of Science and Technology's innovative medical equipment program, NCTU's Electrical Engineering and Computer Science departments collaborated on the development of a wireless ECG solution designed to improve cardiology services and lessen the strain created by the growing number of CVD patients. After developing the wireless ECG system and its AI algorithms, they approached Advantech for the IoT platform used in the prototype. Professor Sau-Hsuan Wu of NTCU's Electrical Engineering department pointed out, "Advantech has remained devoted to the development of industrial IoT platforms for many years, and has an established reputation for quality and reliable products. Advantech provided consultation for our proof of concept project and helped us find a system integrator partner. This helped hasten the clinical trial of our wireless ECG and patient monitoring system. At the time, Shin Kong Wu Ho-Su Memorial Hospital - who were determined to transform themselves into the leading cardiovascular center in Taiwan – agreed to participate in the clinical trial. They were hoping to introduce the next generation of cardiology services by investing in medical IoT R&D."

Innovative wireless 12-lead ECG solution improves medical efficiency and safety

NCTU's wireless ECG system facilitates seamless

data collection using three ECG sensor patches, a BLE transceiver, a fall detection/location sensor, and a 9-axis motion sensor. Professor Wu elaborated that the most innovative features are the acquisition of ECG signals and a truly wireless 12-lead ECG device. Compared to similar solutions, such as single lead wireless ECG devices, Holter ECG monitors, and 12-lead ECG monitors, NCTU's wireless ECG system provides 12-lead ECG data through the application of three thin cable-free patches on the patient's upper body. Its compact, wireless patient-centric design makes it easy to collect 12-lead ECG data at any location or time. This eases nurses' workloads, provides comprehensive inpatient monitoring, alerts medical staff remotely, and enables prompt, precise CVD diagnosis.

BLE transfers patient ECG and motion trial data to Advantech's WISE-PaaS platform using several EIS-D210 Edge Intelligence Gateway servers installed in the cardiology ward of Shin Kong hospital. WISE-PaaS transformed ECG raw data and kept it in the database for further AI analysis from NCTU's server. Professor Hsi-Lu Chao of the Computer Science department in NCTU said, "The real-time health information system we developed for clinical trials allows nurses, cardiologists, and doctors to check patients' ECG, heart rates, respiratory rates, blood pressure and blood oxygen saturation simultaneously from various fixed or mobile devices in the hospital." The system also integrated a floor plan to help locate patients, ensuring their safety and prompt treatment.

Due to low costs, connectivity, and mobility, the NCTU team suggested that the 12-lead wireless ECG could replace older Holter monitors in the future. This would allow patients to upload ECG data to the hospital system from their personal devices, instead of taking Holter monitors to their doctors. Moreover, hospitals will be able to provide tele-cardiology services, which hasten the discharging process, reduce costs, and make cardiac rehab and follow-up more convenient. Additionally, when using the 12-lead wireless ECG and initial AI diagnosis in response to cardiac conditions, emergency medical technicians can deliver accurate assessments and treatment immediately to increase recovery and survival rates.

Most hospitals in Taiwan are adopting IoT medical solutions. NCTU's wireless ECG system can replace bulky, expensive machines and ease transitions into medical IoT. The NCTU team is confident that it will advance the development of medical IoT in Taiwan.

Advantech Assists Techman Robot Company in Machine Upgrade with AI and AOI to Improve Quality Inspection Efficiency

The Techman Robot Company started with a built-in vision system robot. Since then, they have been actively integrating their robot technology with deep learning systems and utilizing Advantech's AI computer as a training server for smart factory applications. The robots are designed to help manufacturing industries improve the precision and efficiency of their quality inspection processes using AI and Robotic automated optical inspection (AOI) applications.

Photos provided by Techman Interview with Dr. Chung-Hsien Huang, Manager of Machine Vision Division, Research and Development Department, Techman Robot



In the past, computer manufacturing facility employees on productions lines manually connected cables to motherboard ports. Next, an assembler would conduct a detailed motherboard inspection after connecting the cables to ensure a secure fit. Nowadays, this is achievable with the push of a button using robotic arms that help assemblers conduct inspections. This system is capable of instantaneously notifying assemblers if a cable is faulty and specifies the port it should be connected to.

Robotic arms have vision comparable to the human eye. Techman Robot's newly launched TM AI+ solution and the manufacturing facility belongs to the parent company of Techman Robot – Quanta Computer Inc.,. Through the integrated application of machine vision, deep learning, and Advantech's AIR-300 AI system, the robotic arm lifts and places objects accurately, and can be used in quality inspection, thus improving the efficiency and accuracy of inspection.

Integrating AI deep learning and expanding AOI applications

According to Dr. Chung-Hsien Huang, Manager of Machine Vision Division, Research and Development Department at Techman Robot, "AOI utilized in traditional quality control is primarily used for inspecting soldered joints, assembled PCB, and optical character recognition code reading. Breaking away from these application fields and conducting inspections for abnormalities based on a product's appearance (e.g., scratches and cracks) is quite challenging. Numerous quality control personnel need to be assigned, and various rules need to be set. In actual operation, problems arise when the system's recognition incorrectly identifies false-positive defective product statuses, which then requires human personnel to perform re-inspection."

Mr. Huang emphasized that traditional machine vision inspection applications are restricted to only a few areas by various limitations. However, AI deep learning technology helps AOI overcome these limitations and expand quality inspection applications in various industries.

"Take the connection of flat cables on the motherboard as an example; various situations, such as cable bending, can cause interference with flat cables. These circumstances can inhibit traditional AOI systems' ability to recognize errors on a flat cable's connections, resulting in manual re-inspection. After being integrated with deep learning AI technology, AOI systems can automatically formulate recognition parameters through analysis of defective and normal product pictures. This enables these systems to identify flat cables that are in the wrong port, thus improving inspection accuracy and ensuring product quality".

Advantech AIR-300 optimizes AI algorithm training

In AI and AOI applications, maintaining accurate decision-making requires a continuously improving AI model. Therefore, when Techman Robot was developing the TM AI+ solution, they set up an Edge AI training system at their factory in order to store the image data captured from production lines. This allows them to train and optimize their AI neural network model, and then transfer the re-trained models back to the production line robotic arms.

After taking the factory's environment and requirements into consideration, Mr. Huang elaborated that the Edge AI Training System they were seeking must satisfy at least four conditions. First, it needs to be a stable system for long-term factory operation. Second, it must have substantial image/data storage capabilities for multiple robotic arms. Third, it must have excellent desktop CPU computing with high-performance graphics card support to complete model training. Finally, it needs an improved thermal design to reduce the risk of overheating and subsequent malfunctions in harsh environments.

Advantech's AIR-300 Edge AI System meets the above-mentioned requirements and performs extremely well in AI training. With a built-in power supply, there is no need for an additional power adaptor when installing a high-performance graphics card. It supports a NVIDIA high-performance GPU cards via a PCIe x16 slot, meaning that Techman Robot was able to utilize a powerful GPU. In addition, the AIR-300 is equipped with a smart fan that helps control system temperature, making it possible to detect the graphic card temperature automatically for fan speed adjustment and control as necessary.

These advantages, combined with strong technical support and flexible and customizable services, means Advantech has become the best choice for Techman Robot. Looking forward, the company will continue to develop more smart and automated solutions with Advantech, using AI to help Taiwan's manufacturing industry through the AI-based automation.

Semiconductor Plant Incorporates Advantech's DeviceOn/iEdge I.App to Enable Real-Time Monitoring of Air Pressure Conditions

Advantech's DeviceOn/iEdge Industrial App has been adopted by a global semiconductor company to enable monitoring of equipment air pressure in real time. By ensuring the immediate reporting of emergency events, the App can effectively reduce system downtime resulting from abnormal air pressure conditions.

Photos provided by Shutterstock Interview with Sammy Hsu, Product Manager, Advantech

Staff of a packaging plant operated by a global semiconductor company were having a monthly meeting in the centralized monitoring room when the chief engineer's mobile phone suddenly received an emergency notification. He checked the phone and found a text message that read, "Urgent! Irregular air pressure detected for machine 3 on production line A." Before he could contact production line staff, he received a message from the production line manager that read "A production line abnormality has been detected. I'm on the way to fix it." Because the equipment air pressure meters had been fitted with additional sensors, and Advantech's DeviceOn/iEdge Industrial App had been deployed, plant managers were able to determine the real-time air pressure conditions on production lines. This allowed them to monitor air pressure changes and avoid equipment downtime and production interruptions.

Four functions enable real-time monitoring of production line air pressure

Sammy, product manager at Advantech, pointed out that semiconductor manufacturing equipment is extremely varied and fixed air pressure levels are required to support diffusion equipment. Accordingly, semiconductor plants typically use a centralized air delivery system for each production unit, which can result in less than ideal air pressure levels. Moreover, although each machinery set can be monitored independently, whether sufficient air pressure is provided cannot be accurately determined, which eventually results in low yield rates.

To address this issue, the semiconductor company contacted Advantech and Mirle for an effective solution. Mirle installed pressure sensors capable of detecting various gases, such as argon, oxygen, and nitrogen. These sensors were coupled with an edge intelligence server featuring Advantech's DeviceOn/iEdge software for intelligent edge management. By enabling realtime air pressure monitoring and immediate warning notifications, this solution effectively reduced the risk of equipment downtime, while boosting production capacity and improving yield rates.

Sammy explained that Advantech's DeviceOn/iEdge solution has four major features that address typical factory pain points. First is the communication protocol and data integration function, which facilitates the digitalization of analog air pressure data for convenient collection and visualization. Second is the edge computing and analysis function, which enables prompt air pressure detection at the edge without transmission to the cloud. Third is the remote control and centralized management function, which allows air pressure data processed at the edge to be accessed throughout the entire plant. Fourth is a pre-loaded instrument panel management interface, which enables easy development of instrument panels with minimal editing and rapid



deployment.

Sammy asserted that although most semiconductor plants conduct a high degree of intelligent manufacturing, some traditional facilities still use sensors to support monitoring and management. Thus, Advantech's DeviceOn/iEdge provides a solution that integrates software and hardware for comprehensive intelligent manufacturing.

DeviceOn/iEdge deployed in diverse vertical industries

Besides semiconductor manufacturing, DeviceOn/ iEdge has been widely deployed in various vertical industries. For PCB factories, it can be used to collect hotair oven data, automate oven temperatures, and integrate collected data with manufacturing execution systems to accelerate intelligent production. For the CNC machine tool industry, DeviceOn/iEdge can be used to monitor and analyze CNC machine data via servers equipped with the OPC-UA communication protocol. It can also be used for real-time detection of consumables to enable preventive maintenance.

Because different IT segments have varying environment needs, DeviceOn/iEdge is flexible. It supports private edge-to-cloud solutions and allows users to scale up deployment through public clouds such as Microsoft Azure and AWS Marketplace. Additionally, because vertical industries have differing requirements for smart applications, Advantech has collaborated with many domainfocused solution integrators (DFSIs) to ensure DeviceOn/ iEdge can be adopted by many industries. Looking to the future, Advantech plans to continue partnering with DFSIs to accelerate intelligent manufacturing across a wide range of vertical industries.



Advantech, Intel, and Heroic-Faith Join Hands to Improve Medical Care with Al

Heroic-Faith Medical Science joined forces with Advantech and Intel to launch an Al-based continuous lung sound sensor monitoring system. The system allows nurses to track the respiratory conditions of numerous patients on their ward in real time from a nursing station, greatly improving care efficiency.

Photos provided by Heroic-Faith Medical Science Interview with Dr. Fushun Hsu, founder, Heroic-Faith; Mr. Yuan-Ren Cheng, co-founder of Heroic-Faith.



During a particularly severe period of the COVID-19 epidemic in April 2020, medical staff at the intensive care unit of Wuhan No.9 Hospital in China wore full isolation gowns to treat patients and record their vital signs. They did this without the need to remove their headgear or use stethoscopes to record patients' respiratory conditions. They were able to do so because of an AI-based continuous lung sound monitoring system developed by Heroic-Faith Medical Science. Clinicians could listen to the patient breathing through a micro-electro-mechanical system (MEMS) capacitive microphone patch without taking off their isolation gowns, significantly reducing the risk of cross-infection.

Breakthrough in respiratory monitoring and treatment

In addition to the treatment of critically ill patients with COVID-19, the AI-based continuous lung sound

monitoring system is also suitable for non-intubated anesthesia, cardiopulmonary surgery, and long-term monitoring in intensive care units," explained Dr. Fushun Hsu, founder of Heroic-Faith Medical Science. Respiratory parameters including respiratory rates and abnormal adventitious lung sounds are very important indicators in the clinical care of critically ill patients, but there was no instrument that could continuously monitor such parameters. The lack of data and the inability to monitor conditions remotely for extended periods of time contributed to unsatisfactory levels of treatment.

Heroic-Faith therefore implemented their AI-based continuous lung sound monitoring system to replace the traditional stethoscope with thin auscultation patches. The system continuously records respiratory parameters simply by attaching the patches to the patient.

Moreover, AI algorithms help identify the patient's conditions and results are simultaneously fed into a mobile device, such as Advantech's 8-inch medical tablet AIM-75H, then turned into spectrogram, which can also be played through the device's loudspeaker. By using visual and sound aids for diagnosis, it is much easier for clinicians to identify abnormal sounds and quickly intervene when necessary.

In addition to bedside monitoring and care, Heroic-Faith also integrated Advantech's USM-500 Medical-Grade Edge Server, VEGA-340 Edge AI Acceleration Module, and Intel's OpenVINO[™] toolkit to develop a central monitoring system that can simultaneously collect and aggregate respiratory parameters of every patient in the ward. Nurses can see the respiratory conditions of 24 patients in the ward at the same time from the nursing station. This reduces their workload and bolsters the overall quality of medical services.

Finding the right balance between computing performance and cost

"In the process of developing the central monitoring system, Heroic-Faith struggled to find the right balance between computing performance and cost. Not until the deployment of an integrated solution from Advantech and Intel was the issue finally resolved," said Mr. Yuan-Ren Cheng, co-founder of Heroic-Faith. Heroic-Faith originally used a high-end GPU to improve computing performance in the early stage of product development and retro-fitted commercial mobile phones for displaying spectrograms. Although this system architecture could be applied to bedside care, it brought up two major problems when undergoing further development. First, as the amount of monitoring data increased, the computing performance of the GPU required by the system increased, resulting in a substantial increase in cost. Second, the system resources of commercial mobile phones are limited, and a mobile phone can only monitor one channel, which makes it impossible to achieve the goal of central monitoring.

To tackle these problems, Heroic-Faith converted the system to the Intel OpenVINO[™] architecture and utilized CPU optimization to meet computing performance requirements. It also actively sought suitable hardware solutions. After careful consideration of industry reputation, customization capabilities, and product reliability, it chose Advantech's USM-500 and VEGA-340 to create a total solution.

Mr. Cheng emphasized that Heroic-Faith specializes in AI algorithms and is not familiar with hardware design details, such as power supply and medical certifications. "Advantech USM-500 has passed IEC-60601-1-2 medical certification and offers tremendous benefits when combined with VEGA-340, which is equipped with 8x Intel® MovidiusTM MyriadTM X VPUs (vision processing unit) that can handle the respiratory sensors from four channels and provides processing performance of 0.7 pictures per second per core, a total of 8 cores in one AI card. Compared with the original system architecture that used mobile phones to process pictures, the computational performance nearly doubled. The combination of USM-500 and VEGA-340 completely solved Heroic-Faith's hardware problems. Moreover, Advantech's solution is fully tested and compatible. In addition to the product itself, it boasts a dedicated cradle, a power supply system, and several USB slots to fully satisfy customer needs.

Most importantly, Advantech respects each customers' opinions. Whenever Heroic-Faith put forward a request, Advantech listened carefully and responded quickly. For instance, it adopted Heroic-Faith's suggestion to adjust the product cradle so that it can be locked in place. In the future, Heroic-Faith hopes to work more closely with Advantech and Intel in areas ranging from product development to marketing and promote its AI-based continuous lung sound monitoring system in even more markets. The goal is for technology to reduce the burden on medical care personnel and provide the public with a higher quality of medical services.



Edge[#]AI Solutions **Powerful Edge Inference Systems** For Complex Al Challenges



To realize real-time intelligence at the edge, Advantech provides powerful AIR inference systems integrated with an AI toolkit and IoT device management software. Customers can easily deploy their trained models to AIR systems to enable deep learning inference in defect inspection, AGV/Robotics, smart retail and roadside monitoring applications.

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Preloaded with Edge Al Suite & OpenVINO Toolkit











CPU/VPU/GPU

Edge Inference Systems



AIR-100 Low power, quad displays with one Intel Movidius Myriad X VPU



AIR-101 12-28VDC DIN-rail with two Intel Movidius Myriad X VPUs



AIR-200 Ruggedized, high performance with two Movidius Myriad X VPUs



AIR-300 Server-grade computing, supporting one GPU card

Advantech Solution Contributes to Taiwan Schools' Pandemic Prevention and Containment Efforts

Advantech helped a Taiwanese system integrator (SI) overcome budget and technical challenges to create a total solution for facial recognition and thermal imaging for schools in Taiwan. This enabled them to implement accurate, efficient epidemic prevention and containment.

Photos provided by Shutterstock Interview with Alan Kao, product manager of Embedded IoT Group, Advantech

Facial recognition technologies have been around for many years. In the past, low recognition rates and high costs served as an impediment to mass adoption. However, due to advancements in AI and cameras, facial recognition applications are now being widely deployed in the healthcare, automotive, smart home, and access control industries. For instance, Toyota introduced a driver facial expression analysis solution capable of triggering autonomous responses from vehicles to prevent accidents. Facial recognition is used in airports to authenticate passengers' identity at departure and arrival gates. The onset of the COVID-19 outbreak has further increased the popularity of facial recognition and thermal imaging systems. Indeed, these systems monitor social distancing, detect the wearing of masks, and spot abnormal body temperatures.

The combination of edge AI and facial recognition drives contactless applications

"We have seen growing demand for contactless applications that utilize facial recognition technology, edge AI, and infrared thermography technologies; such as contactless lifts and access control gates. Apart from the pandemic, the key drivers are the total cost of ownership and mature and proven total solutions," said Alan Kao, Advantech's product manager of Embedded IoT Group. In the past, deploying a facial recognition solution required a large investment in centralized servers and facial recognition software. At present, edge AI technology allows facial recognition models to be run on edge computers. This significantly reduces costs and increases system response times by capturing videos and enabling responses close to the event source.

Earlier this year, a Taiwanese system integrator (SI) specialized in the integration and installation of school IT and surveillance systems was developing epidemic prevention systems for schools in response to COVID-19 outbreak. As most schools could not raise the funds required to meet urgent epidemic prevention and containment needs, system costs were the SI's biggest concern. The SI also faced a lack of trained engineers and limited knowledge of facial recognition and AI. To meet these challenges, the SI chose Advantech's FaceView industrial app. After consultations with Advantech's professionals, the SI decided to start with a pilot project at a school in Taipei.

Fully-tested and proven solutions from industry leaders

Advantech provided a total solution comprised of their AIR series edge AI inference system integrated with VEGA-300 AI acceleration modules and FaceView



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industrial app to address the SI's concerns. Mr. Kao stated, "Powered by CyberLink's AI engine, which is ranked one of the best in the NIST Face Recognition Vendor Test worldwide, FaceView provided high precision real-time facial recognition. In fact, FaceView boasts a recognition accuracy rate of over 99.8%. Our total solution allows SIs to shorten time-to-business outcomes and serve their customers with fully-tested and proven systems from industry leaders, Advantech and CyberLink, at very reasonable prices."

The total solution featured built-in APIs designed to help the SI quickly integrate the school management system, student information database, and LINE push notification system. Each AIR series edge computer was connects to up to five infrared thermal imaging cameras, which scan entire classrooms automatically every few hours. Moreover, Advantech's total facial recognition solution can identify students wearing masks. Names of students with abnormal body temperatures or without face masks were recorded into the school system and sent to staff using LINE push notifications. The system fulfilled the school's pressing COVID-19 prevention needs and contributed to the containment of other viruses that can cause high body temperatures. By implementing Advantech's facial recognition and thermal imaging solution, the SI saved time and money; and overcame several technical disadvantages. Now, all the SI's school clients benefit from the same efficient and accurate epidemic prevention and containment operations at a very reasonable cost.

The Taiwanese SI is now preparing for a large-scale system rollout at several schools in northern Taiwan. Mr. Kao pointed out that, "The solution is expandable; if schools require functions such as identifying strangers, fall detection, or violence detection, AI models can be deployed using the same edge computers." Advantech has witnessed fast-growing demand for contactless applications using facial recognition technology since FaceView was launched this year. FaceView can also be used for other tasks like access control of entrance gates and sensitive equipment, building management, contactless lifts and more. The application scope of FaceView will continue to expand even after the pandemic abates.



Microsoft Azure + Advantech WISE-PaaS Accelerate the Development of IoT Applications

To assist various industries in swiftly deploying IoT applications, Advantech utilizes Microsoft Azure IoT and AKS services to support the upgrade of the WISE-PaaS technical architecture. This allows domain-focused solution integrator (DFSI) partners to meet their IoT deployment goals of one-time development for multiple deployments with unified operations.

Photos provided by Advantech and Shutterstock Interview with Eric Chu, director of Embedded IoT Group, Advantech; Ning Kang, WISE-PaaS product director, Advantech; Louis Lu, director of Embedded IoT Group, Advantech

With the lightning speed advancement of AI and 5G, coupled with the maturity of edge computing, the workload of IoT is gradually shifting from the core (enterprise data center) to the cloud and network edge. To help global enterprises accelerate the deployment of edge and cloud integrated smart applications, Advantech offers Microsoft Azure based WISE-PaaS public cloud services. This allows global DFSIs to develop industrial

IoT applications in various fields and accelerate the implementation of smart applications globally.

Azure drives smart applications with AI, database, and IoT services

Eric Chu, director of Embedded IoT Group at Advantech, pointed out that Azure is an Infrastructure as a Service (IaaS) open cloud platform. "Its biggest



feature is the integration of innovative development tools or software packages, which allow partners to quickly utilize cutting-edge technologies and develop smart applications. For example, Azure AI Service includes tools such as machine vision, semantic recognition, and synthesized speech, allowing developers to quickly add AI functions to applications. Azure Database Service includes virtual computing and visual analysis tools, allowing developers to focus on application development instead of managing the database. Azure IoT Suite provides tools such as time series insights, device twinning, and IoT Edge, allowing IoT application developers to build more flexible solutions based on industry demands, as well as to be fit for the edge and cloud IT environment."

Eric further explained, "To strengthen Azure services, Microsoft has been promoting several open strategies in recent years to encourage more partners to join their ecosystem, such as supporting the non-profit open-source organization of the Apache Software Foundation, and recruitment of professionals to innovate Kubernetes (K8s) technology. Furthermore, to assist system developers to quickly develop applications, Microsoft is also constantly innovating module services for use in various industries. For example, in response to the COVID-19 epidemic, the cloud for healthcare service was launched, which integrated Azure's latest healthcare functions, such as health bot, which greatly assisted in the innovation of more smart healthcare applications."

Advantech and Microsoft cooperate closely with a clear and open mindset

While Microsoft is building the Azure ecosystem, Advantech is linking up IoT ecosystem partners with its co-creation strategy, and the two parties have been working closely together. In the early days, Advantech was approved as a global authorized distributor of Windows Embedded and now it has been granted as an authorized Azure Cloud Solution Provider. In addition, due to the reliability and security of Azure services, Advantech uses its infrastructure and modularized services to optimize its WISE-PaaS industrial IoT cloud platform to help customers quickly and securely create industrial IoT applications for the Edge and Cloud.

In order to expand WISE-PaaS platform's IoT ecosystem, Advantech used Kubernetes to transform Cloud Foundry based WISE-PaaS 3.0 to WISE-PaaS 4.0, which is a cloud native platform. Microsoft's AKS service was also used for easy deployment and management of containerized applications.

Ning Kang, Advantech's WISE-PaaS product director, explained that WISE-PaaS 4.0 mainly adopts container technologies to create a microservices architecture. "Decoupled service components can all operate independently and can be reused, which allow designers to develop applications through distributed collaboration. This makes the WISE-PaaS platform more flexible and easier to use, and enables Advantech and DFSIs' joint development of Industrial Apps."

More importantly, WISE-PaaS 4.0 can integrate Azure's multi-platform features, allowing DFSIs and IoT application developers to deploy SaaS services more quickly. Louis Lu, director of the Embedded IoT Group at Advantech provided a good application example, "We had a European retailer who adopted the Azure cloud platform so they could quickly implement POS solutions to several retail locations. They developed their smart application using WISE-PaaS, which was then deployed and ran on the Azure platform."

Ning Kang added that many companies go through the demonstration and verification process in a single application field before officially deploying IoT applications. "During the process, they will use an intelligent all-in-one edge computing machine to build IoT solutions. After successfully verifying their solution, and they then decide to transfer to the Azure public cloud even when deployment at multiple locations is required,



verified solutions can still be migrated or expanded seamlessly due to WISE-PaaS' support for Azure. In other words, WISE-PaaS multi-cloud integration support and management allow enterprise to enjoy one-time development benefits for multiple deployments and unified operation."

On the other hand, to allow IoT applications to grow exponentially, Advantech has put some WISE-PaaS solutions, such as WISE-PaaS/IoTSuite and WISE-DeviceOn, on the Azure Marketplace. As a result, DFSIs in different regions can purchase WISE-PaaS solutions on the Azure platform as an industrial app and deploy them in their clients' projects faster and more easily.

WISE-PaaS's three framework services greatly benefit IoT application deployment

With Advantech technical team's effort and close cooperation with Microsoft, Advantech has successfully created three application framework services for WISE-PaaS 4.0 based on containerization technologies, visualization (WISE-PaaS/Dashboard and WISE-PaaS/ SaaS Composer), asset performance management (WISE-PaaS/InsightAPM) and AI framework service (WISE-PaaS/AIFS). These services provide many IoT application deployment benefits for enterprises.

Louis further elaborated on the framework services, "Visualization mainly helps Advantech's partners, such

as DFSIs, to communicate clearly through 2D and 3D views with enterprise customers in different application fields. InsightAPM provides assistance on healthcare, manufacturing and many industries to optimize equipment efficiency. Plus, they further enable equipment integration services and offer after-sale maintenance services."

WISE-PaaS/AIFS allows Advantech to quickly upgrade regular embedded devices to Edge AI devices, helping more customers accelerate the utilization of AI for various IoT applications. Louis further explained, "Because AI's self-learning capability enables continuous improvement on accuracy, the most important thing is life cycle management, for which AIFS collects a lot data for training and building inference engines. Therefore, if hundreds or even thousands of Edge AI devices are to be deployed in the field, AIFS can provide rapid deployment and up scaling."

Undoubtedly, diversity and openness are keys to accelerating the promotion of smart IoT applications. Advantech will continue to sustain an open and innovative mindset and join forces with cloud service providers including Microsoft to build the underlying infrastructure for smart IoT applications. DFSIs and software developers will then be better able to support enterprises with their forward-looking smart IoT applications and deployment.



Use I.App Building Blocks to Construct Your Own AloT Solutions

Advantech WISE-Marketplace is your one-stop AloT industrial apps marketplace. From domain specific apps, to edge and cloud services, training and consulting, its all here for you. So start looking for the industrial app that best fits your domain scenario. Go for it!



Symtek Automation Asia and Advantech's Collaboration Overcome the Obstacles to Industry 4.0

Leveraging Symtek Automation Asia (SAA) and Advantech's industry experience and technical strengths, SAA recently developed several innovative smart manufacturing machines that utilize Advantech's Edge Intelligence Server and DeviceOn/iEdge to provide customers with an Industry 4.0 end-to-end manufacturing solution.

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Industry 4.0 is driven by a synergy of technology advancements in IIoT, smart manufacturing, AI, wireless communications, and robotics. McKinsey's Digital Manufacturing Global Expert Survey indicated that 68% of the participant companies consider Digital Manufacturing a top priority, but only about 29% of companies are capturing value from Industry 4.0 solutions. The main roadblocks to their adoption of Industry 4.0 is related to a lack of resources and implementation know-how, as well as the time and costs required for digital transformation.

SAA fast-tracks transformation of digital manufacturing

Established in 1999, SAA is a renowned supplier of manufacturing logistics solutions for many industries including the ceramic substrates, the LED assembly, the IC packaging and testing, and semiconductor industries. To meet digital transformation challenges in manufacturing, SAA set up a digital manufacturing R&D center, and started researching commonly encountered Industry 4.0 hurdles as early as 2013. Using customized services, SAA gained a leading position in the global smart manufacturing sector. Eight out of the world's top ten PCB manufacturers are SAA customers.

By integrating SAA's expertise and know-how in

production automation and cutting technologies such as machine vision, edge computing, robotics, autonomous vehicles, and rail-guided vehicles, SAA has transformed from an automation machinery manufacturer to a fullservice digital manufacturing solution provider. Its innovative three-axis robot arm sold more than 5,000 units.

SAA pointed out that there are many technologies involved in the operation of smart factories. Therefore, it is impossible for a single supplier to provide everything. Because SAA's resources are limited to manufacturing logistics solutions, co-creating digital manufacturing solutions with a trust-worthy solution partner like Advantech is essential.

Having complementary advantages accelerates the implementation of Industry 4.0

In 2016, SAA collaborated with Advantech to facilitate OT and IT system integration for several smart manufacturing solutions. Advantech played an important role in SAA's journey towards becoming a total solution provider. As a leading provider of industrial computers, Advantech's brand awareness, complete product lines, and R&D capabilities augmented SAA's Industry 4.0 offerings.

Leveraging SAA and Advantech's industry experience and technical strength, SAA became a pioneer of smart manufacturing solutions for the Taiwanese PCB industry.



Utilizing Advantech's Edge Intelligence Server (EIS) and DeviceOn/iEdge (iEdge) industrial app, SAA's technical team were able to develop several dedicated smart manufacturing solutions based on the end customers' production line and application requirements. Being able to develop solutions quickly using Advantech's industrial app hastened the implementation process.

As a manufacturing logistics solution provider, many SAA machines are applicable to diverse production line workstations. They improve procedures, quality control processes, and product traceability. The most important factor in project success is the ability to handle various communication protocols from different legacy machines while meeting varied customer demands. Thanks to EIS' edge-to-cloud integrated architecture design and iEdge's support for commonly used protocols such as Modbus and OPC-UA, SAA can focus on the development of customized applications that interface with the customers' existing systems. These applications convert raw data into meaningful information, instead of integrating protocols from scratch. In addition, iEdge helps users monitor and diagnose systems remotely, as well as update mass edge devices over the air. These functions significantly, reduce service times and costs. EIS's pre-installed software tools support IoT applications, cloud services, system integration, and system sustainability. Similarly, DeviceOn/iEdge leverages integrated McAfee and Acronis for threat protection and backup recovery. These security features empower remote system recovery for production machines.

Dynamic partnership led to innovative solutions

SAA and Advantech have collaborated successfully over many years. Advantech has responded to problems as they emerge and made necessary changes to meet project requirements or adjusted specifications to keep up with the industry trends. Advantech regularly adopts the latest technologies and solutions that will benefit SAA's future projects and help them stand out in the competitive and over-saturated production equipment market. Indeed, this dynamic partnership has led to innovative smart manufacturing machines.

Through SAA and Advantech's innovative smart manufacturing solutions, end customers can enjoy fruitful outcomes without investing large amounts of time and money in research and development. SAA hopes to help more manufacturer's provide smart manufacturing machines in the future. SAA is also extending their services to monitor environmental risks that can lead to production downtime.





Advantech, Intel and CyberLink Team Up to Drive AI Adoption

As face-to-face business events were canceled and postponed due to growing global health concerns about the spread of Covid-19, many have gone digital. In order to drive adoption of edge AI technology, Advantech partnered with Intel and CyberLink to hold a series of online webinars in USA, China, Europe, Japan and Taiwan in 2020. With the participation of industry leading AI computing and software innovators, more than a thousand people registered and joined in the recent webinars. Participants learned about how edge AI is accelerating deep-learning inference on edge devices and their practical usage in the field.

AI is now a dominant force driving today's digital world. This means, there are plenty of opportunities to develop new solutions, new ways of working, and new partnerships—once we get past this pandemic. Intel has extended its hardware and software portfolio for AI and analytics with the launch of its MovidiusTM Vision Processing Unit (VPU) and OpenVINO toolkit. Advantech has been working closely with Intel to develop edge AI solutions including VEGA-300 series AI acceleration modules, AIR series AI inference systems, and GUI-based Edge AI suite software. To help customers accelerate AI deployment, Advantech also collaborated with CyberLink to launch its FaceView AI facial recognition industrial app using CyberLink's AI engine for contactless access control and services. As the world's top 20 fastest and most precise facial recognition engines provider, CyberLink's AI engine can hit 99.7% accuracy. Advantech will continue to work with ecosystem partners to take a huge step in making AI a reality for manufacturing, transportation, retail and smart city applications.

Realize AloT Solutions with WISE-PaaS Services and Ecosystem



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WISE-PaaS Industrial IoT Data Application Platform

Advantech's WISE-PaaS industrial IoT data application platform provides edge-to-cloud software and services to help system integrators, solution developers, and industrial end customers; enabling real AIoT-powered business models in various vertical markets.

Leveraging Advantech's extensive hardware portfolio, WISE-PaaS integrates diverse software services, including WebAccess, WISE-DeviceOn, DeviceOn/BI, WISE-EdgeLink, and WISE-PaaS/VideoService. Data collected for the WISE-PaaS/EnSaaS industrial PaaS helps our ecosystem partners quickly develop SaaS and domain-specific IoT solutions based on our data-driven AIoT data application platform: WISE-PaaS.

WISE-PaaS/loTSuite

An all-in-one industrial **I**oT PaaS service

WISE-PaaS/EnSaaS4.0

Industrial PaaS solution with flexible IaaS delivery options

WISE-PaaS/InsightAPM

Asset performance management

WISE-STACK

An AloT private cloud solution based on WISE-PaaS

WISE-PaaS/AIFS

AI framework service

WISE-Marketplace

marketplace

A one-stop AloT industrial apps

WISE-PaaS/Dashboard WISE-PaaS/SaaS Composer

Data analysis & visualization in 2D & 3D





Prepare Industry 4.0 Future Talent

AloT Course and Certification

Empower educator and students with various learning modules and resources to support AIoT education and lay the foundation for success.

AloT InnoWorks Developer Program

Invite students from the world to use WISE-PaaS industrial IoT cloud platform to develop unique industrial application solutions, solve social and environmental challenges, and realize enthusiasm and ability!

Elite 100 Internship

Join a cross-field internship team of different experts from different backgrounds to explore IoT cloud applications that develop your potential and boost your career skills.







