Intelligent
Healthcare

Accelerating Hospital Digital Transformation and Connected Care

25%

Teleconsultation issue of insuffici services

Medical AI

Revolutionize Endoscopic Brain Surgery

With Advantech's rich experience in the medical in USM-500 was designed with various expansion op solution providers flexibility without having to wo corresponding drivers, operating system, or heat c

Optimize Nursing Care and Patient Treatment

Application Story

CONTENTS

24

08

22

Smart Hospital - The hospital of the future

Cloud Micro Services

Command Center

| Device management | Building management | Operation Management | Hospital insights | Clinical Dashboards |

Data Acquisition   **Medical Data AI**   **Medical Image AI**

SaaS Platform

| EHR/ Practice Management | NIS | LIS | PACS |

Hospital System

Specialties Care System

| Smart Emergency | ICU Intelligent | Smart Obstetrics | Smart OR |

Smart Emergency
- EMR Dashboard
- RTLS

ICU Intelligent
- Device gateway
- Vital sign
- Alert notification

Smart Obstetrics
- OBS Nursing Dashboard (Intrapartum/Management/ Postpartum)
- OBS Patient system

Smart OR
- OR Scheduling
- OR Control System
- OR Dashboard
- OR video Streaming and Recording

Inpatient
iWard

| Nursing Call | Patient Care | Nurse Scheduling | Patient Management | Medication Management |
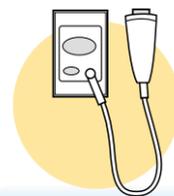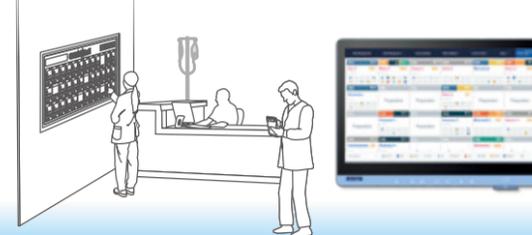
Patient Care
- Patient education
- Patient satisfaction

Public Space
iOutpatient
iTeleMed

| Signage System | Kiosk | Queueing System | Telehealth | RTLS |

Accelerating the Global Deployment of iHealthcare with Ecosystem Partners

The rapid and continuous development of IT has accelerated the rise of intelligent healthcare. Cutting-edge technologies such as edge computing, AI, imaging, robotics, 3D printing, and others are being adopted across the healthcare sector, helping to solve problems related to the unequal distribution of medical resources and care inefficiency. Catering to this trend, Advantech has embraced the challenge of promoting health and well-being through intelligent medical services and healthcare, and its iHealthcare business has already developed many core competencies and expertise.

Intelligent healthcare solutions revolutionize the industry

Frank Huang, Sr. Director of iHealthcare Division at Advantech, pointed out that the integration of cutting-edge technologies such as AI, imaging, and robotics has begun to affect the entire healthcare industry and brought about massive change. Frank stated, "First, technology shortens the learning curve for doctors, allowing hospitals to train more outstanding doctors faster, overcoming the issue of insufficient staffing. Second, the integration of technologies such as AI and 3D printing can accelerate the development of smart customized medical equipment, providing patients with better medi-

cal services and improved quality of care. Third, AIoT applications that connect resources through high-bandwidth networks and advanced imaging technologies make telemedicine more feasible, solving the problem of insufficient medical resources for remote areas. Finally, medical equipment featuring AI and imaging technology is facilitating the development of precision medicine. As a result, medical services such as minimally invasive surgery and radiography have significantly improved, delivering better patient treatment with fewer side effects.

Three interconnected strategies to bolster innovation of smart solutions

As a leading player in the global intelligent healthcare market, Advantech is currently utilizing three interconnected strategies to build a new healthcare ecosystem.

The first strategy is the integration of cloud computing and software. Advantech utilizes comprehensive software, hardware, and cloud platforms to collaborate with global partners. For example, Advantech teamed up with NVIDIA and used its Clara Holoscan MGX, a reference design for a real-time medical-grade AI computing platform, used to collaborate with software developers from the healthcare sector in developing software that integrates AI and imaging technology.

The second strategy is the integration of OT and IT. Advantech has extensive experience in the healthcare sector and has worked with renowned and newly established medical equipment manufacturers to help them develop more advanced medical equipment.

The third strategy is to provide hospitals and healthcare centers with smart solutions directly. Currently, Advantech has developed iHospital solutions based on WISE-PaaS, which comprises intelligent wards, intelligent telehealth, and real-time location systems that enable high-quality, patient-centered healthcare.

Multipronged market strategy underpins global launch of iHealthcare

Advantech has adopted different regional strategies. Frank Huang pointed out that for large-scale markets such as Europe, the United States, and China, "Advantech has utilized a partnership model for providing medical-grade industrial computer products and iHospital solutions to domain focused system integrators (DFSI) or medical equipment manufacturers to

accelerate the promotion of iHealthcare. For example, Advantech collaborated with Intuitive Surgical, a prominent US medical equipment manufacturer, to combine medical-grade monitors and tablet computers featuring built-in AI and image recognition with a robotic surgical system to jointly drive the development of precision surgery."

In Taiwan and Southeast Asia, Advantech has cooperated with hospitals directly to implement smart applications. In Taiwan, Advantech has assisted the Taipei City Women and Children's Hospital, Taipei Veterans General Hospital, and Yeezen General Hospital in implementing solutions in various fields. For instance, Yeezen General Hospital has built an iCommand Center with Advantech's support, showcasing how hospitals can benefit substantially from intelligent healthcare.

In the wake of the COVID-19 pandemic, people have started to pay more attention to intelligent healthcare. As governments worldwide continue to relax laws and regulations, making it easier to implement telemedicine and precision medicine, Advantech will look to collaborate with ecosystem partners to advance intelligent healthcare for well-being of everyone, and help realize intelligent healthcare in more places around the world. ■
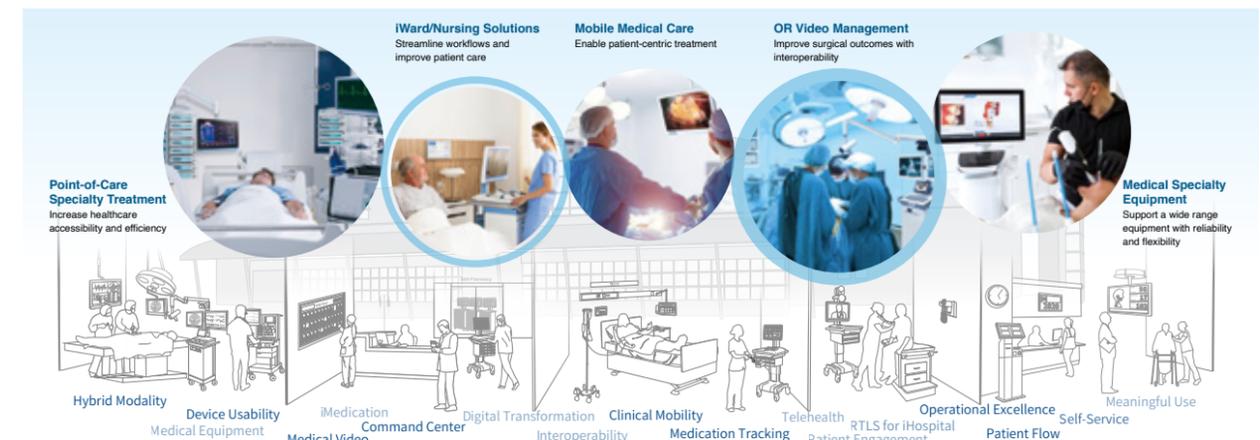
Top Artificial Intelligence Trends and Their Application in Healthcare

Photos provided by Advantech and Frost & Sullivan
Article by Maeirah A. Ashaie, Consultant of Healthcare & Life Sciences, Frost & Sullivan

Globally, the medical imaging market, which comprises technologies (e.g. CT scan, MRI, ultrasounds and X-rays) used for diagnosis, treatment, or monitoring is expected to grow substantially at a CAGR of 6.8%. During the same period, the global imaging informatics market, which comprises Radiology Information Technology (IT) and Enterprise Imaging IT technologies and supports doctors in interpreting increasingly complex images, is expected to grow at a CAGR of 7.6%.

Growth Drivers & Restraints

As global healthcare recovers from the impact of COVID-19, the backlog of screening and diagnostic imaging procedures will be addressed from 2022 onwards, leading to increasing demand for radiologists and procurement of additional diagnostic imaging equipment to address this rising demand. Cloud-based systems are likely to replace traditional picture archiving and communication systems as growth is further supported by increasing digitization. These cloud-based artificial intelligence (AI) systems are increasingly popular due to their potential to reduce the workload of radiologists, boosting productivity to meet growing demand. To successfully digitize imaging informatics,

companies will need to solve the issues in data migration between different platforms to support continued growth.

Key AI Trends

Increasing implementation of AI in diagnostics

The first key trend is how AI algorithms are being developed for use with traditional diagnostic equipment throughout the imaging process. For example, there are AI systems that aid positioning of patients before imaging to increase consistency. These systems then utilize deep-learning neural networks to reconstruct images with better low-contrast detectability, reducing radiologist reading time while also achieving a lower radiation dose and noise. Additionally, there are diagnostic AI technologies which come into play towards the end of the imaging process. This can be seen through a solution developed by Advantech and its partner, whereby the solution analyses chest X-rays to detect problems and highlights patients with life-threatening lesions to radiologists for immediate treatment. This is highly beneficial for patients as it allows them to receive prompt care which could not have been achieved in the traditional first come, first serve workflow.

Increasing implementation of AI imaging solutions in surgery

Surgical workflows (pre, during, and post) and AI systems that support better surgical outcomes are increasingly being implemented.

Pre-surgery, AI is supporting surgeons in their planning by turning traditional CT or MRI scans into 3D reconstructions. The National Health System (NHS) in the United Kingdom has recently partnered with a company that uses de-identified scans from NHS clinicians to create 3D reconstructions. The 3D image segmentation is used to reconstruct the organs and it is checked for accuracy before reconstruction. The model is then used by surgeons to assess a patient's anatomy as part of their pre-operative planning.

Moving forward in the surgical process, AI systems are being used to improve the consistency of treatment between surgeons. Applications such as OrthoGrid's surgical navigation applications, assist orthopedic surgeons in real time and help them to reduce errors and improve patient outcomes. It is able to do so with unmatched efficiency as it utilizes Advantech's USM-500, a medical-grade high performance computer, to capture real-time images for AI processing to provide instantaneous feedback. OrthoGrid's AI ecosystem of procedure specific apps aims to interpret, assess, and process critical data from fluoroscopic X-ray images so surgeons can make faster and more reproducible clinical decisions.

Before, during, and after surgery, Theator's

Leverage Medical AI

USM-500 / PAX Series

Surgical Intelligence Platform supports post-surgery analysis of the recorded surgery videos generates analytics from surgical videos. Its end-to-end Surgical Intelligence Platform captures intraoperative surgical video using, NVIDIA certified, USM-500 to record surgeries in 4K. All surgeries are anonymized, uploaded to the cloud; from the cloud, videos are analyzed to provide insights such as procedural challenges and annotations that improve consistency and performance variability in surgical performance and opportunities for improvement. Overall, the platform contributes to reduced surgical variability and improved patient care as well as operational efficiency.

Barriers to AI Implementation

Despite the advantages that AI brings to healthcare systems in terms of efficiency and patient care, there remain fundamental barriers to implementing AI.

Data privacy and security are top of patients and regulators minds when it comes to providing AI with access to sensitive health data. Authorities are also still grappling with how to regulate an ever- changing AI system. Moreover, creating a usable and understandable AI for healthcare workers while structuring the variety of healthcare data into usable inputs will require personnel trained in both data science and healthcare, which is currently lacking. Lastly, the biggest barrier is the core computing infrastructure needed to efficiently run the vast amounts of information collected and processed by healthcare systems.

However, high performance computing coupled with AI framework solutions are a worthwhile long-term investment trend for hospitals as they can be used across various fields such as surgery and radiology. High performance processing will be crucial in supporting digital twinning — computer simulated visualization of real-world objects or processes that can be used in surgical planning or in imaging such as CT or MRI scans. Displaying the results of AI systems and digital virtualization will also require the use of medical grade displays such as Advantech's PAX series of monitors that can accurately display traditional surgical and diagnostic imaging alongside AI visualizations. Furthermore, high performance computers will become highly beneficial for hospitals to be able to store and retrieve information from a single established library DB as AI vendors integrate themselves within the healthcare system and expand further to provide a comprehensive solution across multiple technologies.

In summary, the medical imaging and informatics market is growing steadily. It is expected to recover to pre-COVID-19 levels and beyond. AI is increasingly playing a role in imaging diagnostics and in operation rooms. The successful implementation of AI will require significant capital, investment in skilled personnel and buy-in from patients, healthcare providers, and authorities. ∎

Frost & Sullivan, as a growth pipeline consulting firm, is at the center of an ecosystem of best practice cultivation, executive peer support, and cutting-edge insights that is singularly focused on reshaping the world through managed growth.

FROST & SULLIVAN

Leveraging Medical AI
First-ever NVIDIA-Certified Medical-Grade Package for Healthcare AI Applications

NVIDIA. CERTIFIED

PAX-3 Series | Medical Displays

Wide Connectivity
HDMI, SDI, DisplayPort, DVI, VGA and S-Video supported

DICOM Compliant
DICOM calibration and recalibration support

High Reliability
Strong ESD protection

Key Features
- Optional FHD resolution (1920 x 1080) & 4K UHD resolution (3840 x 2160)
- Optional touchscreen panel
- Optional 4K SDI supports 3G x 4 or 12G x 2

USM-500 Series | Medical Box PCs

Medical Grade
IEC-60601-1-2 certified medical-grade design

Modularized Design
Flexible front cover and buttons for easy customization

Smart Fan
Auto-adjusted fan speed

Key Features
- 9th generation Intel® Core™ i3/i5/i7 processor with 10 years longevity
- NVIDIA-certified with support for NVIDIA RTX A6000 GPUs
- Provides 4 x PCIe expansion slots for diverse add-ons, graphics, data capture and LAN cards. All systems medical certified ready.

www.advantech.com

PAX-3 Series Product Page

USM-500 Series Product Page

ADVANTECH

Enabling an Intelligent Planet

iWard Solutions

Transforming Nursing Care with Digital Wards

Drive market value with Advantech iWard solutions:

- **Rapid installation**
- **Scalable integration**
- **Flexible customization**
- **Modularized expansion**
- **Achieve HIPAA and GDPR compliance**

Nursing care challenges

1.Time-consuming paperwork

Nurses are often tasked with handling patients' physiological measurements, treatment records, and other paperwork. Illustratively, studies indicate that nurses spend an average of 50% of their workday looking at screens. This is time that could be better spent taking care of patients.

2.Lack of system integration

The lack of interoperability between hospital systems creates circumstances in which nurses need to be proficient in various software platforms while repeating data input tasks on devices with different information systems. This is an arduous, time-consuming process that can create medical error risks and/or data discrepancies.

What are iWard Solutions?

Advantech's iWard line comprises turnkey solutions designed to help medical personnel and enhance patient care. iWard solutions leverage a flexible configuration and an intuitive user interface to facilitate the provision of clear information and interactive patient education. These features increase patient engagement and improve overall healthcare outcomes.

Benefits

Optimize operational efficiency

Eliminate paper-based processes

Augment communication efficiency

Enhance Patient care

iWard Products Implemented

1.Nursing control station

The nursing control station is an integrated platform designed to manage inpatient care operation. This station provides real-time notifications that enable medical personnel to respond to patient requests promptly while delivering professional, high-quality care.
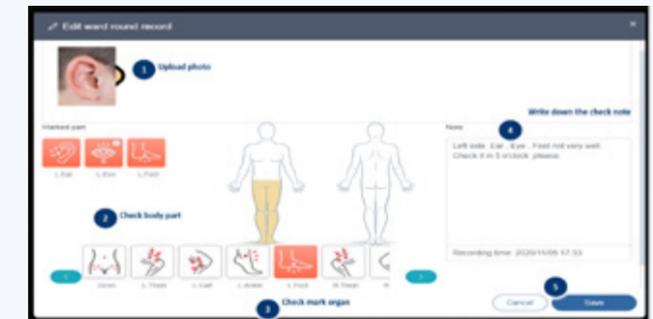
Ward round note

2.Nursing dashboard

The iWard Nursing Dashboard is an integrated information platform that streamlines workloads and optimizes care delivery. By using this solution, medical personnel can access patient insights easily and decrease response times.
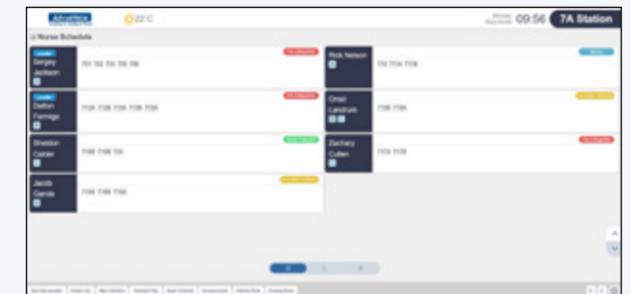
Nursing schedule

3. Patient information terminals

Patient information terminals are installed in inpatient rooms. By integrating with hospital networks and information systems, they provide information access, entertainment, and real-time communication.
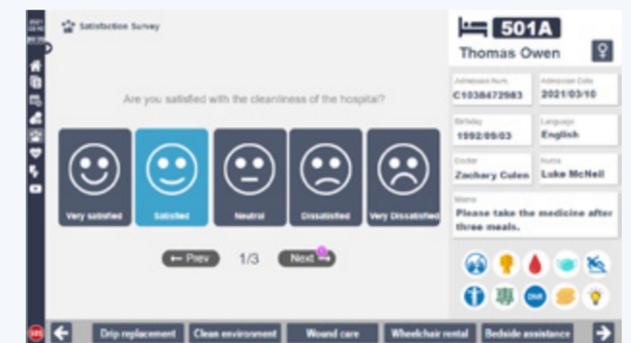
Satisfaction Survey

Case Study: Chung Shan Medical University Hospital

Chung Shan Medical University Hospital has spent over two years upgrading existing beds with intelligent ward solutions. In contrast to most hospitals, which only upgrade VIP or personal wards with such solutions, this hospital chose to introduce bedside Patient Infotainment Terminal (PIT) systems to all their wards. These PIT solutions reduce the amount of time medical personnel need to spend consulting with patients and family members by streamlining information. Indeed, they enable staff to focus on treatment and care while reducing the need for extended information delivery. The introduction of Advantech's iWard System has proven influential in strengthening health education and improving management efficiency.

> *The Advantech iWard solution for information integration improves immediacy of use. It also improves medical personnel work efficiency, and enables patients to receive better medical care through intelligent work practices.*

- Chiu-Hsiang Lee, Deputy Dean of the Nursing Department at Chung Shan Medical University Hospital

We provide solutions for the following use cases

1 General ward

2 Obstetrics

3 ICU

4 Emergency room

Solutions Page

Watch Video

Transforming Healthcare with iWard Solutions
Optimize Nursing Care and Patient Treatment

Cloud Native

ADVANTECH WISE-PaaS
AIoT Solutions & Marketplace

iHospital iWard

Patient Information Terminal

Nursing Dashboard

Nursing Control Station

iWard Mobile Nursing Station

iWard Mobile

ADVANTECH
Enabling an Intelligent Planet

GDPR

HIPAA COMPLIANT

Digital Transformation of Hospital Wards

Advantech's iWard solutions are turnkey offerings designed to assist healthcare workers and enhance patient care. Featuring high configuration flexibility and an intuitive user interface, iWard solutions facilitate the provision of clear information and interactive patient education for increasing patient engagement and optimizing healthcare treatment. Additionally, iWard solutions have achieved Health Insurance Portability and Accountability Act (HIPAA) certification in the U.S. and General Data Protection Regulation (GDPR) certification in Europe.

iWard Solution Software

iHospital **iWard** Basic

iHospital **iWard** Bedside

iHospital **iWard** Mobile

iWard Basic
- Nursing Control Station
- Nursing Dashboard
- iWard Nursing Cart

Bedside iWard
- Bedside Information Terminal
- Patient Information Terminal
- Doorside Terminal

Mobile iWard
- iWard Mobile

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Advantech Headquarters
No.1, Alley 20, Lane 26, Rueiguang Road,
Neihu District,Taipei, Taiwan, 114, R.O.C.
Tel: 886-2-2792-7818
Fax: 886-2-2794-7304

iTeleMed Solutions

Start your virtual care service right now! Presenting an integrated B2B software portal for virtual clinics.

Drive market value with iTeleMed solutions:

- **Streamlined installation**
- **Easy deployment (web-based)**
- **Intuitive design**
- **Achieve HIPAA and GDPR compliance**

Challenges in starting virtual clinics

1.The lack of a shared platform between institutions

The lack of a unified information system between healthcare institutions makes sharing appointment schedules, patient data, and medical records across different institutions a challenge when starting a virtual clinic.

2. The lack of preexisting workflow integration

The lack of virtual care platform integration forces medical personnel to repeat data input. It also necessitates returning patient information to existing information systems (such as HIS & EMR) following retrieval. This clinical workflow is time-consuming and redundant.

What are iTeleMed solutions?

By providing easy access to exam results and medical records while streamlining appointment scheduling and management, Advantech's iTeleMed solution enables healthcare institutions to provide effective remote care for virtual outpatient services.

Benefits

Shorten patient travel times

Expand community healthcare availability

Achieve seamless patient-centered care

Enable responsive remote care

iTeleMed Solutions Overview
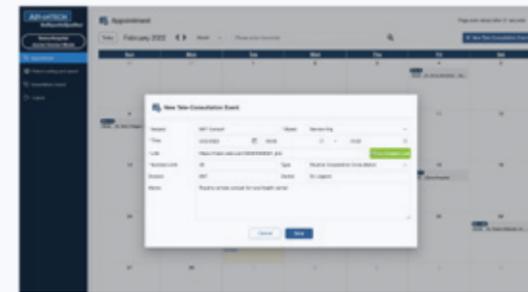
1.Appointment management
- Create consultation events
- Schedule synchronization
- Ease patient registration
- Edit patient lists
- Modify patient info

2. Patient exam
- Upload patient exams and results (iExam)
- Survey exam results quickly
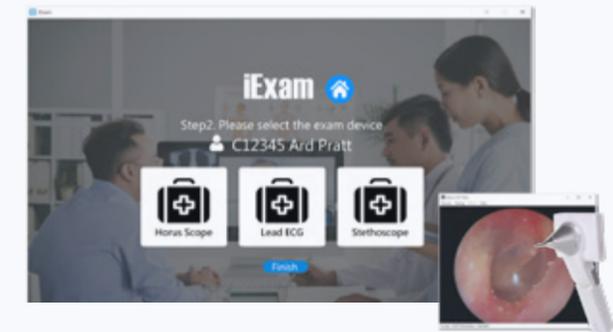
3. Tele-consultations
- Join video chats
- Take SOAP format records
- View exam results
- Attach images for improved record keeping
- Patient queue dashboards

4. Report/record
- Review and consult records
- Return/update records on HIS/EMR
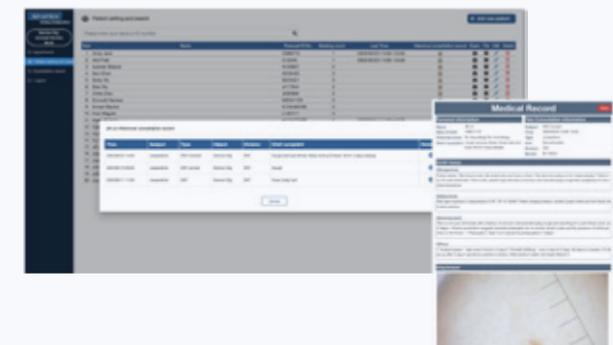
Application Scenarios

Delivering virtual care to rural areas

- Real-time remote consultation with specialists
- Establish healthcare facilities in rural areas, nursing homes, or schools with ease
- Connected care for patients make return visits following discharge more convenient

On-demand care at pharmacies

- On-demand care for common, non-emergency medical conditions
- Private room with teleconferencing and medical diagnostic equipment
- Physicians can direct patients using diagnostic tools, make diagnoses, and write prescriptions
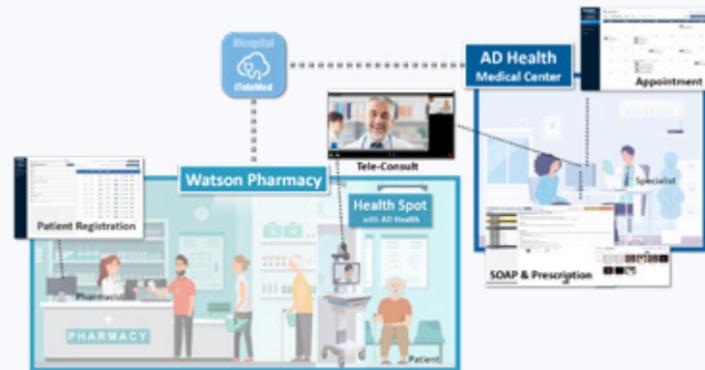
Tele-ER on offshore vessels

- Enables real-time contact with emergency medical personnel
- Doctors can provide remote treatment guidance to onboard medics or recommend a transfer to the nearest hospital

Hardware Options

Solution Page

AMiS-30EP Slim Telehealth Workstation

AMiS-72 Powered Telehealth Workstation

AMiS-22 Telehealth Suitcase

DeviceOn/iService

Minimizes Downtime and Maximizes Healthcare Efficiency

Advantech DeviceOn/iService is a device management software that enables remote management of field devices for enhanced efficiency and optimized operations.

Benefits of DeviceOn/iService

Real-time remote monitoring of everyday operations

Compatible with multiple OS, IT departments can easily have real-time visibility of diverse medical equipment, peripherals, and software and receive instant alerts about faults.

OTA batch updates and remote configuration

Through DeviceOn/iService's user-friendly management user interface, it only takes three simple steps to rapidly filter devices for batch firmware/software updates, configuration and assigning tasks. The update progress of each device can easily be seen on the platform.

Remote troubleshooting avoids multiple site visits

DeviceOn/iService enables on-site remote troubleshooting by allowing remote desktop and remote operations.

Flexible integration allows flexible asset management

DeviceOn/iService SDK supports the integration of additional devices and peripherals as well as open APIs for incorporating third-party services.

A Giant Step Forward for the Application of AI in Surgery

Photos provided by Advantech and Theator Inc.
Interview with Theator Inc.

theator

Theator Surgical Intelligence Platform

Although somewhat limited, the dream of autonomous actions in surgery is already here. In the process of surgical care, AI has the potential to improve surgeon performance, patient outcomes, and doctor–patient relations. Catering to this smart healthcare trend, Theator has leveraged Advantech's medical-grade solution to realize the world's first Surgical Intelligence Platform.

Smarter surgical decision-making and precision

Theator, a company dedicated to pioneering the surgical intelligence revolution with advanced AI, is creating a whole new practice of AI being used in surgery by integrating it into everyday surgical practices. Their vision is to leverage surgical intelligence to build a next-generation operating room with AI-driven, real-time surgical decision making support in robotic and laparoscopic procedures.

Turning their vision into reality, Theator has assembled a team of leading surgeons, computer vision experts, clinical specialists, and software developers to develop advanced AI capabilities powered by computer vision to build a Surgical Intelligence Platform using real-world scientific data. Surgical intelligence utilizes AI and video to scan video footage of real-world procedures, identifies critical moments, and annotates them with smart metatags. The result is an indexed library of fully annotated procedures along with individual and hospital-wide analytics on surgical performance, giving surgeons unprecedented insight into how to improve their surgical performance, helping reduce unpredict-ability whilst improving accuracy and precision.

For Theator to implement AI-powered solutions in hospitals, various support is needed from the industry. As a leading provider of certified medical computing systems and smart healthcare solutions, Advantech is naturally the ideal partnership choice for Theator, as Advantech has a wide range of off-the-shelf certified medical hardware platforms with high processing power for data acquisition and AI deployment.

## Surgical Intelligence from medical-grade edge server

Catering to Theator's requirements in realizing its Surgical Intelligence Platform, Advantech proposed its USM-500, a cost-effective yet powerful and scalable solution for AI applications. The USM-500 is a medical-grade edge server equipped with an 8th Gen Intel® Core™ i7/i5/i3 processor and four PCIe slots for integrated graphics and data capture cards for video recording and analysis.

With Advantech's rich experience in the medical industry, the USM-500 was

The USM-500 was integrated with Theator's Surgical Intelligence Platform

Case Study Benefits

1. A cost-effective yet powerful and scalable solution for AI applications
2. NVIDIA RTX-4000 can process 4K video data and execute AI algorithms and analysis in real time

designed with various expansion options, giving solution providers flexibility without having to worry about the corresponding drivers, operating system, or heat dissipation. Additionally, as display and video capture technologies have advanced to 4K resolution, medical visualization technology and minimally invasive surgery equipment have also migrated to 4K resolution, offering clear, sharp images of human tissue, blood vessels, and structures. To improve surgical performance and optimization, customization was needed for this project, so two video capture cards and an NVIDIA RTX-4000 graphics card were added to capture 4K video data and perform AI-assisted analysis in real time.In the implementation, the USM-500 was integrated with Theator's Surgical Intelligence Platform and mounted on a laparoscopic cart in the operating room. As the NVIDIA RTX-4000 platform processes the captured video, Theator's software uploaded to its virtual training environment in the Amazon and Azure clouds, which provided access to more than 30,000 hours of surgical footage to help surgeons with preoperative preparation and postoperative analysis.

As AI expands its footprint from databases to intra-operative video analysis in healthcare systems, Surgical Intelligence Platform is playing a vital part in revolutionizing the way surgery is taught and practiced. With Advantech's collaboration, Theator is taking a giant step forward in accelerating the application of AI in surgery. ∎

Advantech and ClearMind Revolutionize Endoscopic Brain Surgery

Photos provided by Advantech
Interview with Carrey Yang, CEO of ClearMind

Despite all the advancements in minimally invasive brain surgery over the past 20 years, patients sometimes suffer from poor postoperative recovery due to a lack of intelligent and sophisticated surgical devices and instruments. To improve this situation, ClearMind Biomedical developed the innovative Axonpen System, integrating its Axonpen neuroendoscope with Advantech's medical-grade tablets to provide an intelligent medical system for endoscopic surgery.

Reshaping how a neuroendoscope is used in surgery

The Axonpen is a steerable and single-use neuroendoscope with an integrated camera and LED light that allows surgeons to view the surgical operation in great detail. It combines excellent tissue visualization, suction, and irrigation functions and has a working channel for use with surgical accessories.

To provide a portable solution that regional hospitals can easily adopt to enhance their brain surgery treatment right from the get go, ClearMind started to search for a powerful computing device with advanced mobility and reached out to Advantech. According to Carrey Yang, CEO of ClearMind, Advantech's in-depth cultivation of powerful medical-grade computers and smart healthcare division is the reason why ClearMind adopted Advantech's medical products into their product.

Advantech's medical-grade tablet is an exceptionally waterproof and drop-proof product and can display the location details and condition of a patient's intracerebral hemorrhage with crystal-clear images. Additionally, it is lightweight and portable and provide stable Wi-Fi connectivity for mobile applications, enabling rapid deployment in more hospitals.

Co-creating a solution with shared medical domain knowledge

The Axonpen System comprises a neuroendoscope (Axonpen) and a monitor (Axonmonitor). It provides illumination and visualization of intracranial tissue and fluids as well as the controlled aspiration of tissue and fluid during minimally invasive brain surgery. To integrate the Axonpen with Advantech's tablet, ClearMind developed the AxonBox, an accessory that acquires and transfers video feeds from the distal end of the Axonpen for visualization on the tablet.

Advantech's in-depth cultivation in powerful medical-grade computers and smart healthcare is the reason we adopted their solution in our products.

- Carrey Yang, CEO of ClearMind

Case Study Benefits

1. Lightweight and portable, allowing quick deployment to hospitals.
2. Accelerated time to market.

Mr. Yang pointed out that the system works by capturing brain image signals with the Axonpen's sensors, which the AxonBox decodes for display on the Axonmonitor. To make this happen, corresponding firmware and software had to be developed to communicate seamlessly. During the design process, Advantech coordinated directly with ClearMind to help them whenever they encountered development concerns or challenges.

Thanks to the extensive knowledge, experience, and resources in medical certification, Advantech provided valuable insights and assistance into its design, OS, and related certification process. They successfully cooperated with ClearMind to complete this phase and accelerated its time to market. When ClearMind applied for FDA approval for the Axonpen System, cyber security risks arose and had to be addressed, so Advantech, aided by its broad knowledge of cyber security specifications, gave immediate assistance to swiftly solve ClearMind's problems.

The Axonpen System delivered outstanding clinical outcomes, the average stay in intensive care units before being released to general wards is now only 3 days, which is far superior to the standard 14-day period for traditional endoscopic brain surgeries.

The portability, high computing power, stability, and scalability of Advantech's medical-grade tablet has helped many medical equipment manufacturers innovate better smart medical solutions. Consequently, ClearMind has already started working on a next-generation Axonpen System with Advantech, forming closer collaboration that benefits public health. ∎

Increasing Access to Healthcare in Rural Areas with Telehealth

Photos provided by Advantech
Interview with Advantech Healthcare Team

"As the COVID-19 pandemic continues to have a global impact on the medical industry, Advantech Telehealth solutions address healthcare gaps in remote rural areas and deliver the well-being of crews working offshore."

A two-month-old baby cries in the isolation ward with his mother beside him, feeling distressed and helpless; an eighty year old grandfather stands at a roadside bus stop with a cane waiting to take a two-hour bus ride to hospital; and a forty-year-old ship crew member lies in the crew cabin, enduring discomfort with a painful expression on his face after a fall. Although these patients differ in age and have different symptoms, they all experienced difficulty receiving medical treatment because they are located in remote areas. Especially after the COVID-19 pandemic, the problem of seeking medical treatment in remote rural areas is more severe than ever.

Fortunately, the application of smart technology has brought hope to their difficult lives. As part of its commitment to benefit society, deepen local partnerships, and strengthen community care, Advantech has been developing telemedicine applications using the latest IoT technology, allowing patients in remote rural areas and patients from isolated wards to receive convenient and immediate medical treatment regardless of their location.

The following three stories demonstrate how telehealth services based on Advantech IoT solutions have helped improve the health and well-being of people in remote rural areas of Taiwan.

Telehealth cart plays a vital role in isolation wards

At the end of June 2021, Taiwan was experiencing its most severe period since the pandemic broke out. In the county of Hualien, a two-month-old baby boy and his mother were both diagnosed with COVID-19. While the mother was uncomfortably ill herself, she worried about her child constantly and suffered both physically and mentally. The mother and son, who live in a remote rural area with insufficient medical resources, struggled to receive treatment. Fortunately, Advantech donated two telehealth carts to the Mennonite Christian Hospital in Hualien during the COVID-19 pandemic, and doctors were able to conduct remote video diagnosis and treatment for both the baby and the mother through the telehealth cart.

According to the hospital, Advantech's telehealth carts were immediately put to work in the isolation wards, where they were mostly needed to facilitate doctors' video diagnosis and treatment and give patients a chance to see their loved ones via videoconferencing. After 17 days of treatment, the baby and the mother were discharged from hospital in good health,

which was made possible by the professional care provided by the doctors and nurses, the support of their family, and of course — the telehealth cart.

Teleconsultation solves the issue of insufficient medical services

In the northernmost point in Taiwan, Shimen, a district that attracts tourist crowds with its delicious food and beautiful scenery, severely lacks medical resources. For example, there are over 2,000 ophthalmologists in Taiwan, but there is not even one ophthalmology clinic in the Shimen district. Unfortunately, there are 20 more districts in New Taipei City that also lack medical resources and specialist clinics, just like Shimen District.

To solve the problem of insufficient specialist doctors in remote areas, the New Taipei City Department of Health has helped rural health clinics and regional hospitals implement teleconsultation services. Participating in these government programs, Advantech provided telehealth solutions to the Shimen Public Health Center to facilitate remote treatment by ophthalmologists located at the Fu Jen Catholic University in New Taipei City's Taishan District.

Chun-Kai Chang, Business Development Manager for Telehealth at Advantech, cited that patients with diabetes are at high risk of developing complications such as diabetic retinopathy, and managing their condi-

Healthcare environment of remote areas in Taiwan

Taiwan has more than 50 outlying mountainous islands and 117 towns/villages. Thus, despite Taiwan boasting one of the best healthcare systems in the world, the lack of medical resources in remote areas has presented considerable challenges. Fortunately, the smart application of technology has brought light and hope to these remote areas.

tion requires regular checkups and ongoing monitoring. Mr. Chang said, "Using Advantech's telehealth carts equipped with a computer, camera, and microphone, doctors can assess patients' health and prescribe appropriate medication and treatment plans."

The New Taipei City Department of Health offers diabetes patients one free eye examination every year. However, only 34 percent of patients nationwide take advantage of this service, with Shimen District reporting a substantially lower examination rate due to the lack of locally-based ophthalmologists. However, Advantech's telehealth solutions have improved the flexibility of eye diagnosis and examination and significantly reduced travel time for patients. And as a result, patients are more willing to return for regular checkups.

Enabling remote healthcare on an offshore construction support vessel

For people working in unique working environments, difficulties accessing medical services can cause serious harm. For example, Taiwan has actively promoted offshore wind power in recent years, and more and more people are going out to work at sea. As a result, managing and ensuring their health and safety has become a new challenge.

A renowned global offshore wind power company is helping construct Taiwan's first large-scale far-shore wind farm. Given that most crew members work and live on the offshore construction support vessel (CSV) throughout the construction period, a trained medic was employed to provide basic medical care, and Advantech's AMiS-22 telehealth suitcase equipped with a 10.1" industrial-grade panel was deployed to assist the medic.

In a serious incident or emergency, using AMiS-22, the medic can contact a doctor to conduct a full clinical evaluation in real-time utilizing the wireless ultrasound probe and ECG machine to capture ultrasound images and measure heart rates. Also, using a digital stethoscope to record, stream, and playback heartbeat and breathing sounds, the encrypted video conferencing data allows the doctor to coordinate a rapid diagnosis based on the real-time data of the patient's vital signs and condition. The doctor can then provide remote treatment guidance to the medic or recommend transferring the patient to the nearest hospital.

All these case studies show how Advantech's IoT solutions have improved peoples' health and well-being in remote rural areas. ∎

Improve Medication Safety
Medication Administration Solution
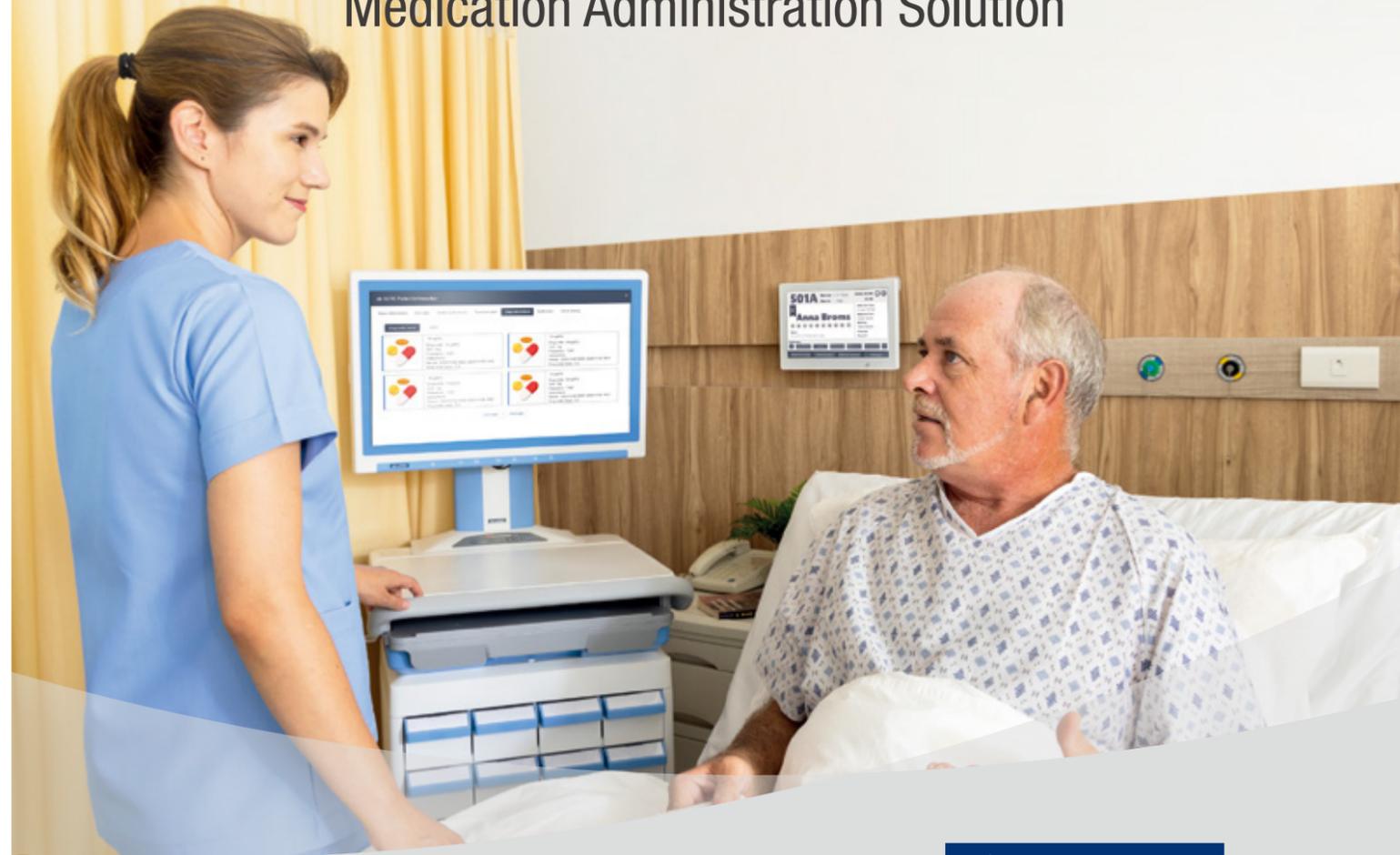
ADVANTECH
Enabling an Intelligent Planet

Advantech's intelligent medication administration solution streamlines medication inventory and dispensing at hospital pharmacies, nursing stations, and patient wards. Medication solution minimizes medication errors and increases patient safety.

▸ RFID-based medication bins with individual mechanisms.
▸ Medication software API can be integrated with electronic medical records.
▸ Offers secure access and control of all medications.
▸ All medication usage records can be traced.
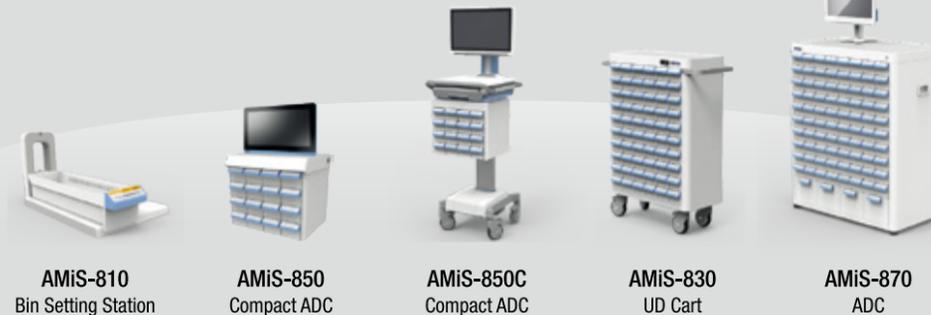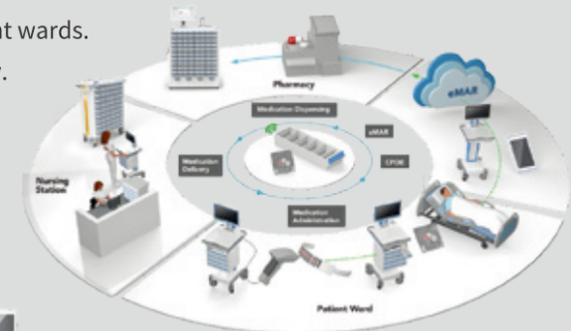
AMiS-810	AMiS-850	AMiS-850C	AMiS-830	AMiS-870
Bin Setting Station	Compact ADC	Compact ADC	UD Cart	ADC

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Advantech Headquarters
No.1, Alley 20, Lane 26, Rueiguang Road,
Neihu District,Taipei, Taiwan, 114, R.O.C.
Tel: 886-2-2792-7818
Fax: 886-2-2794-7304

OrthoGrid Reshapes Orthopedic Procedures with AI-powered Platform

Photos provided by Advantech and OrthoGrid Systems
Interview with Edouard Saget, Co-Founder and Co-CEO of OrthoGrid Systems

Surgical navigation systems and computer-assisted surgery have been used in orthopedic procedures for over three decades. Traditional orthopedic image-based navigation systems, such as fluoroscopy, allow surgeons to execute their intraoperative plans and support precise navigation during surgery. However, rapid growth in the utilization of artificial intelligence (AI), robotics, and augmented reality has led to new innovations in orthopedics.

Creating an AI-powered surgical guidance solution to augment professional workflows

According to Mr. Edouard Saget, Co-Founder and Co-CEO of OrthoGrid Systems, within the US, fluoroscopy has the largest medical market share in the surgical image-based navigation segment, with usage growing from zero in 2008 to over 45% of all total hip replacement surgeries today, and over 90% in the fastest growing market of Direct Anterior Approach Total Hip Replacement (DA THA). "We anticipated the trends in DA THA, based on the ubiquitous use of fluoroscopy in other areas of orthopedic surgery, with over 10 million cases worldwide depending on intraoperative imaging. We discovered early on that extracting the data behind the imaging information in these surgeries could transform, forever, how orthopedic surgeons would be performing all these procedures," Mr. Saget stated. In this endeavor, OrthoGrid's goal was to extract data from images, create specialized data sets, and train algorithms in the pursuit of surgical workflows.

> "Our goal was to extract data from images, create data sets, and make sense of them relative to the demanding professional workflows of surgeons."
>
> - Edouard Saget,
> Co-Founder and Co-CEO
> of OrthoGrid Systems

Acetabular cup position during Total Hip Replacement, assisted live with AI

Leg Length Measurement during Total Hip Replacement, assisted live with AI

Founded in 2012, OrthoGrid's vision is to be the leader in digital transformation of orthopedic surgery leveraging data-powered technology. OrthoGrid's applications can correct fluoroscopic distortion, interpret images, understand surgical steps and provide instantaneous feedback to surgeons who may benefit from improved performance without compromising on efficiency, invasiveness or cost. "We invested on the development of deep learning AI-algorithms with a focus on two requirements: high performance and efficacy. To date, we have deployed solutions for total hip replacement, trauma and hip preservation surgeries. Surgeons assisted by AI using intraoperative imaging technology, can experience support provided by intuitive, automated systems in the varied context of orthopedic procedures," said Mr. Saget.

To minimize latency and guarantee the real-time performance of its intraoperative AI platform, OrthoGrid needed medical-grade hardware that can accommodate powerful video capture cards, a dedicated GPU, and meet the requirements of real-time AI-powered applications. It also had to be designed for use in various medical spaces. Coinciding with the company's vision of providing a value-based solution, OrthoGrid decided to create a subscription business model that enabled surgeons and hospitals to benefit from continuous improvements to AI algorithms. Therefore, OrthoGrid's software applications are hosted on a surgery-optimized, ergonomically designed hardware platform comprised of a high-quality wide screen, and the Advantech's USM-500 NVIDIA-certified medical-grade computer.

Medical-grade computer delivers stability, reliability, and future upgrade prospects

The USM-500 was developed based on Advantech's extensive experience in the medical industry. USM-500 complies with CE, FCC, and IEC-60601-1-2 regulations

for medical equipment, featuring a 9th Generation Intel® Core™ i7/i5/i3 processor. Its design gives expansion options to medical solution providers, without them worrying about corresponding drivers, OS, or heat dissipation. In this project, two video capture cards and an NVIDIA® Quadro RTX™ 4000 GPU were integrated into the USM-500 to capture large fluoroscopy X-ray images and execute AI algorithms and analysis in real time, delivering performance, stability, and reliability in line with medical industry requirements.

OrthoGrid's AI-powered orthopedic software provides real-time imaging guidance during surgery, offering the potential for surgeons to improve accuracy and efficiency and minimize intraoperative errors. To date, over 250 physicians have used one of OrthoGrid's products. With a 98% retention rate, the latest AI-powered solution for total hip replacement surgery to come on the market in May 2022 will be the first in the world to offer autonomous workflow interpretation in support of critical surgical steps, thus allowing surgeons to focus on their work and assessments. For the growing number of hospitals and physicians implementing these solutions, OrthoGrid's value proposition is to constantly optimize its role in improving quality by periodically upgrading total hip arthroplasty, hip preservation, and orthopedic trauma applications with enhanced performance and functionality. Due to USM-500's mini-ITX industrial motherboard design with Win10 LTSC, Win10 Pro, Linux OS/ drivers, and 10 years' long-term support, future solution migration, CPU or GPU and software updates can be performed quickly and easily.

Mr. Saget concluded, "Given that OrthoGrid is not a dedicated hardware company, Advantech's proven track record in the medical industry and expert team were key to helping us select the right platform and NVIDIA GPU so that we could focus on developing our applications. As a leader in the IoT and AIoT space, Advantech is the

type of the partner we wanted; one that understands what it takes to be and stay ahead of industry trends!" ■

Solution and Application Benefits

OrthoGrid's AI-powered orthopedic software transforms how surgeons are empowered in their work by the improved performance of their image-based navigation systems in the multi-billion dollar orthopedic surgery market. Surgeons benefit from accelerated access to critical clinical data to support reproducible intraoperative decision making. OrthoGrid's AI powers more intuitive, less invasive, more efficient and easier to use solutions and thus optimizes the healthcare value equation of quality over cost for hospitals and partners.

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Our Upcoming Events

CMEF
China International Medical Equipment Fair

With the theme of 'Innovating technology and making smart medicine within reach', Advantech will attend CMEF 2022, the medical equipment exhibition showcasing comprehensive solutions including medical imaging, iWard, and integrated operating rooms.

Shanghai
21-24 August
Booth No.B06

Exhibition Detail

MEDICA

Visitors can expect live demonstrations within specific applications inside hospitals and clinics, including integrated operating rooms, mobile care, critical care, intelligent wards, and video streaming solutions.

Dusseldorf
14-17 November

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Featured healthcare technology solutions in the areas of telehealth, portable tablets, nurse call solutions, medical AI imaging, live operating room and video streaming solutions, and ODM solutions.

Chicago
17-21 April, 2023

2022 Virtual Booth

Empower Your Digital Transformation Journey

ADVANTECH
WISE-Marketplace
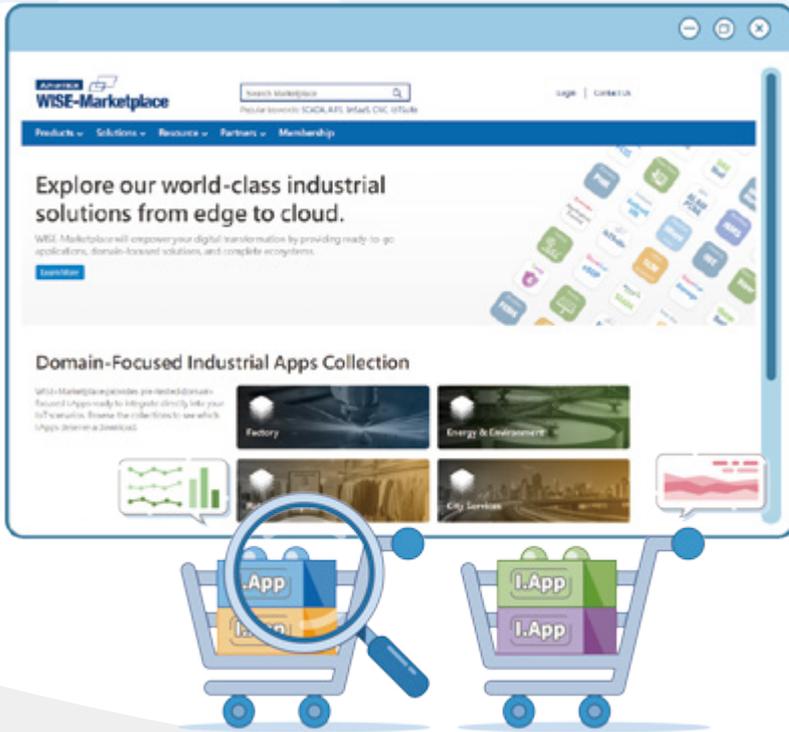
Transparent Pricing
Friendly pricing models with flexible payment methods to meet the needs of a wide variety of users.

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

Shorten Development
No need to develop from scratch by leveraging Advantech and partner's toolkits.

Increase Revenue
Domain know-how involvement to optimize solutions and increase revenue.

Support Mechanism
Full support for payments, delivery, deployment, technical training, and more.

Co-create Ecosystem
Become a partner to enjoy the best benefits and leverage Advantech's ecosystem.

ADVANTECH
Enabling an Intelligent Planet

WISE-Marketplace unlocks innovation with world-class solutions from edge to cloud.

WISE-Marketplace is an open IoT platform from Advantech, a world-class leading brand in IoT intelligent systems that make shop-floor operations simple, scalable, and manageable.

We've selected ready-to-go applications, software iApps, and hardware devices to facilitate your digital transformation through IoT, networking, data analytics, AI applications and operations. You can explore our products and services online, request demonstrations, test, and deploy them in your own business.

Advantech's WISE-Marketplace and comprehensive ecosystem will empower your digital transformation!

Quickly Realize Your AIoT Digital Transformation.

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