High Performance Edge Computing eBook

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11

Redefining Next-Generation Applications at the Edge



Enabling an Intelligent Planet

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Why Advantech

Advantech is a leading provider of innovative products, services, and solutions. We offer comprehensive system integration, hardware, software, customer-centric design services, embedded systems, and global logistics support. We work closely with our partners to provide complete solutions for a wide range of applications in different vertical segments.





Telecom, Industry 4.0, IoT, Gaming, Retail, iLogistics, Mil/Aero, Broadcasting, Agriculture, Healthcare



CUSTOM PRODUCT CAPABILITY

72% of what we build is the brand behind the brand for our partners



WORLDS LARGEST IPC COMPANY

32% market share

Advantech 🛛 🔵 Other IPC Companies

\$2.09B REVENUE



KEY ECO-SYSTEM PARTNERS

ubuntu

0

QUALITY SYSTEMS IN PLACE

- OHSAS 81001
- ISO-170256
- IECQ QC 080000
- Sony GP
 - IECEx QAR
 - FDA

1MILLION+ sq. ft.

In-house manufacturing Kunshan, China, Eleven SMT Lines





Linkou, Taiwan

Kunshan, China

- MANUFACTURING PLANTS
- Vertically Integrated manufacturing (Self contained)
- Full Manufacturing redundancy (Risk Mitigation)
- Full BOM and lifecycle control (End-to-End control over quality)



WORLDWIDE OFFICES



EMPLOYEES

Design Centers Manufacturing Centers CTOS Centers Logistics Centers On-Site Service Repair Centers Sales Offices

Edge² Embedded Design-in Platforms



Embedded AloT Design-in Service



High Network Bandwidth

> Reduce Data Transmission Time



Mass Data Processing

Streaming Data Aggregation, Analysis and Transfer



Scalability and Easy Deployment

Modularized Design for Quick Expandability



Remote Management

> Easy Accessibility and Operation

> > Low Latency

Communication

Data-Driven to Take on Challenges

High Performance Computing at the Edge

The Edge Computing Market

\$61 Billion by 2028

CAGR 38.4%

GRAND VIEW RESEARCH, May 2021

\$55 Billion by 2028

7.31%

VERIFIED MARKET RESEARCH, Dec 2021

The High Performance Computing (HPC) Market The Edge Data Center Market

\$13 Billion by 2024

▲ 20%

GLOBAL MARKET INSIGHTS, Mar 2019

Top Edge Computing Applications

Areas of Deployment

CPU	GPU	Connectivity
Control Logic 37% Data Analytics 30%	Artificial Intelligence40%Video Analytics28%	Data Exchange between Nodes — 30%

Artificial Intelligence	GPU	40%
Control Logic	CPU	37%
Data Analytics (Involving 1GB+ of Local Storage)	CPU	30%
Data Exchange Between Multiple Nodes On	Connectivity	30%
Video Processing and Analytics	GPU 2	3%
Sensor Fusion (Data Aggregation and Filtering)	27%	
Data Exchange Between Multiple Nodes	26%	
Edge-Deployed Cloud Workloads	24%	
Other (Please Specify)	5%	



https://outreach.eclipse.foundation/iot-edge-commercial-survey

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Redefining Next-Generation Applications at the Edge



Data-Driven Healthcare

- Al-assisted Data Analytics
- Diagnostic Imaging
- Connected Healthcare



Data-Intensive Automation

- Autonomous Robotics
- Visual Inspection
- High-speed Testing and Measurement



Telecom Network Edge

- 5G Networking
- Cyber-Security
- Intelligent Surveillance



High Performance Edge Computing

Hurdles of Designing High Performance Edge Computing

The Industry Needs Core Solutions and Guidance for HPEC



Advantech's Featured Technology



High Density Core

Extreme High Performance multi-stream computing

• 64 Cores • 768GB Memory • 256MB L3 Cache



Remote Edge Management

System control, monitoring and OTA software updates

- BIOS OTA update
- WISE-DeviceOn
- IPMI (OOB)
 SUSI API and Utility



Reliable and Trusted

Rugged design to ensure system stability in harsh environments

- -40 ~ 85 °C (-40 ~ 185 °F) operating temp.
- Anti-vibration: 7.7Grm
- Memory Down / Rugged SODIMM



Advanced Security

Highly integrated data encryption and security features

- Boot Guard TPM 2.0
- Secure Boot
 Intel[®] TME, SGX and TXT



High Bandwidth Connectivity

Super speed data throughput with low-latency transmission

- 25 Gigabit Ethernet
 Four PCIe x16 Slots
- PCI Express Gen5
 USB4[™]



Compact Form Factor

Fast integration, better scalability and easy maintenance

- COM Express and COM-HPC[®] Embedded
- Industrial motherboard

Computer







64-Core AMD EPYC[™] Industrial MicroATX Motherboard

Driving Next-Generation Workloads at Edge

Phase In January 2023

Longevity | January 2028

Features

Maximize AI Computing with Latest High-speed Technology

- 4 x PCIe Gen 4.0 x16 slots empower Machine Learning and Deep Learning
- Supporting 2 x double-deck Al-accelerated PCIe x16 card by steel and durable slot
- High-speed PCIe 4.0 onboard SSD by M.2 M-Key connector

Ultimate Performance Powers Workloads at the Edge

- 64 Core AMD Milan EPYC[™] 7003, Zen 3 core 7nm CPU
- Up to 768GB DDR4-3200, 6 x channel memory

High Throughput Connectivity to Cloud

- Dual 10GbE LAN high-bandwidth connectivity empowers big data cloud services
- Dual 2.5GbE LAN simplifies private cloud deployment

Remote Management

- WISE-DeviceOn features remote access and efficient OTA operations
- IPMI 2.0 centralized management

Applications







Precise Diagnostic

Intelligent Video Surveillance

Edge AI and Analytics



High Expandability MicroATX Motherboard

Empower the Performance Robotic Control

Phase In October 2022

Longevity | January 2026

Features

AMD Zen3 Ryzen[™] Embedded 5000 Series Desktop CPU

- AMD "Zen 3" Cores 7nm CPU with 16 Cores / 32 Threads
- Zen 3 core Instructions Per Clock is 19% higher than Zen 2
- Support DDR4-3200 up to 128GB

Made for Camera-based Applications

- Four built in Gigabit Ethernet ports (2 x 2.5GbE, 2 x GbE)
- 8 x USB 3.2 10Gbps ports
- High speed interfaces deliver connectivity to more than 10 x high video quality cameras

Applications







Intelligent Surveillance

Machine Vision

Smart Manufacturing

Adaptable to Industrial Applications

- 1 x PCI-Express x16 Gen4 technology for graphics demanding applications
- Dual PCI-Express x4 slots offer the expandability to integrate robotic (arm) controller cards for industrial applications
- Onboard M.2 M-Key socket supports high-speed SSD for real-time OS operations





High Performance Graphic Computing MicroATX Motherboard

Empowers Embedded Industrial Applications

Phase In November 2022

Longevity January 2032

Features

Designed for Graphics-Intensive Applications

- Advanced graphics processing capabilities via PCIe x16 Gen 5 with data transfer speeds up to 32GT/s
- 4 x independent displays with 4K@60Hz via 2 x DisplayPort, 1 x HDMI, and 1 x eDP empower the graphics-intensive applications
- The integration of the diverse expansion slots enhance the performance of medical imaging and machine vision systems

High Performance CPU Computing Capabilities

- The 12th Gen Intel[®] Core[™] processor with 16 cores delivers unprecedented performance via a new hybrid architecture that combines Performance- and Efficient-cores (P-core and E-core)
- Support DDR5 memory up to 4400Mhz and Max. 128 GB

Flexible I/O Design Improves Functionality

- 4 x GbE LAN ports with up to 2.5 GbE for high-resolution, low-latency image capture via high-speed IP cameras
- Supports up to 8 x USB 3.2 for image data processing via different peripherals alongside 8 x SATA ports for superior data synchronization precision and reduced latency

Applications







Medical Imaging

Surveillance

IoT Edge Server



1U THIN GPU-Accelerated Computing

Out-of-the-Box Design Revolutionize Edge Intelligence

Phase In | October 2022

Longevity January 2032

Features

Innovative All-in-One Design Simplifies Edge Al Integration

- AIMB-288E combines cutting-edge CPU, GPU, memory, NVMe SSD, and cooling systems within a 42 mm height form factor design that saves 66% more space than comparable generic motherboards.
- Integrates Advantech's strict design process, thermal technology, and IEC-60068-2 compliance design to deliver stability during long-term operation.

Powerful 12th Gen Intel[®] Core[™] and NVIDIA CUDA Core Computing

- 12th Gen Intel[®] Core[™] Desktop Processor, DDR5-4800 memory, and NVIDIA Quadro T1000 GPU (MXM module type) with 896 CUDA Cores and 4GB GDDR6 to deliver 2.5Tflops single-precision performance
- 12th Gen Intel[®] Core[™] Desktop Processors up to 16 cores i9-12900E
- Up to 64GB DDR5-4800 memory produces a 1.36 fold increase in performance as previous generation processors

1U Thermal Design Delivers 100% Performance with TDP of 110W (CPU+GPU)

- Ultra-slim cooling system enables AIMB-288E to fit within 1U systems while yielding 100% performance in 60 °C environments
- Out-of-the-box design decreases developers' workloads, associated costs, and overall time to market.

Applications







Medical Imaging

Service Robot

Semiconductor Tester



16-Core Low Power Consumption4" Embedded Single Board

Compact and High Performance Efficiency Balance

Phase In January 2023

Longevity | January 2031

Features

Native AI Computing with Real-Time and Redundancy Technology

- Core™ i9/i7/i5 -TE (35W) up to 8P + 8 E Core for best performance per watt
- Intel® Xe 32 Eu and PCIe x4 Gen.5
- Dual TSN 2.5GbE and Intel® TCC reduces jitter and latency

Wide Sensor Interface Type and High-Speed IO Throughput

• Integrated CANBus, high-speed 1Mbps UART, and I2C

High Throughput Connectivity to the Cloud

 Dual 2.5GbE LAN high-bandwidth and WI-FI 6/LTE connectivity empowers big data cloud services

Remote Management and Monitor

- WISE-DeviceOn features remote access and efficient OTA operations
- Out-of-band watchdog, temperature, and power manageability

Ubuntu Certified

• Hardware compatibility certified by Canonical enhances reliability

Applications







FA CNC

Service Kiosk

Service Robot



Powerful COM-HPC[®] with 64 Cores and 79 PCIe Lanes

Facilitate Edge Server Revolution

Phase In | March 2023

Longevity | March 2028

Features

High Performance COM

- COM-HPC[®] Proprietary Pinout Size E (200 x 160 mm)
- Proprietary pinout for higher TDP and more PCIe
- EPYC[™] 7003 REAL server grade CPU (64C/128T/225W) and socket type CPU

Maximum CPU Cores, High-Speed I/O, and RAM

- Single CPU with headroom for the most enterprise workloads
- 512GB large memory size with 4 x DDR4 long DIMM
- \bullet 79 x PCIe Gen 4.0 lanes for various add-on cards NIC, GPU, and FPGA

Applications







Data Center

High End Test Equipment

Networking

Cost and Energy Efficient Performance

- Supports more VM per server
- Parallelized cores ideal for NFV and SDN
- High performance-per-watt reduces energy and operation cost

Advanced Network Solution with Security and Service

- Supports IPMB for BMC remote control
- TPM support for advanced security
- Supports security boot or fast boot by customized BIOS





Extended Temperature COM-HPC[®] Server D Module



Enable Edge Server Evolution and Time-to-market

February 2023 Phase In

Q1 2032 Longevity

Features

Superior CPU Performance and Memory Capacity

- COM-HPC[®] server module size-D (160 x 160 mm)
- Intel[®] Xeon[®] D-2700 Processors (Ice Lake-D HCC), up to 20C, 118W
- Up to 512GB large memory with 4 x DDR4 long DIMM

High-bandwidth Ethernet Connectivity and High Speed I/O Expansion

- 8 x 10GbE or 4 x 25GbE BASE-KR support
- 32 x PCIe Gen 4 and 18 x PCIe Gen 3 for the flexible expansion capabilities

Applications



5G Base Station





In-Flight Entertainment

In-vehicle Radar



Rugged Outdoor Application Usage

- Native wide range temperature support (-40 ~ 85 °C)
- QFCS 2.0, advanced thermal solution: Slim, light with the best thermal efficiency

Advanced Security Solution

- Supports IPMB for BMC remote control
- Onboard TPM support for advanced security
- Supports security boot or fast boot by customized BIOS



The First COM With Intel[®] Core[™] i9, DDR5, and PCIe Gen 5



Enable Accurate Operation and Cost Saving For Edge Solutions

Phase In October 2022

Longevity | Q1 2032

Features

Powerful CPU Computing with Intel Desktop Solution

- COM-HPC[®] client module size-C (160 x 120 mm)
- \bullet 12 th and 13 th Gen Intel $^{\otimes}$ Core i Processors, up to 16C and 24C, 65W

The Latest Memory Technology and Speedy Data Transmission

- 1st DDR5 memory solution with 4 x SODIMMs w/up to 128GB support
- PCIe 16x Gen 5 and 4 x PCIe x16, 10 x PCIe Gen 3 for greater data transmission and bandwidth
- Designed with USB 3.2 Gen 2x2 (20G) inside

Al and Scalability

- Adopts Intel[®] UHD Graphics 770 by XeArchitecture, 4 x displays (up to 8K)
- Edge AI Suite for faster AI implementation

Advanced Security and Professional Design-in Services

- Onboard TPM support for advanced security
- Advanced cooling solution via the latest QFCS 2.0 thermal solution

Applications







Medical Equipment

Test Equipment

Edge Server / Video Streaming



COM Type 7 Solutions for Extreme Network Acceleration



Accelerating the Edge Gateway Revolution

Phase In October 2022

Longevity October 2032

Features

High Performance COM

- COM-Type 7 proprietary pinout size (95 x 95 mm)
- Proprietary pinout for extra 3 x GbE support
- NXP LS1046A 4 A72 core (12.71W) and SO-DIMM socket

Efficient Network, High Speed I/O, and RAM

- 2 x 10Gb-KR and 4 x GbE for the efficient network transmission
- Flexible RAM selection with SO-DIMM socket, Max. 16GB
- 3 x PCIe Gen 3.0 lanes and 3 x USB 3.2 Gen1 delivers myriad add-on functions, efficient Networking, high-speed I/O, and RAM

Applications







Data Center

IoT Gateway

Networking

Cost and Energy Efficient Performance

- Supports Data Path Acceleration Architecture (DPAA) SDK, and is compliant with Intel DPDK
- DPAA components include Queue Manager (QMan), Buffer Manager (BMan), Frame Manager (Fman) and Security Engine (SEC)
- DPAA reduces software overhead associated with high-touch, packetforwarding operation — including
- routing, bridging, firewalls, VPNs, IDS/IPS and network anti-viurs

Advanced Network Solution with Superior Security and Service

- Supports Trust Architecture Components including secure boot, storage, key protection, revocation, tamper detection, storage partitioning, and manufacturing protection
- Security Engine (SEC) accelerates the following security protocols: IPSec, SSL/TLS, SRTP, IEEE
- 802.1AE MACsec, 3GPP RLC



Server Grade Edge Computer

For Power-hungry Graphic AI Applications

Phase In | March 2023

Longevity | January 2026

Features

Superior Computing Power for AI Applications

- AMD EPYC[™] 7003 Milan Server Grade CPU
- 6-channel DDR4 up to 3200MHz for heavy computing workloads
- Dual 10G LAN for smooth data stream
- Integrated with NVIDIA Quadro RTX A6000

Industrial Grade System Design

- ESD protection is designed to sustain IEC Level 4 discharge
- EMC protection is designed for both industrial and residential environments
- 1200W 80+ GOLD power supply to support up to two NVIDIA Quadro GPU cards

Applications







Medical Imaging

Service Robot

Semiconductor Tester

Hyper-converged Infrastructure - VMmark@3.1.x vSAN

2 x AMD EPYC™ 7713 280%			280%
2 x Intel [®] Platinum 8268			
VSI - Login VSI™ Pro v4.1.40.1 average			
2 x AMD EPYC™ 7763 214%		214%	
2 x Intel [®] Gold 6258R			
Database - TPC Benchmark™ Express HS	5		
1 x AMD EPYC™ 75F3 227%		227%	
2 x Intel [®] Gold 6262V			
High Performance Computing - ANSYS®	LS-DYNA [®] carss		
2 x AMD EPYC™ 75F3 181%	181%		
2 x Intel® Gold 6258V			
Integer Performance - SPECrate [®] 2017_ i	nt_base		

Integer Performance - SPECrate[®] 2017_ int_base 2 x AMD EPYC[™] 7763 206%

2 x AMD EPYC™ 7763 206%	206%
2 x Intel [®] Gold 6258R	

Edge Computer

EPC-B5587

Intel[®] Xeon[®] W Processor NVIDIA Quadro Series GPU Cards



Server Grade Edge PC with NVIDIA Quadro Family



Drive Graphic AI for High-precision Surgery

Features

Server Grade Computing

Advantech EPC-B5587 is equipped with Intel[®] Xeon[®] server grade platform to deliver computing power to complex and intensive tasks.

10G Ethernet Communication

2 x 10G Ethernet RJ45 ports provide the bandwidth needed to guarantee the smooth communication of high-resolution graphic data.

Comprehensive I/O for Diverse Peripheral Connections

Numerous reliable I/O for peripherals — including digital and legacy interfaces for most medical applications.

Longevity

June 2029

Industrial Grade System Design

June 2022

Phase In

EMC protection for both industrial and residential environments, 80+ GOLD certified 1200W PSU and IEC-62368-1 certified.

Applications







AI Robotics

Deep Learning

Machine Vision

Embedded System

ARK-7060 Intel[®] Xeon[®] D-1700 Processors NVIDIA Quadro Series GPU Cards



Edge Computer with Xeon Server-grade Computing and 10GbE Data Transferring



Empowering High Performance AI Visual Applications

Phase In October 2022

Longevity | December 2028

Features

Extreme Scalable Performance

- Intel[®] Xeon[®] D-1700 series up to 10 cores 67W
- 4 x DDR4 SO-DIMM ECC/non-ECC memory up to 128GB
- Support graphics card up to 350W i.e. RTX-3090, RTX-A5000/A4500

Versatile I/O and Expansion Options

- 2 x GbE, 4 x USB 3.0, 4 x COM, and 2 x optional 10GbE
- PCI, PCIex4, and PCIex16
- Expansible with M.2 B key and E key

Applications







Edge Data Servers

AOI Visual Inspection

AI Vision Equipment

High-Speed Data Transfer

- 2 x optional 10GbE ports
- M.2 B key for 5G modules

Remote Management and Security

- Remote management by WISE-DeviceOn and onboard BMC
- Dual BIOS for BIOS backup and recovery
- Support McAfee and Acronis
- Optional TPM 2.0



Industrial SSD and Memory

Superior Speed with Comprehensive Data Security

Hi-End Image Processing Applications		Rugged Solutions for Homeland Security and/or Defense Applications		Diverse AloT Market Applications	
	SQFTash SQFTash Marine Construction	FIPS Compliance	Softash Marketer Softash Marketer	Military Compliance	
2.5 SATA SSD	M.2 2280 NVMe SSD	2.5 SATA SSD	M.2 2280 SATA SSD	U.2 NVMe SSD	M.2 2280 NVMe SSD
• SATA 6.0 Gbps • Up to 7.6TB • 0 ~ 70 °C /-40 ~ 85 °C	• PCIe Gen. 3 x 4 • Up to 7.6TB • 0 ~ 70 °C /-40 ~ 85 °C	• SATA 6.0 Gbps • Up to 2TB • 0 ~ 70 °C	• SATA 6.0 Gbps • Up to 2TB • 0 ~ 70 °C	 PCle Gen.3 x 4 Up to 7.6TB 0 ~ 70 °C /-40 ~ 85 	 PCle Gen.4 x 4 Up to 3.8TB °C 0 ~ 70 °C /-40 ~ 85 °C
RDIMM DDR5	SODIMM DDR5	M.2 2280 NVMe SSD	UDIMM ECC DDR5	Rugged DIMM DD	R4 Ultra wide temp DDR4
• 4800 MHz • Up to 64GB • 0 ~ 95 °C	● 4800 MHz ● Up to 32GB ● 0 ~ 95 °C	 PCle Gen.3 x 4 Up to 2TB 0 ~ 70 °C 	• 4800 MHz • Up to 32GB • 0 ~ 95 °C	● 3200 MHz ● Up to 32GB ● -40 ~ 85 °C	• 3200 MHz • Up to 32GB • -40 ~ 125 ℃

Embedded Software Services



Embedded Software Services

- Embedded BIOS and LTS OS
- SUSI software API and OS lockdown utility
- iManager: Intelligent self-management on chip



Device Management

- Remote management
- Monitor and control • Update management Alert and action
- Data visualization
- IT/OT total security

Microsoft



Ubuntu Desktop 20.04

- Full-blown graphic UI OS
- Preferred platform for AI, ML, and DL applications
- Consistent OS experience across platforms with long-term support

Windows Server 2022 LTSC

- Advanced multi-layer security • Hybrid capabilities with Azure
- Flexible application platform
- Windows Admin Center

Digital Transformation in Medical Imaging Analysis

Intro

Medical imaging systems — such as CT, MRI, X-ray, and ultrasound machines — are important tools for diagnosis prior to intervention. Consequently, imaging analysis accuracy is a matter of life and death.

Challenges

There is a shortage of medical imaging analysis specialists. Indeed, some studies indicate that by 2023, the world will need 31% more specialists than traditional manpower. Medical organizations are expected to fill such jobs. This could result in analysis mistakes, and be exacerbated by shortened working times.

Solutions and Technologies

Graphic AI based edge computers have the potential to tackle this problem. AI algorithms operating with powerful graphics processing capacities can deliver analytic results that help medical professionals diagnose patients accurately faster. The Advantech EPC-B5592 leverages the AMD EPYC[™] 7003 Milan CPU and the NVIDIA Quadro A6000 CPU to deliver server-grade computing power to complex AI tasks. Diagram



010101

Benefits

- Superior computing power designed for graphic AI applications
- Industrial system design endures harsh EMC environments
- 1200W 80+ GOLD power supply to support up to 2 x NVIDIA Quadro GPU cards

Cloud-Based Al Surgical Assistant Robot

Intro

The aging populations of advanced economies are creating a shortage of healthcare professionals. This shortage, which extends to surgeons, will increase demands for surgical robots over the next few years. Indeed, newly developed surgical robotics have grown more intelligent, and use AI. These abilities have caused them to gain traction in the healthcare industry.

Challenges

Smooth service flows are crucial in intense healthcare operations. Despite this, limited data flows can slow the transmission of graphic data with life or death consequences.

Solutions and Technologies

This solution required a server-grade CPU with powerful graphics performance to conduct image processing and complex AI algorithm computing tasks. Likewise, communication within a private cloud network necessitated smooth data transmission.

EPC-B5587 Intel[®] Xeon[®] W-1290E with NVIDIA Quadro RTX A6000

Diagram



Benefits

- Industrial grade EMC protection and IEC-62368-1 related certification
- 10Gb Ethernet ports for smooth communication
- Complete thermal design for the computing operation requiring 1200W power

Machine Learning Assisted Computing Upgrade for Automated Visual Inspection Equipment

Intro

Deploying Advanced Visual Inspection solutions in smart manufacturing necessitates high computing power and machine learning capabilities that maximize productivity.

Challenges

Seeking to improve production efficiency, the customer in this case required multiple high-speed digital cameras run with an embedded computer featuring additional machine learning capabilities.

Solutions and Technologies

Advantech AIMB-522 and EPC-B3522 leverage high performance AMD Ryzen[™] Embedded 5000 CPUs with 16 cores. These CPU are capable of managing manufacturing data processing workloads. The high-expandability provided by onboard PCIe x16/x4 slots and the M.2 socket provide the interfaces needed to install add-on cards that engender AI acceleration and/or robot control. In addition, high-speed I/O connectivity with 8 x USB 3.2 Gen 2 (10Gbps) ports and 4 x 1GbE Ethernet ports simplify the adoption of mainstream industrial cameras and help customers build visual inspection machines with ease. Diagram



Benefits

Capable of managing multiple high-speed cameras

- Improve manufacturing accuracy and productivity
- · Fast deployment and resilience

Most Powerful COM-HPC[®] Module to Enable Fast and Flexible Deployment on 5G Edge Al Server



Intro

Edge AI Servers are used in visualized data collection applications. They are often used to monitor, collect, and analyze big data and thus provide valuable business insights and opportunities.

Challenges

Upgrading traditional 13U servers requires too much time and money.

Solutions and Technologies

The Advantech SOM-E780 is equipped with an AMD EPYC[™] 7003 socket CPU with up to 64 cores for superior computing power. It features a 512GB ECC RAM and 79 pairs of PCIe Gen 4 within a COM-HPC[®] Server module. This reduces edge AI server time to market and corresponding development costs. It is also easily upgraded and maintained, and fulfills a variety of demands in different platforms or 5G server applications. When paired with Advantech's prompt and professional local design in services, it facilitates the rapid exploitation of business opportunities.

Diagram



Benefits

- Featuring a COM-HPC[®] proprietary pinout for EPYC[™] 7003 REAL Server-grade socket CPU, up to 64 Cores to save energy and costs by supporting more VM per server. Producing a solution with high performance-per-watt
- 79 x PCIe Gen 4 lanes for various add-on cards, like NIC, GPU, and FPGA
- On-board TPM chipset for Advanced Security
- Active and Passive Thermal Solutions for 60 °C environments

Improve Quality Inspection Efficiency with AI Visual Robotics

Intro

In this case, AI-guided robotic arms conduct defect inspection. This application was designed to help manufacturers simplify and improve data analysis and overall product quality.

Challenges

This application required a powerful edge computer capable of handling inference and training workloads. This computer needed to support multiple connections for robotic arms, cameras, and sensors.

Solutions and Technologies

Advantech ARK-7060 is a high performance edge computer powered by Intel[®] Xeon[®] D-1700 series processor with up to 10 cores that accommodates performant GPU cards up to 350W. This combination provides superior video capabilities that can handle AI inference and retraining workloads. ARK-7060 also provides multiple expansions for 1 x PoE frame grabber card connecting with 4 x PoE cameras and EtherCAT PCI master card for motion control. In addition, the Advantech ARK-7060 enables high-speed data transfer via 2 x 10GbE ports and M.2 expansions for 5G modules.

Diagram



- Server-grade computing with DDR4 memory capacity up to 128GB
- Expansion slots for motion control cards, frame grabbers, and GPU cards
- IPMI 2.0 remote management via on-board BMC

Analytic Gateway for Intelligent 5G Transmission Inspection and Abnormal Packet Interception

Intro

In this case, an advanced gateway solution was deployed in a next-generation core (NGC) network where it analyzes transmission data and intercepts abnormal data. These capabilities helped ensure network security and performance.

Challenges

The customer in this case required an instant analysis gateway with embedded computer to improve 5G transmission performance. This embedded computer needed to provide instant packet analysis and security protections.

Solutions and Technologies

The Advantech ROM-8720 leverages NXP LS1046A SoC with 4 x cores Cortex A72. These SoC are capable of managing and optimizing 5G transmission data workloads. The connectivity provided by 2 x 10GbE and 4 x 1GbE provides the interfaces needed for high-bandwidth 5G network transmission, and engenders 5G packet inspection capabilities. Likewise, the ready-to-use Ubuntu package Data Path Acceleration Architecture (DPAA) engine and SW library compliant with Intel[®] Data Plane Development Kit (DPDK) delivers efficient QoS performance and Trusted Architecture engines. These features help customers develop instant analysis nodes of network packets with strict security protection.

Diagram



Benefits

- · Analyze network transmission data instantly
- Ready-to-use Ubuntu package ensures fast deployment
- Strict security with Trusted Architecture engines

Industrial Motherboard













Embedded Single Board Computers

	AIMB-592	AIMB-522	AIMB-588	AIMB-288E	MIO-4370
	Micro-ATX	Micro-ATX	Micro-ATX	Mini-ITX Extended	4SBC
Processor	AMD EPYC [™] 7003 Series	AMD Ryzen™ Embedded 5000 Series	12 th Gen Intel [®] Core™ i Processors	12 th Gen Intel [®] Core [™] i Processors and Nvidia Quadro T1000 GPU	12 th Gen Intel [®] Core™ i Processors
Cores/ Threads	64C / 128T	16C / 32T	16C / 24T	16C / 24T	8C / 24T
Memory	6 Channel 288-pin DDR4 RDIMM up to 3200MHz 6 x DIMM slots, Max. 768GB (128GB per DIMM)	4 Channel 288-pin DDR4 UDIMM up to 3200MHz 4 x DIMM slots, Max. 128GB (32GB per DIMM)	4 x Channel 288-pin DDR5 UDIMM up to 4400MHz 4 x DIMM slots, Max. 128GB (32GB per DIMM)	2 x Channel 262-pin DDR5 SODIMM up to 4800 MHz 2 x SODIMM slots, Max. 64GB (32GB per DIMM)	1 x Channel SODIMM up to 4800MHz 1 x SODIMM slots, Max. 32GB (OOB ECC support)
Display	VGA	HDMI, VGA, DP	HDMI, 2 x DP, eDP	2x DP, eDP	2 x HDMI, eDP
Expansion	4 x PCIe x16 slots	1 x PCIe x16, 2 x PCIe x4, and 1 x M.2 M-key, 1 x M.2 E-key	1 x PCle x16, 2 x PCle x4 1 x M.2 M-Key 2280	1 x M.2 B-Key 2242 1 x M.2 M-key 2280	1 x M.2 E-Key 2230 1 x M.2 B-key 3042(option) 2 x M.2 M-Key 2280(PClex4 Gen.4) AT, ATX input Vin 12V
Power Input	ATX input	ATX input	ATX input	DC-in 24V	AT, ATX input Vin 12V
I/O Ports	2 x 2.5GbE 2 x 10GbE 1 x 1GbE for BMC Management 5 x USB 3.2 Gen1 1 x RS-232	2 x 2.5GbE 2 x GbE 8 x External USB 3.2 Gen2 3 x Internal USB 2.0 6 x Internal RS-232	1 x GbE 3 x 2.5GbE 4 x USB 2.0 5 x USB 3.2 Gen 2 3 x Internal USB 3.2 Gen 1 1 x USB Type C Gen 2x2, 5 x RS-232 1 x RS-232/422/485	2 x GbE 4 x USB 3.2 Gen 1 2 x Internal USB 3.2 Gen 1 2 x RS-232/422/485	2 x 2.5 GbE 4 x USB 3.2 Gen 2 2 x Internal USB 2.0 Gen 1 2 x RS-232/422/485 1 x I2C 1 x CANBus 1 x SMBus(option I2C) 1 x GPIO (8 bit)
Thermal (Fan or Fanless)	CPU cooler	CPU Cooler	CPU Cooler	1U CPU+GPU Cooler	CPU cooler
Operating Temperature	0 ~ 40 °C(Depends on CPU)	0 ~ 60 °C(Depends on CPU)	0 ~ 60 °C(Depends on CPU)	0 ~ 55 °C(Depends on CPU+GPU)	0 ~ 60 °C(Depends on CPU)
Dimensions	244 x 244 mm	244 x 244 mm	244 x 244 mm	170 x 190 mm	165 x 115 mm
Software	Windows Server 2019 WISE-DeviceOn Ubuntu 20.04	SUSI API WISE-DeviceOn Linux Ubuntu	SUSI API WISE-DeviceOn Windows Linux Ubuntu	SUSI API WISE-DeviceOn Windows Linux Ubuntu	SUSI API WISE-DeviceOn Windows Linux Ubuntu

Computer on Module









	SOM-E780	SOM-D580	SOM-C350	ROM-8720
	COM-HPC [®] Server Size E Proprietary	COM-HPC [®] Server Size D	COM-HPC [®] Client Size C	COM Express Compact
Processor	AMD EPYC [™] 7003 Series	Intel [®] Xeon [®] D-2700 Series	12 th and 13 th Gen Intel [®] Core [™] i Processors	NXP LS1046A Series
Cores/ Threads	64C / 128T	20C / 40T	16C / 24T	4C
Memory	4 x 288P DDR4 RDIMM, up to 3200MHz ECC/ Non-ECC, Max. 512GB	4 x 288P DDR4 LRDIMM, up to 2933MHz ECC/Non-ECC, Max. 512GB	4 x 262P DDR5 SODIMM, max. 128GB ECC/Non-ECC	1 DDR4 SODIMM slot, 16GB
Display	N/A	N/A	3 x DDI, 1 x eDP	N/A
Expansion	79 x PCIe Gen 4	32 x PCIe Gen 4 18 x PCIe Gen 3	16 x PCIe Gen 5 16 x PCIe Gen 4 10 x PCIe Gen 3	3 x PCIe Grn 3.0 x1
Power Input	Vin: 11.4-12.6V VSB: 4.75-5.25V RTC Battery: 2.0V ~ 3.3V	Vin: 11.4-12.6V VSB: 4.75-5.25V RTC Battery: 2.0V ~ 3.3V	Vin: 11.4-12.6V VSB: 4.75-5.25V RTC Battery: 2.0V ~ 3.3V	Vin 12V
I/O Ports	2 x SATA 3.0 1 x 2.5 GbE 4 x USB 3.2 Gen1 4 x USB 2.0 2 x RS-232 12 x GPIO 1 x IPMB 1 x TPM 2.0 (Optional)	2 x SATA 3.0 1 x 2.5 GbE 8 x 10GbE or 4 x 25GbE (depends on SoC sku) 4 x USB 3.2 Gen1 4 x USB 2.0 2 x RS-232 12 x GPIO 1 x IPMB 1 x TPM 2.0 (Optional)	2 x SATA 3.0 2 x 2.5 GbE 4 x USB3.2 Gen 2x2 (Optional) 8 x USB 3.2 Gen 2x1 8 x USB2.0 2 x RS-232 12 x GPIO 1 x TPM 2.0 (Optional)	4 x GbE 2 x 10Gb-KR 3 x USB 3.2 Gen1 2 x USB 2.0 2 x2-wire UART 8 x GPIO 1 x I2C
Thermal (Fan or Fanless)	Slim Cooler (QFCS 2.0)	Slim Cooler (QFCS 2.0)	Slim Cooler (QFCS 2.0)	Heat-spreader and Smei-heatsink with Fan
Operating Temperature	0 ~ 60 °C	-40 ~ 85 °C (Depends on CPU)	0 ~ 60 °C	-20 ~ 70 °C
Dimensions	200 x 160 mm	160 x 160 mm	160 x 120 mm	95 x 95 mm
Software	WISE-DeviceOn Windows Linux	WISE-DeviceOn Windows Linux	WISE-DeviceOn Windows Linux	Ubuntu WISE-DeviceOn

Edge Computer







	EPC-B5592 EPC-B5587		ARK-7060
	Server Grade Edge Computer	Server Grade Edge Computer	Xeon Edge Computer for AI Vision
Processor	AMD EPYC [™] 7003 Series NVIDIA Quadro Series GPU Cards	Intel [®] Xeon [®] W Processor NVIDIA Quadro Series GPU Cards	Intel [®] Xeon D-1700 Processors
Cores/ Threads	64C / 128T	10C / 20T	Up to 10 cores / 20 threads
Memory	6 Channel 288-pin DDR4 RDIMM up to 3200MHz 6 x DIMM slots, Max. 768GB (128GB per DIMM)	Dual Channel DDR4 2400/2666/2933 MHz Non-ECC SDRAM/ ECC SDRAM	4 x DDR4 SO-DIMM sockets support ECC/ non-ECC memory up to 128GB
Display	VGA	2 x DP / 1 x VGA	VGA for BMC
Expansion	4 x PCIe x16 slots	1 x PCI-E x16, 1 x PCI-E x4, 1 x PCI-E x1	1 x slot PCI, 1 x slot PCIe x4, 1 x slot PCIe x16
Power Input	ATX input	ATX input 700W PSU Inside	100-240V AC
I/O Ports	2 x 2.5GbE 2 x 10GbE 1 x 1GbE for BMC Management 4 x USB 3.2 Gen1 1 x RS-232	2 x 10GbE 2 x GbE 4 x USB 3.2 Gen2 2 x DP 1 x VGA 1 x Audio-out, 1 Mic-in	2 x GbE 4 x USB 3.0 4 x COM 2 x optional 10GbE 1 x BMC LAN 1 x BMC VGA 1 x BMC COM
Thermal (Fan or Fanless)	CPU cooler and system Fan	CPU cooler and system Fan	CPU cooler and system Fan
Operating Temperature	0 ~ 40 °C (Depends on CPU)	0 ~ 40 °C	-10 ~ 50 °C
Dimensions	380 x 454 x 176 mm	380 x 454 x 176 mm	230 x 205 x 390 mm
Software	WISE-DeviceOn	WISE-DeviceOn	WISE-DeviceOn Windows 10 Windows Server Linux Ubuntu



Product Series	SQF-CU2 ER-1	SQF-C8M ER-1	SQF-C8M 930	SQF-S25 840
Category	U.2 (SFF-8639)	M.2 2280 (M Key)	M.2 2280 (M Key)	2.5" SATA SSD
Flash Type	3D TLC	3D TLC	3D TLC	3D TLC
Capacity	400GB ~ 6.4TB	400GB ~ 3.2TB	480GB ~ 3.8TB	240GB ~ 7.6TB
Transfer Mode	PCIe Gen. 4x4	PCIe Gen. 4x4	PCIe Gen. 4x4	SATA III, Up to 6Gb/s
Max. Power Consumption (*) (W)	Read: 8.0 Write: 8.0	Read: 7.3 Write: 6.1	Read: 11.0 Write: 11.0	Read: 2.6 Write: 3.7
Sequential R/W Performance (*) (MB/s)	Read: up to 7,100 Write: up to 6,700	Read: up to 6,500 Write: up to 5,000	Read: up to 7,200 Write: up to 6,300	Read: up to 560 Write: up to 537
Random R/W (*) (IOPS)	Read: up to 750K Write: up to 700K	Read: up to 770K Write: up to 750K	Read: up to 750K Write: up to 1000K	Read: up to 99K Write: up to 89K
Endurance (DWPD) (*)	Read-Intensive: DWPD 1 Mixed-Use: DWPD 3	Read-Intensive: DWPD 1 Mixed-Use: DWPD 3	General: DWPD 0.5	General: DWPD 0.9
Operating Temperature	Commercial grade: 0 ~ 70 °C Industrial grade: -40 ~ 85 °C	Commercial grade: 0 ~ 70 °C Industrial grade: -40 ~ 85 °C	Commercial grade: 0 ~ 70 °C Industrial grade: -40 ~ 85 °C	Commercial grade: 0 ~ 70 °C Industrial grade: -40 ~ 85 °C
Shock Resistance	1,500 G, peak / 0.5 ms			
Vibration Resistance	20 G, peak / 80 ~ 2000 Hz	20 G, peak / 80 ~ 2000 Hz	20 G, peak / 80 ~ 2000 Hz	20 G, peak / 80 ~ 2000 Hz
Dimensions (mm)	100.2 x 69.85 x 15 mm	80.4 x 23.3 x 20.5 mm	80.4 x 23.3 x 20.5 mm	100 x 69.85 x 7 mm
Software	DeviceOn/ SQ Manager	DeviceOn/ SQ Manager	DeviceOn/ SQ Manager	DeviceOn/ SQ Manager

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Product Series	SQR-SD5N	SQR-UD5N	SQR-RD5N	SQR-SD5N(ECC)	SQR-UD5N(ECC)
DDR	DDR5	DDR5	DDR5	DDR5	DDR5
CI-tRCD-tRP	40-39-39	40-39-39	40-39-39	40-39-39	40-39-39
DIMM TYPE	SODIMM	UDIMM	RDIMM	SODIMM	UDIMM
PIN	262pin	288pin	288pin	262pin	288pin
Data transfer rate	4800 MT/s	4800 MT/s	4800 MT/s	4800 MT/s	4800 MT/s
Capacity	8/16/32GB	8/16/32GB	16/32/64GB	16/32GB	16/32GB
Voltage	1.1V (1.067V ~ 1.166V)	1.1V (1.067V ~ 1.166V)	1.1V (1.067V ~ 1.166V)	1.1V (1.067V ~ 1.166V)	1.1V (1.067V ~ 1.166V)
Operating Temperature	0 ~ 85 °C / -40 ~85 °C	0 ~ 85 °C	0 ~ 85 °C	0 ~ 85 °C	0 ~ 85 °C
Vibration	6G 20-500Hz	6G 20-500Hz	6G 20-500Hz	6G 20-500Hz	6G 20-500Hz
Function	-	-	Registered with ECC	ECC	ECC
Dimensions (mm)	69.6 x 30 mm	133.35 x 31.25 mm	69.6 x 30 mm	69.6 x 30 mm	133.35 x 31.25 mm
Software Support	DeviceOn/SQ Manager SQRAM Manager	DeviceOn/SQ Manager SQRAM Manager	-	DeviceOn/SQ Manager SQRAM Manager	DeviceOn/SQ Manager SQRAM Manager

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