Accelerate the next-generation of UHD video-based AI solutions

Powered by Intel, Advantech's Edge AI Server Platform delivers efficient AI acceleration in edge applications where intense video processing is required

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Enabling an Intelligent Planet

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Smart Cities Landscape

As technology continues to rapidly advance in line with increased urbanization, there is tremendous potential for cities to leverage emerging technologies such as 5G, AI and vision, edge computing, IoT, and more. Cities around the world are being challenged to provide tangible and equitable economic, social, and environmental benefits for their citizens. They must also provide better quality and more sustainable services, improve public safety, address congestion and environmental issues, reduce costs, and promote local economic competitiveness.

Embedded smart city technologies like sensors, cameras, and edge computing, can now provide near real-time awareness of issues requiring attention, and data collected and analyzed from these devices can be used to optimize city operations. Smart city solutions can improve basic services, enhance public safety, increase sustainability, and inform planning and policy making. The reach and impact are broad, but every application helps result in a better quality of life for citizens.

Industry Challenges

IoT technology approaching ubiquity across modern smart cities brings with it new challenges:

Data privacy and security are primary concerns among citizens and organizations alike. As the volume of data collected continues to grow exponentially, organizations must thwart cyberattacks from hackers and leakers, and scaling security capabilities in line with technology growth.

Deploying and managing IoT solutions at scale demands a complex convergence of compute, networking, communications, and software. Without a flexible infrastructure that can scale with soaring data usage, cities will be unable to realize the full manifestation of a connected, smart city.

Even the "smartest" cities must contend with a myriad of point solutions and legacy infrastructure that pose obstacles to supporting the ever-evolving needs of smart city applications with deep learning capabilities, high-resolution video processing, and advanced analytical capabilities. Current detection models such as a YOLO and Faster RCNN work with images with relatively low resolution of approximately 608 x 608 pixels, which can limit performance capabilities across a city.

Industry Trends

Modernizing each city is a unique puzzle, but there are trends taking shape across major metro areas. Many of these trends involve vision-based applications that can address a host of challenges across the city.

Using real-time monitoring alerts to resolve issues faster

- In an effort to reduce response times, cities are deploying real-time monitoring capabilities in more scenarios. One of the most common instances is transportation monitoring. Some cities are using real-time monitoring to analyze, interpret, and predict traffic levels that can influence transit operations, such as opening additional lanes during periods of high congestion.

- Monitoring can be coupled with other smart city uses such as analytics and automatic alerts that can be sent to the proper parties via SMS or email to reduce response times.

Leveraging analytics and historical data to inform long-term planning

- City leaders are using video data not just to take immediate actions, but building it into their long-term planning initiatives as well. They are using video analytics to improve transit systems by analyzing usage of facilities or infrastructure, identify peak travel times, and engage with the data to help plan future transportation projects.

Product Overview

With the rise of smart cities comes a major increase in data usage. Outdated infrastructure simply cannot provide the level of analysis and compute/processing capability that is required. Accelerator cards address this issue by increasing workload capacity for big data analysis, AI and deep learning processing, and high-power compute. The Advantech Edge AI Server Platform combines Advantech's VEGA-3500 Edge AI video accelerator with Advantech's SKY-8000 Edge Servers based on Intel® Xeon® Scalable processors to offer both performance and video processing efficiency at the edge. These performance and processing improvements aim at generating more power, which is offset by the integrated heat sink that has a thermal dissipation capability to help reduce the risk of overheating and help ensure the device can run more reliably. The flexible design based on PCI Express cards offloads AI inferencing and video pre-processing tasks. This allows application developers to build a complete and efficient system for workloads that need extensive video processing in real time. The SKY-8000 is a Series of Edge Servers that has been specifically designed for high density and high reliability to support optimized performance of mission and business critical application at the network edge. The VEGA-3500 card comes equipped with 11th generation Intel® Core i7/i5 processors or Intel® Celeron® C6305E processors, and leverages powerful AI and video processing such as Intel® Iris® Xe Graphics or Intel® Deep Learning Boost to help deliver improved performance.

Business Benefits

Process video workloads fast and more efficiently by leveraging the combination of the VEGA-3500 and powerful Xeon-class server platform is aimed at increasing both performance and video processing efficiency in a flexible design based on PCIe cards to offload both AI inferencing and video pre-processing tasks to the GPU.

Realize high-quality imaging without sacrificing performance by scaling camera feed object detection quality up to 7680 x 4320 pixels while maintaining high-processing speed with powerful Intel® Iris® Xe Graphics and Intel® Deep Learning Boost for state-of-the-art performance.

Reduce costs of deployment and scalability by leveraging Intel® Distribution of OpenVINO™ Toolkit and integrating into Intel® Smart Edge Open framework with more security and optimized resource management.

Integrate with additional applications to widen deployment options such as combining situational monitoring with traffic management and fully realize a smart city's capabilities.

Integrated Technologies

Solution integrators deploying solutions built on Advantech SKY-8000 Servers and VEGA-3500 cards can leverage powerful tools from Intel to optimize their offerings. Advantech has developed required drivers and software tools to easily integrate the VEGA-3500 into Intel® Smart Edge Open framework to reduce development time and get to market quicker. Additionally, the Intel® Distribution of OpenVINO™ Toolkit provides referencing for AI inferencing operations including a model optimizer, and runtime and development tools.

Intel® Smart Edge Open

- **Accelerate your time to market** - Reduce cost and performance risks associated with developing cloud-native networking platforms by using reference architectures optimized for Intel® hardware.
- **Simplify complex network architectures** - Deploy reference architectures for common use cases and edge locations.
- **Ready for 5G networking** – Run compute-intensive workloads at the edge at 5G speeds.

Intel® Distribution of OpenVINO™ Toolkit

- **High Performance, Deep Learning** - Convert and optimize models to achieve high performance for deep-learning inference applications.
- **Streamlined development** - Facilitate a smoother development process using the included inference tools for low-precision optimization and media processing, computer vision libraries, and preoptimized kernels.
- **Write once, deploy anywhere** - Deploy your same application across combinations of host processors, accelerators, and environments, including CPUs, GPUs, VPUs, on-premises and on-device, and in the browser or in the cloud.

Platform components and features

| Section	Component/Feature
SKY-8000 Series of Edge Servers	
CPU	Single or Dual 2nd or 3rd Gen Intel® Xeon® Platinum, Gold, Silver or Bronze Processors
Memory	Up to 32x DIMM sockets for up to 2048GB total capacity per system
PCIe Expansion	Rich Gen 4 or Gen3 PCIe card support for high density I/O and acceleration
Management	IPMI 2.0-compliant management with reliability and security enhancements
Dimensions	1U or 2U short-depth servers, from 11" (300mm) to 20" (530mm) depth
Environmental	Wide operating temp range from -40 to +65 degrees Celsius and rugged IP65 configurations
VEGA-3500 Edge AI Accelerator	
Hardware	• Intel® Core i7/i5 processor • Intel® Celeron® C6305E processor • Intel® Iris® Xe Graphics
Dimension	PCIe Gen 4x16, ¾ length full height
Power	ATX 6-Pin12V Connector, 75W Consumption (Non-turbo mode)
Security	Support TPM 2.0
Video Input	• Support Multi Video Stream input via Ethernet over PCIe • Support 40Gb/s Video input via thunderbolt 4.0
Video Process	• Support 4-ch 4Kp60 VP9, HEVC, AVC &AV1 encoding, decoding, and transcoding • Support HDR, up to 4:4:4 sampling, 12-bit color w/ preprocessing
Software	Support Linux SDK & FFmpeg plugins
AI	Support Intel AI/DL VNNI and CV/AI applications
Extension	• Support M.2 socket for storage • Support add-on card to extend 2.5GbE, thunderbolt 4.0, SATA port, and USB 3.0 port

VEGA-3500 Accelerator Card

SKY-8000 Series of Edge Servers

Use Cases

The majority of these use cases are dependent on vision-based AI/ML/DL applications, highlighting the necessity of powerful and flexible processing capabilities. The Advantech Edge AI Server Solution enables powerful use cases to help improve public safety, enhance citizen's quality of life, and increase efficiencies across smart cities.

Situational Monitoring

- As more people move into urban areas, the ability to effectively monitor areas for both security and public safety reasons is of paramount importance. The VEGA-3500 accelerator card enables intelligent video processing, such as Intel® Deep Learning Boost, to quickly analyze video content in real-time, extract data, and send out alerts when an anomaly is detected.
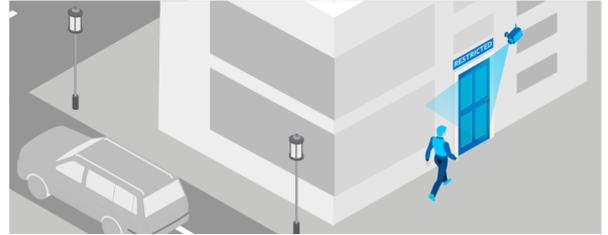
Crowd Management

- Crowd management is a dynamic use case required at sporting events, concerts, high density commuting areas, and more. With the need for dynamic and flexible capabilities, the Intel Smart Edge Open network is an ideal foundation to reduce deployment time, analyze at the edge for larger and more intensive crowd density heat mapping, and scale when necessary, such as to additional sections of a city.

Traffic Management

- Effectively managing flow of traffic can improve not only transit operations to reduce congestion, but can enhance safety for pedestrians and cyclists as well. Utilizing video analytics requires a large amount of bandwidth, especially in a busy environment like city streets. The accelerator's PCIe card can reduce data transfer speeds, handle high-bandwidth tasks, and enable powerful AI and video processing. Being able to quickly identify traffic patterns, alert drivers to accidents, and provide rerouting options are all critical to improving transportation flow in smart cities.
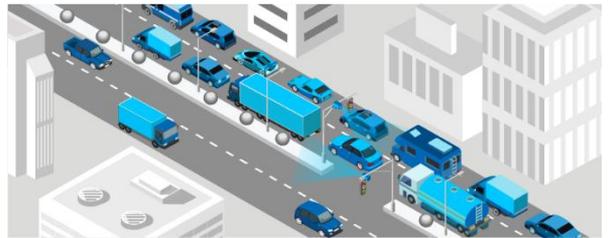
Learn More

Smart cities require an orchestrated connection between technology and people and Intel is committed to building more resilient and connected communities that benefit everyone. Want to learn more?

Intel Smart City Solutions | Advantech Edge AI Reference Platform | SKY 8000 Series Product Page | VEGA-3500 Product Page

intel.

Source: Deloitte, "Urban future with a purpose, 12 trends shaping human living," 2021