My WISE-PaaS

An Advantech Magazine Transportation 2022-2023

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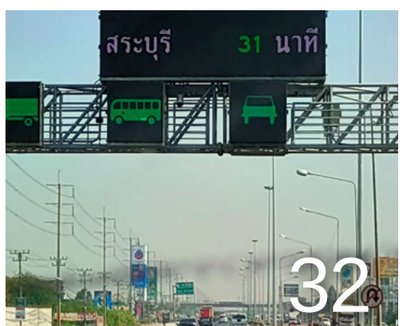
Advantech View

Advantech Fuses Innovative Technologies and Leads Ecosystem Partners to Accelerate MaaS Development

Application Story

Advantech's Ultra-Compact Edge Technology Facilitates Autonomous Mobile Robots



Customer Partnership

FETC International and Advantech Collaborate to Develop Next-Generation MLFF ETC Systems

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Powering Edge Intelligence with WISE-EdgeLink

Connecting Industrial Data via

WISE-EdgeLink

Safe, Simple, and Efficient

Secure Integration
Secure Data Conversion for Integrating Data with Third-Party Systems

Zero Coding
Rapid cloud-based deployment without programming

Code

Security
- VPN
- OPC UA
- Whitelisting

Data Collection
- Data Acquisition
- Protocol Conversion
- Data Pre-processing

Data Management
- Data Logger
- Notification/ Alarm
- Store and Forward

Publish Service
- Data to Cloud
- MES / ERP
- Open API

Transmitting data to the cloud for easy integration

Advantech's WISE-EdgeLink is a lightweight gateway software solution that supports data acquisition for asset monitoring, performance tracking, alarm notifications, system management, and remote configuration. WISE-EdgeLink ensures easy migration from stand-alone legacy systems to modern IoT architectures by providing an intelligent platform that serves as a bridge between devices. Furthermore, WISE-EdgeLink enables superior monitoring and control of field equipment and industrial facilities.

ADVANTECH
Enabling an Intelligent Planet

Edge-SRP
Edge Solution Ready Package

Edge Data Collector Solutions

ESRP-PCS-ECU4553
ESRP-PCS-ECU1051
ESRP-PCS-ECU1251
ESRP-PCS-UNO420
ESRP-PCS-WISE710

ESRP-PCS-ADAM3600
ESRP-PCS-ADAM6717
ESRP-PCS-ADAM6750
ESRP-PCS-ADAM6560D

Edge Analyzer Solutions

ESRP-CSS-UNO2271
ESRP-CSS-UNO1372
ESRP-CSS-UNO2484
ESRP-CSS-UNO2372

ESRP-AWS-UNO2271
ESRP-AWS-UNO1372
ESRP-AWS-UNO2484
ESRP-AWS-UNO2372

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Advantech Contributes to Sustainable Green Mobility Through its Ecosystem Leadership

Expansion of the global economy and the increased mobilization of people and goods, have led to increased traffic congestion, greenhouse gas emissions, energy consumption, and other environmental problems. To address these challenges, intelligent transport systems (ITS) have emerged as an important solution. ITS deployment enables transport agencies and operators to offer customers greater reliability and comfort, while simultaneously improving safety, security, and energy efficiency. ITS solutions also facilitate more effective traffic and transport management, as well as enhanced decision-making in the event of serious disruptions.

To help partners and customers shorten time-to-business and meet safety and reliability requirements, Advantech has focused on optimizing the development and certification of solutions for in-vehicle and roadside applications, in addition to enhancing product continuity and support.

In the Application Story and Customer Partnership sections of this issue, we demonstrate how Advantech is utilizing cloud and edge computing, AI, and visual recognition technology to assist SI partners, software developers, and transport agencies with developing their own transport/traffic management solutions that fulfil their unique goals. The application stories feature various smart on-board, in-vehicle, and roadside solutions to highlight how transport agencies in Taiwan, the U.S., and Australia have benefited from the traffic monitoring and management solutions co-created by Advantech and its SI partners. Also highlighted is how AI-powered in-vehicle solutions deployed in Europe and Vietnam have enabled bus operators to improve operational efficiency, fleet safety, and passenger satisfaction.

In the Power Insight and Advantech View sections, Mr. James Huang, Chairman of the Taiwan External Trade Development Council (TAITRA), and Mr. Van Lin, Senior Director of Advantech's Service IoT Group, both emphasize the importance of cooperation with ecosystem partners. In the meantime, Advantech has the accumulated experience and technical expertise to lead the integration of technological resources within ecosystems in Taiwan.

ITS deployment can help reduce carbon emissions by enabling road users, passengers, transport agencies, and operators across all transportation modes to make smarter use of transport networks and accelerate the development of mobility-as-a-service (MaaS). Accordingly, Advantech has developed a range of total solutions for roadside and in-vehicle applications to provide ecosystem partners with a variety of flexible options for each project. Through the implementation of innovative transport and traffic management solutions, Advantech and its partners hope to make mobility greener and more sustainable. ■

Advantech Fuses Innovative Technologies and Leads Ecosystem Partners to Accelerate MaaS Development

With ITxPT, V2X, edge AI, and 5G technologies continuing to mature, Advantech has developed a range of roadside and in-vehicle total solutions to help transport agencies, operators, road users, and passengers make safer and smarter use of transportation networks and accelerate the development of mobility-as-a-service (MaaS).

Photos provided by Advantech
Interview with Van Lin, Senior Director of the Service IoT Group of Advantech

To achieve safe, efficient, and sustainable mobility, while also reducing traffic congestion and CO2 emissions, many countries have implemented policies in regards to intelligent transport systems (ITS). Over the last two decades, ITS have evolved alongside advancements in IoT, AI, data computing, and telecommunications, paving the way for more innovative transport and traffic management solutions. Moreover, by connecting vehicles, traffic systems, toll systems, and other infrastructure into highly integrated transport networks, these technologies will contribute to achieving the goal of mobility-as-a-service (MaaS).

Advantech is a long-standing provider of in-vehicle and roadside transport and traffic management solutions. Mr. Van Lin, Senior Director of Advantech's Service IoT Group, asserted that "the scope of both ITS and MaaS is very broad, involving many stakeholders. At the moment, our focus is inland transport. With information technology for public transport (ITxPT), V2X, edge AI, and 5G continuing to mature, we have developed a range of total solutions aimed at traffic flow analysis, smart traffic management, violation detection, fleet management, eBus transport, and electronic toll collection. All of these solutions leverage edge AI inference technology and visual recognition algorithms to collect, analyze, and transform metadata, so that insightful data can be transmitted to the cloud server via 5G." Advantech's solutions are designed to help transport agencies, operators, road users, and passengers make safer and smarter use of transport networks as we move away from personally-owned modes of transportation towards MaaS.

Improved passenger experience and safety with integrated ecosystems

In the total solution ecosystem, Advantech takes a leading role in the provision of reliable and compatible total solutions. These include integrated sensors, electric vehicle powertrains, IP cameras, and high resolution LIDAR sensors for robotics and autonomous vehicles amongst many others. For the recent VinBus project, all necessary features and functions, such as fleet safety management, passenger information broadcasts, driver behavior management, and battery management, were implemented via Advantech's TREK eBus solution. It utilizes edge AI computing with an in-vehicle computers, intelligent camera ADAS, industrial communication system, and advertisement system.

"To improve the passenger experience and safety, support from various ecosystems is critical. We considered the needs of every ecosystem and developed a robust, reliable, yet flexible solution that can be easily installed by local vendors," said Mr. Lin. He further highlighted that a high-quality installation can minimize signal loss and transmission latency, which have a crucial impact on real-time monitoring and edge AI computing. To ensure local vendors could easily perform high-quality installations, all components, even those as insignificant as connectors and cables, were supplied by Advantech's trusted ecosystem partners.

In recent years, Advantech has transformed into an application-oriented solutions provider, encouraging partners to move towards a SaaS business model. At the company headquarters, regional business units have adopted a more vertical and industry-specific approach for developing new solutions. This approach allows Advantech to create solutions that target most functions and peripherals. Furthermore, the open and flexible structure of Advantech's hardware and software platforms enables local SIs to continue developing solutions in the future.

Innovative solutions strengthen prospects for MaaS

Mr. Lin emphasized that safety and reliability are the most important considerations for transportation and traffic management. Undoubtedly, AI-powered solutions are superior for executing traffic light management, lane-departure correction, and collision avoidance tasks. Although there is always a risk of hardware failures and software errors occurring, AI-powered solutions have the potential to reduce traffic accidents, making roads safer for everyone. However, as smart solutions are increasingly implemented in vehicles and transport infrastructure, the responsibilities of drivers, operators, and systems need to be carefully defined.

"We considered the needs of every ecosystem and developed a robust, reliable, yet flexible solution that local vendors can easily install and integrate." — Van Lin, Senior Director of the Service IoT Group at Advantech.

Accordingly, policy-level support is vital to the development and deployment of AI-powered transport solutions. In many countries, legislation and insurance policies continue to lag behind technological advancements. Nevertheless, the global trend for utilizing ITxPT, V2X, edge AI, and 5G technologies is becoming more evident, with many governments expecting these solutions to boost MaaS development. As a leading transport and traffic solutions provider, Advantech will continue collaborating with ecosystem partners to create more sophisticated solutions for specific vertical markets and support transport agencies, operators, and drivers with delivering intelligent transportation. ■

Taiwan Leverages ICT to Explore Global Electric Bus Business Opportunities

Taiwan's tech companies, through consolidated national effort, can exploit global business opportunities for electric buses in emerging markets by serving as system integrators (SI), uniting upstream and downstream companies in the bus supply chain, and offering consolidated services.

Photos provided by TAITRA
Interview with James Huang, Chairman of the Taiwan External Trade Development Council (TAITRA)

Growth momentum in the global EV market continues to strengthen as green energy and environmental protection gain traction. In order to take advantage of business opportunities while addressing battery power and supply bottlenecks, traditional automakers and major tech companies are developing EVs, deploying charging stations, and establishing maintenance centers. James Huang, Chairman of the Taiwan External Trade Development Council (TAITRA), believes that the global EV market will grow at an increasing pace as more countries move towards banning the sale of fossil-fuel vehicles between 2030 and 2040.

"Faced with the EV wave, Taiwan manufacturers are more likely to find opportunities in electric buses than electric cars," stressed Mr. Huang. Taiwan lacks the support of manufacturing plants in the comparatively competitive car market, Taiwan cannot effectively compete with international rivals that boast a robust supply of key EV components for cars. Conversely, Taiwan already possesses many assembly plants and can utilize its ICT prowess to develop smart in-vehicle infotainment and safety systems for the electric bus market. Indeed, Taiwan could more effectively exploit market opportunities by orienting itself towards producing electric buses for both urban transportation and shuttle services/point-to-point transportation.

Taiwan ICT companies can serve as SIs to build national EV production effort

Japanese and Korean manufacturers leverage major conglomerates as integration partners that pool domestic industrial resources for joint forays into overseas markets. Taiwan should endeavor to build a similar platform by assessing the resources and advantages of all its industrial manufacturers carefully and formulating complementary strategies that explore international markets.

Mr. Huang added that, "Taiwan excels at integrating ICT and three electric systems (battery systems, electric drive systems, and electric control systems). Electric buses will develop in the intelligent direction, which will lead to ever-increasing demand for intelligent solutions such as driver behavior management, advertisement and infotainment. Accordingly, Taiwanese ICT companies should position themselves as SIs that develop smart systems while partnering with manufacturers of batteries, motors, and other key EV components. This will enable these companies to offer complete EV solutions and attract potential overseas buyers."

Consolidated services capture business opportunities in emerging markets

Mr. Huang thinks that Taiwan is not at the level of Germany or Japan in terms of battery and motor manufacturing technologies, but that it can adopt an innovative business model bolstered by high product quality and flexible pricing. Indeed, Taiwan can provide the most competitive smart in-vehicle system solutions and electronic control systems while offering key components in a variety of packages. Doing so would allow customers in emerging markets to select optimal combinations based on their budget and need and this would allow Taiwanese manufacturers to deliver customized products and services that attract new business opportunities using this strategy. For instance, one bus manufacturer produces low-cost, small, and fast-charging batteries designed to reduce vehicle weight while augmenting operating efficiency. The company can access a market for small electric buses used in point-to-point transportation by pairing its batteries with diverse smart systems, after which these components can be assembled into complete vehicles.

Mr. Huang added that Advantech is experienced in designing and manufacturing industrial computers and IoT devices. Likewise, Advantech is capable of integrating the technological resources of Taiwanese vehicle and key component manufacturers. Advantech co-worked with TAITRA and won VinBus project in 2020 and start operation in Hanoi by end of 2021. Should Advantech cooperate with other Taiwanese innovators in the future — like RAC , Master, Tron-e, TAV, MaxWin, Chimei Motor Electronics — they would improve their competitive advantage while gaining new overseas markets.

TAITRA is an important platform in the development of overseas markets for Taiwanese manufacturers. It actively matches business deals between manufacturers and overseas EV buyers while building connections between tech firms and traditional automakers in Taiwan. This helps jointly promote products and services from Taiwan's EV industry in emerging markets. ■

Promoting Vehicle and Road Intelligence Empowers Smart Transportation

Smart developments in roadside transportation cover a wide range of application fields. Advantech invests in many of these fields and is working to build smart urban road networks with complete systems and solutions from the edge to the cloud.

Photos provided by Advantech & VinBus
Interview with Van Lin, Senior Director of Intelligent Mobile Solutions and Fleet Management of Advantech; David Yang, Product Manager of Advantech

A fundamental consideration in road and smart highway development is the continuous advancements in AIoT and other innovative technologies related to intelligent vehicles and roads, which are constantly evolving. Advantech is working closely with ecosystem partners from every sector to develop and implement in-vehicle and infrastructure solutions for smart highways and roads as part of a greater effort to advance smart cities.

Advantech provides VinBus with complete software/hardware integrated solutions

Vehicle intelligence systems include vehicle positioning, navigation, collision avoidance, and safety warning solutions. Many of these technologies have matured and are now used widely by vehicles in urban areas. VinBus, a renowned public transportation service provider in Vietnam, is equipping its electric buses with Advantech's intelligent bus solution. These buses are the first of their type and have been deployed in Ho Chi Minh City, Hanoi, and Phu Quoc.

VinBus specializes in intelligent electric buses and is a subsidiary of Vietnam's largest conglomerate called VinGroup. They recently launched a large-scale electric bus project aimed at improving environmental sustainability. VinGroup sought to improve commuter experiences by building safe, comfortable electric buses that provide a range of diverse smart services.

VinFast, a subsidiary of VinGroup that manufactures automobiles, was seeking a partner capable of supplying the smart solutions they needed for their electric buses. Advantech's superior hardware and software-integrated solutions for electric buses and extensive experience implementing similar projects in Taiwan made them the logical choice.

While collaborating with Advantech, VinBus opted for the TREK intelligent electric bus management system as their solution. David Yang, Product Manager at Advantech, said "The TREK intelligent bus management system delivers advanced driver assistance and behavior management functions, as well as Wi-Fi services and advertising. The system improves bus safety, comfort, and convenience; and is helping to transform public transportation in Vietnamese cities."

VinBus's intelligent electric buses have been undergoing trials since May 2021. These trials involved the provision of passenger services on 10 routes in Hanoi and four routes in Ho Chi Minh City and Phu Quoc, respectively. Between 150 and 200 buses were put into service during this first phase. These buses delivered a comparatively safer, more convenient, and comfortable public transportation experience to Vietnamese commuters. Van Lin, Senior Director of the Intelligent Mobile Solutions and Fleet Management Sector at Advantech, pointed out that VinBus has completed the first phase of the electric bus project and is expected to launch the second and third phases within the next two to three years. The second phase will involve the deployment of 2,000 to 3,000 electric buses in major cities in Vietnam. These electric buses will combine comfort and intelligent features in an effort to make bus patronage more appealing.

Advantech is now replicating this successful project in other countries. Advantech has further developed the TREK-60 modular in-vehicle AI platform in an effort to meet the unique criteria of different cities. TREK-60 features a high-performance processor with 5G and Wi-Fi 6.0 technologies, supports expansion via add-on modules, and offers other high-end communication capabilities aimed at producing more intelligent solutions for buses.

Advantech promotes road intelligence

Roadside smart solutions are used in smart bus stops, parking fee collection, traffic signal controls, electronic toll collection (ETC), intelligent bus routing, and intersection safety controls. Advantech solutions proved crucial in realizing all of these applications.

When considering bus stops, Mr. Lin posits that countries committed to promoting bus rapid transit (BRT) systems are presently attempting to

integrate road information into smart bus stops. This improves travel experiences by facilitating the provision of precise arrival times that enable passengers to better plan their itinerary.

He added that in addition to general gate control systems, the popularization of electric vehicles means that future parking lots will create demand for charging and vehicle management smart applications. Accordingly, Advantech is working with its partners to provide relevant software and hardware-integrated solutions for charging stations.

Advantech and FETC International are working together to promote smart transportation applications for ETC systems. Currently, FETC uses WISE-PaaS, Advantech's industrial IoT cloud platform, because of its comprehensive device connectivity and management functions, remote operation and maintenance, and AI model training. According to Mr. Lin, their collaboration with Advantech will make it easier for city transport administrators to implement new smart applications. These applications will be in line with their operational goals and aimed at improving overall road network management.

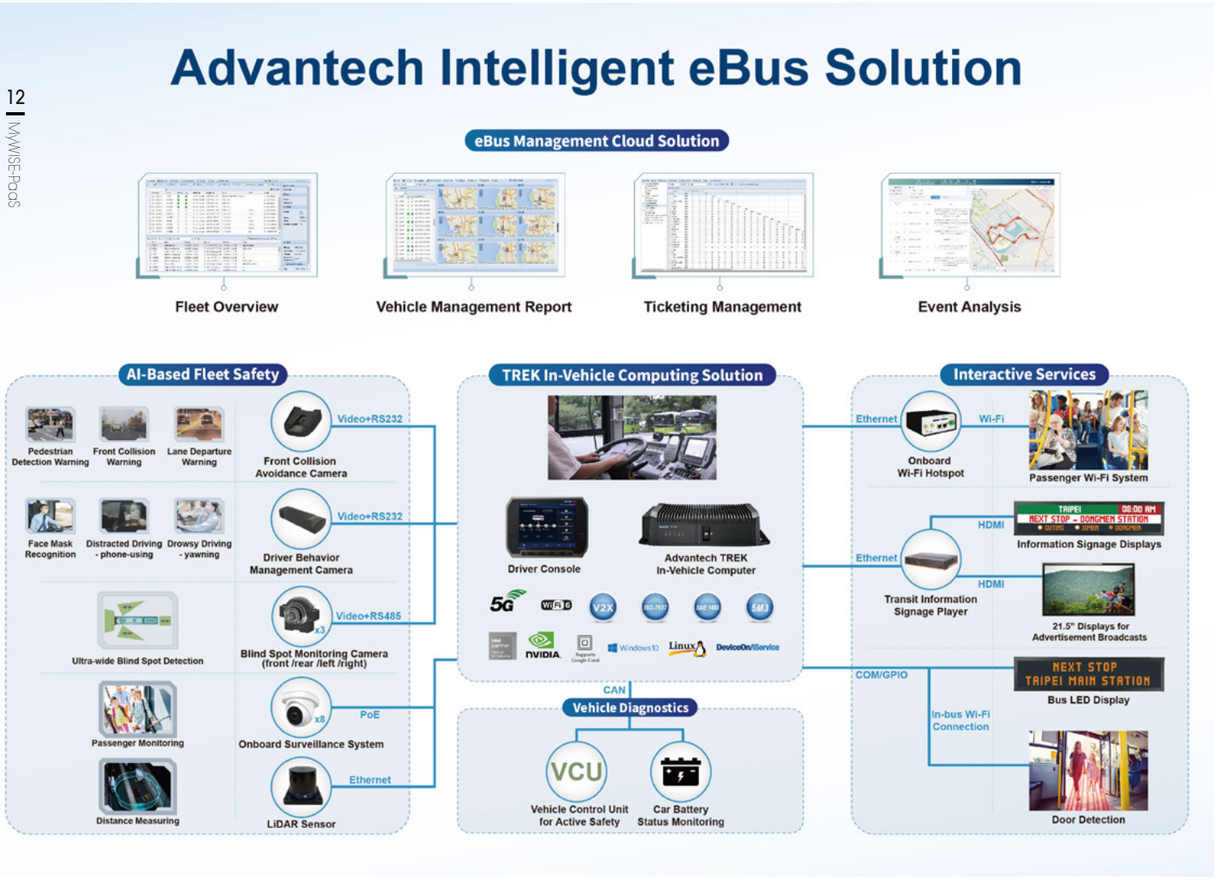
Building a complete smart road system from the edge to the cloud

Mr. Lin added that smart road networks can only be built if the vast data collected from in-

vehicle systems and road infrastructures are integrated on a dedicated platform for analysis. Doing so is key to creating door-to-door smart transportation services through the utilization of Mobility-as-a-Service.

Likewise, smart roads development cannot be accomplished by building single-point applications. This development necessitates a set of intelligent systems that connect expandable platforms at the network edge using an open cloud platform. System administrators seeking to create intelligent applications need ensure that data is accurate and used effectively.

Mr. Lin concluded that realizing smart road transportation systems pivots on a city governments' ability to build smart infrastructure. This influences everything, from smart intersections and roads, to the eventual formation of a complete smart road network. Industry chain manufacturers in smart road transportation should encourage further collaboration to develop smart road solutions. Advantech's role in this development involves the utilization of its specialized industrial grade hardware and Advantech's WISE-PaaS as the core integration platform that connects partner solutions and creates an open SaaS. ■



Advantech products and solutions

1. **eBus management cloud solution**
2. **TREK in-vehicle computing solution**
3. **AI-based fleet safety**
4. **Interactive services**
5. **MachineUnite solution powered by WISE-PaaS platform**

Advantech Contributes to Taiwan's Intelligent Transportation System Development Project

Advantech has joined forces with local systems integrators (SIs) and software partners to contribute to Taiwan's Intelligent Transportation System (ITS) Development Project. This has helped cities in Taiwan establish a regional smart dynamic traffic monitoring and control system that has reduced traffic congestion and highway bottlenecks.

Photos provided by Fotolia

In many Asian countries, rural-urban migration is on the rise, resulting in constant challenges for road and traffic systems. In Taiwan in particular, extremely high car and motorcycle ownership rates are already pushing these systems beyond their limits. To address this issue, Taiwan's Ministry of Transportation and Communications launched the ITS Development Project in 2017. This is a long-term project focused on utilizing the latest technologies to improve infrastructure and provide smart mobility services to citizens and road users.

In the first stage of the project, the Transportation Corridor Congestion Improvement Program was launched. By deploying the latest visual recognition, big data, edge AI, and cloud computing technologies, the government aims to establish a regional smart dynamic traffic monitoring and control system for improving traffic at congestion hotspots and minimizing bottlenecks near highway interchanges.

Leveraging expertise to deliver a self-adapting traffic signal control system

Advantech joined forces with a local SI that specializes in transportation planning, engineering, operations, and management and a software developer that specializes in AI-based visual recognition solutions. For this project, the team selected Advantech's MIC-720AI compact AI inference system with NVIDIA® Jetson™ Tegra X2(TX2) module to serve as the edge AI system installed in roadside traffic control cabinets, while Advantech's SKY-6100 AI inference server was selected to be deployed in the control room.

In addition to visual recognition algorithms for collecting, analyzing, and transforming data, MIC-720AI features edge AI inference technology to run AI algorithms for vehicle type recognition and tracking. Its powerful deep learning capabilities satisfy any requirements for edge computing, including packaging and transmitting metadata to the centralized control room. Additionally, MIC-720AI is equipped with multiple interfaces that enable integration with other traffic equipment.

Meanwhile, at the centralized traffic control room, the SKY-6100 inference server with intuitive dashboards is used to perform AI analysis and generate reports that provide insights such as road occupancy rates, average wait times at

intersections, and information regarding the type and number of vehicles heading in any direction. Thus, the SKY-6100 server enables real-time traffic monitoring and self-adapting traffic signal control, while also identifying traffic patterns to optimize traffic management.

End-to-end AI solution for traffic prediction and proactive transportation planning

Traffic insights allow city governors to predict future road traffic patterns and plan proactive transportation measures, including traffic impact assessments, public transportation planning, and road design. Moreover, by integrating edge AI visual recognition capabilities with the traffic management system, traffic violation notifications can be broadcast on LED displays at roadsides to instruct drivers to adjust their driving behavior.

Well-designed, end-to-end dataflow is crucial for real-time traffic monitoring applications and self-adaptive traffic light control. However, many traffic monitoring systems currently available on the market focus on vehicle recognition and counting. They also lack the raw metadata analysis and processing to make them more beneficial. In contrast, Advantech provides an end-to-end AI solution and offers comprehensive edge AI inference systems that have sufficient deep learning capabilities to initiate AI functions.

The KPI report for Phase 1 of this project was released in early 2021 and indicated a 15% improvement in overall traffic. This contributed to saving 373,853 liters of fuel and reducing annual CO2 emissions by 846 tons. Accordingly, an increasing number of cities in Taiwan plan to install edge AI computers in roadside traffic control cabinets to collect traffic data. Furthermore, if these edge AI computers are integrated with existing traffic systems, such as highway traffic control centers, data collected by self-adapting traffic signal control systems can be shared between organizations and ultimately enhance traffic efficiency. This is expected to further reduce traffic congestion in urban areas and enable safer, more enjoyable transportation. ■

Advantech's Solutions and Application Benefits

Advantech has developed end-to-end AI solutions, edge AI systems, and AI inference systems with deep learning capabilities to enable AI inference for transforming raw traffic metadata in order to optimize intelligent transportation systems.

Taipei City Reduces Wait Times with AI Traffic Light Control System

Advantech has helped the Taipei City Government implement AI smart traffic light control systems at major intersections in Taipei. These system use advanced edge AI technology to improve traffic efficiency, reduce vehicle wait times at red lights, and enhance pedestrian safety.

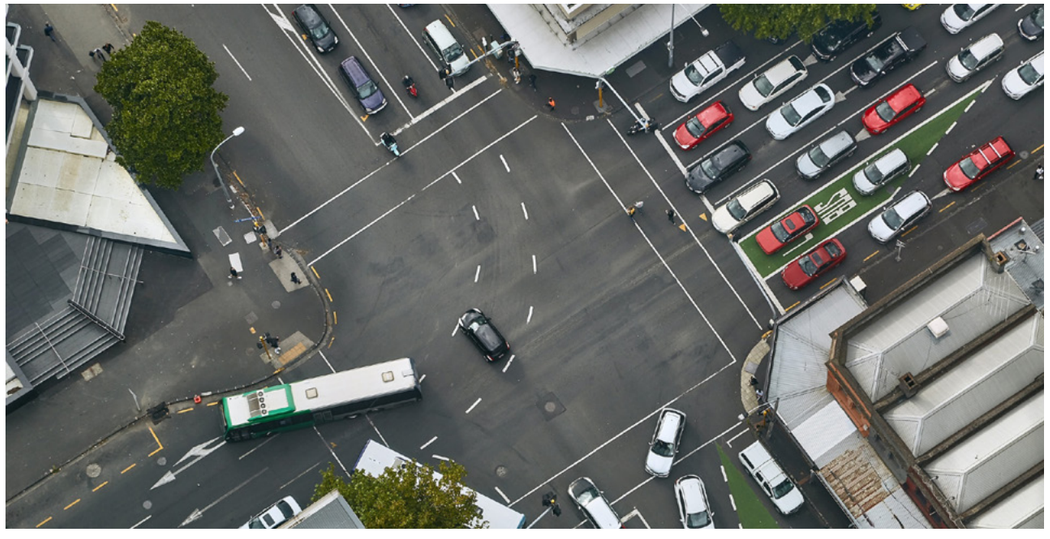
Photos provided by Advantech

Ensuring pedestrians have enough time to safely navigate intersections necessitates making vehicles wait longer at traffic lights. While this approach is necessary during the daytime, it becomes less salient at night when fewer pedestrians are on the streets. It also results in nighttime drivers having to wait for unnecessary periods at intersections on arterial roads. To address this issue, the Taipei City Government has been implementing AI smart traffic light control systems since 2019.

Advantech's edge AI system plays a key role

For this project, the AI smart traffic light system was integrated by THI Consultants Inc. The system combines cameras with Advantech's MIC-720AI industrial-edge AI host and Yuan High-Tech's AI algorithm to enable traffic light adjustments based on actual traffic flow.

The roadside surveillance cameras are used to collect pedestrian and vehicle data via AI image detection. First, all captured images are uploaded to MIC-720AI in real time. The system then initiates AI image detection functions to calculate the position of the pedestrians and vehicles. Based on the results, the system can extend the duration of green traffic lights by activating relevant control signals in real time. In terms of algorithm performance and recognition accuracy, Yuan High-Tech continually monitored and adjusted the system's label and item recognition capabilities to maintain the precision of the AI image recognition algorithm.



For this project, the AI smart signal control system utilizes an edge computing structure that necessitates the hardware meets three key criteria. First, the hardware must be capable of high-performance computing to facilitate stream decoding and image processing. Second, the hardware must have sufficient processing power to facilitate deep learning and deduction since environmental changes impact image recognition precision. Third, the hardware must be capable of withstanding the harsh environmental conditions typical of outdoor installations, including exposure to high temperatures, rain, and humidity.

To meet these criteria, Advantech's MIC-720AI is equipped with an NVIDIA® Jetson™ Tegra X2 module. The fanless design features built-in image recognition modules and supports deep-learning models and processes. The wide operating temperature range also makes it ideal for outdoor applications that require AI edge computing. Moreover, MIC-720AI can be upgraded to a complete AI solution with the integration of a signal control system.

In addition to providing a solution that satisfied their usage requirements, Advantech offered excellent after-sales services. AI smart signal control systems typically stop functioning during outages and require engineers to reactivate systems onsite. To address this issue, Advantech also installed special circuit boards that automatically reactivate devices upon power restoration, significantly reducing operating and maintenance costs.

Annual savings of US$66,000 with AI smart signal control

Overall, the system can adjust traffic signals according to actual real-time traffic flow. Moreover, it improves the efficiency of arterial roads during the day and reduces red light wait times at night. Indeed, the average wait time for a vehicle across different periods has decreased by 15% to 78%. Time spent waiting for red lights on arterial roads at night has also declined by 35%, with lights on arterial roads staying green for 7% to 79% longer.

The reduction in red light wait times corresponds with a decrease in vehicle idle times and fuel consumption. One estimate indicates that the system has reduced annual carbon emissions by approximately 23 tons, for an additional economic benefit of saving US$66,000.

In 2020, the Taipei City Government expanded the upgrade of the city's intersections. They added advanced AI smart signal control systems that incorporate accurate and reliable detection equipment. This has reduced unnecessary wait times, improved traffic efficiency at intersections, reduced traffic jams, and increased overall capacity. In recent years, Advantech has invested considerable resources into the development of edge computing equipment. When coupled with THI Consultants' extensive experience in integrating smart traffic systems, this forms an ideal partnership for creating practical edge computing applications. Moving forward, the continued collaboration between THI Consultants, Yuan High-Tech, and Advantech will serve to accelerate the development of the smart traffic system market. ■

Advantech Future-Proofs AI Edge Computing for U.S. Smart Cities and Roadside Infrastructure

The U.S. Department of Transportation (DOT) has implemented an AI edge video monitoring system that was built in collaboration with Advantech. This system improves road infrastructure, traffic management, and operational efficiency while ensuring safe and congestion-free roads.

Photos provided by Advantech

Road infrastructure is designed to manage traffic. Despite this, congestion in large cities is unavoidable. On behalf of the United States Department of Transportation (U.S. DOT), Advantech built a powerful and robust AI edge video monitoring system aimed at improving road infrastructure and traffic management to facilitate safe and worry-free road travel.

Finding an adequate and cost-effective solution

The U.S. DOT implemented Advantech's AI edge video monitoring system in an effort to improve transportation safety and reduce traffic congestion through visual recognition and data analysis. It was critical that the system support 5G and be future-proofed to facilitate the development of smart city applications for managing growing traffic demands.

The U.S. DOT needed a video monitoring solution that did not rely on the use of an underground loop detection system to achieve this goal. This is because such systems are time-consuming to construct, costly, and challenging to maintain. Instead, Advantech suggested using an aboveground video detection system with a powerful edge computer and GPU to minimize expenditures and maintenance. The proposed system uses video cameras and sensors to capture data for processing and provide critical information to traffic controllers.

The acquired data enables the district and traffic control centers to monitor and manage traffic congestion, flow, and efficiency. Additionally, the intelligent AI video system supports edge data analytics to enable predictive travel time analysis for reducing traffic at intersections.

Advantech and partners build a customized platform

Advantech collaborated with several partners to create a customized platform for the AI edge video monitoring system in order to meet district-specific demands. Indeed, Advantech, Intel, and NVIDIA collaborated on integrating Intel's x86 architecture and an NVIDIA GPU system into a single platform for roadside infrastructure. Intel and NVIDIA's respective support for edge computing systems and edge GPU processing enabled Advantech to engineer a complete system capable of reliable data processing.

Advantech used an ODM model to address complex system design challenges. The end result was a future-proofed edge system capable of processing video, traffic, and sensor data for traffic management and flow optimization. This edge computing system and GPU unit support future expansion to other smart city infrastructure applications.

In addition to this project, Advantech's partnership with NVIDIA has benefited the development of AI for other smart transportation and smart city applications. Together, Advantech and NVIDIA are driving innovative transformation in AI applications through close collaboration with AI product development partners and shared global marketing programs. For example, Advantech's MIC Jetson Series offerings, which are powered by the NVIDIA® Jetson™ platform, offer all the performance of a GPU workstation in an embedded module. In addition to multiple I/O, these devices offer full compatibility with Jetson, making them ideal for video capturing, recording, and streaming. When paired with an AI SDK, the MIC Jetson Series devices offer rapid AI deployment with AI function blocks. As demonstrated in this project, inclusion of the NVIDIA® Jetson™ platform enabled Advantech to rapidly integrate AI with the intelligent transportation system.

The future for smart transportation and smart city applications is bright. Many cities are promoting the smart development of their urban infrastructures. Advantech and its partners will continue to collaborate on solutions that accelerate this process in an effort to make cities smarter and safer. ■

MIC-720AI, MIC-730AI Key benefits

1. **Improves traffic flow and operational efficiency**
2. **Predictive travel time analysis reduces traffic at intersections**

Advantech's Ultra-Compact Edge Technology Facilitates Autonomous Mobile Robots

Advantech recently helped a renowned Chinese robotic solutions provider implement autonomous 3D vision-guided robots or autonomous mobile robots (AMRs) as charging stations for electric vehicles (EVs), taking EV technology to the next level.

Photos provided by Advantech

The development of EVs has received much attention in recent years, with EVs proving to be an increasingly popular option for new car buyers. However, anxiety over the existing charging infrastructure remains a concern and source of hesitation for buyers considering purchasing an EV. Challenges related to charging stations include the risk of running out of power while driving, not having enough time to charge at home, and difficulty locating a charging station. Drivers without a garage or designated parking space may be unable to setup a personal charging station, and long electric cables around the house may pose a safety risk.

To address these challenges, the robotic solutions provider chose Advantech's industrial edge product offerings to construct AMRs. Specifically, Advantech's compact, high-performance computers were deemed most suitable because of their industrial-grade design and compliance with relevant certifications. This ensured they would be able to withstand operation in harsh outdoor environments and support applications that necessitated longevity and reliability.

Overcoming the limitations of fixed charging stations

The proposed AMR system was an integrated software/hardware solution that was both cost-effective and flexible. Instead of EV drivers needing to locate a vehicle charging station, an autonomous charging robot seeks out and comes to the EV to charge it. With the flexibility of this system, any ordinary parking lot can be converted into an EV charging station.

Regarding hardware, the AMR comprises several high-power components and advanced machine vision systems, including a drive motor, battery, industrial computer, 3D positioning sensors (binocular cameras), laser radar, switches, 4G/5G network modules, and speakers. USB 3.0 is used to connect the system to cameras for managing guidance tasks and capturing images. Because parking lots have limited space, the provision of a compact edge solution was vital for ensuring quick and efficient charging.

With the ability to support diverse application requirements, Advantech's comprehensive product portfolio makes it easy to develop highly integrated solutions. The solution provided specifically for this project included an Advantech IPC-240 industrial computer, PCE-GIGE4 expansion card with PCIe x4 support, PCIE-1154 4-port PCI express USB vision frame grabber, QCAM-UM1440-220CE industrial camera, PCI-1680U 2-port CAN bus universal PCI card with isolation protection, and a BB-SL300 series SmartStart industrial LTE cellular router.

Creating an AMR with an ultra-compact form factor

The AMR was designed to perform various tasks autonomously, including identification (facial recognition and behavior analysis), network communication, and visual positioning. During driving operations, the EV's network module accesses digital maps and obtains precise location information. Meanwhile, the AMR's industrial cameras gather environmental data and the laser radars measure distances, detect obstacles, and locate charging ports on EVs via binocular cameras in order to accurately locate and control individual robots.

The solution provided by Advantech was exceptionally effective for EV recharging applications. Powered by a 7th generation Intel® Core™ i processor, the IPC-240 computer features multiple I/O and PCIe/PCI card expansion slots for integrating image acquisition functions, communication (LAN), and Fieldbus control into a single and highly adjustable solution. Its compact size and specialized industrial design allow for easy installation and future expansion, which is an essential requirement for robots. Moreover, support for wide input voltage combined with the smart fan design ensure stable operation in all environments.

PCIE-1154 is a 4-channel USB frame grabber card that features an isolated USB 3.0 port for independent bandwidth camera interfaces to enable consistent data transmission without frame dropping. The lockable design eliminates the risk of accidental cable disconnection, ensuring reliable connectivity. Meanwhile, the PCE-GIGE4 expansion card features an Intel® I210 Ethernet controller that connects to the laser radar for ultra-fast data transmissions. This controller functions alongside the PCI-1680U PCI card to control the robot's movement; for example, applying the brakes, changing direction, and accelerating. The BB-SL300 router, with support for LTE full Netcom, was adopted to deliver seamless industrial communication.

Overall, the solution's excellent capabilities and Advantech's impeccable project execution have contributed to a positive public perception of EV infrastructure. With its global customer support, prompt repair services, and consultation capabilities, Advantech has the capabilities to consistently deliver reliable innovative solutions. Looking to the future, Advantech will continue collaborating with partners to develop solutions that promote and popularize EV adoption globally. ■

Advantech's Intelligent City Transportation System Promotes Autonomous Driving

A Chinese manufacturer of commercial vehicles adopted Advantech's smart transportation solution while implementing an autonomous driving bus rapid transit (BRT) system in China. The project helped the manufacturer secure its status as a major player in the smart bus market.

Photos provided by Shutterstock

Big data, AI, 5G, and other cutting-edge technologies are pushing urban transportation towards sustainable, intelligent, and networked solutions. Analogously, autonomous cars play a central role in the move toward smart city transportation. Traditional car manufacturers have endeavored to create smaller passenger cars while larger vehicles like buses have transitioned to autonomous driving. A city government in China implemented an autonomous BRT with assistance from Advantech and the manufacturer of commercial vehicles on the main streets of the city in an effort to become a smart city and leverage smart autonomous driving.

Advantech's intelligent transportation system: the brain of the vehicle

Promoting sustainable development was a core ambition of the manufacturer's autonomous driving system. The manufacturer demanded stable and reliable high-computing products for use as major controller components in autonomous driving. Following careful consideration the company chose Advantech as its partner. This decision was based on the characteristics of Advantech's products, Advantech's reputation for producing high-quality/high-performance computing platforms, and their innovative manufacturing and after sales support.

The core control unit for the entire system was Advantech's ITA-460 fanless system. This system perfectly met the manufacturer's demands related to performance and size. ITA-460 functions as the vehicles brain, and is responsible for processing the vast amounts of external environment data. It can analyze and distinguish obstacles, perceive and locate objects in the environment, and then decide how to proceed. These functions necessitated a system with high performance computing in order to support the complex environmental calculations required by the system.

The ITA-460 met customer's hardware requirements and passed their stringent environmental testing and EMC certification. Furthermore, Advantech made specific customizations for this project based on years of experience in designing industrial power modules. These customizations follow the commercial vehicle safety regulations strictly and have excellent anti-radiation and anti-interference performance. The robust design of the hardware is also specifically tested for protection against dust ingress and provides impact resistance. ITA-460 is fitted with M12 connectors and a wireless network expansion card. This brings both stability and flexibility, and delivers video test support and wireless capabilities. The manufacturer's system operates in complex traffic conditions and now has an advantageous position in the smart bus market.

Advantech continues to invest in innovations for commercial vehicles

Helping the company implement autonomous buses is a small step for Advantech towards realizing smart transportation worldwide. Advantech continues to invest substantial R&D resources into smart applications for commercial vehicles in order to create more smart urban transportation applications. In particular, the company has realized that machine vision is one of the most basic and crucial parts of autonomous systems. For example, the implementation of intelligent facial recognition, crowd control management, and fare evasion tracking requires better image recognition technology. Such systems must also be able to upload recorded image data to a cloud server when buses arrive at stations.

Advantech has deployed a new generation of vehicle-mounted devices that offer high performance and computing power in an effort to meet these needs. They utilize 8th and 9th generation Intel® Core™ i platforms and support GPU expansion. This provides high computing power while meeting the demands of image processing and AI-assisted applications. In conclusion, Advantech's complete ITA series products are set to become a driving force for the development of smart transportation in more cities.

Advantech is the ideal partner for many smart transportation customers around the world. Advantech offers stable and reliable product quality and complete pre- and after-sales services. As an important promoter of smart autonomous driving, the manufacturer will continue to work closely with Advantech. This mutually beneficial strategy will produce smart city transportation innovation. ■

Advantech Enhances Passenger Safety and Services on the Sydney Metro System

Seeking a system that complies with EN50155, EN50121-4, and IEC 61373 railway application standards, a global technology leader chose Advantech's ARK-2250R ultra-rugged railway transportation solution (TS) to improve safety and enhance services on the Sydney Metro System. The solution needs to handle heavy workloads and harsh environmental conditions on moving trains to ensure safe, reliable operation.

Photos provided by Shutterstock
Interview with Nic Lin, Project Assistant Manager of Advantech

Sydney is the largest city in Australia, with a population of nearly six million who rely heavily on its overstretched road networks. According to the Australian Bureau of Statistics, over 90% of Sydney households owned at least one motor vehicle in 2016. The city's rail network was designed to accommodate Sydney's 1970's population of just over 3 million, and has not been expanded. Consequently, traffic congestion and car dependency have become increasingly prominent issues. To address these issues and reduce carbon emissions, Sydney Metro, Australia's largest public transport project, began operations in May 2019. It is now Australia's first fully automated driverless metro service.

Rugged, certified onboard system for long-operation under harsh conditions

A global technology leader specialized in creating high-tech solutions, services, and products was selected as the systems integrator (SI) in this project. This company's history of providing solutions to diverse industries in 70 countries qualified them to build the central control and communication system for the Sydney Metro. The communication system on the train connects the public address system, passenger information systems, video surveillance systems, digital information boards, door sensors, and alarm systems, enabling a fully-integrated approach to information management.

The system needed to provide real-time arrival predictions and a route network map, notify the central control system of alarm events, and record around-the-clock video footage for future enquiries. Therefore, to ensure a smooth operation and seamless connectivity, the onboard embedded computer, which serves as the communication system, had to be rugged enough to operate stably for long periods in harsh conditions. Additionally, it had to comply with international standards for equipment intended for use on railway vehicles, such as the EN50155, EN50121, and IEC 61373 standards.

Professional field experience contributed to every aspect of the project

Advantech proposed using their ARK-2250R ultra-rugged railway transportation solution in an effort to cope with heavy workloads in hash environments with vacillating temperatures and shock/vibration. Featuring 6th generation Intel® Core™ i5/i7 processors, this solution delivers

the computing and graphics power needed to perform video transcoding, supports operation in wide temperatures (-40 ~ 70 °C/-40 ~ 158 °F), and is resistant to shock and vibration (IEC 61373 Category 1, Class B). To fulfill video surveillance requirements, the ARK-2250R provides up to 8 x PoE ports for IP camera connectivity through a single cable, eliminating unnecessary wiring in passenger coaches and streamlining installation. Furthermore, real-time surveillance video streaming from all IP cameras can be recorded on ARK-2250R's hot-swappable 2.5" SATA/SSD drive.

ARK-2250R comes preloaded with Advantech's WISE-DeviceOn remote device management software. This provides status information and alerts — on disk wear, overheating, and system overloads — that help the control room schedule system maintenance and guarantees nonstop-automated metro services. ARK-2250R helps enhance passenger safety and service quality by connecting to passenger information system displays. Likewise, it provides Wi-Fi services for passengers. To prevent doors from being obstructed, sensors and alarms fitted to the automated train doors are also connected to ARK-2250R. An audible signal will trigger in the event of an incident and the central control room will be notified.

A bespoke 4U front access chassis with a 2.5" SATA/SSD drive bay was used in the project to accommodate the limited space within the system's cabinet. In addition, the SI learned that the project required a watchdog software module after the system's launch and trial. This module needed to be delivered quickly for project verification. Accordingly, Advantech's technical team developed the watchdog API from scratch within 3 days then helped the SI package it with Linux OS after they encountered loading issues.

Two factors led the SI to choose Advantech. First, Advantech boasts considerable professional in-field experience and proven competence in rolling stock applications, and has a record of solving software and hardware integration difficulties in many other projects. In addition, disappointment with the previous supplier's supply chain reliability and services led the SI to seek a company with continuous hardware product supply and provision of local after-sales services. In the future, the solution will be upgraded with 11th generation Intel® Core™ processors, delivering faster and higher performance computing power to more advanced urban mobility applications. ■

Advantech's In-Vehicle Computer Facilitates a Comprehensive Fleet Management and Infotainment Solution

A renowned European systems integrator (SI) specializing in fleet connectivity, infotainment solutions, and passenger information systems (PIS) has chosen Advantech as its strategic partner. Through this cooperation, the two companies were able to assist a coach operator with improving fleet efficiency and increasing passenger satisfaction.

Photos provided by Shutterstock
Interview with Nic Lin, Project Assistant Manager of Advantech

In recent years, Europe's passenger coach service industry has undergone major changes. In 2017, the European Commission proposed a deregulation of the passenger coach market in an effort to reduce transport emissions and road congestion by encouraging the development of intercity transportation across Europe. The deregulation was successful in igniting competition and resulted in some service improvements.

However, to improve passenger experiences, many coach operators have digitally transformed their operations and services to enable passengers to take advantage of the enhanced comfort and improved services when travelling. These improvements include larger seats, power outlet sockets for charging mobile devices, free internet access, and passenger infotainment systems.

Reliable products, global logistics, and after-sale services key to pan-European projects

Advantech's long-established reputation for reliable high-quality products, as well as its global logistics network and after-sale services, were the key winning factors for this project. In the last few years, the SI has completed many successful transportation projects that incorporated Advantech's in-vehicle computers.

For a recent cross-border coach service project, the SI required a solution that was internationally certified, rugged, and capable of withstanding operation in harsh environments. They also needed backend software that supported remote device monitoring in order to manage in-vehicle systems and ease the after-sale services load. Meanwhile, the coach operator required real-time fleet management, PIS, and infotainment system capabilities combined with stable multi-country 4G LTE and in-vehicle Wi-Fi connectivity.

Fleet management and infotainment solution for diverse usage scenarios

After considering all the required features and functions, the SI selected Advantech's TS-206 in-vehicle Transportation Solutions (TS). Powered by a 6th Gen Intel® Core™ i5/i7 processor, TS-206 has sufficient computing power to support an infotainment system, PIS, and AI algorithms for driver behavior recognition, while also collecting vehicle data and recording real-time video streams from multiple cameras.

Additionally, TS-206 has received e-Mark and ISO-7637-2 certification for after-market in-vehicle electronic systems that can withstand vibration and shock (IEC 60721-3-5 5M3). The inclusion of multiple mini PCIe slots allows the SI to provide cost-effective pan-European SIM data packages and reliable Wi-Fi connectivity. In terms of safety and security, TS-206 features four PoE ports for connecting IP cameras to facilitate monitoring of passenger analytics and driver behaviors, such as driver fatigue and distractions.

By combining the SI's advanced programming with data from the built-in GPS module, 3-axis accelerometer, and CANbus interface, the TS-206 in-vehicle system can provide information regarding the vehicle location, speed and direction, travel time and distance, fuel consumption, and vehicle diagnostics. This information can then be transmitted to the SI's centralized Management and Monitoring System (MMS) to facilitate content management services, fleet connectivity statistics, and business analytics reports. The information also allows the SI to provide accurate and dynamic arrival time estimates throughout the journey, even when coaches are traveling through mountainous areas with limited network connectivity. However, with accurate vehicle positioning capabilities, places of interest in the surrounding area can be highlighted on the in-vehicle infotainment system for passenger entertainment.

The SI also integrated its software with Advantech's WISE-DeviceOn remote device management platform to create a dashboard for managing in-vehicle systems remotely. The provision of a centralized MMS and remote device management capabilities allowed the coach operator to conduct real-time fleet monitoring and predictive maintenance, improving overall fleet management and scheduling.

In the year since its deployment, this fleet management and infotainment system has operated without issue. Due to the benefits obtained from this solution, the coach operator has decided to extend the solution application to more of its long-distance coach routes. Moreover, because Advantech's TS-206 TS supports both Windows 10 and Windows 7 operating systems, this fleet management and infotainment solution provides a sustainable tool for diverse transportation providers. ■

Advantech's WISE-PaaS Platform Plays a Key Role in Accelerating the Development of Smart Transportation Applications

Advantech utilizes its WISE-PaaS industrial IoT platform to accommodate smart transportation trends driven by 5G, AI, and autonomous vehicles. Indeed, this platform connects ecosystems and partners, and accelerates the development of solutions for IoT applications in smart transportation.

Photos provided by Shutterstock
Interview with Sam Chuo, Senior Business Development Manager of Advantech

Continual advancements in digitalization, 5G, and AIoT technologies are combining with trends towards contactless business created by the COVID-19 pandemic to increase demands for smart city applications. Likewise, the growing popularity of autonomous vehicles has made smart transportation one of the most popular smart city development applications.

At the moment, the digital transformation of the transportation sector has expanded to include many fields — including airports, highways, railways, mass rapid transit (MRT) networks, buses, charging stations, and smart poles. All aspects of equipment networking, data acquisition and analysis, centralized cross-site management, and agile application development require the support of a powerful IoT management platform.This is why Advantech is utilizing its WISE-PaaS platform to promote digitalization and collaborating with transportation systems integrators (SIs) to educate partners on transport protocols, technologies, and customer needs. Together, we are working to develop various IoT application solutions for smart transportation in an effort to satisfy the operational needs of different sectors.

Assisting rail transit companies execute cross-site operations management

According to Sam Chuo, Senior Business Development Manager at Advantech, various smart transportation applications have similar operational architectures. Indeed, they all involve connecting the edge to a cloud platform for conducting data acquisition and device management despite the complex differences between application scenarios. For example, smart transportation solutions incline more towards the service industry than smart factory applications — making passenger safety, comfort, and convenience important considerations. In addition, the construction of transportation infrastructure is often tied closely to government regulations; thus, the direction of policies and regulations correspondingly influence demands for IoT implementation.

Likewise, the many elements connecting IT and OT systems in the transportation sector make collaborating with traffic engineering consultants, SIs, cloud service providers, and IoT platform provider (such as Advantech) essential. Plus, there are numerous factors involved in establishing close collaboration, maintaining solution flexibility, and supporting various protocols.

Considering all these elements, Advantech's WISE-PaaS platform provides the ideal solution for complex transportation projects. With its high flexibility, enhanced security, and easy integration, WISE-PaaS can support the entire service process from the edge to the cloud. This is the reason Advantech has participated in various smart transportation projects in recent years and become a popular partner for many transportation engineering consultants and SIs.

For example, Advantech has been involved in various smart pole projects led by county and city governments in Taiwan. Many devices, such as 5G base stations, sensors, roadside equipment, and network cameras, have been installed on street light poles that are interconnected and managed via WISE-PaaS. Additionally, because autonomous vehicles must collect roadside data while performing computation and transmission tasks, they require a reliable and seamless connection to smart poles. As the use of electric and autonomous vehicles becomes more prevalent, demands for smart pole construction are expected to increase.

Advantech has also contributed to many rail transit construction projects, even co-developing subway station management applications with SI partners in China. The WISE-PaaS platform allows data from multiple sources to be easily accessed and supports visualization and digital twinning functions to provide managers with a clear overview of real-time operations. Information regarding every transit route, station, and piece of equipment can be visualized using a tree diagram. This level of detail allows administrators to check the relationship between different stations and pieces of equipment in order to optimize cross-site operations.

Supporting DevOps to realize the rapid iteration of transportation applications

Mr. Chuo also reported that Advantech recently formed an official partnership with FETC International Co., Ltd., a subsidiary of Far Eastern Electronic Toll Collection Co., Ltd. Together, these companies have co-created a next-generation electronic toll collection (ETC) management platform and exported the platform overseas. The platform has since been implemented in Thailand, providing an inspiring example of digital transformation in smart transportation.

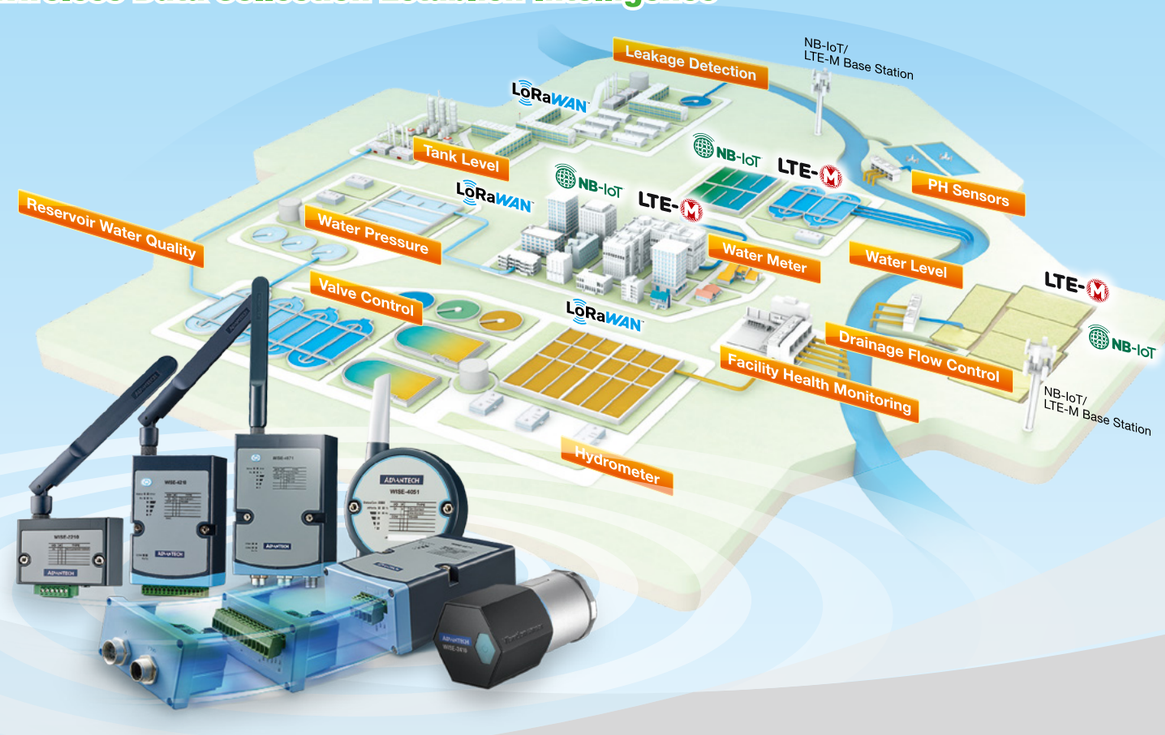
The co-created ETC management platform is primarily based on the WISE-PaaS software MachineUnite. This is a machine-to-intelligence (M2I) software solution that can be integrated with sensors, cameras, RFID readers and other devices to facilitate equipment management and data visualization. For operations and maintenance personnel, MachineUnite accelerates troubleshooting and optimizes operational efficiency.

Finally, efforts to control the global COVID-19 pandemic over the last two years have sparked a trend for contactless interaction, which has altered the business model for airport services. For example, boarding passes used to be issued in person at an airline counter. However, this is now being phased out and replaced with self-service kiosks. With support for remote device control, WISE-PaaS provides a practical solution for navigating this paradigm shift.

Mr. Chuo highlighted that previously, applications in the traffic sector were infrequently updated. However, with the popularization of digital tools and mobile devices, consumer needs and habits have changed drastically. To keep up with these changes, businesses are faced with implementing application updates every 3 to 5 days. Because WISE-PaaS is based on Kubernetes (K8s) technology, it can support DevOps, CI/CD, and other tools that facilitate rapid updates. Overall, WISE-PaaS is a highly flexible and expandable solution that can accelerate the implementation of smart transportation applications. ■

Data Accelerates the Evolution of Smart City

Wireless Data Collection Establish Intelligence



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WISE-6610, WISE-4610, WISE-2410

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WISE-4471, WISE-4671

NB-IoT/LTE-M IoT Wireless Modular I/O

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FETC International and Advantech Collaborate to Develop Next-Generation MLFF ETC Systems

Advantech has partnered with the smart transportation expert Far Eastern Electronic Toll Collection Co., Ltd. (FETC) to co-create next-generation multi-lane free flow (MLFF) electronic toll collection (ETC) management platforms.

Photos provided by FETC International
Interview with Kenny Chen, Vice President of FETC International; Dr. Allan Yang, CTO of Advantech

The growing use of ETC systems globally is driven by demands for increased transportation safety and efficiency and reduced traffic congestion and pollution. Moreover, technological advancements in IoT, ICT, and intelligent transportation systems (ITS) have provided a variety of solutions aimed at key ETC operations, such as automatic vehicle identification and classification, transaction processing, and violation enforcement. Of the various solution options, open-road ETC systems are widely preferred due to the complete elimination of toll booths. This allows vehicles to maintain typical driving speeds, preventing traffic bottlenecks caused by vehicles slowing down to go through a toll booth lane.

Taiwan's highway MLFF ETC system was launched in 2014 and is the world's largest highway ETC system. More importantly, Taiwan is the first country in the world to switch to an all-electronic MLFF system. This highly integrated open-standard intelligent transportation solution supports a comprehensive range of IoT, ICT, ITS, and one-for-all services.

Upgrading MLFF ETC systems with Advantech's WISE-PaaS platform

Founded in 2004, FETC was contracted by the Taiwanese government to build and operate an ETC system for freeways nationwide. The company was also responsible for integrating the Taiwan ETC total solution. This included front-end and back-end systems as well as the overall business model, which covers planning, designing, building, testing, and operation. Taiwan's ETC system has undergone several changes since 2004. Even today, FETC continues to re-configure the system based on public feedback.

To achieve a nationwide distance-based MLFF ETC system, low-cost RFID sticker tags compliant with the ISO 18000-6C standard were introduced to Taiwanese road users in 2012 and were quickly adopted. Subsequently, between May 2012 and January 2014, the ETC usage rate accelerated from 43% to 94%. Overall, this distance-based MLFF ETC system has yielded a tolling success rate of 99.97% with approximately 99.98% vehicle detection accuracy.

Advantech has collaborated with FETC since 2004. Recently, the two companies co-created the next generation of ETC management based on Advantech's WISE-PaaS platform. The plan was to first target the Southeast Asian market, before using that success to rollout to the global market. In fact, the first successful implementation was recently completed in Thailand.

Combining industry-specific expertise to penetrate the global market

Mr. Kenny Chen, Vice President of FETC International, asserted that cooperating with Advantech to develop a next-generation ETC management system for the Thai project was strategically significant. Because the ETC system uses thousands of IoT sensors to ensure non-stop operation, the facilities of each toll gantry must be continuously monitored.

Advantech's WISE-PaaS provides a smart platform for data integration and collaborative management. Leveraging FETC's decades of development and technical experience in the ETC field, the platform not only provides an efficient visualized overview of all highway toll gantries, but also enables sensor inspections in 3D or VR format. This allows operations and maintenance personnel to implement corrective actions that resolve issues promptly, thereby minimizing the time spent troubleshooting and reducing overall maintenance costs.

According to Dr. Allan Yang, CTO at Advantech, "The integrated smart transportation solution leverages FETC's business intelligence and Advantech's ICT strengths. The platform is based on Advantech's industrial application software, MachineUnite, which satisfies FETC's requirements for equipment integration, equipment management, and data visualization." Advantech and FETC's collaboration serves as an excellent example of how Advantech's astute expertise and core competencies can be used to co-create solutions with local domain-focused systems integrators (DFSI).

Using Advantech's local sales and service networks in Southeast Asia, the two companies have been able to penetrate the Southeast Asian market. Advantech has a dedicated WISE-PaaS platform team in Southeast Asia for targeting countries prioritized by FETC, such as Malaysia, Thailand, the Philippines, and Vietnam. The team has established strategic business development plans with local ecosystem partners and signed contracts with 12 VIP WISE-PaaS customers.

As long-term strategic partners, Advantech and FETC plan to continue evolving their software and hardware capabilities and innovation in an effort to secure more ETC projects in Asia, Europe, and the U.S. ■

Advantech Joins Hands with Partners to Form an Electric Bus National Team

Photos provided by Advantech

In response to emerging opportunities in the global low-carbon public transportation market, Advantech has joined hands with the Taiwan External Trade Development Council and Tatung Co. to host Advantech Connect eBus webinar aimed at integrating upstream and downstream manufacturers in the electric bus industry. The mission is to effectively build a national team that can offer complete solutions in this field. Advantech's ecosystem will play a vital role in this national industry chain. With our comprehensive electric bus solutions that utilize AIoV (AI + Internet of vehicles) technology and our industry partners' outstanding long-term advantages in the ICT, motors, microcontroller units, and the batteries, Advantech can help the industry become extremely agile and competitive in the global market. ■

Advantech Assists VinBus to Launch Vietnam's First Smart Electric Bus in Hanoi

December 2, 2021: VinBus—a subsidiary of Vingroup, Vietnam's largest conglomerate specializing in intelligent electric buses—has launched the country's first smart electric bus fleet in Hanoi. The e-buses incorporate Advantech's Intelligent Electric Bus Management System—a complete AIoT solution that integrates both hardware and software. At this point in time, 48 vehicles are now operating along three bus routes. By adopting smart technology, VinBus has achieved the intelligent management and operation of its vehicles through centralized monitoring, charging, safety inspections, maintenance, repairs, and automatic cleaning.■

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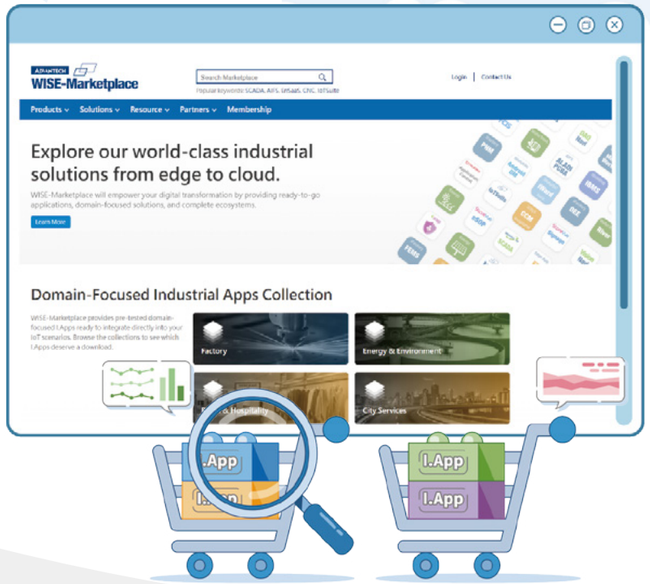

Complete Modules
Full-range of AIoT modules with transparent information to evaluate.

Shorten Development
Leverage Advantech and our partner's toolkits, don't need to develop from scratch.

Support Mechanism
Domain know-how involvement to optimize solutions and increase revenue.

Increase Revenue
Fully support from payment, delivery, deployment, technical training, and more.

Co-create Ecosystem
Become our partners to get the best benefits and leverage Advantech's ecosystem.

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Explore world-class industrial solutions from edge to cloud, all on WISE-Marketplace

WISE-Marketplace is an open platform originated from Advantech, a world-class leading brand in Internet-of-Things (IoT) intelligent systems, that makes shop-floor simple, scalable and manageable.

We've dedicated to selecting more than 200 industrial applications on disciplines of IoT, Networked-Devices, Data Analytics, AI applications & intelligent operations tailored for 7 focused-domains, including factory, water treatment, renewable energy, city services, healthcare, retail, and construction industry.

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- Suitable for the vehicle retrofit after sales markets in transportation and construction, autonomous cars and trucks, farm equipment, and heavy-duty vehicles.

Product Offerings

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In-Vehicle Fanless Platform

ITA-460G
In-Vehicle AI Fanless Platform

SKY-MXM-A2000
MXM 3.1 Type A NVIDIA® Quadro Graphics Card

AIW-355
5G WWAN Module

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ADVANTECH

Enabling an Intelligent Planet

Advantech's hardware, software, I.Apps, and integration solutions consist of various products designed for specific applications, such as in energy (solar energy, wind energy, smart grids, electric vehicle charging stations, building energy-saving, and energy-saving monitors), flood and disaster prevention, sewage treatment, remote education, public safety (smart street lighting, transportation safety), public health, telemedicine, smart medicine, cold chain management (food safety), smart agriculture, information security, and cloud computing. In 2020, our worldwide revenue for the sale of products used for sustainable purposes accounted for 15.79% of our total revenue.

In the future, we aim to incorporate sustainability concepts into our strategy blueprint for developing new products in different industries. We will continue to develop smart solution plans to make the world cleaner, safer, healthier, and more convenient, enabling an intelligent and sustainable planet.

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