

## PRODUCT BRIEF

Intel® Vision Products  
Smart Cities IoT Solutions



# Intel® Vision Products Enable Consolidation of Smart Cities Data to Enhance Safety and Efficiency

Increase security, support emergency and law enforcement agencies, and enhance efficiencies with the AAEON Atlas\* edge node, powered by Intel® Vision Products

### Executive summary

The Internet of Things (IoT) can transform the way municipalities manage cities while delivering enormous savings—in both day-to-day operation and infrastructure costs. Smart video, environmental monitoring, and smart lighting capabilities bring exciting new services to the smart city here and now. Not only can these capabilities provide enhanced safety in shopping areas, streets, and neighborhoods, they can also make urban life more enjoyable in practical, convenient ways.

AAEON Atlas\*, powered by Intel Vision Products, is a powerful edge node that consolidates data streams from smart lighting, environmental monitoring, and video sensors. Atlas works at the edge to allow city administrators to create a connected data hub that enables numerous new applications. For example, when the Atlas edge node is deployed in conjunction with a camera, network video recorder (NVR), and management system, it can power a citywide parking application. Car drivers can park on city streets without having to fish for change or pay at a meter—nearby smart cameras on streetlights can capture and classify images such as license plates using computer vision and charge the owner directly for the exact parking time via a gateway and cloud-based management system connected to a department of motor vehicles database.



Authors  
**Suman A Sehra**  
Global Director  
Intel Smart Cities

**Kevin Ting**  
Product Director  
AAEON Smart Cities

AAEON Atlas can be added onto existing infrastructure, such as street and traffic lights. The node streamlines multiple overlapping efforts by city agencies and saves on costs (see Figure 1) by helping agencies consolidate their data and application. Atlas includes outdoor smart lighting control for streetlight systems and environmental monitoring using multiple gas sensors. The edge node can be used to monitor traffic flow, parking availability, pedestrian crossings, seismic activity, trash receptacle overflow, and even atmospheric changes in addition to numerous other use cases. With these capabilities, the AAEON Atlas edge node helps smart cities improve operational efficiency, increase citizen satisfaction, and decrease costs.

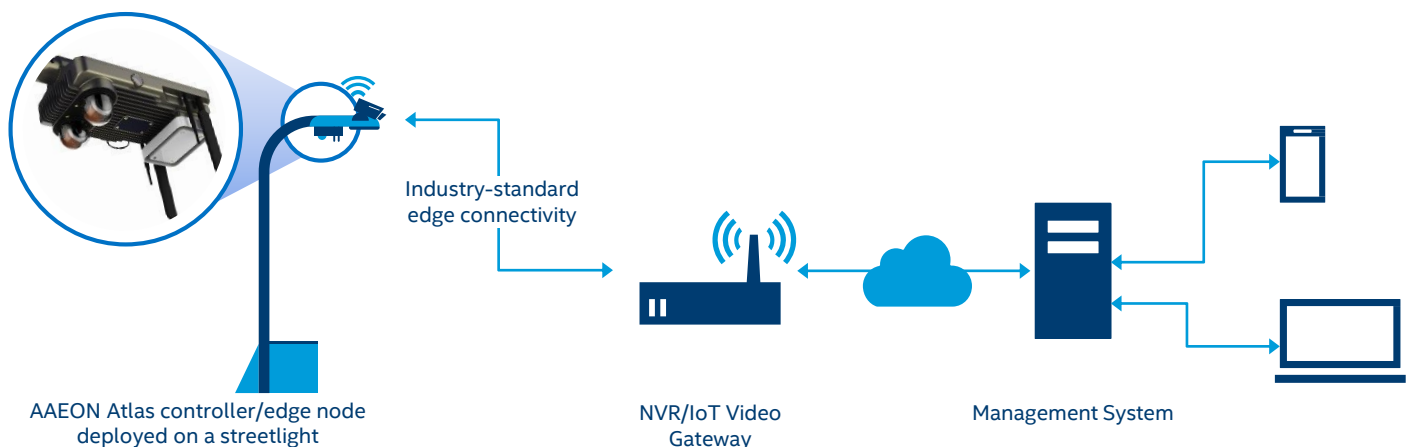
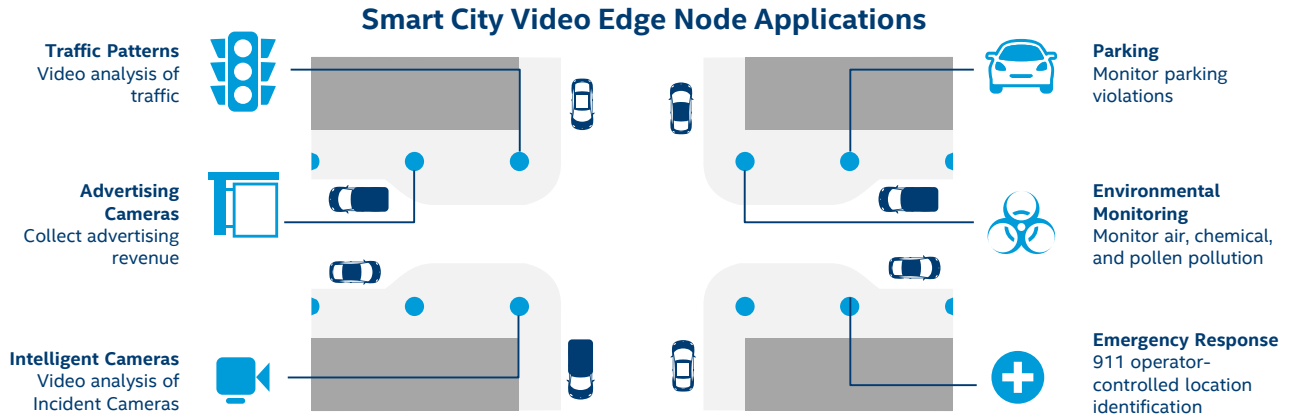


Figure 1. AAEON Atlas shown in conjunction with camera, NVR, and management system powered by Intel® Vision Products

**Figure 2.** The benefits of smart video, lighting, and environmental monitoring can lead to improved safety, better city services, and new revenue opportunities



**How it works**

The AAEON Atlas\* edge node can pair with smart cameras that are deployed on existing streetlights and fixtures that capture video and images. Captured images are processed and forked into two branches—one for onboard analysis by the Intel® Movidius™ Myriad™ X vision processing unit (VPU), the other for storage and later retrieval if required. The IP66-rated ruggedized design helps ensure long-lasting durability in all climates.

The AAEON Atlas\* edge node connects to an integrated edge gateway gathers and ingests data from multiple sensors and analyzes this data using edge computing. This includes the video capture from cameras, but can also include data from a variety of other sensors including lighting controllers, environmental monitoring sensors, and audio sensors. The gateway is built on the AAEON NANOCOM-APL\*, powered by an Intel® Atom™ x7 processor. The gateway’s onboard 512 GB SSD provides NVR support and 15 hours of storage for 3840x 2160 resolution (or longer for 1920 x 1080 resolution).

Captured data retrieval can be achieved by streaming via an LTE or Ethernet interface, and images are backhauled to a cloud for deeper analysis and remote monitoring and control. The solution includes connectivity features via WIFI, Gigabit Ethernet, and 4G/LTE. Users can easily monitor the status of the entire system with the management app using an intuitive

dashboard. The web-based interface allows authorized users to access applications that alert them to use-case-specific actions.

To meet the requirements of any smart city application, neural networks based on Intel® Distribution of OpenVINO™ toolkit enable users to customize the solution leveraging different AI and deep learning algorithms. The Intel® Distribution of OpenVINO™ toolkit provides further flexibility, enabling users to convert trained AI models to run on any Intel-based solution across smart city use cases.

**Key capabilities and uses**

The AAEON Atlas edge node can be used in any outdoor application, including intersections, parking lots, recreational parks and sports fields, shopping malls and shopping districts, airports, office parks, and college campuses, for numerous use cases, including:

- Pedestrian detection and crowd/pedestrian flow monitoring
- Alerts for overflowing trash receptacles, water-main breaks
- Automated parking, including fee collection
- Crime prevention: license plate/vehicle recognition, crowd monitoring, accident detection, safety violation detection
- Traffic congestion monitoring and real-time signal optimization
- Vehicle detection and classification

**Solution Benefits**

**Increased safety and citizen satisfaction.** Adding an edge node for data consolidation contributes to more livable cities by helping to enhance safety and reduce congestion, improve traffic and parking, and increase convenience.

**Analytics at the edge or in the cloud.** Mission-critical, low-latency data can be analyzed at the edge to allow city agencies to make quick decisions. Algorithms developed using the Intel® Distribution of OpenVINO™ toolkit can classify images into predefined categories.

**Reduced energy and operational costs.** Without the need for infrastructure replacement or hardware overhaul, the Intel Distribution of OpenVINO toolkit allows smart cities to leverage computer vision and deep learning capabilities on existing edge devices.

Intel® Movidius™ Myriad™ X VPUs are capable of operating on customizable complex networks and network layers with high compute and ultra-low power consumption, resulting in industry-leading performance and costs.

**Increased revenue opportunities.** Smart video and edge node capabilities can provide new revenue opportunities and added capabilities through Intel’s vast developer community and powerful processing capabilities. Cities can decide how to engage users of captured video and other data, then define the revenue opportunities that the data generates.

**Enhanced management through IoT.** With an IoT network, cities can create a smart city platform for centralized command and control operation across multiple agencies.

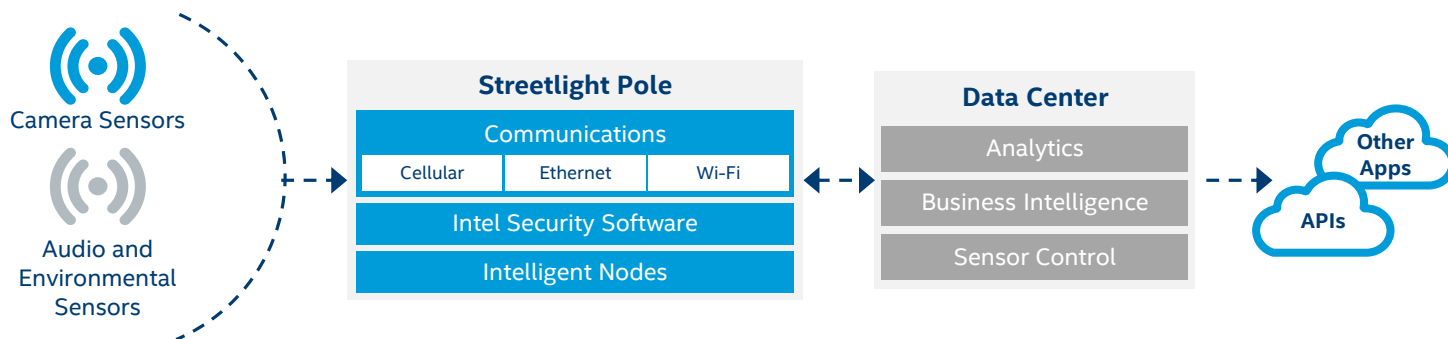
**Multilevel end-to-end security.** The Intel technology-based solution provides end-to-end protection across the entire IoT platform. Hardware- and software-fortified security creates a chain of trust, from edge to network to cloud. This solution is designed to enable IoT networks to identify and secure communications, safeguarding all data against theft and tampering. Only trusted data is analyzed, allowing cities to prevent, detect, and correct attacks.

## Features

<b>Video monitoring/recording</b>	<ul style="list-style-type: none"> <li>Built-in NVR Management (Require Atlas Camera Module)</li> <li>Instant metadata transfer using LTE or Ethernet</li> <li>Streaming (if required) through LTE or Ethernet</li> <li>Supports live monitoring via mobile app (iOS &amp; Android)</li> <li>Edge inference algorithms based on Intel® Distribution of OpenVINO™ toolkit (traffic detection, smart parking, etc.)</li> </ul>
<b>Automatic lighting operation</b>	<ul style="list-style-type: none"> <li>On/off</li> <li>Dimming control (0-10V / DALI Interface)</li> </ul>
<b>Automatic lighting adjustment</b>	<ul style="list-style-type: none"> <li>Onboard astronomical calendar</li> <li>Ambient Light Sensor</li> </ul>
<b>Lighting control priority</b>	<ul style="list-style-type: none"> <li>Predefined exceptions</li> <li>Local Manual override</li> </ul>
<b>Malfunction management</b>	<ul style="list-style-type: none"> <li>Real-time alerts (via Email/Compatible CMS platform)</li> </ul>
<b>Lighting control management</b>	<ul style="list-style-type: none"> <li>Group control (w/ Add-on Lighting Control Module)</li> <li>Real-Time Management through built-in CMS platform w/ Smart Phone APP support</li> </ul>
<b>Air quality measurement</b>	<ul style="list-style-type: none"> <li>Microclimatic measurements for SO2, VOC, O3, NO2, CO, PM2.5</li> </ul>
<b>Flexible map visualization</b>	<ul style="list-style-type: none"> <li>Public or private map-provider integration</li> </ul>
<b>Luminaire compatibility</b>	<ul style="list-style-type: none"> <li>Compatible with different lamps and lamp controllers (DALI interface and 0V to 10V)</li> <li>OpenAPI for Integration with different vendor CMS platform</li> </ul>

## Technical specifications †

<b>Processor</b>	<b>Main Processing Module:</b> AAEON NANOCOM-APL* (Intel® Atom™ processor) <sup>1</sup>	<b>Camera Module:</b> AAEON AI Core XM 2280* (based on 2 x Intel® Movidius™ Myriad™ X VPU, MA2485) <sup>2</sup> <ul style="list-style-type: none"> <li>Optional Add-on UP Core Plus (Intel® Atom™ x7-E3930 processor) for advance edge analytics</li> </ul>
<b>Camera</b>	<b>EverFocus EBN1840-A*:</b> <ul style="list-style-type: none"> <li>Supports D-WDR</li> <li>Equipped with 3.6mm fixed lens</li> <li>Dimension: 80 x 22 mm</li> <li>Supports True Day/Night with automatic IR-cut</li> <li>Extended IR range up to 30m / 98ft. with 18 LEDs (depends on scene IR reflectivity)</li> </ul>	
<b>Memory</b>	<b>Main Processing Module:</b> 4GB DDR4 (Upgradable to 8GB)	<b>Camera Module:</b> 4GB DDR4 (w/ Add-on Up Core Plus)
<b>Storage</b>	<b>Main Processing Module:</b> M.2 512 GB SSD, 32 GB eMMC for OS Imaging.	<b>Camera Module:</b> 32GB eMMC for OS Imaging (w/ Add-On Up Core Plus)
<b>Expansion slot</b>	<b>Main Processing Module:</b> <ul style="list-style-type: none"> <li>2 x Mini PCIe (USB Signal Only) for 3G/4G/LTE Module</li> <li>1 x Mini PCIe (w/ USB Signal and PCI-E[x1])</li> </ul>	
<b>Connectivity</b>	<ul style="list-style-type: none"> <li>Wi-Fi : Azure Wireless CM389MA*</li> <li>4G/LTE: Telit LE910* Pluggable add-on card</li> <li>Gigabit Ethernet – WGI211AT</li> </ul>	
<b>Power input</b>	<ul style="list-style-type: none"> <li>85-264V AC</li> <li>Supports PoE and 12VDC</li> </ul>	
<b>Operating temperature range</b>	<b>Main Processing Module:</b> 0°C~60°C <b>Environmental Monitoring Sensors:</b> 0°C~45°C	<b>Camera Module:</b> 0°C~50°C
<b>Operating humidity</b>	<ul style="list-style-type: none"> <li>10%~80%RH, non-condensing</li> </ul>	
<b>Software</b>	<ul style="list-style-type: none"> <li>Media and video analytics - Intel® Distribution of OpenVINO™ toolkit</li> <li>Camera HAL</li> <li>Installation guide</li> <li>Data center E2E engine, IPC software stack (video capture, video data preprocessing, encoding), NVR E2E engine (raw video data storage, video playback)</li> <li>Algorithms supported: Smart transportation</li> <li>Management service</li> <li>Supported frameworks: Tensorflow, Caffe, MXNET</li> </ul>	
<b>Analytics support</b>	Functional plugin (license plate detection, face detection, face recognition), vehicle color/type/maker/model classification, perimeter intrusion prevention	
<b>Dimming</b>	DALI and 0V to 10V	
<b>Power switching</b>	1000W, lamp power on/off	
<b>Power consumption</b>	< 40W	
<b>Ruggedized standard</b>	Weather-proof IP66 rated	
<b>Sensors</b>	ALS, 3D G-sensor, GPS 8MP Progressive scan CMOS sensor	
<b>Energy meter</b>	Calibrated to 1 percent accuracy (for real time monitoring of lamp power consumption)	
<b>Control events and schedules</b>	Real-time commands, scheduled events, ALS	
<b>Certifications</b>	FCC, CE, UL	
<b>Com Express Type</b>	10 (COM.0 Rev 3.0)	
<b>Display</b>	<ul style="list-style-type: none"> <li>LVDS 18/24-bit 1-channel (Optional: eDP), DDI x 1</li> </ul>	
<b>USB</b>	USB 3.0 x 2, USB 2.0 x 8	
<b>UART</b>	<ul style="list-style-type: none"> <li>2 (Tx/Rx)</li> </ul>	
<b>Others</b>	<ul style="list-style-type: none"> <li>12C</li> <li>SMBus</li> <li>8b-GPIO/(SDIO)</li> </ul>	



**Figure 3.** Captured data is transferred and analyzed from edge to cloud with complete support for scalability and back-end security. Through the open architecture design, developers can work with cities to create new solutions that utilize the data.

### Key Intel components

#### Intel® Atom™ x7-E3950 Processor

The Intel® Atom™ x7 processor provides excellent performance on the go with a small form factor, and low energy requirements. Mobile devices can manage multiple activities, and produce dazzling images. Built-in security features help you avoid malware, protect your identity, and keep your data safe.

#### Intel® Movidius™ VPUs

Intel® Movidius™ VPUs are designed to bring vision technology out of the data center and into devices at the edge. Intel Movidius VPUs have a dedicated architecture that offers power efficiency for high-quality image processing, computer vision, and deep neural networks, making them suitable for the demanding mix of vision-centric tasks in modern smart devices. These VPUs are ideal for conditions constrained by size, power, and cost, offering the optimal balance of power efficiency and high computing performance.

### Conclusion

For today's organizations, gathering video, lighting, and environmental data is insufficient—they need to be able to quickly analyze, index, and search this data to extract insights. AAEON and Intel are empowering today's smart cities with actionable intelligence and transformative insight.

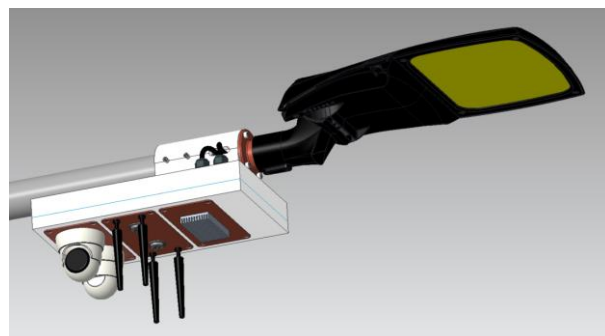
For more information, visit

<https://www.intel.com/content/www/us/en/internet-of-things/smart-cities.html> and <https://www.AAEON.com/en/ac/intelligent-street-lighting>.

For more product information and sales support, contact at [sales@aaeon.com.tw](mailto:sales@aaeon.com.tw).

#### Intel® Distribution of OpenVINO™ toolkit

This toolkit from Intel enables developers to easily integrate deep learning inference into their applications using industry-standard AI frameworks and standard or custom layers.<sup>3</sup> These can then be deployed across the continuum of Intel-based product lines—from camera to cloud—irrespective of the target platform on which they will be run. With Intel® Distribution of OpenVINO™ toolkit, developers can write code once and make it future-proof for fast, seamless deployment across current and future Intel hardware—eliminating application redevelopment.<sup>4</sup> Based on convolutional neural networks (CNN), the toolkit extends workloads across Intel hardware and maximizes performance.



**Figure 4.** The AAEON Atlas\* node depicted in a typical streetlight deployment.



<sup>^</sup> Results have been estimated or simulated using internal Intel analysis or architecture simulation or modeling, and provided to you for informational purposes. Any differences in your system hardware, software or configuration may affect your actual performance.

Cost reduction scenarios described are intended as examples of how a given Intel-based product, in the specified circumstances and configurations, may affect future costs and provide cost savings. Circumstances will vary. Intel does not guarantee any costs or cost reduction.

1. AAEON NanoCOM-APL\*: <https://www.aaeon.com/en/p/com-express-modules-nanocom-apl>

2. AAEON AI Core X\*: <https://www.aaeon.com/en/p/ai-edge-computing-board-ai-core-x>

3. The broad set of popular frameworks and topologies supported include, but are not limited to, Caffe\*, Caffe2\*, MXNet\*, neon\*, TensorFlow\*, Theano\*, and Torch\*.

4. While any standard algorithm will run on any Intel® silicon architecture, performance may vary from one architecture to another. In some cases, extra work may be needed using the OpenVINO™ toolkit to port an algorithm from one architecture to a different architecture

Intel technologies' features and benefits depend on system configuration and may require enabled hardware, software or service activation. Performance varies depending on system configuration. No computer system can be absolutely secure. Check with your system manufacturer or retailer or learn more at intel.com.

This document contains information on products, services and/or processes in development. All information provided here is subject to change without notice. Contact your Intel representative to obtain the latest forecast, schedule, specifications and roadmaps.

Intel, the Intel logo, Movidius, Atom, and Myriad are trademarks of Intel Corporation or its subsidiaries in the U.S. and/or other countries.

\*Other names and brands may be claimed as the property of others.