Smart City × Industry 4.0
Success Story

A Business Spirit of Openness and Co-Creation:

Advantech's Collaboration with Partnerships in Smart City and Industry 4.0 Applications

Interviewee: Chaney Ho, Founder and Executive Director of Board, Advantech

IoT has been a global industry trend in recent years and a direction that Advantech has constantly strived toward. Since 2010, Advantech has been devoted to IoT development and the adjustment of business directions in accordance with this industrial evolution. According to our market observations, IoT advancements have gradually shifted from conventional technological developments to innovative practical applications over the years. Three major directions for practical IoT applications are intelligent living (e.g., e-commerce, wearable devices, etc.), smart cities, and Industry 4.0, as evidenced by an IoT report from McKinsey & Company. The report points out that by 2025, the output value related to IoT applications will reach US$11 trillion, which is equivalent to China's total annual GDP. In particular, smart factory applications not only exhibit the fastest growth rate but also account for the largest market output (approximately 33%), and this is followed by the combined output of smart city and smart healthcare applications (approximately 15%). I believe that the main reason that Industry 4.0 has developed faster than smart city applications is that smart cities rely more heavily on public investment. Since governments have certain political factors to consider and decision-making processes to follow when promoting new concepts, the developmental pace of public projects is naturally slower compared to private projects. On the other hand, private manufacturers can decide whether to invest in smart factory applications. With relatively simpler decision-making processes, private institutions tend to have higher production efficiency, higher product quality, and lower resource consumption. Hence, the developmental pace of private projects is invariably faster than public projects.

Following the publication of the "Smart City White Paper'" in 2014, Advantech has issued "Smart City & Industry 4.0 Success Story'" in 2017. This collection of IoT cases from around world is intended to educate system integrators and business owners about IoT applications. These case studies, which demonstrate the integration of IoT technology, are aimed at inspiring them to apply IoT technology to improve their city and factory environments. Through this collection, Advantech hopes to share its IoT solutions to inform system integrators and business owners devoted to IoT applications so that they are aware of the assistance and services that Advantech offers.

Advantech's Three-Stage IoT Development

At present, our IoT development strategy is organized according to the following three stages: hardware, solution-ready packages (SRPs), and cloud services. Despite producing low market output value, low self-created value, or even running the risk of the user becoming a free service provider at the initial hardware stage, hardware remains the most fundamental basis for IoT development. In contexts where even a moderate amount of data is involved, there is no way of collecting information without hardware, and the absence of hardware would render subsequent applications and cloud services moot. In the IoT field, Advantech plans to continue maintaining its competitive advantages by developing new, cost-effective products by employing various
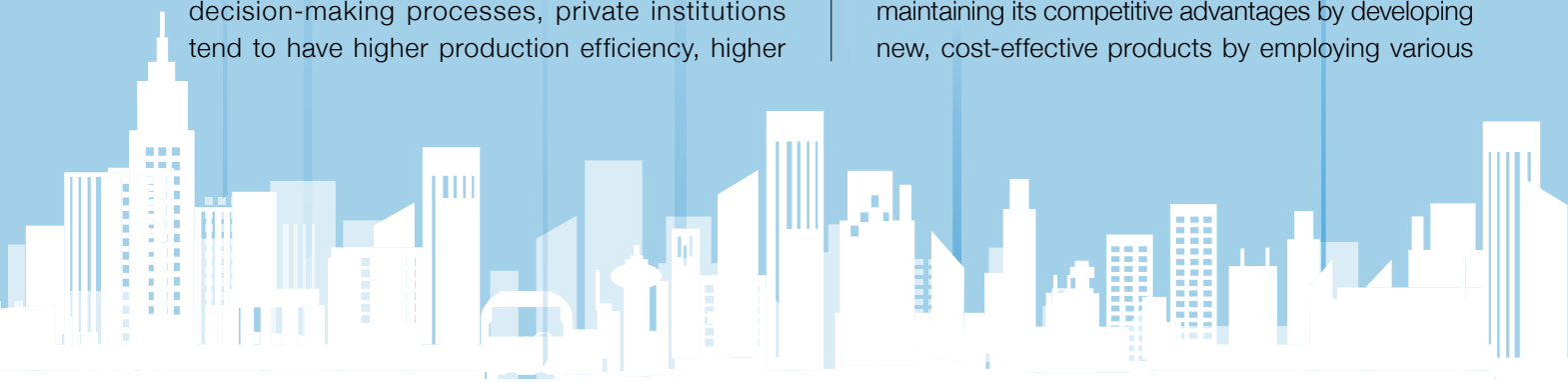
management approaches and IoT technologies to fulfill different IoT hardware requirements.

For hardware, Advantech is currently developing SRPs composed of hardware and middleware in addition to edge intelligence servers, and these will be the main driver of Advantech's business growth in the future. Over the past 3 years, the company has invested a considerable amount of resources into software design and development while actively working with external experts. For instance, the IoT PaaS platform is a perfect R&D outcome from collaborating with IT industry experts and Industrial Technology Research Institute of Taiwan. In the future, Advantech will continue to devote itself to this field in the hope of developing top-tier middleware for even more IoT hardware manufacturers in order to raise the value of the IoT hardware industry. For SRPs, Advantech has also developed a range of SRP solutions to address the various needs of different sectors. We may in the future introduce an API so that business operators can develop their own IoT applications. After all, in an era where a sharing economy has become a norm, following personal ideas irrespective of external circumstances will impede both self-growth and business competitiveness. Regarding cloud services, the cloud is taken as a basis for providing IoT application services; it is also at this stage that most IoT value is created. For instance, through cloud-based big data analysis, a machine manufacturer could inform one of its customers of the time at which a machine is predicted to malfunction, which would allow for repairs and maintenance to be arranged at an earlier stage and thereby avoid affecting customer production schedules as a result of mechanical malfunction. Since this is a part of the vertical application market that Advantech is yet to become involved in, we hope to guide local system integrators to participate in this market in the future. At present, Advantech has reached an agreement with the Industrial Technology Research Institute to nurture 10 IoT system integrators in specific industries over the next 3–5 years. In addition, Advantech is also seeking suitable system integrators from large markets in Europe as well as in America and Japan. Through collaboration, we hope to create new businesses together in the future.

Encouraging Openness and Co-Creation to Generate Opportunities in the IoT Era

In general, IoT systems refer to application systems that connect end devices to the cloud. End devices in this context refer to sensors and other equipment dedicated to data collection. Through middleware and gateways, the data are uploaded to a cloud platform for further analysis and processing. In IoT, Advantech plays an important role in the course of connecting end devices to the cloud. With years of experience in manufacturing end devices, Advantech has developed middleware and gateways in various vertical markets so that hardware can connect to cloud platforms more smoothly.

Advantech also believes that openness and co-creation are critical to fostering a positive business spirit in the IoT era. During the course of IoT development, Advantech has witnessed many businesses seeking to introduce IoT applications but were unable to determine how. Therefore, we have published this series of application cases to provide system integrators and business operators with a basic reference for developing IoT applications. From these case studies, we expect that they will be inspired to create new things and learn from each other, so that more IoT applications will be launched in the future. In our experience, we have found that hardware/software integration is a major bottleneck for system integrators. Accordingly, we are actively seeking partnerships with those who share common interests and aspirations, so that the products and services we provide can assist system integrators. By working together, Advantech is committed to the performance and success of businesses in the future IoT world.

Table of Contents

Intelligent Retail

Intelligent Logistics

Intelligent Healthcare

Intelligent Transportaion

Energy & Environment

Industry 4.0

Intelligent Ret

Implement Data Management to Improve

Supermarkets

Chain Restaurants

Hospitality Services

Branded Stores

Shopping Malls

ail

- Customer Service

Reinventing the Retail Experience

G-Super: Utilizing Data to Understand Customer Needs

In contrast to traditional retail industry practices, G-Super—a subsidiary of GreenLand Group, China's real estate industry leader—has utilized Advantech's UShop+ store solution to improve its retail conversion rates by analyzing customer attributes and enhancing management efficiency, thereby increasing revenue growth.

Article by Peijiun Liao
Images by Advantech
Interview with Wesley Liu, Business Development Manager of Intelligent Retail, Advantech

Precise Positioning and Smart Management to Highlight the Advantages of G-Super

In December 2014, the Shanghai-based property company Greenland Group officially established its first global product direct distribution center, G-Super. In less than 2 years, the group established more than 10 branch stores across China. Each store demonstrated outstanding performance on its first day of business, attracting the attention of Chinese consumers.

G-Super is branded as a boutique-oriented supermarket that primarily sells fine foods from all over the world. To reduce costs and ensure quality, Greenland Group has established G-Super branches in the United States, United Kingdom, South Korea, and Australia, building direct sales channels for purchasing overseas products. Thanks to this extended global presence, G-Super was able to import more than 15,000 product types, successfully establishing an advantage in price differentiation. Furthermore, G-Super has actively integrated IT tools for its smart management practices, not only by introducing a multifunctional smart analysis system at the headquarters but also by integrating Advantech's UShop[+] cash register loss prevention and customer-flow statistics system. The use of these IT tools has enabled all branch stores to transmit various types of information (e.g., customer age, gender, time spent in the store, purchase amount, etc.) in real time for analysis, the results of which can be applied to increase revenues and enhance management efficiency.

Using Smart Analysis to Acquire Information on Customer Flow and Customer Groups

Wesley Liu, business development manager of intelligent retail, Advantech, indicated that Advantech's UShop[+] solution helps branch managers at G-Super acquire information on customer flow (e.g., flow volume) and attributes (e.g., gender and age). In other words, they can use the system to understand the daily number of customers and changes in customer flow at different time points. Furthermore, they can also further analyze point-of-sale (POS) transaction information to determine consumer preferences and shopping times on the basis of age or gender. Through these applications, branch managers can engage in smart practices such as adjusting employee break times according to customer flow or revising procurement strategies or promotion plans according to the combined POS information.

With the rapid development of branch stores, finding experienced management experts has always been a challenge for retailers. However, when expanding its business, G-Super was unconcerned about this problem because of its effective utilization of Advantech's UShop[+]

solution for the collection and analysis of big data, which provide useful reference information for managers, assisting them in making effective decisions rather than having to rely on personal experience or intuition.

Expandability and Service Quality Make Advantech's UShop⁺ the Optimal Choice

There are many solution suppliers claiming to specialize in cash register loss prevention and customer flow analysis. G-Super opted to cooperate with Advantech primarily due to considerations of future expandability. Wesley Liu observed that Chinese businesses urgently require and are highly accepting of innovative applications because of intense market competition. However, when making purchases, Chinese business owners prefer one-stop services, and so solution suppliers are selected if they can ensure that their hardware and software will meet the requirements prescribed for a solution. Thus, when future problems arise regarding system operation, the risk of software and hardware suppliers evading responsibilities can be reduced. Moreover, unnecessary costs can be avoided, because for hardware manufacturers to dispatch repairmen for maintenance inspections entails a cost of at least RMB 500 per trip, and this cost would be wasted if the problem proves to be unrelated to hardware.

Advantech not only provides solutions for smart retail applications, such as cash register loss prevention, customer flow analysis, business information analysis, and energy analysis and management, but the company also offers basic facilities for daily operations, which includes equipment such as POS devices, handheld inventory equipment, and electronic signage. The company can cover all the IT needs of retailers and naturally became the first choice for green supermarkets. Furthermore, Advantech adopts an active attitude toward solving problems during system implementation, and the company also

Advantech adopts an active attitude toward solving problems during system implementation, and the company also provides high-quality services.

provides high-quality services. These qualities have contributed to the satisfaction of G-Super customers.

Wesley Liu provided a few examples of Advantech's advantages. First, concerning problems associated with the angle of camera installations, because G-Super has a large floor area, CCTV cameras must be installed at specific angles to capture customers' faces, and Advantech spent a considerable amount of time with testing to determine the optimal camera angles. Second, a ceiling spotlight is installed at the entrance of G-Super, and this type of light can be problematic for facial recognition systems; therefore, Advantech spent 2–3 months adjusting the system algorithm settings to reduce the probability of errors. Finally, G-Super cooperates with three weak suppliers who have adopted

different brands of IP cameras. To facilitate future integration, Advantech took the initiative to undergo system integration with these three suppliers so that images are viewable as soon as a camera is connected to a system.

Because this system integration process proved to be effective, Advantech's UShop$^+$ solution (cash register prevention and customer flow analysis) has become G-Super's basic facility. In future, G-Super will continue to expand in China while integrating store benefit analysis systems to analyze the store areas where customers spend more time. Subsequently, G-super managers can be informed about what consumers have purchased in addition to which products they are interested in, and this information can then be used to adjust product merchandising and thereby boost product flow and revenue growth.

Carrefour Taiwan Embraces Digital Innovation

Applying Information and Communications Technology to Improve Customer Satisfaction

To improve customer satisfaction, Carrefour Taiwan seeks to provide a customer experience that focuses on offering a comfortable environment that is conducive to shopping. Carrefour stores in Taiwan utilize technology to formulate services and create six major solutions. Additionally, technological services are integrated into the shopping process and visitor flow analysis is utilized to improve overall service quality and convenience.

Article by Peijiun Liao
Images by Advantech
Interview with Margery Ho, Head Office National Public Affair & Service Manager, Carrefour Taiwan

Many families spend their weekends shopping, eating, and enjoying the comforts and fun of shopping plazas. In addition to using conventional advertising methods, many retailers rely on SMS notifications to inform customers of their promotional offerings. Signage displays are also commonly employed for this purpose, in addition to being adopted for payment systems and customer satisfaction surveys. Through the integration of software and hardware, Advantech is committed to establishing front-end platforms that connect the entire process from a customer's arrival to checkout at the cashier register, as well as providing back-end supermarket management systems.

Intelligent Digital Signage Solution Delivers Prompt Advertisements to Consumers more Efficiently

Most supermarkets use digital billboards to display static promotional information, but many of these systems still require a conventional USB dongle to operate. In the face of changes in retail advertising, Carrefour prioritizes placing new products on shelves that have high visibility, and they hold promotional activities on an almost weekly basis. Under such circumstances, a more effective and systematic management system would allow marketing staff at the 100+ Carrefour branches in Taiwan to update their promotional content on a daily basis, so that it is in line with the

marketing strategies implemented at Carrefour Headquarters. Staff could then log onto a cloud software management platform to quickly edit, schedule, and deliver marketing materials or advertisements by using Advantech's digital signage software. In addition to ensuring that broadcasting content is made available at the appropriate shopping areas so that customers receive the right information at the right location and time, management would also be able to easily upload advertising content to the cloud and confirm the signage host device status at each supermarket in real time. In the future, Carrefour plans to continue expanding its application of digital signage such as by connecting online catalogues with product displays to provide a shopping guideline.

Branch Customer Flow Analytics System for Staff Roster Optimization

In Carrefour, the store managers always face a problem of not having enough cashiers during peak hours (or having idle part-time worker during low traffic day). We implement UShop[+] Store Traffic Analytics with total 8 2D UCAM at Carrefour Taiwan branch store and the UShop Store BI Report helps the store manager to easily find out the peak/off peak trend in daily, weekly, monthly or annual report. So store managers can optimize his/her plan on daily manpower arrangement. In Taiwan, over 100 Carrefour supermarkets are divided into 5 regions. Each

regional manager can access to UShop+ cloud platform to get a comprehensive analysis of traffic data across different branch stores. Additionally, regional managers and company headquarters would be able to perform a cross-supermarket customer flow analysis to evaluate the performance of multiple branches in different areas throughout the country.

Long-Term Monitoring to Improve Air Quality

In 2011, the Taiwan Government passed the Indoor Air Quality Act, which also raised public awareness on air quality issues. Previously, air quality patrol and inspection personnel would use handheld indoor air quality monitors to perform inspections in designated areas. However, due to the large area of supermarkets, this approach is typically very time-consuming and prone to human error, resulting in unreliable data. In addition, because some supermarkets regularly outsource their air quality inspections, any inconsistencies in the measured data would make it difficult for managers to locate the actual source of a problem. To address this concern, Carrefour Taiwan has installed indoor air quality sensors at strategically placed locations throughout their supermarkets, enabling them to implement continuous air-quality monitoring. Subsequently, the company utilizes background software to analyze the data to inform management personnel of air quality trends at different times, thus highlighting any problem

areas. This means that abnormal conditions can be addressed immediately to provide customers with a higher quality shopping environment.

Customer Satisfaction Survey System for Improving Service Quality

Previously, Carrefour positioned staff near cashiers to complete written customer satisfaction questionnaires. However, this required additional human resources to be allocated to analyze the survey results, which also introduced the possibility of human error. The Customer Feedback System successfully implemented at over 100 Carrefour hypermarkets and convenience stores throughout Taiwan. With this system, customers need only rate the cashier's service quality after completing checkout. If the customer clicks on "dissatisfied,'" the cashier director and headquarters personnel are immediately notified to attend the register to understand the cause and make timely improvements. This not only saves human resources but also improves the supermarket's overall efficiency. The system immediately and precisely provides store managers and the head office with the visibility of service quality of every cashier at every Carrefour store in 5 areas. The rating contributes to not only on each cashier's service, but also accumulate to store managers, regional managers and overall Carrefour Taiwan's service quality. This

Innovative Technology Applications to Create Differentiated Services

"Since Taiwan's bulk retail industry is highly competitive, reasonable pricing and a comfortable shopping environment are the basic conditions for successful business operations. To attract customers, we must create a unique feature for our supermarkets,'" Mrs. Ho explained, further pointing out that Carrefour has branches in more than 30 countries around the world, each of which has been integrated with local cultures to create unique features. Because Taiwan's IT industry is highly advanced and can provide a comprehensive range of software and hardware solutions, incorporating technology to improve service quality and create differentiated market services has become a key developmental strategy for Carrefour Taiwan. Advantech assists Carrefour with its data collection, processing, and analysis to derive valuable information that can aid managers with decision-making, which in turn helps improve the operating efficiency of individual branches while providing customers with a brand new shopping experience.

With this system, customers need only rate the cashier's service quality after completing checkout. If the customer clicks on "dissatisfied," the cashier director and headquarters personnel are immediately notified to attend the register to understand the cause and make timely improvements.

system aligned with Carrefour Taiwan's strategy "zero-customer-complaints'". So that Carrefour Taiwan can create an even more pleasant and enjoyable shopping experience for shoppers.

Intelligent Retail

15

85℃ Bakery Cafe
Smart Store Management

Using IT to Maximize Loss Prevention

In response to market changes, 85℃ Bakery Café comprehensively updated its point-of-sale (POS) system, which is used in nearly 600 of its branch stores in China. The company also introduced Advantech's UShop⁺ solution to prevent losses incurred from cash register schemes. This solution involves collecting and transmitting POS data for comparison with CCTV images recorded during transactions. Thus, the risk of cash register schemes occurring in branch stores can be reduced, thereby enhancing management efficiency.

Article by Peijiun Liao
Images by Advantech
Interview with Wesley Liu, Business Development Manager of Intelligent Retail, Advantech

In a business exchange meeting hosted by the Taiwan Chain Stores and Franchise Association, several food business owners were discussing problems related to store management. Apprehension was expressed about 80% of business transactions this month being made through groupons, yet this was inconsistent with the actual number of groupons that had been sold. Concerns were also raised about the hiring of personnel to monitor CCTV footage to check for signs of fraudulent transactions. The approach was found to be inefficient and had a low probability of catching the thief. For retailers, determining how to prevent cashiers from engaging in embezzlement is a crucial management issue. A well-known retail chain in Taiwan and China, 85°C, introduced Advantech's UShop$^+$ cash register scheme prevention to almost 600 branch stores in China to simplify management procedures through the adoption of IT.

Established in 2001, 85°C entered the Chinese market in 2007. In the following 10 years, the company has delivered outstanding performance, yet the effects of rising prices, adjustments to brand positioning, a rapid increase in the number of branch stores, and the emergence of new payment methods (e.g., Weixin and Alipay tools) rendered 85°C's IT systems unable to fulfill current user requirements. Therefore, 85°C began transforming its IT system for the third time since its inception, by introducing a new POS system and integrating Advantech's solutions.

The old and new POS systems differ in their data transmission structure; the old system was built into a terminal POS device that uploaded data directly to the company's headquarters. However, the new system stores data in a local server at the branch store before uploading to headquarters. Thus, after updating its system, 85°C had to equip its branch stores with small servers for POS data storage and transmission. Subsequently, Advantech's UShop$^+$ cash register prevention solution, which integrates both software and hardware, became 85°C's optimal choice.

According to Wesley Liu, Intelligent Retail Business Development Manager at Advantech, 85°C's original plan was to purchase general desktop computers as the branch store POS servers. However, considering factors of expandability, operational stability, and functionality, the company finally decided to cooperate with Advantech.

The UShop$^+$ cash register scheme prevention solution uses a DS-570 embedded computer as the host server. In addition to enabling the identification of abnormal transactions, the system also features expandability for integrating smart applications such as tools for energy and environmental management, store benefit analysis, customer flow statistics, and customer group analysis. Furthermore, 85°C required

17

that these store servers operate around the clock, but they did not require a mouse or keyboard because they were to be remotely controlled from the company's headquarters. General desktop computers are not suited for long hours of operation, whereas Advantech's IPC-7130 is a factory-controlled technology specifically designed to operate steadily for long periods. Finally, to ensure data security, 85°C requested that a RAID1 configuration be included with the local servers at the branch stores; to accommodate this request, Advantech customized its IPC-7130 units to contain two 1-TB hard drives.

Continuing the Expansion of Smart Applications from Transaction Loss Prevention to Energy Management

Because the UShop⁺ solution demonstrated significant effectiveness, 85°C anticipates continuing to integrate Advantech's other UShop⁺ solutions this year, including those for energy and environmental management and customer flow analysis. For 24-hour chain stores, energy expenditure accounts for more than 20% of the company's total operational costs; therefore, energy management is pivotal for 85°C. Before June this year, six of its branch stores in Shanghai took the lead in introducing the energy and environmental management solution; by the end of year, this solution will be extended to all branch stores in China. Subsequently, 85°C will be able to monitor the historical records of each store and compare the energy consumption levels by time point

the UShop⁺ solution demonstrated significant effectiveness, 85℃ anticipates continuing to integrate Advantech's other UShop⁺ solutions this year, including those for energy and environmental management and customer flow analysis.

and store; this will enable quickly identifying any abnormalities in individual stores, and energy consumption costs can thus be reduced.

Dean Sun stressed that Advantech's UShop⁺ provides solutions for various smart retail applications, including cash register loss prevention, store benefit analysis, restaurant queuing, air quality monitoring, energy management, and smart electronic signage. From a single-point application perspective, numerous solution suppliers are currently competing in the market but none of them resemble Advantech, which integrates all smart retail applications into a single platform to provide a comprehensive range of hardware and software solutions. With Advantech's one-stop UShop⁺ cash register prevention solution platform, retailers can purchase whatever smart applications they need to facilitate the realization of Industry 4.0.

Intelligent Retail

Maximize the Economic Benefits of Each Gaming Table

UTC Table System Improves Casino Management Efficiency

Advantech UTC products provide efficient data-processing capabilities, user-friendly human-machine interface, and flexible integratability, allowing casinos to track every player's game behavior more closely.

Article by Sharlene Yu
Images by Advantech
Interview with Mason Wu, Product Manager of Intelligent Retail Advantech

When taking extended holidays overseas, many people spend their vacations at resort hotels that also have casinos. For people who are unfamiliar with betting games, visiting a casino can be an eye-opening experience, especially for those whose only point of reference is scenes from old movies. A distinctive feature of modern casinos is the use of tablet computers and other interactive devices. For example, when new players arrive at a table, the dealer will typically ask them if they have a membership card, which is used for purposes ranging from player identification to rewards schemes.

Applying Technology Judiciously in Managing Casino Operations

As risk-taking endeavors that depend largely on luck, games of chance involve a considerable amount of uncertainty. The gambling industry is also an industry in which transactions involving large amounts of cash are conducted. Macau and Las Vegas are two world-famous cities renowned for gambling, and these two cities alone attract approximately 10 million visitors each year. To process large quantities of cash and chips on a daily basis and to prevent employees from committing errors and guests from cheating, casinos employ various high-tech electronic products such as management software, intranets, desktop computers, servers, high-capacity hard drives, radio frequency identification (RFID)

technology, CCTV monitoring systems, and self-service kiosks.

Casino administration systems, for example, enable confirming each player's identity, how long they stay at the table, and how many chips cash they use. In addition to enabling the management of rewards schemes, such systems enable the casino's marketing department to analyze the collected data to identify the most suitable business strategies and promotional activities. Casinos can also utilize the data to identify valuable players in order to maintain good customer relations with them and enhance their loyalty. Digital information can also facilitate internal auditing and control, thereby avoiding human error or negligence that might lead to financial losses or loss of goodwill.

Digital information can also facilitate internal auditing and control, thereby avoiding human error or negligence that might lead to financial losses or loss of goodwill.

Simple but Stylish UTC Models Replacing Desktop Computers

Although desktop computers have been widely used in casinos for some time, they require a considerable amount of space, and their bulky appearance and the clutter of exposed cables and wires can diminish the often

grandiose aesthetic of gaming establishments. Furthermore, the user interfaces of older casino systems are not intuitive and may cause dealers and table staff to spend too much time operating them, which impedes the progress of games and contributes to reducing the overall revenue generated at each table. To address this problem, some casinos have begun deploying tablet computers as their player tracking terminals, which provide a simple but stylish alternative casino management solution.

Advantech's elegant UTC series of ubiquitous touch-based tablets, such as the 10.1-inch UTC-510D and 15.6-inch UTC-515D/E, have been well received by renowned casinos and are widely deployed at all types of gaming table. These two products are fanless, low-power, and industrial-grade all-in-one units. Their noise-free operation and high stability make them ideal for such applications as in casinos, which operate around-the-clock. The 16:9 widescreen displays of these models, which can be configured in both landscape and portrait orientations, provide convenience for staff to enter data easily or query information from the player tracking system. The flat panel meets the IP65 protection standard (i.e., dust-proof and splash-resistant) and is easy to clean, which can be particularly beneficial in casino environments where food and drinks are routinely provided to customers at the tables.

In addition, the UTC series provides a special

Advancements in technology have brought a substantial amount of change to the operation and management of casinos.

requirement of keeping complete records of all player activities.

Enhancing Economic Benefits and Ensuring Long-Term Competitiveness

Advancements in technology have brought a substantial amount of change to the operation and management of casinos. Some industry experts have pointed out that the depth and breadth of IT applications are crucial to a casino's operations. Those that employ IT to a greater extent give themselves a competitive edge over their rivals, while those that do not will inevitably be phased out by the market. Advantech's UTC family of products provides high-performance data processing capability, a user-friendly interface, and flexibility and ease of integration with peripherals, allowing casinos to track players' betting behaviors and patterns more conveniently while maximizing each gaming table's revenue potential. This enables casino operators to retain their competitiveness in the highly competitive gaming industry.

constructional design that allows peripheral devices such as card readers, RFID sensors, 1D/2D barcode scanners, and magnetic stripe readers to be seamlessly integrated. These devices can be firmly attached to the UTC unit, thus eliminating the extra space that would otherwise be needed to accommodate them. Regardless of whether a bank card, casino membership card, or barcode requires scanning, everything can be completed at the gaming table, thus satisfying the casino's

Intelligent Retail

Fashionable POS System for Retail Settings
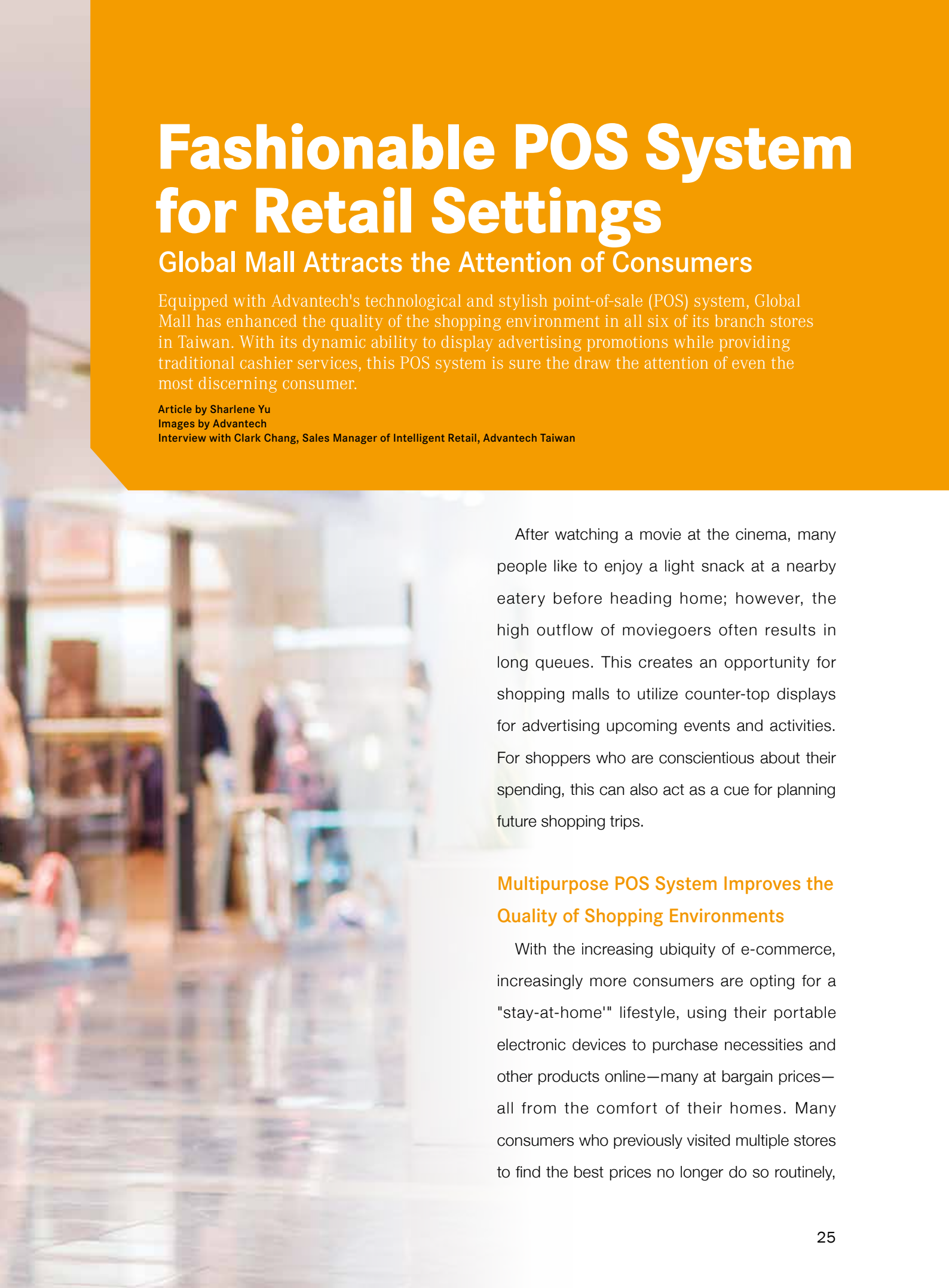
Global Mall Attracts the Attention of Consumers

Equipped with Advantech's technological and stylish point-of-sale (POS) system, Global Mall has enhanced the quality of the shopping environment in all six of its branch stores in Taiwan. With its dynamic ability to display advertising promotions while providing traditional cashier services, this POS system is sure the draw the attention of even the most discerning consumer.

Article by Sharlene Yu
Images by Advantech
Interview with Clark Chang, Sales Manager of Intelligent Retail, Advantech Taiwan

After watching a movie at the cinema, many people like to enjoy a light snack at a nearby eatery before heading home; however, the high outflow of moviegoers often results in long queues. This creates an opportunity for shopping malls to utilize counter-top displays for advertising upcoming events and activities. For shoppers who are conscientious about their spending, this can also act as a cue for planning future shopping trips.

Multipurpose POS System Improves the Quality of Shopping Environments

With the increasing ubiquity of e-commerce, increasingly more consumers are opting for a "stay-at-home'" lifestyle, using their portable electronic devices to purchase necessities and other products online—many at bargain prices—all from the comfort of their homes. Many consumers who previously visited multiple stores to find the best prices no longer do so routinely,

and those who do are more likely to just window-shop, thus making some brick-and-mortar stores little more than an expensive showroom. This trend has had a major impact on physical retail stores. Therefore, to improve consumers' shopping experiences, physical department stores and shopping malls are actively seeking innovative marketing practices and providing personalized in-store services to attract more visitors and increase purchase rates.

Boasting six locations around Taiwan, Global Mall is committed to service excellence and finding innovative ways to conduct business. Attention to detail regarding the in-store shopping environment is a particular point of emphasis. Even the look, feel, and placement of check-out counters are considered in efforts aimed at maximizing customer satisfaction. This has led Global Mall to completely replace conventional cash registers with stylish, modern POS systems equipped with dual screens. These units can be used for customer checkout and electronic

signage for product promotions. Together, these features enhance both operational efficiency and service quality.

Stylish and Intelligent POS System

Global Mall is a major shopping center that provides a wide variety of services such as recreational facilities, family entertainment, gourmet food, and shopping. In addition to typical department stores (e.g., cosmetics, clothing, and other daily necessities), the malls also have restaurants, movie theaters, gyms, and furniture outlets there. The configuration of spaces for hardware at each sales location is unique, making it difficult to find a POS unit that not only meets the requirements of various

Advantech's intelligent POS system is a powerful but compact unit with adjustable pole-mounting features for a second display,

payment processing applications but also has an additional screen in the back for displaying advertisements.

Advantech's intelligent POS system is a powerful but compact unit with adjustable pole-mounting features for a second display, which serves as a customer display. This second display satisfies the various requirements of Global Mall's payment processing counters at different stores. The system offers the stability of an industrial-grade machine and features an attractive black aluminum alloy exterior, which is excellent for cooling. In addition to serving as a stylish, technologically superior cash register, its small-footprint base saves counter space, its cable-free modular design provides convenience in installation, repair, maintenance, and upgrades without any exposed wiring, and its fanless design ensures quiet operation while preventing vent clogging or overheating.

Advantech's custom-designed adjustable pole feature also allows users to freely adjust the screen height and orientation, ensuring that both sales staff and customers can read the display and operate the device at a comfortable visual angle. The model is also equipped with dual 15-inch screens with flat bezel-less touch panels for displaying information on transactions, promotions and events, and even advertisements via the second display. Thus, the display can occupy waiting customers while promoting targeted products.

Dual-Purpose System that Maximizes Product Benefits

A key difference between online and brick-and-mortar stores is that while the former is heavily price-focused, the latter allows for real, face-to-face human interaction. With the deployment of Advantech's POS systems, which combine the functions of a cash register and electronic billboard, Global Mall has created an excellent shopping atmosphere for its customers. Furthermore, frequently updated on-screen advertisements have also successfully attracted the attention of customers, who have expressed appreciation for the convenience that they provide. An additional benefit of this multipurpose POS model is that it also serves as a marketing tool without the additional hardware cost that would be required for extra digital signage. The high level of satisfaction and benefits from deploying these units has prompted Global Mall to roll them out to multiple locations around Taiwan.

Intelligent Logi

IoT Helps Turn a New Page for Logistics

Logistics and Warehousing

Heavy-Duty Fleets

Ports

Utility Fleets

stics

Applications

Real-time Management from Warehouse to Logistics Fleets

Shanghai Tingtong Logistics Opens Up a New Era for Intelligent Logistics

Operating in a labor-intensive industry, Tingtong Logistics has solved the bottleneck problems commonly observed in traditional logistics management. Utilizing a comprehensive digital and paperless operation process to replace the manual approach, Tingtong has not only minimized picking and delivery errors but also greatly enhanced its operation efficiency.

Article by Peijiun Liao
Images by Advantech
Interview with Chiu-Ming Huang, Director of IT, Tingtong Shanghai, China

In 1998, the transportation department of Master Kong, well-known FMCG company, spun-off to form a new logistics company, Tingtong. In 2004, Itochu Corporation, a Fortune Global 500 company, became a shareholder of Tingtong Logistics. In addition to Shanghai, Tingtong established branch offices in Beijing, Guangzhou, Chengdu, and Shenyang, and has 56 self-operated distribution centers throughout China. As a professional, large-scale integrated third-party logistics company, Tingtong's main focuses are FMCG logistics, sophisticated logistics and retail consolidated warehouse logistics, as well as e-commerce logistics. Tingtong's main clients are all industry leaders.

In Tingtong Logistics' warehouse, staff drive forklifts, pallet trucks, and order pickers to store stock and pick orders in an orderly fashion. In the past, whenever there were picking lists, administrative staff would hand a stack of picking lists over to the warehouse staff. Today, warehouse staff obtain this information through handheld devices to begin loading operations. With the help of onboard computers and large remote barcode scanners, staff no longer need to memorize a bunch of numbers in advance to accurately locate the required shelves, goods, and quantities, or leave their the trucks to scan barcodes. After picking, the system will automatically update the inventory in real time, let the picker know which exit and which pallet to place the goods via the computer, and even

automatically arrange for orders with nearby delivery locations to be placed on the same delivery truck. Tingtong can also track the location and driving route of each truck through the newly introduced order tracking management system in real time.The company can also obtain real-time delivery completion updates of trucks and stores.

When talking about the changes in Shanghai Tingtong's warehouse operations, Tingtong Logistics' Assistant Vice President Mr. Huang said: "With the rapid growth of the Chinese economy, wages in China are also growing. The logistics industry is characterized by high requirements for human resources and low margins. This puts a lot of pressure on Tingtong. If logistics companies want to increase profits, they must rely on advanced technology to optimize and monitor warehouse operations and the transport and delivery of goods, thus reducing the number of operational aspects such as work hours, losses, and the consumption of other resources throughout the entire logistics process. This would help improve the logistics companies' overall operational efficiency. This is also why Tingtong introduced Advantech's digital logistics solution."

Paperless Process, Tingtong Breaks Through the Efficiency Bottleneck

Although Tingtong used barcodes to manage goods and storage locations in the past,

warehouse staff still had to get off their trucks to scan the barcodes. Operating this way intangibly increased safety hazards and working time; thus, warehouse operating efficiency was not improved fundamentally and picking or restocking operations were still highly dependent on the familiarity of warehouse personnel. Additionally, picking and restocking operations relied heavily on paper documents and data entry took a great amount of time. On-site warehouse workers even had to wait2hoursbefore receiving the newest printed documents, thereby delaying subsequent processes. Real-time inventory updates were also hard to achieve.

Advantech's Digital Logistics and Fleet Management large account customer service representative Yi Ren Huang said, "Our warehouse operation optimization solution uses large barcode scanners, which eliminates the need for warehouse workers to get out of their trucks to scan barcodes. This not only reduces operating time, but also eliminates safety risks when scanning barcodes. The onboard computers can receive commands from the control center and return results via the wireless network, and even plan the tasks and paths workers should follow. Thus, when warehouse operations are no longer limited by the level of experience of the staff, space and time efficiency can be improved and the accuracy of the work performed is ensured. Since onboard computers can also return job results, warehouse workers no longer need to waste time on waiting for printed documents and administrative staff in logistics centers can also save a lot of time on preparing reports. Everyday before 08:00, the

control center can obtain accurate inventory information of the previous day up until 24:00."

Real-Time Order Tracking Freight Management to Enhance Efficiency

After the goods leave the warehouse, the control center must track the driver's driving behavior, route, and whether the order was delivered. In the past, after the cargo was loaded, the control center had no way of tracking the truck's location, and therefore could not determine whether the driver arrived at the delivery location. Due to various reasons, the driver sometimes cannot get the signed delivery documents back in time. Thus, keeping a photocopy of the proof of deliver yis conducive to future verification and recovery. In customizing the order tracking management system for Tingtong, Advantech used advanced wireless transmission and GPS positioning technology with handheld computers to realize location tracking throughout the driver's trip, order tracking, and other business needs. Drivers can also take photos of the delivery receipts with the handheld computer. The photos are sent back to the control center immediately. The control center then knows the status of the deliveries in real time. If the need for re-deliveries or returns arises, drivers can report this information to the control center via the handheld device. The control center can then monitor the relevant information to handle re-deliveries and returns through the order tracking system. This process not only reduces the amount of work for processing re-deliveries and returns, but also reduces the disputes that may arise during this period. When other abnormal occur during the transport of goods, the logistics center can receive the related information immediately and create countermeasures through the handheld computers.

Advantech Solution Improves Operational Efficiency

"Prior to introducing Advantech's solution, we other suppliers. However, Advantech was the only one who could provide an integrated solution including software, hardware, and project management, and only Advantech has a nationwide service network that can match our national logistics network. Advantech is a publicly listed company in Taiwan whose brand and reputation are also superior to other suppliers. In fact, after introducing Advantech's solution, Tingtong Logistics' operational efficiency improved." When talking about Advantech's digital logistics solution, Assistant Vice President Mr. Huang said, "A digital and paperless workflow such as this not only replaces previous tasks that relied heavily on manual processing, but also greatly reduces picking errors and improves efficiency. In the past, it was very difficult to monitor drivers' driving behavior, route, and delivery situation between the drivers and stores. Now, we can monitor all of these situations in real time.

Complete Control of Staff, Behicles and Cargoes

Intelligence-Enabled Tech That Subverts Logistics Thinking

Business opportunities in e-commerce have been experiencing a rapid growth. Advantech provides custom-designed solutions to help the logistics industry to deploy highly intelligent dispatch and delivery systems capable of providing precision tracking of staff, vehicles and cargo, thus further improving the efficiency of all logistics operations.

Article by Peijiun Liao
Images by Advantech
Interview with Wesley Liu, Business Development Manager of Intelligent Service, Advantech

At precisely 00:00 hours on November 12, 2016, the world's largest online shopping event concluded. The CEO of Alibaba Group, Daniel Zhang, stood in front of the electronic billboard displaying the total amount of transactions processed during the November 11, 2016 online shopping festival. It was a 12-digit number: 120,748,589,125. Within 24 hours, Alibaba, the online shopping leader in mainland China, achieved a transaction amount of over 120 billion yuan in 657 million transactions with a 100% payment success rate. This astounding number created headaches for the merchants: how in the world could they deliver the 657 million purchases to the consumers?

Fueled by the ubiquity of the Internet, business opportunities in e-commerce have been growing at breakneck speed. In 2016 the total global transaction amount in this sector exceeded US$16 trillion. One reason that online shopping has been able to grow at near-geometric progression, apart from the rapid advancement of information and communications technologies and increasingly easy-to-use shopping platforms, is that the payment flow and physical delivery mechanisms have experienced successive innovations. In terms of payment, as credit card and third-party payment have matured, the remaining problems have been solved gradually over time. Logistics, on the other hand, has long plagued e-commerce operators. In geographically limited regions such as Taiwan, transportation via human is still the mainstream approach, but in a vast country like China, delivery times and payment issues are inevitable.

Intelligent Parcel System: Solving the Problem of Payment Flow and Logistics in One Fell Swoop

To tackle the logistics problem, mainland China adopted the "intelligent parcel" approach two years ago. Currently in Taiwan intelligent parcels can be spotted at many MRT stations and in certain street locations. It works as follows: a logistics operator delivers the goods to a intelligent parcels designated by the buyer, who

will then open the box with a third-party payment card. If a credit card has already been used to pay for the goods at order time, the buyer can enter a code assigned by the merchant into the logistics box's touch panel to open it.

The intelligent parcel system solution solves both the electronic logistics and payment flow problems at once. In the absence of this mechanism logistics operators must deliver goods at time slots that are convenient for the consumers, which tend to reduce delivery efficiency. With the intelligent parcel approach, there is no need for the consumers and the logistics operators to synchronize in terms of delivery times. Upon delivery of the goods to a designated logistics box, the system will notify the consumer of the arrival of the merchandise, which is ready for pickup at the consumer's convenience.

The intelligent parcel system represents a new type of equipment. Its internal structure consists of a larger number of devices, including the control panel, long-range communication module that connects with servers, and the lock/unlock mechanism for each compartment, which need to be integrated. Apart from their existing functions, most intelligent parcel are operational around the clock and are available to the consumers, so the system must be able to operate reliably 24 hours a day. If for any reason the system fails, not only will consumers be inconvenienced but the operational procedures between the merchants and logistics operators will be disrupted completely.

Currently the intelligent parcel system can be found in both mainland China and Taiwan. As the functions provided by an intelligent parcel system are rather complex and necessitate connections with a number of different devices, Advantech has provided the following connectivity features in the communication interface: USB, COM port, RS-232 and GPIO. These allow the unit to connect to the backend management system, transport vehicles and logistics box switches. In terms of stability, UBC-220 offers a closed, fanless design that is dust-proof, which prevents the system from shutting down in the event of a failed cooling fan.

Fleet Management via Cloud Computing

In addition to the intelligent parcel system, fleet management is also a major focus of a logistics system. As e-commerce transaction volumes continue to rise, the logistics operators' fleets of delivery vehicles are also gradually expanding.

Existing fleet management models have become antiquated. Modern delivery approaches require not only the ability to handle large volumes but also precision timing. For this reason, fleet management of logistics vehicles has become extremely important.

Advantech offers three products aimed at logistics fleet management systems: UBC-220, ROM-3420 and WISE-1020. The low-power UBC-220 model, in particular, can be built into the delivery vehicle. Its features include the tracking of vehicle locations via GPS and sending data to the backend control center via long-range transmission technology. This allows the backend system to keep track of the movements and routes taken by vehicles in the field. In addition, UBSU-220 can be connected to devices installed in the vehicle itself, such as the tire pressure detector and braking recorder. System administrators will be able to gain knowledge of a driver's driving behavior with the collected data.

The ROM-3420 model can be used in packaging and dispatch centers. The dispatch center will be able to track the quantities and movements of goods via the ROM-3420, optimizing the precision dispatch and efficiency of vehicles and delivery of goods. Information regarding the current locations of goods can also be provided to consumers so that they can plan their pickup schedules. The WISE-1020 is the ideal tool for cloud-based services. Its wireless sensor module can be integrated with Advantech's WISE-PaaS system. With this wireless sensor feature, the logistics system will be able to capture all types of sensor data from the logistics environment in its entirety and transmit the collected data to the WISE-PaaS for storage and further analysis.

The rapid development of the Internet has not only stimulated the growth of e-commerce on a massive scale but also enabled the exchange of consumer information at a faster pace and in a more direct manner. The instantaneous spread of consumer experience has had a tremendous impact on merchants' business practices. For this reason, e-commerce operators must be cautious when dealing with each and every part of the consumer purchase process. They must also be able to propose a more efficient and smarter business model to offer consumers an improved shopping experience. Within the logistics system, both delivery vehicle control and intelligent parcel system are extremely important. Advantech has had a long history in the field of logistics and has garnered reputation in the industry with respect to fleet management and management systems. Apart from supplying hardware products, Advantech can also provide customers with tailor-made and cost-effective solutions with high performance with the company's extensive expertise in this field. These solutions will help operators solve existing logistics problems and gain a firm footing in the highly competitive e-commerce market and create even greater business opportunities.

Real-time Remote Monitoring and Control of Heavy-Duty Machinery in Quarries

Fully Control the Health Of Engines to Reduce Operational Risks

Unlike the general cars on the road, the heavy-duty machinery, such as excavators, operated in the quarries need to face a complex terrain and harsh operating environment, and the on-site maintenance work of the machines are also very difficult and costly. It is thus a must to establish a remote monitoring and control system for the health of engines.

Article by Yu-feng Chen
Images by Advantech
Interview with Kenny Marchel, CTO of Digitalinstincts Teknologi

Mines are often located in remote areas. In such demanding geological environments, even the slightest mistake when operating heavy machinery can result in injury, financial loss and worse. Additionally, the provision of on-site maintenance and repair services necessitates the employment of highly skilled technicians which generates substantial cost. Therefore, for mine operators, preventative measures against

To address these requirements, smart monitoring devices are being increasingly developed for the various heavy machines employed in mines.

these risks are preferable to cures.

To address these requirements, smart monitoring devices are being increasingly developed for the various heavy machines employed in mines. These monitoring devices are designed to record relevant statistics and instantly identify and report abnormal conditions in order to improve safety. So considering all the industry demands, Digital Instincts Teknologi (DIT) and Trakindo collaborated to create a remote engine monitoring system for their Cat® 6030 excavator.

TREK-570 Built to Withstand Harsh Operating Environments

DIT is a systems integration consultancy

company located in Jakarta, Indonesia that offers various tools to assist clients in complying with mining and energy laws and regulations required by the Indonesian government. Trakindo is an Indonesian heavy equipment solutions provider that supplies machines made by Caterpiller. Cat® 6030 features an 1140 kW (1,530 hp) engine output and a maximum operating weight of 300 metric tons, and is Caterpillar's widely employed and bestselling hydraulic excavator.

Under DIT and Trakindo's combined effort, a remote engine monitoring system has been successfully integrated into Caterpillar's Cat® 6030 excavator that provides diverse capabilities, including remote engine monitoring, instant reports/alarm notifications, real-time statistical data updates and cloud access for constant engine monitoring.

A digital and paperless workflow such as this not only replaces previous tasks that relied heavily on manual processing, but also greatly reduces picking errors and improves efficiency.

In order to deliver these capabilities and withstand the environmental extremes, the vehicle computer installed in the system had to satisfy a number of stringent standards. DIT Chief Technology Officer Kenny Marchel pointed out that, "The vehicle computer employed for this system needed to have powerful yet flexible processing capabilities and unique features such as high stability, extreme temperature tolerance, and water and anti-vibration resistance. The TREK-570 in-vehicle computer developed by Advantech offered all

these features, making it the ideal system for our requirements."

In-vehicle computing systems are designed to improve fleet management efficiency. Advantech's TREK-570 is equipped with an Intel® Atom™ E3826 processer that ensures reliable operation, supports -30 ~ 70 °C wide temperature operation, and its anti-vibration and anti-impact features exceed MILSTD-810G and 5M3 standards.

Advantech's TREK-570 is also equipped with multiple I/O ports for integrating tire pressure monitoring and video surveillance systems. Furthermore, the inclusion of CAN bus enabled instant detection of engine problems. Marchel also emphasized that, "Because communication conditions differ between mining sites, in-vehicle computers must be designed to support diverse communication technologies to ensure the collection of various types of data for subsequent integration analysis." With the introduction of this system, mining managers can obtain instant status reports, significantly improving data digitization.

Using a range of communication technologies, including WWAN, WLAN, Bluetooth, satellites and GPS, TREK-570 is able to transmit data such as vehicle information and status, location, driver behavior, images and cargo to the back-end server for monitoring and real-time management, and thus serve as a highly functional fleet management system.

Enhanced Technical Support and Streamlined System Integration

In only two months, Advantech's TREK-570 in-vehicle computing systems were installed in 40 Cat® 6030 excavators, which were distributed among four mines (10 machines per mine). Marchel stated, "Because Cat® 6030 machines can be widely employed in a variety of mines, the integration of TREK-570 will be ongoing. Therefore, we expect to continue our long-term cooperation with Advantech."

"From among the countless vehicle hardware companies currently operating, we choose to collaborate with Advantech because of its products' stability, low maintenance and repair costs, and competitive price compared to similar American and German products", Marchel asserted, elaborating that, "Advantech's in-vehicle computer is a product with a high price-performance ratio. Furthermore, Advantech provides comprehensive service and premium technical support to ensure efficient system integration. These are the main reasons that we decided to establish a collaborative partnership with Advantech."

Intelligent Logistics

Brilliant in Every Field Advantech-DLoG

A Great Manufacturing Asset for Egger

The German-based wood panel manufacturing company Fritz Egger GmbH & Co. replaced their old computers, which had low impact resistance and high failure rates, with Advantech-DLoG's sturdy tablet computers. These not only enhanced support for Egger's manufacturing production lines and package controls but also improved production efficiency for the company's panels.

Article by Yu-feng
Images by Advantech
Interview with Gunther Wallinger, Fritz Egger GmbH & Co. OG

In today's world where computers are ubiquitous, all businesses have experienced computer shutdowns at one time or another. But for manufacturing industries, computer shutdowns can not only disrupt production lines, but also waste valuable time, deplete human resources, and raise production costs due to subsequent maintenance, repair and mechanical restoration. Frequent computer shutdowns can even lead to postponed deliveries, which not only affects business credibility but also incurs huge financial losses. There are several reasons behind computer shutdowns, so businesses must maintain their hardware regularly. But if shutdowns are still too frequent they may need to consider drastic remedial action.

Eliminating Frequent Computer Shutdowns

Fritz Egger GmbH & Co. OG, are a well renowned manufacturer of wood-based panels; they have 16 factories in Austria, Germany, UK, France, Russia, and Romania. They introduced the HYDRA manufacturing execution system (MES) into their factories more than 15 years ago. By digitizing production documents, all production lines and regional factories can easily be supervised. However, since the original computer systems went down frequently, both production line workers and managers were constantly delayed, which cost the company valuable time and money.

Because the computers in Egger's wood panel manufacturing factories operate in a harsh environment with a lot of dust, heat and vibration, computers must resist temperature fluctuations, tolerate a great amount of dust and debris generated from the manufacturing process, and withstand constant impacts. But it was not until the original computers started exhibiting frequent shutdowns that disrupted the entire production line did the company finally decide to replace all its old computers with new and sturdy industrial computers. At that time, the company had great difficulty finding an industrial computer that met their needs. Not until the company tested Advantech-DLoG computers did they find a solution that eliminated the frequent shutdowns.

According to Advantech-DLoG Project Manager Richard Rieger, back in 2006 it was almost impossible to get hold of an industrial computer like Advantech-DLoG's MPC6, which not only operates well under harsh working environments, but also meets all of Egger's ADC/MDC specifications. Since the MPC6 has a touch interface, it was easy for Egger workers to familiarize themselves with operations, without the need for further training. MPC6 industrial computers not only meet the demands of Egger's managers, but also those of on-site operating personnel.

New Product Captivates Customer Hearts

Over the years, Egger has integrated several Advantech-DLoG products into its factories and

has recently added DLT-V83 tablet computers. According to Egger's Project Manager Gunther Wallinger, "Advantech-DLoG has been our long-term partner, and they are well-renowned for their robust industrial computer products. Ultimately it was a no-brainer to introduce DLT-V83 machines into our factories."

The super-sturdy DLT-V83 tablet is used on their automatic production lines where it is accessed by both management and workforce. The built-in Intel® Core™ i5-4300U processing unit is equipped with the latest OS, and its excellent computing capacity supports Egger's HYDRA system. In addition to extreme temperature resistance and fanless design, the DLT-V83 also boasts IP66 waterproof and anti-dust protection, which means that the DLT-V83 can soldier on even when faced with temperature fluctuations and showers of foreign matter. Meeting 5M3 standards, the product resists vibration and impact levels three times higher than those tolerated by its military-grade counterparts. The resistant and reliable touch screens tolerate high levels of wear and tear, and users can easily select functions even with protective gloves on.

DTL-V83 tablet computers were installed not only in the Egger production line as a communication platform between the operator and the MES system, but were also adopted by the logistics department for shipping control. Workers operating on the production lines can easily log-in or out to perform their everyday tasks, while managers can monitor order processing and machinery operation status. Through DTL-V83's scanning functions, the logistics department can also monitor product inflow and outflow, with lots of information being recorded to maintain product traceability. Furthermore, if items or quantity errors arise they are quickly corrected at an early stage, well before product delivery.

Excellent Product and After-Sale Service

Unlike a typical tablet computer, DTL-V83 has a bold, sturdy design with anti-vibration, anti-scratching, shatterproof, waterproof, and dustproof features. In addition to providing DTL-V83 and other products, Advantech-DLoG also offers Egger unsurpassed after-sale services. Having passed the tests, the same solutions will be rolled out to other Egger factories to fully realize the goals of transparent management and improved production efficiency.

Strengthening Chile's National Defense

Innovative and Cost-effective Solutions Achieve Success in a Highly Competitive Market

Because national defense and military security operations cannot tolerate even the slightest error, strict standards are required for devices installed in naval ships, tanks, and other military vehicles. Moreover, military communication systems must maintain continuous connectivity and function normally under all adverse conditions.

Article by Yu-feng, Chen
Images by Advantech
Interview with Jose Miguel, Telecommunications Projects Engineer of SISDEF
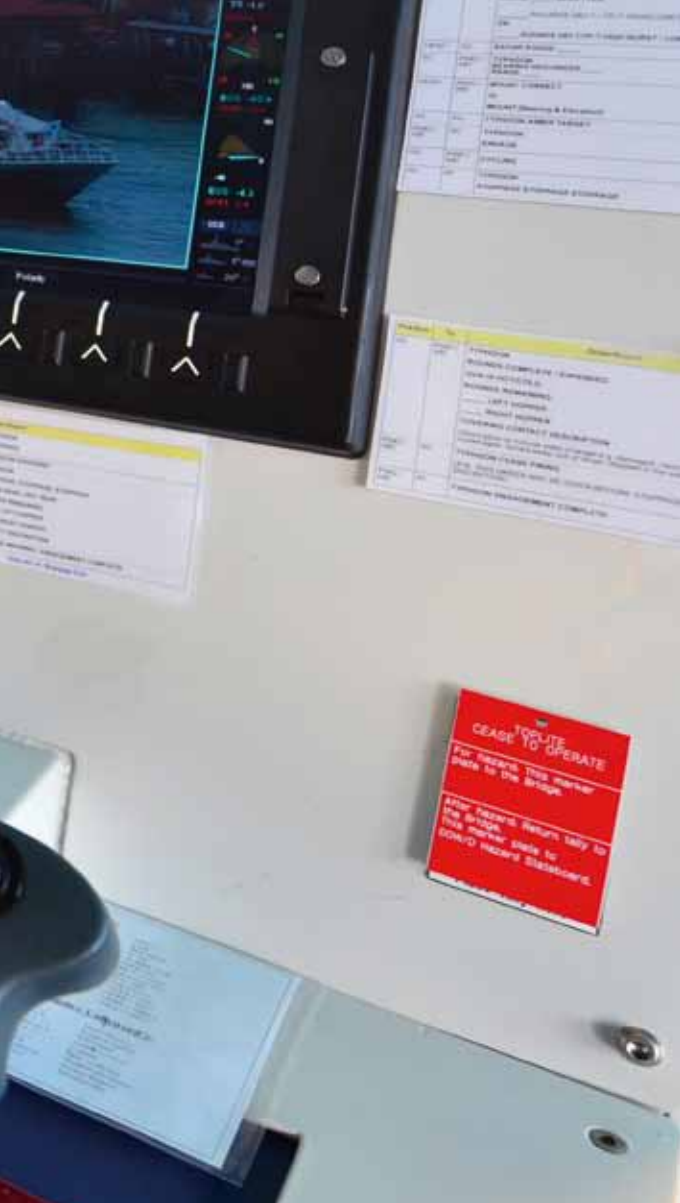
In relation to national defense applications, communication systems can be regarded as the central nervous system, responsible for directing various operations at each node. Similarly, ICS-DAS, an integrated communication system developed by SISDEF, can support a command center with internal and external communications. Several versions of ICS-DAS have been developed for diverse installation, for example, in a command center, naval ship or aircraft. Notably, the mobile data terminal (MDT) adopted by ICS-DAS is none other than Advantech's TREK-753.

Since its establishment in 1983, SISDEF has been developing and providing integrated communication systems to national defense, military security, and industrial markets, and has become a leading supplier of command/control systems and system integration throughout the entire Latin American market. All national defense institutions in Chile have adopted the SISDEF integrated communication system. In addition, four other Latin American countries have also adopted SISDEF communication systems.

SISDEF headquarters is located in Quintero, a coastal city in Chile, with its regional offices distributed in Santiago, Antofagasta, Valparaiso and Talcahuano. Additionally, a branch office has also been established in Mexico City. Of SISDEF shares, 90% are held by naval shipbuilding and ship maintenance companies in Chile, while the remaining 10% are held by SISDEF itself. All

SISDEF's standard operating procedures have passed ISO 900:2008 standards.

Since the beginning of 2010, ICS-DAS has been adopted by the Chilean and Columbian government for national defense, government, and military security applications. Jose Miguel from SISDEF said, "The first challenge when building communication systems is enabling the device (remote terminal) to process vocal messages from both internal and external communication systems." Such telecommunication devices include Satcom, U/VHF, HF, IP, PABX, public announcement systems, mobile phones, and cellular networks.

TREK-753 Serves as the Core Device for Stable Operations

Because ICS-DAS uses a single device to operate and manage all communications, the remote device must be able to receive and deliver messages from internal and external communication systems. ICS-DAS also features the capacity to store all input/output communication by transforming radio waves into digital backups to enable replays as required.

Because of Advantech's knowledge and understanding of vertical industries and local market trends, SISDEF can better operate and expand its business.

To satisfy usage demands, SISDEF adopted Advantech's TREK-753 mobile data terminal (MDT) as the core device for its ICS-DAS. TREK-753 is a multifunctional MDT equipped with a 7-inch touch-controlled LCD screen. Miguel reasoned that, "Advantech's components protect our telecommunication devices from electromagnetic disruption when connected to a power supply."

TREK-753 is designed to allow stable operation even with power fluctuations and telecommunication interruptions. Moreover, the MDT functions on a 12V/24V power system, can be operated from 6V to 36V, and is compliant with ISO7637-2 and SAE J1113. TREK-753 not only tolerates a wide voltage range, but also uses intelligent software to overcome unstable power conditions. Furthermore, for vehicle environments where temperatures can soar or drop drastically, TREK-753 supports an operating temperature of -30 to 60 °C. Because all devices installed in an ICS-DAS system must meet IP54 standards and MIL-STD-810 specifications (verified through environmental engineering and laboratory testing), Advantech developed TREK-753 to meet or even exceed the industry-required specifications.

Miguel further highlighted that, "Advantech's products provide substantial enhancement and a long mean time between failure (MTBF), making our system more stable than ever." Because these products are installed in mobile

vehicles such as naval ships, they must be capable of reliable operation despite long-term exposure to vibration and movement. In fact, in the year since Advantech's TREK-753 MDTs have been integrated into ICS-DAS systems, no malfunctions or incidents have been reported. To date, more than 20 TREK-753 units have been integrated with the ICS-DAS system. With the establishment of a long-term, cooperative relationship between SISDEF and Advantech, public demand for the product is expected to continue to increase in the future.

Technological Support Provides Advantages and Competitiveness

From the beginning of 2010, SISDEF has integrated Advantech products and technologies into its company solutions. "By leveraging this long-term, collaborative relationship, as well as Advantech's excellent products, technological support, and software integrations, our system efficiency has improved significantly," said Miguel regarding the benefits of collaborating with Advantech. "Additionally, because Advantech produces many types of products, we can select the most cost-efficient solution based on our budget, thereby effectively reducing overall costs while significantly increasing turnover rates."

Because of Advantech's knowledge and understanding of vertical industries and local market trends, SISDEF can better operate and expand its business. Miguel stated, "We can now provide our customers with solutions that offer superior efficiency, quality, value, and competitiveness. By cooperating with Advantech, our customer satisfaction has improved significantly."

After initiating sales, market demand for ICS-DAS has steadily and sustainably increased. By enhancing system functions and adopting new technologies, SISDEF has continued to meet customer demands. Miguel asserted, "Advantech is a solid partner who works with us through the entire process. We can now develop innovative solutions with more cost-efficient approaches, helping us achieve success in a highly competitive market."

Intelligent Logistics

Intelligent Hea

Creating a Triple-win Scenario for Doctors

Quality Nursing Care

Digital OR/ICU

Intelligent Patient Services

lthcare

s, Nurses, and Patients

Mobile Medical Care Revolutionizes Medical Care Experience

Full Integration of Nursing Stations Provides Seamless Access to Services

To enhance medical care efficiency and improve drug safety, UnitingCare Health has adopted the Advantech medical care cart AMiS to fully integrate nursing stations and enhance medical care flexibility and effectiveness.

Article by Pearl Wright
Images by Advantech
Interview with Howard Hsiung, Business Development Manager of Intelligent Healthcare, Advantech

Healthcare systems around the world are currently undergoing radical transformation as innovative approaches to healthcare delivery are adopted to reduce cost and improve care quality. With the use of electronic medical records and digital management systems practically ubiquitous nowadays, medical equipment, including diagnostic tools, analysis and laboratory equipment, medication dispensing carts, computerized physiotherapy, and patient monitoring systems, all leverage PC-based architectures as hospitals are becoming increasingly sophisticated digitized medical facilities.

Amid this groundswell of technical innovation and technology integration, the entire medical landscape is experiencing significant developments. Traditional healthcare models are evolving towards organized delivery by teams rather than individuals, care measured on outcomes rather than activity, and total solutions rather than individual systems. Under the new care model, mobility, supported by wireless applications and communication devices, is fast becoming an essential component of healthcare provision. This leveraging of healthcare devices for disease surveillance, treatment support, chronic disease management, and prevention education, continues to push the limits of data acquisition, access, and integration as big data analytics and remote participation become increasingly important.

Mobile clinical workspace solutions are the future of patient care and underpin a new approach to streamline workflows with data-driven decisions that deliver cloud-based collaborative care. Increased connectivity and data access give rise to continuous learning systems, create feedback loops between medical advances and clinical practice, and empower people to actively participate in health management with the provision of new tools such as health-care related apps for managing chronic conditions; technological advancements that will both enable and drive future changes in healthcare.

UnitingCare Health Delivers Fully Integrated Solution

In 2014, UnitingCare Health, one of the largest providers of health and community services in Australia, partnered with Ascom to develop a Workstation on Wheels (WoW) solution for St. Stephen's Hospital in Queensland, Australia.

Their solution comprised of 45 Advantech AMiS-50 medical carts integrated with Elliott Data Systems MedProx dispensary cabinets aimed at drastically enhancing the quality of healthcare through the provision of a fully integrated nursing station that optimizes patient care and enables mobile point-of-care.

The implementation of this solution contributed to St. Stephen's Hospital's official recognition as the first fully integrated digital healthcare facility. However, this state-of-the-art "hospital of the future" goes beyond merely leveraging mobile communication technologies to support existing workflows, and instead transforms the entire healthcare experience. In this new setting, patient medical records, X-ray results, and pathology reports can be remotely accessed from any location in the hospital, including patient bedsides, providing clinicians with instant access to data for faster and more efficient decision making. As the first hospital in Australia to achieve Stage 6 certification from the Healthcare Information and Management Systems Society (HIMSS), St. Stephen's Hospital has become a national benchmark in automated patient care, paving the way for further advancements.

Individually Lockable Drawers

For St. Stephen's Hospital, the AMiS MedProx solution is a patient-specific medication dispensing solution designed to place medication distribution in proximity to patient care to assist in achieving the Five Rights of Medication Administration. Managing medication at the patient's bedside eliminates potential errors and increases patient safety. On the frontlines of healthcare, few tasks are as important as medication administration.

According to the Institute of Medicine, in the United States alone, medication errors including missed consumption and incorrect dosage or infusion rates generate US$3.5 billion in costs and affect 1.5 million patients every year. Closed-loop medication is the latest medication management process for ensuring patient safety and regulatory compliance. The unique features of MedProx cabinets, such as medication alerts, locks, user logins, provide multiple layers of security and tracks all medication dispensing activity. These cabinets enable nursing and pharmacy staff to better support each other with a workflow that fosters greater communication and accountability.

AMiS Cart Designed for Ease of Use

Because mobility is an essential feature under the new healthcare paradigm, Advantech's AMiS mobile cart was specifically designed to address the mobility challenges of healthcare environments. Unlike conventional medical carts that use lead-acid batteries, AMiS-50 is powered by a lithium iron phosphate battery, which reduces the total cart weight by approximately 50% to a trim 8 kg. This combined with an even weight

distribution, large casters, and arched handles make AMiS carts easy to steer and push on a range of surfaces. Additionally, the lithium iron phosphate battery offers an extended runtime of 8-10 hours, with a total recharge time of no more than 3 hours. The intuitive dashboard design is also equipped with an electric height adjustment motor to further enhance convenience and ease of use.

Superior Infection Control

In addition to EN60601-1, and UL60601-1 safety certifications, the AMiS cart boasts a cordless and fanless design that prevents the accumulation of dust and particles for superior infection control. Additionally, all cables are routed through the integrated cable duct built into the neck, eliminating accidental snagging and ensuring easy and convenient cleaning.

Designed for Flexible Integration

Unlike other medical carts, AMiS is developed from the ground up and features comprehensive computer-to-cart technology. Advantech designed, manufactured, and integrated all the cart body and computer components to reduce integration issues and ensure fast and convenient maintenance. Because the cart is shipped with the computer and battery already integrated, users only need to attach the display to operate the cart. Embedded for greater durability, the industrial-grade computer features USB and Ethernet ports, as well as

two built-in 5-dB antennas to ensure constant connectivity.

The AMiS cart also features a DIN rail design with over 30 optional attachments, such as scanner holders, disinfection bottle racks, baskets, folder holders, and storage box attachments, to enable flexible customization according to the demands of specific hospitals and clinical applications. The flexibility of the hardware and software ensure that the system is future-proof and can be adapted to enhance and facilitate increased networking in hospitals.

Empowering a New Era of Mobility

The delivery of high-quality patient care and improved healthcare outcomes is no longer dependent on hospital facilities, instead it is achieved through the provision of sufficient care wherever, whenever, and however. Nowadays, mobile workspaces are critical for healthcare to provide both clinicians and patients with full access to data, services, and applications across locations for truly seamless caregiving. By achieving secure clinical mobility, the healthcare organization gains new levels of agility and performance while improving patient experiences and outcomes.

Finally, the AMiS cart is built for growth and designed to evolve with you. As user needs are identified, the flexible infrastructure and responsive capabilities can be developed and adapted to specific environments.

Overcoming Distance Barriers with Mobile Medical Services

OG Medical Helps Upgrade Hospital Intelligence

OG Medical, located in Portugal, provides continuous connectivity and flexibility for intelligent medical devices at fixed points throughout hospitals. These have helped OG Medical's customers quickly upgrade their services to provide next-generation intelligent medical care.

Article by Pearl Wright
Images by Advantech
Interview with Sandro Pinto, Business Manager of OG Medical

56

Based in Portugal, OG Medical is a systems integrator with expertise in device engineering, process management, logistics and marketing, and solution customization for the digital healthcare market. OG Medical distributes Advantech's medical computer platforms (AMIS, POC, HIT, MICA, MIT) as well as other medical-grade devices, mobile EMR platforms, registry systems, medical technologies, and value-added solutions with the aim of assisting diverse customers with modernizing their IT infrastructure and optimizing efficiency.

The company's beginnings date back to 2011. At that time, F.Fonseca, OG Medical's parent company and a leading provider of industrial automation solutions for more than 35 years, was serving as Advantech's sole representative in Portugal. Since their partnership with Advantech in 2001, F.Fonseca had experienced remarkable success in the industrial automation market, eventually establishing OG Medical as a subsidiary business unit to manage their industrial healthcare/medical instrumentation business.

As the 2011 economic crisis began impacting markets worldwide, F.Fonseca saw an opportunity in the digital healthcare sector. While many industries flailed amid the economic downturn and ongoing uncertainty, F.Fonseca found that the digital healthcare sector showed consistent growth, with hospital investments in IT hardware and software infrastructure

increasing in both the private and public sectors. By realigning their efforts towards the digital healthcare market, F.Fonseca not only negated the negative economic conditions, but also established the market foundations for OG Medical's current success. OG Medical was officially established as a separate company and an Advantech channel partner in 2013.

Responding to Industry Needs

As a channel partner, OG Medical can leverage Advantech's technical knowledge, industry experience, brand recognition, and more, to flexibly address market needs and customize innovative solutions that respond to emerging healthcare trends. Recent technological advances are changing the existing

treatment paradigm and delivery of healthcare. Devices that offer constant connectivity and flexible use at the point of care are attracting considerable attention in Portugal and around the world as important tools for providing more patient-centric care.

The introduction of portable workstations at a private hospital located in the north of Portugal was part of a recent effort to bring doctors and nurses to patient besides by facilitating the delivery of healthcare services at the time and place of patient care. The project was realized by OG Medical using Advantech's HIT-W182 terminals specifically customized to the hospital's usage needs.

The hospital required a portable workstation solution that could be integrated with existing hospital information systems, including a picture archiving and communication system (PACS), computerized physician order entry (CPOE) system, and electronic medical records (EMRs), to provide medical personnel with real-time access to patient data, medication prescriptions and administration schedules, laboratory test results, and diagnosis/treatment information from any location within the hospital.

Advantech's HIT-W182 information terminal is specifically designed for the healthcare sector and certified to EN 60950 and EN 60601-1 standards to ensure clinical safety and advanced infection control. The fanless design and IP65-rated front panel ensure quiet

operation and prevent the accumulation of dust and other contaminants. The benefits for the hospital included the digitalization of hospital processes, improved resource allocation, reduced medication errors and data duplication, streamlined workflows, and enhanced patient care. Beyond these initial benefits, the solution also offers additional long-term value. The flexibility of the hardware and software ensure the solution is future-proof and can be adapted to new applications.

More than Just Products

Advantech produces products of the highest quality that are specifically designed for medical applications. This means they are certified to the highest medical standards for hygiene and safety. With access to Advantech's extensive portfolio of products, OG Medical has become a strong product distribution channel in the European healthcare industry. Yet, this partnership involves more than just products. Sandro Pinto, Business Manager of OG Medical, commented "Our privileged relationship with the market leader, Advantech Digital Healthcare, has given us the ability to grow faster and differentiate ourselves from other established competitors."

Advantech is an integral part of OG Medical's business. As a trusted brand with years of experience providing intelligent scalable computing solutions, Advantech offers OG Medical not only extensive technical knowledge,

after-sales support, industry contacts/sales leads, and expanded market coverage, but also opportunities to interact with industry leaders for knowledge sharing and greater innovation.

A Bright Future Built on a Solid Partnership

The potential for growth and innovation in healthcare industry remains high, and OG Medical is optimistic about future growth opportunities. In addition to seeking partnerships with OEMs and other system integrators to generate new business, OG Medical plans to establish a maintenance department for promoting an industry-wide transition from standard PC-based platforms to medical-grade solutions.

Furthermore, OG Medical has ambitions to expand into other Portuguese-speaking markets throughout Africa and South America. Supported by Advantech's global presence, OG Medical understanding of the language and local culture makes them well-equipped to navigate the various distribution challenges. Partnerships that maximize resources by combining the strengths of each partner have the ability to yield substantial mutual benefits and drastically advance business growth.

From Hospital Administration to Medical Care

Comprehensive Mobile Healthcare Services

Peking University People's Hospital has introduced various Advantech medical care cart solutions to mobilize all its systems, from administration to medical care services, and fully realize its patient-centered service concept.

Article by Lin Long
Images by Advantech
Interview with Fan Liu , President Assistant of Peking University People's Hospital
Eugene Lin, Business Development Manager , Intelligent Healtchare, Advantech China
Jun Yang, Supervisor, Intelligent Healthcare, Advantech China

Amy, who had been hospitalized with leg injuries sustained in a car accident, was finally able to leave hospital due to obtaining physician approval. While thinking how to go to the checkout counter at the first floor to complete discharge formalities, she was surprised to see a nurse pass by with a cart that had a cash register, credit card terminal and printer. She smiled at Amy and said, "Are you ready to leave? Since you can't fully walk properly yet, checkout can be done here".

This situation is not fictional but a real everyday service provided by Peking PKUPH. Founded in 1918, PKUPH is one of the top 10 hospitals in China. In 2014 June, the hospital received the Acute Care Stage 7 award from the American Healthcare Information and Management Systems Society (HIMSS) Analytics (less than 2% of the hospitals have achieved this level currently), and also received the HIMSS-Elsevier Digital Healthcare Award. These awards are the best testimony of PKUPH's medical healthcare quality and management improvement through the hospital's new system.

Fan Liu, President Assistant of Peking University People's Hospital, expressed that with their new enhanced management efficiency, the hospital hopes to better deploy all its patient-centered services. Since 2012 it began to cooperate with Advantech by implementing a wide variety of mobile information devices, including computerized nursing carts, documentation carts, meditation carts for resident physicians and the previously mentioned mobile cashier cart to improve its overall healthcare services quality.

Eugene Lin, Business Development Manager of Advantech Digital Healthcare in China, stated, "Digitalization of medical records is the first step for an e-hospital." PKUPH had already adopted PDAs earlier on to help its practices, but the small screens with limited functionality were unable to provide adequate power for applications and as such were only being used to confirm the identity of patients. Both reasons encouraged PKUPH to upgrade its IT applications and adopt the PDAs as an auxiliary tool. By using Advantech's computerized nursing carts, nursing tasks such as administration, replacing drip bags and measuring patient's physiological information

After using our mobile cashier cart, PKUPH has significantly decreased the waiting times of patients, and as such its use of time has been expanded from morning only to all day

(blood pressure, body temperature, etc.) could be performed in the ward and be recorded directly into the main system. The cart could also be used as a computer desk at the nursing station because the height could easily be adjusted.

Mobile Workstations in Hospitals

Presently PKUPH receives approximately 8,000 to 10,000 patient visits. However, the buildings of this time-honored hospital are very old so halls and consulting rooms are relatively small. The outpatient service counter is often full of people and such overcrowding affects the service quality. PKUPH has been planning to introduce a mobile temporary billing counter to relieve the long queues, and after evaluating various options, Advantech's mobile cashier cart was chosen as the ideal hardware solution to provide a stable reliable system that could speed up outpatient services.

Jun Yang, Key Account Supervisor of Digital Healthcare in China, noted that mobile cashier carts are different from mobile nursing carts in a number of ways. The former usually has a lot of power consuming devices installed, including three kinds of credit card terminals and two printers. Some of them use AC (alternating current) rather than DC (direct current), resulting in the power integration being critical for smooth operation of all devices. Being proficient in power integration technology, Advantech manufactured and

assembled the equipment from the trolley body to the computer and battery. Moreover, the modular design also reduced customization costs and time. "After using our mobile cashier cart, PKUPH has significantly decreased the waiting times of patients, and as such its use of time has been expanded from morning only to all day", Fan Liu said.

The successful implementation of the two projects allowed PKUPH to continue deepening cooperation with Advantech and adopt mobile medical carts that enable resident doctors to explain conditions to patients and their families during ward rounds, thereby assisting with ward round teaching. Eugene Lin highlighted that every PKUPH mobile medical cart integrates two screens to display PACS images and electronic medical records at the same time so as to better facilitate doctors' understanding of their patients' condition. The hospital is planning to further install high-definition cameras for remote consultation to reinforce the doctors' ability to provide service in faraway and rural areas.

Many manufacturers are able to offer medical equipment to the Chinese market, but the reason why PKUPH chose Advantech's solutions was for two main reasons: The first is the capability of providing small carts with good features for flexible movement and operation within the narrow wards and the space-limited nursing stations. Secondly, the whole package was put together by Advantech instead of selecting commercially available self-assembling products. This enabled more convenient and efficient after-service through a single supplier. In addition, Advantech provides on-site maintenance services throughout China. The repairs are usually completed typically within two days, thus diminishing the risk of equipment failure that could affect hospital operations.

In the future, PKUPH plans to fully implement additional mobile medical carts, as well as continue to carry out its program of digitization of its medical services so as to improve its service quality and efficiency while reducing hospital management costs.

Intelligent Healthcare

24-Hour
Medical Care for ICUs

Hospital in Western Australia Implements an Intelligent Bedside Medical Care System

Royal Perth Hospital has been providing medical care services to residents of Western Australia, especially those in the Perth metropolitan area, for nearly two centuries. In recent years, the hospital has been upgraded to achieve the vision of high-quality medical care and enhance customer satisfaction.

Article by Josie Rae
Images by Advantech
Interview with Santo Gazzo, General Manager of Advantech Australia
                     Daryl Collins, WA State Manager of Peacock Bros.

For nearly two centuries, Royal Perth Hospital (RPH) has been providing healthcare to West Australians, especially those in the Perth metropolitan area. RPH is the largest and longest-serving hospital in Western Australia.

As a premier teaching hospital and cornerstone of health service in Western Australia, RPH observes the highest standards of medical care, pursues innovations in research, and commands an experienced IT engineering team with considerable investment in maintaining their IT infrastructure.

Like many hospitals in Australia and the rest of the world, RPH is now riding the tide of digitalization with the aim of delivering superior patient and physician experiences by improving efficiency, productivity, and quality.

In Australia, approximately 42% of all healthcare spending is provided to hospitals. However, with the country's aging population, hospitals are experiencing increasing pressure caused by growing financial strain and the need to invest in digitalization. Most hospitals are currently competing on digitalization under budget constraints. Nonetheless, because digital hospitals of the future will generate efficiencies, improve safety and clinical outcomes, and provide a high level of patient and clinician satisfaction, the benefits of digitalization are expected to justify capital investment in infrastructure and IT solutions.

Upgrading Aging Equipment for the Latest Technologies

In 2015, RPH initiated an upgrade project that identified a need for medical-grade all-in-one panel PCs for conducting bedside physiological monitoring.

In addition to displaying data, the hospital wanted panel PCs capable of additional functions, such as providing alert/alarm notifications when monitored data reached pre-established thresholds, increasing the required processing capability. The panel PCs also had to satisfy the system specifications needed to support the hospital's Philips medical application solution. These included the ability to run Microsoft Windows 7 OS, connect to printers and Local Area Networks, and satisfy the minimum hard-disk space and memory storage demand.

A Clear And Cost-Effective Solution

The winning contractor and Advantech partner, Peacock Bros., was established in 1888 and specializes in healthcare IT hardware and integration, delivering world-class healthcare solutions to Australian hospitals. They advised RPH that Advantech could meet their needs.

Advantech's POC-W212 is a medical-grade 21.5" ultra-thin, widescreen, all-in-one point-of-care terminal featuring rich I/O. Powered by an Intel® Core™ i5 processor with up to 16 GB RAM, this fanless system design fulfilled all the

> With the final delivery of a digital hospital, where a rapidly evolving technology is initially designed in, there must be allowance and flexibility to encompass newer technologies capable of supporting better care processes near to the opening day.

hospital's requirements to become the product selected for purchase.

The panel PCs were required to run the Philips IntelliVue XDS Application, which is designed to provide an integrated data platform and visual portal. By accessing medical records and data collated from hospital equipment and devices, Philips IntelliVue XDS Application enables data to be displayed on bedside devices or panel PCs connected to the hospital network via data synchronization.

The system allows physicians and medical staff to access updated patient information, such as monitored vital signs, test results, and other relevant treatment reports, in various hospital locations, including intensive care units, emergency departments, and radiology rooms.

Because the main purpose of the system was to facilitate the visualization of patient data, peripherals such as a mouse and keyboard were not required. Instead, the hospital adopted all-in-one PCs with a touchscreen, which addressed space efficiency considerations and minimized wire deployment.

"Advantech's product is one of the best units on the market for satisfying the demands of RPH," said Daryl Collins, State Manager of Peacock Bros. "The feedback we've received from those who have used the system is extremely positive. They are satisfied with the high-quality image and excellent computing performance, as well as the screen resolution and brightness — these are very important for them."

Moreover, Advantech's POC products are certified to UL60601-1/EN60601, Edition 3, international standards for safety and reliability in clinical environments. Additional system enhancements include a fanless design to prevent spread of viruses and germs, COM and LAN isolation to prevent electric leakage, as well as an IP54-rated water-resistant enclosure and IP65-rated dust-proof panel for easy cleaning to ensure infection control.

"These products are clear value for money," Collins added, "When you consider some of the

competing healthcare products out there... this (Advantech's product) is truly fit for purpose and delivers the capabilities and performance required with great cost-effectiveness."

> *"The Advantech product is truly fit for purpose and delivers the capabilities and performance required with great cost-effectiveness."*
>
> — *Daryl Collins, Peacock Bros., WA State Manager*

Collins further highlighted that this case demonstrates the importance of data digitalization and integration because it enables visualized displays of digital data collated from various hospital systems.

By early 2016, 27 Advantech POC-W212 systems had been installed in the RPH Intensive Care Unit on VESA mounts. The terminals were connected to the hospital server and integrated with the Philips IntelliVue XDS Application platform, enabling staff to retrieve medical data and clearly display critical images.

Furthermore, another public hospital located in the south of Perth plans to deploy 10 of Advantech's POC-W242 systems in the same manner.

Digitalizing Healthcare

Keenly aware of the market's changing environment, Santo Gazzo, General Manager of Advantech Australia, commented: "One of the challenges of digitalizing a hospital is integrating existing paper processes with the increasing array of new digital diagnostic devices. Taking advantage of the new digital healthcare era requires the mass conversion of clinical and operational processes from paper to digital."

Although that suggests that newly built hospitals would be better able to implement digital processes, Gazzo highlighted that, "We need to consider that a hospital design process can start five or six years prior to the hospital opening date. With the final delivery of a digital hospital, where a rapidly evolving technology is initially designed in, there must be allowance and flexibility to encompass newer technologies capable of supporting better care processes near to the opening day."

> *"With the final delivery of a digital hospital, where a rapidly evolving technology is initially designed in, there must be allowance and flexibility to encompass newer technologies capable of supporting better care processes near to the opening day."*
>
> — *Santo Gazzo, General Manager of Advantech Australia*

By leveraging the newest technologies, advantageous cost structures, and premium quality components, Advantech will continue to provide flexible and reliable solutions that meet market trends and customer needs in the medical sector.

Intelligent Tran

Internet of Vehicles Makes Travels Even

Railways

Highways

Roadways

nsportation

n More Intelligent

Comprehensive Safeguards Ensure Train Travel Safety

Electro-Motive Diesel (EMD) Establishes a Protective Network with an Automatic Protection System

Train safety is a very important issue in rail transportation. EMD, the largest manufacturer of diesel-electric locomotives, locomotive products, and diesel engines in the United States, has adopted Advantech solutions to construct an effective control system for train so as to enhance passenger and cargo safety.

Article by Peijiun Liao
Images by Advantech
Interview with Cooper Lai, Product Sales Manager of Intelligent System, Advantech

Train safety is a major concern in rail transport. EMD, the largest freight locomotive manufacturer in the U.S., has implemented its positive train control system by deploying Advantech solutions to enhance passenger safety and protect cargo.

Rail transport is a common mode of transportation and one of the oldest types of rail-based vehicle system. By linking a locomotive with multiple train cars, many passengers and large quantities of cargo can be transported. However, despite the speed and convenience of rail transport, incidents such as collisions, derailments, and broken axles occur on occasion. To ensure rail safety, the U.S. government passed legislation in 2010 requiring all freight trains to install a positive train control system, also known as an automatic train protection (ATP) system. Strict enforcement of this law began in 2016. EMD, the largest freight locomotive manufacturer in the U.S., uses Advantech's solution for its ATP system, which is installed in all of its products, thus providing a comprehensive protection mechanism to safeguard both passengers and cargo during transport.

Freight Trains: Monitoring Train and Freight Conditions to Ensure Transportation Safety

An ATP system must feature three essential components: (1) a data collection mechanism for all train operation parameters, (2) an on-board traffic-control computer for controlling all on-board equipment, and (3) stable and reliable computer systems. When a train applies the brakes, the braking distance must be calculated on the basis of the train speed, deceleration rate, brake delay time, condition of the braking system, track geography, and mass distribution of the train. If, for example, the mass at the rear of the train and deceleration rate were high, the momentum of the rear carriage would be too much for the train to stop smoothly; by contrast, if the deceleration rate was too low, the train could collide with another train. Lai Kuan-Lin, product manager of Advantech's Smart Systems Group, pointed out that Advantech's controller products offer high stability, are suitable for all types of harsh environments, and meet the requirements of U.S. laws regarding on-board control computers for ATP systems.

Mr. Lai further explained that given the weight of freight trains, the locomotive requires a considerable amount of power to pull the cars and longer braking distances compared to typical passenger trains. These are major factors that can increase the risk of an accident. Therefore, the reliability and stability of the on-board control computer must be extremely high, and robust signal acquisition and control ability are essential for collecting real-time data on the status of locomotive power, traction, and electrical systems, as well as other factors. As

Advantech has retained flexibility in its controller design, enabling system integrators to configure hardware modules to suit specific purposes.

necessary, the computer utilizes these data to determine when the brakes should be applied according to the calculated braking distance. Furthermore, the on-board computer must also be able to operate in harsh environments. This is particularly pertinent for freight locomotives because the control surfaces are often exposed to particulate matter and high temperatures. Therefore, the on-board computer must be waterproof, shockproof, resistant to particulate matter, and able to tolerate high temperatures.

Freight train control computers must also monitor the car couplings and security of cargo in order to prevent incidents of cars being left behind due to a coupling malfunction. The

valves of fuel oil trains must also be monitored to prevent fuel from leaking.

In the past, technology was not mature enough for the real-time monitoring of trains during transit; instead, electrical and mechanical equipment checks were performed upon arriving at a station. However, Advantech now offers solutions where controllers and sensors can be installed on the train to perform real-time monitoring, thus greatly enhancing train safety and shifting train management to a digital, networked, and intelligent paradigm.

Passenger Trains: Satisfying Safety and Recreational Internet Access Requirements

Different transportation requirements call for different on-board computer specifications. Requirements unique to passenger trains include video surveillance and passenger entertainment/information systems (e.g., wireless Internet access, video programs, and train information services).

Mr. Lai pointed out that, for passenger train applications, Advantech offers comprehensive solutions ranging from control panels to surveillance cameras, controllers, and switches. This saves system integrators and operators time and costs in terms of communication with different equipment vendors. If it is necessary to upgrade the equipment in the future or if the equipment malfunctions, they need only approach

Advantech as the single point of contact.

In addition, Advantech has retained flexibility in its controller design, enabling system integrators to configure hardware modules to suit specific purposes. For example, most electrical and mechanical systems on a train uses the controller area network (CAN) bus or multifunction vehicle bus (MVB) communication interface. For monitoring a train's operating status, system integrators can configure an additional CAN or MVB interface in the controller to connect to the train's electrical and mechanical systems. For video surveillance applications, a solid-state drive can be added to the controller to provide additional storage space for image data. "Because it is impossible for a single controller to satisfy the requirements of all possible applications, Advantech has adopted a modular design that allows system integrators and customers to deploy or replace modules as needed," Mr. Lai explained.

Mr. Lai also stressed that for video surveillance applications, Advantech offers not only hardware solutions but also smart image analysis software that provides functions for the following four applications:

(1) Detection of unauthorized entry into restricted areas: Passengers who linger in front of the conductor's compartment for an extended period may be in danger or require attention. The system will automatically notify the conductor of this situation.

(2) Passenger safety and prevention of terrorist attacks: In some European trains, surveillance cameras are deployed to identify possible explosive devices concealed in passenger baggage. In Dubai, if a passenger pulls out a knife-like object, the system will immediately issue an alarm to alert the authorities.

(3) Counting the number of passengers: When the number of passengers is near the train car's maximum capacity, its door will close automatically. The system can also be used to determine whether any passengers have not alighted from the train when it arrives at the terminal station.

(4) Automatic image analysis: Ambient light and anomaly alarms are considered in determining the image storage resolution. In other words, high-resolution images are capturing at nighttime or under unusual circumstances. Otherwise, images of lower resolution are stored instead.

From freight to passenger train transportation applications, Advantech offers flexible modular hardware and comprehensive, feature-rich software solutions that provide system integrators and operators with one-stop services that meet their requirements.

Shanghai Metro Reduces Queue Times

Automatic Toll Collection System Raises the Efficiency of Ticket Sales

Automatic toll collection systems have been adopted in many international urban rail transit systems. They are used to replace the traditional manual ticketing and checking practices. Set up at the entrance of a station, automatic ticket machines and gate machines allow passengers to purchase their own tickets in a more efficient way, thus expediting the ticketing process and resolving the distress of long queuing lines.

Article by Peijiun Liao
Images by Advantech
Interview with Cooper Lai, Product Sales Manager of Intelligent System, Advantech

With 365 stations across Shanghai's 13 municipal districts, Shanghai Metro is the world's second-largest urban passenger rail transport system. It has a total system length of 588 km, an average daily ridership of approximately 8.4 million, and provides access to most destinations in Shanghai. The key to Shanghai Metro's success is Advantech's AFC solution, which allows passengers to pass through the system—from purchasing tickets to entering stations—without having to wait.

AFC has become fundamental to many metropolitan urban rail transit systems around the world because it improves ticketing efficiency, reduces waiting times, and minimizes the risk of missing trains due to waiting.

AFC systems comprise TVMs, AGMs, and ticket-checking machines, all of which require a computer to act as a controller for rapidly and accurately processing ticketing information and transmitting the data to back-end server and clearing systems via Ethernet switches. Due to the limited space provided by the equipment's design, the controller volume, heat, and power consumption requirements are more stringent relative to other systems. Therefore, industrial computers have become the ideal choice. As for Ethernet switches, because the data volume and transmission rate are both relatively high, conventional commercial-grade products are unsuitable given the high workload. Thus, industrial-grade switches are usually deployed

to ensure the AFC system's reliability, stability, and service lifespan.

Flexibility and Customization Meet AFC's Multiple Application Requirements

Lai Kuan-Lin, product manager of Advantech's Smart Systems Group, pointed out that Advantech's AFC solutions provide stable and reliable Ethernet switches, servers, and controllers developed exclusively for AFC applications, which reduces system installation and maintenance costs. As an example, the AGM itself is not very large, and the surface area and space for technical personnel to work with are relatively limited. On Advantech's dedicated AFC units for AGMs, all of the interface ports are located on the same side and are organized by port type (e.g., separate sections for USB and COM ports), which facilitates installation and maintenance.

In addition, in consideration of the diverse requirements of different rail transport systems, Advantech has also incorporated flexibility and diversity into its product designs to provide standard or customized interfaces to accommodate different ticket sale formats.

Mr. Lai commented that although different rail transport systems appear to be similar, each country or each operator has its own set of unique requirements. For example, the type of accepted payment for purchasing tickets may differ (e.g., cash, credit card, or near-field communication) and the gates may vary

in design (e.g., gates reserved for persons with disabilities or baby strollers require different gate opening times and the option of manually operation). In general, meeting the requirements of such diverse applications requires the system integrator to collaborate with other suppliers, which increases the time for system integration. Therefore, Advantech has allowed for flexibility in modifying the unit's structure. System integrators can thus design products that satisfy the operator's requirements by simply replacing cards or using expansion slots.

For operators with special requirements,

To promptly transport passengers during peak hours, all TVMs are activated, whereas some of them are switched to power-saving mode during off-peak hours to fulfill energy management objectives.

Advantech can provide design-to-order service (DTOS) platforms to facilitate the customization design process. For example, as a precaution against terrorist attacks, some stations require their AFC equipment to include image analysis

capability. Should the AFC system identify a terrorist passing through the gate, the gate will not open and the police or security personnel will be notified immediately. Special applications such as this can be realized simply by adding a facial recognition module through Advantech's DTOS platform. It will take only 50 days for the DTOS platform to produce the desired product from start to finish.

Smart Management Reduces Station Operating Costs

Apart from hardware, Advantech also considers the operator's management requirements. System integrators can employ Advantech's WebAccess and SUSIAccess software for remote monitoring/control and equipment management capabilities. For example, Shanghai Metro has installed over 100 sets of AFC equipment. To promptly transport passengers during peak hours, all TVMs are activated, whereas some of them are switched to power-saving mode during off-peak hours to fulfill energy management objectives. In addition, in the event of an equipment malfunction, administrators can remotely identify the problematic parts, rendering it unnecessary to dispatch engineers to identify the source of the problem.

Mr. Lai added that WebAccess and SUSIAccess not only save system development time for system integrators but also aid station administrators by making equipment management more intelligent, thus reducing operating costs.

The number of AFC devices installed at rail transport stations usually varies according to their size (generally ranging from approximately 200 to 1000). Obviously, having more devices incurs higher administrative costs. In the past, engineers would be dispatched to all stations on a rotating schedule, which would typically require one or two engineers to be assigned to each station for unit administration and maintenance. However, with remote monitoring and servicing, administrators no longer need to send engineers for on-site repairs, and maintenance services can even be outsourced. On-site inspection and servicing are required only when issues cannot be resolved remotely.

From hardware to software, in the process of developing AFC solutions, Advantech always considers how to meet the needs of each party in the rail transport value chain, including system integrators, rail operators, and passengers. The spirit of serving the entire value chain is why Advantech has been able to successfully penetrate mainland Chinese and even global AFC markets. "So we're not just talking about the Shanghai Metro," remarked Mr. Lai. "If we look at the two oldest subway lines in mainland China, which are the Beijing Subway and Tianjin Metro, we can also find Advantech's AFC solutions in them."

Open up the Governor and Conception Vessels for Highways

A New Milestone to Duplicate Solutions to Worldwide

Traffic control and electronic toll collection systems are critical to making highways fully intelligent. Advantech has long been devoted to these two areas. The Yunnan Expressway and Taiwan ETC are two success cases that have set new milestones for this industry.

Article by Peijiun Liao
Images by Advantech
Interview with The Executive Director and President of FETC, Dr. Chang Yung-Chang

Traffic management and electronic toll collection (ETC) systems are critical to smart highway management, and Advantech has demonstrated outstanding achievements in these two areas, with Yunnan Highway in Yunnan Province, China, and Taiwan's ETC system serving as two key examples.

Yunnan Lu-Jiang-Pa Service Area is the largest, most comprehensive and multifunctional service zone on Yunnan Highway. The systems installed for traffic volume control include real-time image broadcast transmission, central image control management, network video recording, and traffic flow statistics systems. These provide various functions, including vehicle identification, vehicle location notification, voice broadcast, road information push notification, and safety monitoring. Management of the service area is

based on information management, for which safety monitoring, vehicle management, vehicle location, and information transmission functions are centralized on a single management platform. Front-end devices installed in the service area include various types of sensing devices for collecting information, ensuring reliable data collection and transmission. In addition, due to the limited amount of space for machine rooms, multifunctional service devices have been developed to realize six distinct system functions. CCTV monitoring has been installed in several crucial areas, such as parking lots, petrol stations, restaurants, storage areas, and vehicle exits/entrances. Furthermore, all data are centralized on a single platform and processed by two core systems (i.e., smart video analysis and consolidation) to realize visual management of the highway service area and real-time traffic management.

Multivideo Fusion System

The system can quickly aggregate and share IP camera video streaming via Real-Time Control Protocol, and it can also balance the streaming transmission. One advantage of the system is that existing cameras and video resources can be integrated without any investment overlap. Thus, a video fusion system achieves video resource integration and sharing and extends smart analysis and related applications to building a cloud-based smart traffic video information sharing platform.

Traffic Incident-Detection System

By leveraging on-road surveillance, a traffic incident-detection system can identify accidents and road events, including wrong-way driving, lane changing, and illegal parking, and notify the traffic control center immediately. Thus, audio and video warning messages can be issued within seconds of an event occurring. By contrast, conventional surveillance systems are incapable of detecting traffic incidents or working intelligently.

Vehicle License Plate Recognition (LPR) System

Concerning traffic management, a high-performance system for identifying vehicle license plates is an indispensable tool for traffic information centers. Accurately inspecting the license plates of traveling cars is key to comprehensively implementing e-traffic 24/7 management, in which volumes of license plate data are examined, recorded, processed, and transmitted. This form of management is particularly crucial because accurate inspection facilitates accurate LPR.

By collating and transmitting data at the front-end service area, the central management function module can quickly process and analyze the data to achieve remote video monitoring, information display, announcement management, and event reporting. Thus, the three major user groups can acquire the information they need:

drivers can acquire traffic information instantly, the management center can perform visual monitoring and advanced management through information collection, and the traffic control center can provide comprehensive monitoring of the highway service areas. In future, highway traffic applications are anticipated to have greater involvement of big data applications, rendering data collation the most crucial aspect at present.

ETC systems are a critical tool for enhancing the service of highway systems and efficiency of highway and freeway use. Given the increasing utilization rate of Taiwan's national ETC system, which was jointly developed by Far Eastern Electronic Toll Collection Co, Ltd. (FETC) and Advantech, payment accuracy is critical, and

a rate of 99.98% has been achieved for ETC. Thus, the complete e-management scheme has attracted the interest of various industry operators in Taiwan's smart traffic system. In future, FETC will cooperate with various parties to demonstrate Taiwan's strong innovation and research and development capabilities to the world.

The Executive Director and President of FETC, Dr. Chang Yung-Chang, indicated that "Once this ETC system—which is an ITS solution combining Advantech's ICT and FETC's experience in intelligent logic—passes a comprehensive inspection, the total solution platform will be able to create more domestic and overseas opportunities for the entire industry

To promptly transport passengers during peak hours, all TVMs are activated, whereas some of them are switched to power-saving mode during off-peak hours to fulfill energy management objectives.

chain of smart transportation." Dr. Chang further explained that FETC's ETC platform, which integrates traffic flow, information flow, and cash flow, will be combined with various technologies (e.g., radio-frequency identification, laser beam detection, optical character recognition [OCR], LPR, virtual private servers, dedicated short-range communications, and cloud applications) in addition to Advantech's industrial-grade servers to build a convenient smart driving environment for drivers. Furthermore, FETC's ETC applications, such as eTag, are accurate, and the high key performance indicator (KPI) value is attributable to the integration of imaging and OCR technologies. "In contrast to ETC services adopted overseas, Taiwan does not have toll gates or speed limit regulations near tolling areas. However, using FETC's eTag alone cannot achieve a 99.98% payment accuracy rate. Therefore, using FECT's LPR technology, we can successfully identify license plates, regardless of whether they are dirty or unclear, and correctly make payment deductions accordingly."

Dr. Chang further believes that Advantech plays a key role in ensuring that highway operations are manageable: "The server installed near the toll gate must be able to operate steadily in harsh environments. Furthermore, if any of the gantry stations were to go offline, it would be impossible to achieve the 99.98% accuracy KPI requirement. Therefore, we are pleased to have such a great partner as Advantech, who provides outstanding industrial-grade technology services." Advantech engineers responsible for this project further elaborated that as recent as 2 years ago, Advantech had already begun providing ETC road tests and laboratory technical services. Furthermore, before the payment system went online, the company had already installed 500 industrial platforms along the entire highway, including high-performance server-grade mainboards and processors that meet ETC requirements for high-speed data access and computational performance. In addition, multiple redundant power, storage, and network systems have been implemented to ensure uninterrupted operation. The reliable hardware design meets industrial regulations for shockproofing, and resistance against physical impacts, extreme temperatures, and humidity. Additionally, the platform's native remote monitoring software enables monitoring the status of both software and hardware devices from central control room, thus reducing labor costs.

A highway requires the construction of multiple monitoring locations and gantry tolling stations to collect various types of data, consolidate them into different databases, and transmit them via a reliable network to the comprehensive platform in the control center. Advantech is seeking to utilize its partners' system integration capacities in its solutions to promote highly accurate ETC systems to other countries.

Successful Implementation of an Intelligent Bus System

Advantech's eBus System has Advanced Intelligent Transport Systems in South America

South American countries have been enjoying a booming economy in recent years. Following this, a comprehensive mass transit solution has become the mainstay of their transport infrastructure development programs. Compared with costly mass transit systems, Advantech's eBus system is an ideal solution for urban and intercity transport systems.

Article by Ying-Zhen Chen
Images by Advantech
Interview with Van Lin, Director of Intelligent Logistics, Advantech

In recent years, increases in the size of urban populations have generated public transportation problems. In many South American cities, the provision of adequate public transportation, which facilitates urban mobility, has become a critical issue. Van Lin, Director of Advantech's In-Vehicle Computing Division, pointed out that South America's continued development and economic prosperity have made urban construction a significant focus. Furthermore, many South American countries are actively seeking to host large-scale international events. Regarding urban humanities, the most important aspect of city planning, apart from building architecture, is public transportation. Resolving urban transportation issues is a major focus for South America, particularly regarding how governments plan to ensure the provision of adequate intercity public transportation. Thus, the implementation of a comprehensive public transportation solution is an essential part of their transportation infrastructure development plans.

According to Mr. Lin, constructing a mass rapid transit (MRT) network would be extremely expensive for South America. MRT carriages and rail equipment alone have been estimated to cost at least US$100 million, and most local residents would be unable to afford the travel fares. By contrast, an eBus system would offer a more convenient and economical transit option for South America's current economic situation. Considering intelligent traffic systems,

Advantech's eBus system provides the ideal solution for municipal and intercity public transportation.

Much like investing in an eBus system, road construction is relatively simple and easy to implement. Thus, local bus fleets have been developed into bus rapid transit (BRT) systems. Because of the challenges to public safety and security in South America, buses are typically connected to two or three additional compartments. However, without a monitoring system, bus companies cannot ensure the safety of drivers or passengers, which increases the risk to public safety. To address the need for enhanced safety, Advantech's South American office developed an eBus monitoring solution. The solution design was focused on three critical considerations: crime prevention, back-end monitoring (including vehicle speed and fleet dispatch), and safety (including environmental and in-vehicle surveillance). Additional features, such as advertising, bus positioning, and ticketing and fare collection, were also considered.

From a hardware perspective, the eBus solution is an intelligent system that monitors driver behavior. Regarding the video recording with back-end control function, because of cost considerations and design of communication networks in South America, the eBus system was designed to transmit still video images to the control room every 5–10 seconds for monitoring. In the event of an incident, the system

automatically begins real-time streaming high-resolution video to the control center. In addition to the system hardware, driver behavior is an important aspect of fleet management. Driver behavior and vehicle diagnostics monitoring informs fleet managers of the loss rate and overall status of each vehicle in a fleet. Recorded data can also be used to improve driver behavior and conduct real-time management.

Mr. Lin stated that "Advantech's eBus solution can provide a detailed record of vehicle driving parameters, such as the engine speed, braking patterns, and throttle position; this not only provides a record of inappropriate driving behavior but also facilitates real-time coaching. For example, when the system detects inappropriate driving behavior, a warning message is immediately issued. If drivers do not adjust their behavior within 10 seconds, relevant information is transmitted to the control room, and control center staff can then contact the driver to ensure that their behavior is rectified." In addition, Advantech's eBus system is equipped with features for preventing drivers' attempting to avoid monitoring (e.g., by deliberately removing the GPS antenna or tampering with the background tracking system). These monitoring functions and security features are aimed at tracking incidents of inappropriate driving behavior and reducing human error. For emergency preparedness, the eBus system is also fitted with an emergency detection device.

In the event of an accident or during critical moments, a distress signal can be sent to the control room, ensuring a prompt emergency response.

────────

A reduction in the driver attrition rate can be attributed to the real-time monitoring of driver behavior and vehicle status enabling fleet managers to promptly implement adjustments and avoid unnecessary waste.

With the development of intelligent transport systems in cities, such systems are likely to become the primary method of transport for local residents. In South America, the number of buses servicing a city center can reach as high as 10,000. This provides considerable opportunities for the generation of advertising revenues. For example, in a city of approximately 10 million people, if roughly 30% of the population were to use the bus system, external and in-vehicle advertising would have the potential to reach up to 3 million people. Given that advertising accounts for 20%–30% of the total revenue generated by public transportation and is one of main revenue sources of the eBus system, it has become the preferred method for many vendors. Moreover, interactive apps have extended in-vehicle entertainment beyond the one-way dissemination of advertising messages. The

apps can even be downloaded to smart phones, enabling passengers to adjust the volume of advertisements and send response messages. By increasing passengers' engagement and reading and listening to advertising messages, interactive advertisements can achieve good advertising effects.

According to Mr. Lin, South America has undergone numerous changes following the implementation of the eBus transport system. Data for several operational performance factors evidence the benefits provided by this system. Specifically, the on-time bus arrival rate has increased by 50%, fare collection errors have declined to below 2%, oil consumption has been reduced by 20%, traffic accidents involving buses have declined by 50%, insurance costs have been reduced by 20%–30%, tire wear rates have declined by 10%–20%, and the number of customer complaints has dropped considerably. A reduction in the driver attrition rate can be attributed to the real-time monitoring of driver behavior and vehicle status enabling fleet managers to promptly implement adjustments and avoid unnecessary waste. Mr. Lin also stated that although the initial cost of implementing the eBus system was relatively high, the total investment over the long term made it the ideal public transportation solution for city residents.

Intelligent Transportation

Energy and En

Progressing Toward a New Future for

Infrastructure and Urban Environments

Energy

vironment

Energy Sustainability

Continuous Monitoring to Ensure PM2.5 Detection

Solutions for a Blue Sky

In the pursuit of economic development, it is also critical that progress be sought in environmental protection. An example of this is the use of technologies such as IoT and big data analytics in the development of systems dedicated to the automatic continuous monitoring of air pollution. Such systems not only provide a snapshot of air pollution emissions to facilitate tracking air quality, but they also offer a more comprehensive means for monitoring and protecting the environment.

Article by Peijiun Liao
Images by Advantech
Interview with Xiuqing Jia, Product Sales Manager of Industrial IoT, Advantech China

The twentieth century saw the fastest growth in industrial technology witnessed in human history. While this rapid development has driven unprecedented economic prosperity, it has also led to a considerable amount of environmental pollution—especially air pollution. Despite the vast improvements in technologies designed to control air pollution in recent years, rising public awareness and related regulations are driving further advancements in this area. To protect the environment and avoid fines for breaching environmental regulations, the implementation of continuous emission monitoring systems (CEMSs) for stationary sources of pollution has become vital for the manufacturing industry. For CEMSs, air pollution monitoring instruments can be installed in chimneys to continuously measure emissions around the clock. This real-time monitoring combined with remote management technology improves the accuracy with which emissions can be measured and controlled.

In recent years, environmental improvement policies worldwide have gradually become proactive. Even China has listed air, water, and soil as major areas of focus in its 13th Five-Year Plan (2016–2020). Historically, dust storms have been common in China, and so public awareness of air quality is already relatively high. Meeting public expectations in this regard naturally presents an enormous business opportunity because of the sheer size of China's market, which is currently serviced by more than 100 equipment vendors of related systems. All levels of local government in China are now focusing on this issue, and the continual implementation of air quality regulations has made CEMSs a must-have for factories in China.

Advantech and its partner Shareshine Technology have developed an air monitoring concept for three distinct applications: the monitoring of emission parameters, the monitoring and signal feedback of volatile organic compounds, and the detection of smog levels and fine particulate matter (PM2.5) in northern China.

In recent years, environmental improvement policies worldwide have gradually become proactive. Even China has listed air, water, and soil as major areas of focus in its 13th Five-Year Plan (2016–2020).

High-Quality Hardware for Low Cost and High Performance

Since CEMSs emphasize continuous remote monitoring, they must operate 24 hours a day and remain online permanently to ensure that the recorded data are reliable. Thus, system stability is critical. Because the monitoring of air quality should not be restricted to a single region, CEMS instruments must be installed over a wide area to provide comprehensive data. Were such a wide

area of detection and a high number of stations to be managed manually, then responsiveness and management efficiency would be less than ideal. Remote monitoring is therefore crucial. The data captured by remote sensors can be transmitted via wireless technology for remote data transmission. Control room staff can also view the operating status of each instrument and perform troubleshooting remotely in the event of a malfunction. For errors that cannot be resolved remotely, service personnel can be dispatched on-site to handle the problem.

The air monitoring system developed by Advantech and its partner Shareshine Technology features a hardware solution that includes ADAM-4000 series data collection modules, Ethernet communication modules, and UNO-2000 series embedded industrial computers. ADAM-4000 series modules can be used to collect data on air flow, pressure, and temperature and transmits them via Modbus to UNO-2000 industrial computers for processing.

Aside from its industrial-grade specifications and high stability in harsh environments, a major advantage of this solution is its wiring simplicity. CEMS sensors are vertically connected to a back-end administration system via Ethernet, while peripherals connect via RS-232 or RS-485, emphasizing the simplicity of the wiring configuration. ADAM-4000 modules adopt the RS-485 standard to achieve a bidirectional, balanced design, making CEMSs more efficient and cost-effective. In addition, the 1/1000 precision of Advantech's ADAM-4107 and ADAM-4017+ modules ensures that they conform to regulations set by the State Council of China, specifically that gas emissions from coal-fired power plants do not exceed 35 mg/m3 for SO2, 50 mg/m3 for NOx, and 10 mg/m3 for smoke.

Advantech's UNO-2000 line of industrial computers can be adopted for their high performance, expandability, and small size. Notably, the series adopts a PCI interface that is particularly beneficial for system expandability. The fanless and dust-proof design also ensures that frontline instruments can endure severe

environmental conditions while maintaining stable performance, thus reducing the need for maintenance.

WebAccess/SCADA for Real-Time Monitoring

On the software side, the CEMS uses Advantech's WebAccess/SCADA platform to provide real-time information on the status of instruments at remote sites. When faults are detected, the system automatically issues an alarm to the system administrator, thus enabling an immediate response. Thus, on-site troubleshooting can be performed before an instrument fails completely, which is particularly useful given the difficulty involved in troubleshooting when there is no prior knowledge of the root cause of the failure. This not only guarantees that the CEMS can continuously monitor emissions while enhancing administrator efficiency, but it also greatly reduces system maintenance costs.

Energy & Environment

A Powerful IoT Solution for City Flood Control Systems

City flood prevention measures have become essential to modern living because of increasingly erratic weather patterns and rising sea levels. Such measures can assist in mitigating problems that can arise from heavy rain and flooding. In related applications, the scheduling of preventive tasks can be facilitated by combining water pump station systems with accurate water forecasting systems. Even in arid countries in the Middle East, storm water management is essential. This has been recognized for some time by local authorities in the UAE, particularly in Al Ain, where advanced storm water management systems have been in operation since 2012.

Article by Peijiun Liao
Images by Advantech
Interview with Eyad Al Hanafi, CEO, ETEK

The scope of this project was to improve and upgrade the operation and maintenance of storm water networks and pump stations in the UAE. It was designed as a two-phase project, the first of which was completed in 2012. From a subsequent evaluation, the conclusion was that Phase One left certain problems unresolved, and in March 2014, ETEK won the contract to undertake Phase Two.

ETEK is a UAE-based technology and integrated solutions provider that delivers a full range of products, services, and support to clients in the Gulf Cooperation Council and Levant regions. They provide industrial automation and applications in addition to business application solutions that focus on water, utilities, IFMS, and MES/MIS infrastructure markets. The problems remaining from Phase One included an excess of integration points, which made troubleshooting, maintenance, and installation expensive (especially since they could be performed from only a single location), and an overall lack of coordination, which made system management difficult.

The system was designed to include existing and newly installed alarms, a detailed reporting system, a configurable dashboard, and integration capability with third-party CCTV systems.

Phase Two of the project included 13 storm water pump stations, each of which required controllers, gateways with 3G/4G modems, and SCADA node gateways with 3G/4G modems. Furthermore, all 13 pump stations had to be designed so that they can be centrally managed from a single web-based SCADA system via a 3G/4G data network. The system was designed to include existing and newly installed alarms, a detailed reporting system, a configurable dashboard, and integration capability with third-party CCTV systems.

The solution proposed for each pump station

In recent years, environmental improvement policies worldwide have gradually become proactive. Even China has listed air, water, and soil as major areas of focus in its 13th Five-Year Plan (2016–2020).

comprised an APAX-5522 PE 32-bit CPU Remote Terminal Unit with an APAX-5045 12-ch DI/DO, an APAX-5040PE 24-ch DI, and APAX-5017PE 12-ch AI modules for pump management and information collection. Under this proposal,

data would then be collected by a compact UNO-2272G Embedded Automation Computer with iDoor technology for 3G/4G modules and then transmitted wirelessly to the control center. Each site would have a third-party CCTV camera installed. In the cases of emergency or unauthorized access, video information would then be sent to a UNO-2184 Embedded Automation Computer via high-speed Ethernet.

The proposal was accepted with minor adjustments. Advantech WebAccess SCADA System 5000 I/O tags were installed on each gateway to manage the flow of data, monitor the CCTV feeds in real time, and make the pump stations manageable from anywhere. WebAccess has many advantages over existing SCADA systems. The centralized system enables viewing, configuring, and controlling any pump remotely from any web browser or mobile operating system, thus significantly reducing the system's maintenance costs. Furthermore, the system was designed to accommodate an unlimited number of clients, meaning that there is no restriction on the number of users or devices that can access the system, making it easy for new users to access the system without the need for additional purchases. To monitor trends in pump operations and manage wear and tear on components, WebAccess stores the data on an SQL database. This can be used to generate reports from the preinstalled software, or it

can be used according to the needs of system integrators.

Because the 13 sites are distributed over a wide area, it is especially useful that engineers in the central control room could see exactly where the pumps are located. Fortunately, the latest version of WebAccess includes access to Google Maps, which can be used to pinpoint the exact locations of the pumps. The operating status of each pump can be clearly observed, and should more precision be required, engineers can query the software for further details.

By using Advantech's cost-effective solution, ETEK was able to deliver a system that was not only easier to engineer and develop but also much more efficient than the originally proposed system. With considerably reduced operating and maintenance costs, this total solution enabled engineers to access all of the system's pumps from any location. Advantech's hardware was easy to install and maintain, and Advantech's WebAccess SCADA made the system fully manageable from any location. With hundreds of preinstalled drivers available for third-party devices, WebAccess is unparalleled in managing legacy systems and makes future expansion considerably less expensive. ETEK's success with this project and their satisfaction with Advantech's solution mean that a win–win solution was attained for all parties, virtually assuring successful bidding on future projects.

Active Monitoring of Wastewater Treatment Clears Questions About Environmental Pollution

Automatic Monitoring System Ensures Effluent Conforms to National Standards

Automatic monitoring systems are essential in the process of sewage treatment. Every sewage treatment plant must ensure that its treated and discharged water complies with national standards and will not pollute the environment. Using IoT technology, Advantech has helped Easy Control Technology Co. Ltd. build a comprehensive backup automatic monitoring system to properly handle sewage problems for a free trade port in an area covering more than 100 hectares.

Article by Sharlene Yu
Images by Advantech
Interview with Chih-Yang Chien, President, EasyControl Technology

Automatic monitoring systems are an essential part of wastewater treatment. Regardless of whether the source of wastewater is residential, commercial, industrial, or agricultural, its treatment is pertinent to infrastructure development and city management. Wastewater treatment can effectively remove pollutants through physical, biological, and chemical means involving multiple filtering and disinfection processes. To ensure that the effluent will not pollute the environment, it must meet national standards before being discharged into public waters.

Since the quality and amount of influent water flowing into a wastewater treatment plant is always changing, wastewater treatment systems must operate 24 hours a day. Organizing shiftwork so that staff can manually control and monitor the system is inefficient. Automatic monitoring and control systems have therefore become a necessity in wastewater treatment plants.

"There is no way for wastewater treatment plants to know beforehand what type of wastewater will be discharged at the source," stated water treatment expert and President of EasyControl Technology, Chien Chih-Yang, "and there is no way that staff can be expected to be continually observing the instruments to monitor every change in the quality and quantity of water. Even if changes are noticed, staff cannot necessarily respond to them right away.

With years of construction experience in water treatment and a monitoring system that can automatically solve problems through industrial control technology

However, automatic monitoring and control systems are different. They can not only detect abnormalities in real time but also perform adjustments according to system default values. For example, when the water acidity is too high, the system will automatically adjust the pH to neutralize it without the need for staff to first find out about the problem and then handle it."

WebAccess Solution: Economical and Flexible

With years of construction experience in water treatment and a monitoring system that can automatically solve problems through industrial control technology, EasyControl Technology was able to secure the instrumentation part of the Kaohsiung Government's public tender "New Construction of Wastewater Treatment Plant for the Nansing Land Development Project" in 2015. To ensure the appropriate treatment of wastewater generated by the Nansing Free-Trade Zone (which covers a total area of more than 100 hectares) and keep the construction costs within the tender budget, EasyControl divided the treatment of wastewater into four processes

that are managed from a central control room, with the four processing substations (influent and settling, biological processing, rapid/slow mixing and effluence, chemical treatment and sludge treatment) being automatically controlled. In addition to the automatic monitoring of wastewater treatment processes and equipment, a CCTV video monitoring system has been established, and the power and air conditioning equipment are also monitored for energy conservation.

With over 1,000 I/O channels, the design complexity of the automatic monitoring system

When a project uses hardware and software from several different vendors, it's hard to identify the problem when a system error occurs. Most vendors won't think that the problem originates from their own product.

for the wastewater treatment plant must be reduced, and future maintenance processes must be simplified. To that end, EasyControl almost exclusively uses Advantech products for its hardware and software. These include WebAccess/SCADA browser-based software, APAX-5620 automatic controllers with several APAX series I/O modules, and two EKI series Ethernet switches. Mr. Chien explained why Advantech products were chosen for the job: "When a project uses hardware and software from several different vendors, it's hard to identify the problem when a system error occurs. Most vendors won't think that the problem originates from their own product. Advantech's product line includes SCADA software, computers, controllers, and network switches, so we do not have to look further to find products that can be integrated into the system or worry about compatibility issues. Even if a problem arises, dealing with a single contact window accelerates the troubleshooting process."

Mr. Chien added, "Advantech provided EasyControl a fully supported comprehensive solution with adequate functionality to enable us to focus our effort on researching innovations for the construction project." For example, the WebAccess/SCADA software provides nodes and communication ports for backup, the APAX controller with built-in dual CPUs can automatically establish master–slave control, and Advantech's proprietary X-ring technology—

which has a recovery time of less than 10 ms—ensures network reliability and stability. The rich and convenient picture bank, open platform for accessing collected data, and programming language that supports the IEC 61131-3 standard also allow project engineers to easily design and integrate automatic monitoring systems to fit their project needs.

Using Advantech's WebAccess solution with integrated hardware and software, EasyControl Technology has provided an automatic monitoring system for wastewater treatment for the entire Kaohsiung Nansing Free-Trade Zone, ensuring that problems can be automatically corrected at any time of the day. Most importantly, the system guarantees that effluent does not pollute the environment.

Energy & Environment

New Challenges for Clean Energy

SPMS Enables Precise Monitoring of Photovoltaic Power Plant Status

Solar energy has become mainland China's key technology focus on clean energy in recent years. Given the wide geographic deployment of photovoltaic (PV) systems, the monitoring of PV power stations presents certain difficulties. To overcome them, BOE Technology Group has implemented Advantech's solar power management system (SPMS) solution to accurately track the operational status of its power plants.

Article by Minde
Images by Advantech
Interview with Yanjun Luo, Business Development Manager of Industrial IoT, Advantech China

In response to the growing haze problem around Beijing and other cities, mainland China has been aggressively promoting the adoption of a clean energy policy in recent years. Developed in 2015, the "Photovoltaic Power Generation Incentives" scheme has accelerated the construction of solar power plants in China. As electricity from solar power is generated through the conversion of natural energy, the system's overall architecture and operations differ markedly from existing electricity generation approaches such as firepower and nuclear power. BOE, mainland China's major solar panel manufacturer, has sought assistance from

Advantech to create a tailor-made high-precision PV monitoring system.

System Characteristics Challenging Equipment Monitoring

As PV equipment must be operational 24/7 year-round, monitoring functions must be integrated into the system prior to implementation. However, compared to other power generation systems, problems affecting the management of PV systems include the equipment being deployed across a wide area, often in harsh environments, and having complex constituent components. These problems present a considerable challenge to the designers of equipment for monitoring PV systems. For example, because there is a wide variety of equipment types, products from different manufacturers have different communication interface standards, which can make system integration difficult. In addition, given that solar panels and related equipment are used in outdoor areas under constant exposure to sunlight, a major concern is whether the equipment can withstand high temperatures in a sealed chassis while operating reliably within normal parameters. Finally, to track the status of all PV equipment, each device is equipped with a communications sensor module. The module retrieves and transmits sensor data to a back-end control platform. However, given the vast deployment area of the PV equipment,

in the event of data transmission failure due to communications sensor module failure, recovering system operation can be difficult. These are the most difficult challenges currently facing the PV system industry.

Two possible scenarios may contribute to the aforementioned problems. First, the communications module may be a relatively low-end component because of budget limitations. In this case, the number of available communication protocols is likely to be very limited. Second, as mentioned, the cause may be too many products being from different equipment vendors, which presents considerable difficulty during system integration.

These two scenarios typically give rise to several issues regarding the system's overall construction and operation. First, some manufacturers may have failed to consider integration with other vendors' products during product design, in which case their devices may fail to connect to the main system. A solution would be to add a bridge or to change the communication protocol, but this would cause the system to become unwieldy and overly complex. Second, most small- and medium-sized data acquisition equipment manufacturers have relatively weak software development capabilities, which may delay the project's development schedule. Third, poor software capabilities may also cause devices from different vendors to lose compatibility. For example, when data transmission by terminal equipment is

disrupted, it would be difficult to retransmit the data or resume the transmission. Additionally, the data formats of the front-end and back-end systems may be incompatible. Finally, when an issue surfaces, it may be impossible to pinpoint the responsible party, and vendors may blame each other for the problem.

Stable and Accurate SPMS Offers Software and Hardware Solutions

To address these issues, BOE has implemented Advantech's SPMS, which combines industrial-grade hardware communications equipment and a Web-based software management platform. It also offers a typical IoT architecture consisting of three tiers, namely data acquisition, communications transmission, and system management, thus enabling BOE to monitor the PV systems accurately and comprehensively.

The smart software native to the SPMS is based on a browser/server configuration. Any device that can connect to an IP network can connect to the system, and no other software is required. The system's powerful expandability eliminates the high costs typically associated with software expansion. The power station information management interface designed specifically for PV applications enables users to easily add, delete, and modify station data. The software also integrates video surveillance, security systems, and geographic information systems. Administrators can monitor the status of each power station at any time via the back-end system. Apart from its management capabilities, the smart software is also equipped with data analysis tools. Data from front-end sensor modules are stored in the back-end system, which enables administrators to obtain all the real-time and historical data of every power station at any

time through using the native WebAccess/SPMS software. In addition to displaying the actual figures, the information can also be visualized as histograms, curves, or other graphical representations. In addition, the native system configuration software WebAccess/SCADA also allows users to write their own specialized software features or application programs.

With respect to hardware, BOE has deployed Advantech's SPMS on the following devices: ECU-1152 (smart industrial communication gateway with six COM ports), ADAM-4117 (eight-channel analog input module with Modbus), EKI-2541S (10/100T (X) to single-mode SC-type fiber optic industrial media converter), and EKI-2528 (eight-port unmanaged industrial Ethernet switch).

The multiprotocol standards and I/O design of the ECU-1152 enable it to connect easily and quickly to other system devices, thus ensuring effortless integration with the overall platform. Its characteristics include powerful computational capabilities, low power consumption, a fanless design, support for a wide range of operating temperatures, and wireless transmission ability, thus ensuring that it can operate reliably and stably in harsh environments. The ADAM-4117 is responsible for the acquisition and transmission of environmental and meteorological data. It can transmit data to the back-end system via the Modbus RTU protocol. In addition supporting a wide temperature range, the ADAM-4117 is also enhanced with antinoise and antisurge

mechanisms. Regarding front-end network connectivity, because PV power stations are located across a vast geographic area and each station has its own type, scale, and requirements, BOE has deployed the EKI-2541S fiber optic converter as an Ethernet connection (which has a transmission distance of only 100 m) to the fiber optic network, thus greatly extending the system's transmission distance. Between the power station and control center, the EKI-2528 ensures a stable communication environment for data transmission.

Cost and Performance Considerations

Advantech's SPMS has proven to be a viable solution to BOE's PV system monitoring problems. This visualizable, manageable, and controllable centralized platform has simplified the PV system management process considerably. Not only has it saved human resource and equipment costs, but the system's efficiency has also been improved. Dr. Han Xiaoyan of BOE pointed out that the SPMS web architecture no longer confines system monitoring to the control center, extending monitoring functions to laptops, smartphones, tablets, and other Internet-capable devices. Meanwhile, data from sensors and other front-end communications modules can also be transmitted from each power station, making data analysis at the back-end management platform more accurate and credible. Thus, a highly efficient PV power system is now a reality.

Industry 4.0

Utilizing Big Data to Upgrade Factory

Equipment Monitoring and Optimization

Process Visualization

Machine Monitoring and Predictive Maintenance

MES Integration and Product Traceability

Factory Energy Management

Machine Automation

Dispatch & Logistics Management

Intelligence

Turning the Page with Intelligentization

Everest Textile Co. Ltd.'s Transformation into a Smart Firm

As a manufacturer in the traditional textiles industry, Everest Textile Co. Ltd. has been actively transforming itself from a labor-intensive manufacturer into a knowledge-intensive firm. Everest is also planning to transform three old factories into smart factories in the next 3 years. During this process, determining how to upgrade the company's many old facilities and devices was its most troublesome problem.

Article by Yeh Gan
Images by Advantech
Interview with Shan-Gui Zhao, Smart Everest Promotion office, Everest

A 30-year-old weaving machine can be remotely monitored and controlled using software, making the machine become an interconnected part of a smart factory. Everest is a partner of world-renowned sportswear manufacturers such as Nike, the North Face, Columbia, and Lululemon. In 1997, the company successfully transformed itself into a manufacturer of high-performance sports fabrics, serving more than 300 well-known clothing manufacturers worldwide. The traditional textile industry was once considered a sunset industry. However, this view has been changing in recent years. Textile manufacturers have continued to research and innovate fabric technology. They have actively explored the transformation of traditional factories, shifting from a labor-intensive business model to a knowledge-intensive one. Transitioning from the previous strategy of low-priced competition and upgrading traditional processes to become intelligent ones are important issues currently faced by traditional industries.

Enhancing Intelligence

Since its establishment in 1988, Everest has positioned itself as a high-tech fabric manufacturer. To successfully implement this strategy, apart from annually investing 3% of profits into research and development in order to differentiate its products, the company has also conducted process improvements and

incorporated environmentally friendly concepts into its machinery and equipment, production management, and plant operations. In recent years, with the continued development of IoT technology and promotion of Industry 4.0 worldwide, Everest has realized that changes in the market and consumer requirements have necessitated this transformation and upgrade. According to Zhao Shan-Gui from Everest's Smart Everest Promotion Office, "The requirements of the market and customers are trending toward smaller quantities and greater diversification, which introduces new requirements in terms of equipment, processes, techniques, and so on." Mr. Zhao added that to quickly respond to changing market requirements, the company had to upgrade and adjust the current management and production model that it had adopted for its plants. As an example, Everest's plant in Taiwan has more than 1,100 weaving machines. For every new order, all related parameters must be reset, which is done using a memory card. In the past, these memory cards had to be changed manually, requiring time and human resources. Now, with the central control system, all equipment can be remotely monitored and controlled, and memory cards can be changed with the press of a button. This saves a considerable amount time and reduces the risk of human error.

Upgrading Old Equipment was the Most Difficult Issue

A tradition at Everest has been to transform the business once every 5 years in order to achieve the objectives of continuous innovation and sustainable development. In 2015, Everest added intelligence to its existing core competencies of innovation and sustainability and officially launched the Smart Everest re-engineering program. The company hopes to become a pioneer of smart manufacturing in the textile industry and is actively pursuing the realization of this goal. However, the company initially faced some difficulties in pursuing this goal. For example, as most machines used in traditional industries are old, attempts to implement automation are often met with integration problems. This is primarily because old equipment typically does not have open communication interfaces, and some machines are no longer in production, making them orphaned machines, which means that suppliers for upgrades, enhancements, or consultancy cannot be found. "From a cost perspective, it was unrealistic to replace all of the equipment. The question of how to transform and upgrade the old equipment became the biggest problem at one point," Mr. Zhao said. However, the solutions control panel provided by the system integrators for Everest uses Advantech products. This demonstrated the stability of Advantech's products to Everest as well as how active

Advantech has been in exploring Industry 4.0 in recent years; ultimately, Advantech's diverse products were able to help Everest resolve its most problematic issue. Advantech's rich and diverse products—including its integrated hardware and software platforms, such as the WISE-PaaS/RMM remote monitoring and management platform and WebAccess HMI/SCADA graphical management software, as well as the ARK-1550 embedded industrial computer and ADAM series Ethernet modules—enabled the collection of data from end devices throughout the plant. These systems can also be seamlessly integrated with high-level control systems and applications, even for very old equipment. For instance, in the technical process of dyeing, the weighing of dyes and combustive substance is performed manually, rendering it impossible to effectively control any measurement errors. This subsequently increases the potential defect rate. At present, the factory uses an automatic

From a cost perspective, it was unrealistic to replace all of the equipment. The question of how to transform and upgrade the old equipment became the biggest problem at one point,

weighing system, and this has effectively resolved this problem, conserving human resources and guaranteeing a consistent dyeing yield rate. In addition, in the texturing process, through remote monitoring and device management, it is possible to monitor and instantly determine whether any yarn has broken and whether there are any temperature abnormalities in the heaters. "In the past," Zhao described, "these problems could be detected and handled only when personnel go to the site in person. Now, it can be done remotely." The solutions that Advantech has provided Everest have also been applied in its spinning mills. From the control center, the machines can be monitored in real time and, on the basis of on-site feedback, production quality can be controlled. In the future, it may even be possible to analyze process improvements to determine the optimal parameters for production and equipment maintenance.

Smart Everest in the Midst of Transformation

Everest's intelligent transformation program has been in implementation for a year, and according to Mr. Zhao, the first stage of data collection has essentially been completed. For 2016, the focus was on data analysis. "All IoT applications are based on big data analytics, and subsequent strategic actions are taken according to the analysis findings," Mr. Zhao stated. Everest is currently analyzing its data on abnormalities in dyeing. In the future, the company will also

perform data analysis on the factors affecting textured yarn grades. These data analyses will be critical to guiding the production process for future plants. Next, Everest hopes that, through intelligent transformation, it can perfect the enterprise's overall operation and management. It can link upstream with the customer management system or downstream to supplier and electronic supply chain management systems. "Everest's re-engineering project is a program that was launched only in November last year, and it has not yet been perfected. However, in the spirit of progress through collaboration, we would like to share what we have experienced throughout the various stages of the company's transformation. In the future, we also hope that with the help of Advantech's technologies, such as automation, IoT, and cloud applications, as well as the consultancy and guidance from other professional fields will enable Everest to rapidly adopt relevant technologies and smoothly construct a factory operation model that complies with Industry 4.0."

Industry 4.0

Advantech Establishes its Smart Factory in Linkou

Accelerating the Realization of Industry 4.0

To speed up the development of Industry 4.0, Advantech has already built up smart manufacturing centers in Linkou (Taiwan) and Kunshan (China). Both centers are open to visitors for technical exchanges. It is hoped that we can help manufacturers transform themselves into smart factories through the integration of software and hardware, experience sharing, and our one-stop services.

Article by Peijiun Liao
Images by Advantech
Interview with Jonney Chang, Vice President of Intelligent IoT, Advantech
Lingo Lin, Vice President of Taipei Manufacturing Center, Advantech

Advantech's manufacturing centers began their active, intelligence-oriented transformation years ago, collecting information from sensors at operating sites and uploading it to the cloud for real-time analysis with visual presentation. Now factory directors and leaders can see the current status of production lines no matter where they may be located. Previously, data monitoring in a factory required manual operation, which not only wasted time but also resulted in higher error rates. Machine failures and unsuccessful staff dispatch, if any, affected factory production schedules. Generally, yield statistics would only be available when production was completed or at the end of the month, when work order progress could finally be understood and operation results be reviewed. But now, since the digital production line management upgrade has been completed, the benefits of Industry 4.0 are obvious: reduced production time, reduced manufacturing costs, and improved capacity and quality yield.

Construction of Model Factory Showcases Potential of Industry 4.0

Smart factory manufacturing describes the collection, integration, and analysis of all factory information using sensors, the cloud, big data, and other technologies to realize the combined goals of enhancing efficiency and reducing costs. The overall concept of Industry 4.0 is not difficult to understand, but the actual implementation does involve a variety of challenges.

According to Lingo Lin, Vice President of Advantech's Taipei Manufacturing Center, the key in acting on Industry 4.0 is determination. Each factory has its own production line configuration, production processes, and equipment. It is crucial that those engaged in the industry dare to accept the pain and challenges of transformation and face the truths revealed by the data after introducing new systems. Industry 4.0 is not simply the introduction of an information system or the construction of hardware equipment. It is a staged development process; comprehensive factory equipment perception, data collection, and networking produce optimized automation and labor savings. Integration and analysis plus data visualization enable decision making based on data analysis, and help develop the factory's required smart services. These stages must be developed gradually in order to achieve factory intelligence.

Cloud-linked Control of All Factory Information

"The cloud strategic situation room is the most obvious change in Advantech's upgrade to Industry 4.0," said Jonney Chang, Vice General Manager of Advantech's Automation Systems & Solutions. "The strategic situation room can be physical or virtual," added Lingo Lin.

Advantech collects, integrates and uploads

data produced by sensors, along with general factory information, to a cloud platform and presents the above to management in the strategic situation room. Due to the link with cloud technology, management can connect with the Industry 4.0 information platform online without time and space constraints to grasp production line information in real time, including equipment status such as which operators are at which production stations, which products are being made, progress of work order execution, production yield and so on, so as to implement decisions more easily. Both factory and management evolve together when senior executives and grassroots employees cooperate closely with each other.

According to Jonney Chang, the strategic

Industry 4.0 is a dynamic process with no downtime that is constantly advancing and changing, Advantech is still continuing the planning of Industry 4.0. The next step is expected to integrate information from external suppliers or logistics information into the platform.

---

situation room is different from a central control room in a traditional factory. A traditional factory collects data for the purpose of monitoring. As soon as a problem arises, management retrieves data in the central control room to determine reasons for the problem, somewhat similar to the role of a data storage center. In contrast, the strategic situation room is an oriented, decision-making center that collects and analyzes factory production and operation data and displays the factory environment and equipment status to facilitate decision-making. If an abnormal situation arises, the system automatically alerts the relevant leaders. It is the soul of factory management and operation.

SRP Software and Hardware Integration Simplifies Industry 4.0 Transition

For those in manufacturing with the intention of transformation to Industry 4.0, Jonney Chang advised them to think about what problems they want to solve before making plans. Advantech, for instance, identified production waste as a potential target, and expected to make further improvements. However, it turned out that the original data collected was insufficient to produce a clear cut path. As a result, it embarked on planning for its own Industry 4.0 transformation.

Therefore, data collection is deservedly called the foundation of Industry 4.0. Though data collection is not difficult, the depth and breadth of collection decides the scope of data application. Thus, where the amount of data is found insufficient, it is necessary to decide whether that data insufficiency is in production lines or equipment.

If production line data is insufficient, it will be necessary to add an action in the production line. For two examples, Advantech has introduced an auto labeler in a production line to replace a manual labeling operation; it has transformed its original process of manual steel plate number painting to automatic infrared scanning to reduce operation time. If equipment replacement is impossible on the production line, equipment data will be insufficient. In that case, an enterprise may be able to upgrade by adding external equipment that collects data from the original equipment. At present, Advantech supports over 450 controller drive programs/communication protocols and all kinds of I/O sensing interfaces to fully meet demands of data collection of different manufacturing devices.

Jonney Chang mentioned that Advantech has a history of over 30 years of devoting itself to industrial automation. From basic data collection to equipment networking, it has developed a series of complete solutions. In recent years, more resources have been concentrated in the roll out of smart factory SRP (solution ready platform) software and hardware integration solutions, emphasizing equipment networking and production visualization programs, providing one-stop services to manufacturers, and avoiding obstacles that may be encountered in the introduction of Industry 4.0 and accelerating the construction of smart factories.

"Industry 4.0 is a dynamic process with no downtime that is constantly advancing and changing, Advantech is still continuing the planning of Industry 4.0. The next step is expected to integrate information from external suppliers or logistics information into the platform. In the future, Industry 4.0 should drive upgrades and growth of the entire industry through applied experience and solutions that jointly usher in a data-driven, intelligent world," said Jonney Chang.

Industry 4.0

Create Smart Factories from the Equipment Networking

Realizing Paperless Production Management with Real-Time Visualization

Using Advantech's WebAccess platform as the core solution, we help system integrators and manufacturers to quickly build equipment networking-related intelligence system, to optimize the existing process and gradually transform the production lines from manual control into the operation mode of automation.

By Sharlene Yu
Images by Advantech
Interview with Marco Chen, Senior Sales of Indsutrial IoT, Advantech

Through the influence of Industry 4.0 and IoT, manufacturing industry is ready to transition to smart factories. The first step in the process of transformation is to collect production line data from the automated equipment network.

Marco Chen, Senior Sales of Advantech Industrial IoT Group stated that capacity and quality are the keys to the competitiveness and profitability of a company. Although some manufacturers have introduced MES, ERP or other manufacturing management systems, they still rely on manual transcription and data entry for information about factory equipment, or assign workers to conduct onsite inspections to confirm the status of production line equipment. Managers have no way of knowing the true status of their production lines in real time using such manual modes of operation. Therefore, equipment networking is an essential link for companies that want to strengthen production management and effectively control production equipment.

CASE I: Juyao Automation's Smart Platform Weight Scale System Stabilizes Food Quality with Auto Batching Program

In recent years, a number of food safety issues have occurred. When problems are exposed, not only do consumers panic, but the food processing industry also fears that momentary negligence or other shortcomings may have caused damage to business reputation and sales may decline. To maintain the brand name and build a good reputation that strengthens consumer confidence, prominent food manufacturers in Taiwan have decided to automate their production processes to reduce errors caused by manual operation, and to build traceability into their production by maintaining complete records of the manufacturing processes.

The system integrator, Juyao Automation, responsible for this particular project for a food manufacturer, recognized that if a barcode machine and platform weight scale were installed on the production line it would help with accurate raw material additions, and all work order information and formula data could be assigned to the product line from the central remote control room. However, the factory environment was not suitable for wiring to the network and production line staff included

both local and foreign laborers, so there were language challenges involved too. Therefore, the system needed to be equipped with a voice module in multiple languages to remind workers about correct operating procedures using wireless technology for communication.

Fortunately, through Advantech's EKI series wireless network module, a touch panel computer and browser-based InduSoft WebAccess software, Juyao Automation developed a smart platform scale and batching solution, through which the work order information and formula data could be smoothly transmitted to the processing site via a wireless network, so no network cabling was required. All peripheral devices such as barcode scanners, voice modules, PLC controllers, and platform scale modules were easily connected to the system. The formula management system inside the central control room also benefitted from the browser-based WebAccess interface, both for data analysis and generating production records, and it also allowed managers to understand production status at anytime and anywhere via their mobile phones, tablet computers, or other devices.

Marco Chen compared the difference before and after introducing the smart solution by taking an instant noodle seasoning packet as an example. "Previously, charging baskets above the production lines distributed materials according to different formulas for each batch and materials were then mixed manually by eye, but this easily led to inhomogeneous mixing or other errors. Inaccurate mixing could lead to an off flavor for the instant noodles, which was only revealed when tasted by customers. This could lead to poor reputation and even loss of our customer base. But with this smart platform scale and ingredient batching system, the contents and weight of the seasoning packet always matched the formula, reducing human error and ensuring product quality," said Marco Chen.

Case II: Streber-Tech Smart Formula Management System Delivers Precise Control of Chemical Wash Ratios to Maximize Yield

During the IC manufacturing process, much effort is expended on achieving cleanliness to ensure product yield, quality, and reliability. With integrated circuit components rivalling or surpassing dust particles for thinness, all contaminants must be rigorously eliminated. Clean air is important; so are solvent washes. Purity testing is performed for each step of the manufacturing process, both before and after each operation. The concentrations of solvent solutions and composition of the various chemicals determine whether zero-particle, zero-metal impurities and zero-organic residues can be achieved during closed testing after cleaning.

Using Advantech's UNO-2483G industrial computer and InduSoft WebAccess, with EKI series Ethernet switches and a wireless bridge,

and the ADAM series of digital and analog I/O modules, system integrator Streber-Tech Semiconductor developed a smart formula integration system for testing of wet cleaning work. With this system, the formula is confirmed by barcode scans and chemicals flow from selected chemical tanks into a mixing tank and are combined, then the solution is discharged into rinse tanks, with related flow data uploaded to the system. Meanwhile, load cells, solenoid valves, pumps, flowmeters and other devices are automatically monitored. If any abnormality occurs in the cleaning operation, an alarm is issued immediately to alert the manager.

"Previously, cleaning agents were mixed manually, but the concentration ratio of each chemical could not be accurately measured. One time an accident happened when a defective batch was produced. It was discovered only after goods had been delivered and caused a significant loss to the manufacturer. After implementing the automation control solution that Advantech built jointly with Streber-Tech, the factory fully mastered the closed-test cleaning operation and also improved their qualified manufacturing yield," said Marco Chen.

WebAccess Platform Makes Integration Easier

The so-called equipment network is intended not only to capture machine data; in fact, any data related to the manufacturing process that can be converted into digital signals can be included in the target data collected. So in our examples, data from the smart platform weight scale system and the smart formula system mentioned above includes information from all related sensors: the barcode machine, the platform scale, voice module, PLC, load cell, solenoid valves, flowmeters and other peripheral devices. The entire manufacturing process becomes transparent, resulting in more efficient and flexible production.

"The key to the correct implementation of Industry 4.0 and IoT lies in Integration," said Marco Chen. For system integrators, the WebAccess solution, plus a wide range of hardware products and real-time monitoring in the central control room can satisfy the demands of data capture from the production line. The dashboard development tool in WebAccess allows developers to more easily design a system with a simpler interface; it also supports OPC, SQL, ODBC and other standards, which makes it easier to aggregate various underlying data into the system.

From the manufacturer's point of view, rapidly introducing equipment networking solutions in response to customer demand can remove the problem of non-real time and error-prone manual operations, and also help to fully master work scheduling and production delivery, dashboard visualization, and real-time and paperless operating modes which help improve production capacity and quality.

Lock Every Screw Tightly

Creating Accurate Predictive Maintenance Functions

The world's leading screw nut manufacturers have set up accurate predictive maintenance systems for their manufacturing equipment by adopting Advantech's products and professional experience.

Article by Minde
Images by Advantech
Interview with Ray Lu, Senior Manager of Industrial IoT, Advantech

The smart manufacturing concept of Industry 4.0 has become the most important trend in manufacturing in recent years. In the pursuit of manufacturing with smart technologies, apart from making manufacturing processes more efficient and flexible, companies have found that equipment management is also a key area of concern. By applying various technologies, factory administrators can gain precise information on the status of equipment, thus significantly reducing the likelihood of unforeseen manufacturing downtime, delays in production lines, and increases in production costs. The global leader in screw manufacturing has partnered with Advantech to successfully create a predictive maintenance system for screw forming machines.

Tracking the Condition and Status of Molds to Improve Equipment Reliability

The company produces 6.6 billion nuts annually. With such a tremendous production capacity, they naturally depend on automated manufacturing equipment to a high degree. Thus, the company is at a high risk of suffering considerable losses in the event of an unforeseen equipment shutdown. Previously, they depended on experienced technicians to literally listen to the equipment to subjectively identify the source of a problem when a piece of machinery would make unusual noises. However, this experience-based troubleshooting method is relatively limited, particularly given the noise levels of factories, difficulty in transferring experience other workers, and unique sounds that different machines make. To rectify this problem, the company invested in predictive maintenance. Initially, they considered purchasing a predictive maintenance solution from a major overseas automation vendor. However, because of the high cost, the company decided to work with a local system integrator.

Eventually, the manufacturer engaged the services of a professional system integrator that implemented the system with Advantech's products.

Finding a suitable local manufacturer for this task proved to be difficult. The main reason was that working with screw forming machines requires a tremendous amount of specialized knowledge. The average equipment supplier or system integrator lacks the relevant experience and would likely need to invest considerable time and effort into research and development. Even after system implementation, calibration would require a substantial amount of effort, and the system's performance would unlikely meet the required standard. Eventually, the manufacturer engaged the services of a professional system integrator that implemented the system with Advantech's products. Utilizing

Advantech's extensive experience in this field, the screw manufacturer successfully completed the development of its predictive maintenance system.

To create an optimal system, it is necessary to possess sufficient technical expertise in the industry in question. In screw manufacturing, metal wires are cut and then passed through a cold forging press three times before the screws are formed. Subsequently, the rough cut must go through several operations, including turning, thread rolling, heat treatment, and electroplating before they are completed. The most important step in this procedure is cold forging. Because this process requires several to dozens of tons of pressure to impact the screw die, the die's lifespan is difficult to estimate. Replacing it too early would be too costly, while delaying its replacement might cause damage to the machine and delay production. Thus, accurately

For smart factories of the future, IIoT will undoubtedly be the principal framework for future manufacturing systems. However, there are many types of manufacturing, with each involving a different set of products and vastly different automation equipment.

estimating the die's useful life is critical.

Based on the company's requirements, Advantech proposed using the IPC-7220 chassis with an AMB-584G2 motherboard (featuring a Core i7-4770S CPU; PCIE-1810 500-KS/s, 12-bit, 16-channel analog multifunction card; and customized PCLD-8712SSO signal-conditioning terminal block). The operation of the overall system is as follows: a piezoelectric sensor is installed in the forming machine to monitor the stamping waveform to determine the degree of deterioration of the die in order to ensure that it is replaced at the appropriate time, thus achieving the objective of predictive maintenance.

The key performance indicator that the company sought to improve by implementing the predictive maintenance system was the availability rate. Following installation of the predictive maintenance system, the screw forming machines used by the company can now accurately detect the status of each die, and the likelihood of unforeseen equipment shutdowns has been significantly reduced.

Expert Experience Ensures Prompt Development of the Optimal Framework

The screw forming machine is a typical example of an IIoT application. IIoT must be constructed on the basis of specialized knowledge about the vertical application market. For screw forming machines, because the stamping pressure exerted on the die is extremely high and because screws are produced in large volumes at very high speeds, accurately detecting the die's status is inherently difficult, which is why adequate industry experience is essential in deriving the optimal implementation method. Advantech equipped the fording mold with sensors; by continuously analyzing the vibration waveforms to determine the mold's condition, the entire system was completed in less than 6 months, including design, testing, implementation, and calibration. It would have taken suppliers with less experience considerably more time to determine the sensor location through comparative testing alone, and the final system would have taken much longer to complete.

For smart factories of the future, IIoT will undoubtedly be the principal framework for future manufacturing systems. However, there are many types of manufacturing, with each involving a different set of products and vastly different automation equipment. Thus, the development of IIoT systems must rely on the expertise of system integrators and equipment suppliers for the optimal system to be built in a reasonable timeframe.

Industry 4.0

Seamless Integration of Production Information

Extend the Benefits of Information System Management

With Advantech's data capture solution, equipment information can be automatically collected and sent to MES or ERP systems. Transparent production information not only enhances production and management efficiency but also extends the application benefits of management systems to the production line.

By Sharlene Yu
Images by Advantech
Interview with Tim Chan & Guey Huang, Supervisor of Industrial IoT, Advanteh

Since the 1960s, the manufacturing industry has used computers to control cost and production to optimize company resources and efficiency. The rapid development of information technology has resulted in the creation of a wide range of information systems, such as enterprise resource planning (ERP) systems, manufacturing execution systems (MESs), and digital systems for managing customers, supply chains, products, manufacturing processes, and equipment. However, regardless of the type of system, data and statistical analysis provides the basis for operation. And although many companies have implemented digital management systems, rather unfortunately, they still rely on manual collection and entry for data acquisition.

Automatic Data Acquisition Replaces Manual Collection and Entry

For most factories (especially in traditional industries), production line operations involve

management printing out work orders via a digital management system. After completing tasks, operators fill in a daily worksheet, which is then submitted to the production managers to be input into the system. Tim Chan & Guey Huang, Supervisor of Advantech Industrial Automation Group believe that this method of operation wastes considerable time and resources, and increases the potential for data errors. Additionally, data is typically only entered into the system at the end of the shift or during the following day. This means that in the event that production operations do not accord with the system data, managers' decision making and production scheduling could be based on incorrect information, potentially resulting in excess inventory, incomplete work orders, and delivery delays. These negative outcomes may lead to business losses for manufacturers.

However, as Tim said, "Advantech's data acquisition solution is capable of automatically collecting equipment information and instantly uploading it to an MES, ERP, or other management system. Time-consuming, manual, paper-based operations with a high potential for error can be transformed with automatic data collection and real-time uploads. Production information transparency can effectively increase production efficiency and enable real-time management." Guey added, "The lack of standard protocols hinder data collection in traditional industries. Advantech's WebAccess

The introduction of an automatic front-end data collection solution provides immediate management benefits. Previously, the factory experienced at least a one-day lag in terms of information availability. With this new solution, real-time monitoring can be conducted, greatly improving management overall...

IoT platform solution not only provides a standard transmission interface and supports numerous drivers, but it can also be connected to various devices for seamless data integration across management systems. This allows developers to collect front-end data easily."

Tim and Guey presented two successful case studies involving VIP members of the WISE-Paas/IIot Alliance. In both cases, system integrators, with assistance from Advantech, were able to extend the functionality of their management systems to enable management of front-end production information.

CASE 1: RuiDing Introduces an Intelligent Reporting System for Presenting Production Information in Real Time

Although most people, even those in the technology or manufacturing industries, are

relatively unfamiliar with hand tools, Taiwan is one of the world's leading suppliers of hand tools, even earning a reputation internationally as the "Kingdom of Hand Tools".

The hand tool industry covers all hand tools used for repairing, adjusting, or dismantling, such as electric drills, hammers, wrenches, and screwdrivers. Hand tool manufacturing typically involves multiple processes, including forging, heat treatment, grinding, polishing, electroplating, painting, and engraving. Because toolboxes generally contain various tools, numerous finished products may be required to fulfil a single production order. Moreover, the production order may involve both in-factory and outsourced manufacturing processes, increasing the complexity of production management.

To assist the RuiTai Group with managing its hand tool manufacturing plant, RuiDing Technology independently developed a data collection system (DCS) using Advantech's WebAccess/SCADA browser-based software package, an ACP-4000 industrial computer chassis, an EKI-5528 Ethernet switch, and a WebOP-2070T human-machine interface (HMI) WVGA operator panel.

The DCS was implemented to automatically collect and transmit factory production data to the ERP management system. The system can display all production line information, such as the equipment operating status, operator behavior, work order numbers, production quantity, and production schedule, on digital signage that provides managers with a real-time overview of the production situation.

The core hardware of this DCS system is Advantech's WebOP-2070T operator panel, which offers durability, compatibility, scalability, and easy integration. This HMI product is suitable for operation in extreme environmental conditions, such as high temperatures, humidity, oil and dust exposure, and can support hundreds of industrial PLC communication protocols to facilitate the collection of CNC machine and equipment data. The built-in USB interface allows all work order data stored on handheld barcode machines to be read directly and uploaded without necessitating an additional network converter.

"The introduction of an automatic front-end data collection solution provides immediate management benefits. Previously, the factory experienced at least a one-day lag in terms of information availability. With this new solution, real-time monitoring can be conducted, greatly improving management overall," said Tim.

The innovative intelligent reporting system developed by RuiDing is suitable for more than the hand tool manufacturing industry. Manufacturers of bicycles, automobile parts, hardware, furniture, machine tools, measuring tools, etc. have also implemented this system to address ERP deficiencies and increase real-time management efficiency.

CASE 2: Alpha Information Systems Implements Paperless Production Management by Introducing a Dedicated MES System

For manufacturers, the introduction of an MES can streamline production, reduce inventory, ensure on-time delivery, and improve product quality. The manufacturing sector in Taiwan includes a wide range of industries. According to the Executive Yuan's Directorate General of Budget, Accounting and Statistics, the manufacturing industry in Taiwan comprises nearly a hundred categories. MES solutions are ideal for manufacturers because they optimize management of the entire production process, from order receipt to product delivery. However, because production methods, along with manufacturers' expectations of management systems, differ between manufacturing industries, MES systems must be configured to specific customer needs or integrated with additional features to maximize functionality.

To address the requirements of factory operations, Alpha Information Systems developed a unique MES (AlphaMES) aimed at a few key manufacturing processes. This system also included Advantech's WebAccess/SCADA browser-based software package, as well as its HPC-7242 industrial rackmount server chassis, PWS-870 rugged tablet computer, EKI-6332GN Wi-Fi network client, EKI-5728 Ethernet switch, WISE-4012 IoT wireless I/O module, and EIS-FEC310-H embedded computer.

This integrated software/hardware system provided the ideal solution for a factory that must make frequent dynamic adjustments to its production lines. Besides allowing managers to quickly understand the production and order processing status via data displayed on digital signage, the system transformed their paper-based order processing operations into digital processes involving barcode scanners and electronic forms, ultimately reducing data collection costs, accelerating the output of reports, and providing traceable production records.

Guey commented that Alpha Information Systems, using its strong customization capabilities, was able to integrate several standardized subsystems into a comprehensive solution by adopting a modularized system design. The combination of Advantech's WebAccess platform and industrial hardware products enable AlphaMES to deliver its front-end data collection functionality. More specifically, the PWS-870 rugged tablet computer allows production line staff to complete work reports electronically, the WISE-4012 IoT wireless I/O module facilitates automatic collection of equipment data, and the EIS-FEC310-H embedded computer enables real-time equipment monitoring and maintenance.

Considering the AlphaPMQ subsystem for example, this intelligent predictive maintenance

system monitors the equipment operation status by measuring equipment vibration. Alpha Information Systems adopted the high-performance EIS-FEC310-H to collect machine data, and then created a dynamic display output using WebAccess/SCADA's user-friendly dashboard development tool. This display output provides managers a clear overview of the control center systems' dynamic uninterrupted power supply (DUPS), allowing them to assess potential risks and schedule early maintenance to prevent catastrophic failure and interruption of the production line. This predictive maintenance function is highly valued by semiconductor manufacturers, and a number of manufacturers in Taiwan and China have also installed this system in their wafer manufacturing factories.

Cooperation to Achieve Early Implementation of Industry 4.0

Information systems that enable digital management play a significant role in business decision making and the management of daily operations. Although information technology and industrial control systems have not traditionally been integrated, the arrival of Industry 4.0 has necessitated cross-system data communication. Accordingly, developers are facing urgent demands for a comprehensive industrial control solution for conveniently and rapidly integrating production information.

"Because system integrators have professional knowledge of specific industries, and Advantech has a diverse product portfolio and extensive experience with industrial control and integration platforms, cooperation and collaboration is the key to accelerating the realization of Industry 4.0. Advantech's scale and prestige in the industrial control market offers attractive advantages for potential partners," said Tim.

Guey added, "System integrators will implement Industry 4.0 solutions with the technical support of original equipment manufacturers. Despite the diversity apparent in the manufacturing industry, Advantech's numerous data acquisition solutions enable system integrators to develop unique systems customized to the production processes of specific industries. Furthermore, because these solutions integrate both software and hardware, they can significantly shorten development time, facilitate early completion, and accelerate the implementation of smart factory applications."

Industry 4.0

AOI System Ensures Accurate Quality Control in Automotive Production

The Strongest Back-up System of Manufacturing

Overcoming human limitations, Advantech's AOI system has become one of the most accurate automotive inspection systems on the market. Adopting six-axis robot arms, the system enhances the flexibility of machine vision technology to render car inspections faster and more accurate.

Article by Minde
Image by Advantech
Interview with Spencer Lai, Product Manager of Industrial IoT, Advantech

Advantech's automated optical inspection (AOI) system has become the most accurate system for automobile inspection systems and a solution for the problem of human errors that can arise during manual inspections. By combining AOI systems with a six-axis robotic arm, Advantech has further enhanced the flexibility of machine vision technology to make automobile inspections faster and more accurate.

Within only a few years, Industry 4.0 and smart factory concepts have become established trends in manufacturing sectors worldwide. With highly intelligent systems, production lines and plants now operate under more streamlined workflows and have become more energy-efficient. Smart systems are based on automation, and the auto industry has one of the highest levels of automation among all manufacturing sectors around the world. Taiwan's auto industry has adopted Advantech's AOI solution to enhance the quality control of vehicles produced in Taiwan.

Automotive manufacturing has been a pioneer in implementing automated systems. This industry has been a leader in various applications, in both the breadth and depth of its innovativeness. There are several reasons for this. First, the industry requires an extremely high number of parts. For example, more than 10,000 parts are required in order to assemble just one automobile. Second, precision is

paramount. Parts and components must be aligned perfectly, and welding must also be extremely precise. The third factor is the weight. As the main body of an automobile is made of metal, human workers are unable to handle the weight for a prolonged period. Thus, considerably more movement control and robotic arms are employed in auto assembly plants than in other manufacturing plants.

Combining Robotic Arms for Added Flexibility

As the quality of an automobile affects the safety of drives, passengers, and pedestrians, quality control is extremely important for automakers. Before an assembled vehicle is received to stock, it must undergo a final comprehensive inspection. Inspection checklists typically comprise more than 200 inspection items including the color of the paint, condition of the tires, alignments of the parts, and so on. Unlike the assembly process, which is highly automated, the inspection process is a largely manual procedure. Generally, a group of three inspectors conducts the inspections, which are typically completed within 2 minutes. However, manual inspections have some limitations. In recent years, Taiwan's automakers have been under pressure because of the strong growth in market demand, and this has increased the workload of inspection teams. When inspectors become physically exhausted, both the

inspection speed and quality naturally decline. To address this issue, the automaker in question implemented Advantech's AOI system, which integrates robotic arms and machine vision.

Advantech has partnered with system integrators by providing machine vision systems that are a combination of industrial-grade cameras and computers. System integrators, on the other hand, are responsible for integrating the machine vision components into robotic arms. The complete system consists of 2 six-axis robotic arms, 22 industrial cameras with GigE interfaces, and industrial-grade computers with built-in digital I/O ports. The AOI system can complete an automobile inspection in 80 seconds after receiving a directive from an upstream manufacturing execution system (MES). The data generated from the inspection are then transmitted back to the MES.

The flexible movement capabilities of the six-axis robotic arms make the inspection procedure more efficient. Industrial cameras used in conventional machine vision systems are generally installed at fixed locations along the production line, and high-resolution imaging is used to inspect rapidly moving products. However, because automobiles are bulky and difficult to move, the system is designed with the cameras embedded in the arms so that they can be repositioned to adjust the camera angle. The movement path is designed to accommodate the robotic arms; thus, during inspection,

the cameras can be moved deep inside the automobile to capture images, which are then transmitted to a high-performance back-end processing system for comparison. Finally, all test results are uploaded to the MES, thus completing the automated inspection and data networking procedure in smart manufacturing.

High-Quality Solutions for the Smart Factory

The system uses Advantech's UNO-3085G industrial computers, which have a fanless design and no internal cabling. Because of the factory's harsh environment, the system design had to be robust enough to prevent dust from affecting normal operations. For communication ports, the UNO-3085G's multiple slots and I/O port design allows flexibility for system integrators to incorporate different peripherals that require different interfaces. Concurrently, the compact slot design facilitates the unit's integration with the overall system.

In terms of communication design, given the efficiency requirements, captured images are rapidly transmitted to the back-end system. For this reason, Advantech's PCIE-1674E-AE communication network card, which features four built-in Ethernet ports, is connected to the QCAM-GM2500-014CE industrial cameras. Because the system adopts the power-over-Ethernet standard, the cameras do not require external power cables. Concurrently, the system

features a PC-1756 I/O card that provides up to 64 channels. The system can control peripherals such as sensors, solenoid valves, and indicators simultaneously, thus enabling administration staff to track the status and condition of the manufacturing floor in real time.

This automobile inspection system has improved the speed and quality of inspections, generating high added value. Through the equipment's network connection, the system is incorporated into the overall IIoT system, thus enabling seamless data flow from the equipment. In the system, data captured from vehicle body inspections are used by back-end IT systems (e.g., MES, ERP, and others). There, the data are stored and organized into actionable information before being compiled into reports for managers, providing instant control over inspections and revealing potential manufacturing strategies. For example, should a particular automobile part be found to have a low yield rate for a certain period, comparisons can be made with the production data to locate the cause and improve the manufacturing process.

Following the emergence of intelligent technologies, smart factories have effectively inaugurated a new industrial revolution in the manufacturing sector. Smart technology-enabled systems must be based on a solid foundation of comprehensive automation. Among all manufacturing industries, automakers have adopted the highest degree of automation.

Currently, major automakers worldwide have implemented systems that are highly automated or based on smart technologies. However, many developments must continue for Industry 4.0 to be fully realized. The reason is that, although the current wave of industrial innovations is quite significant, the pace is rather slow. Innovations and major changes take time. Manufacturers must comprehensively consider their own requirements and introduce necessary changes only gradually. During the implementation process, the role of system suppliers is also very important. Advantech has invested in the auto industry for some time. Apart from the company's products, Advantech can leverage the expertise it has accumulated over the years and combine it with its resources to design tailor-made solutions for automobile manufacturers. In the present case, Advantech created an all-new AOI system. Following its implementation and deployment in production, the system's success has been affirmed by the customer. Going forward, the automaker will expand the installation to include other assembly plants, and Advantech will provide strong technological support to ensure the customer's further success.