AAEON an ASUS assoc. co.

White Paper

Smart Cities Brought to Life

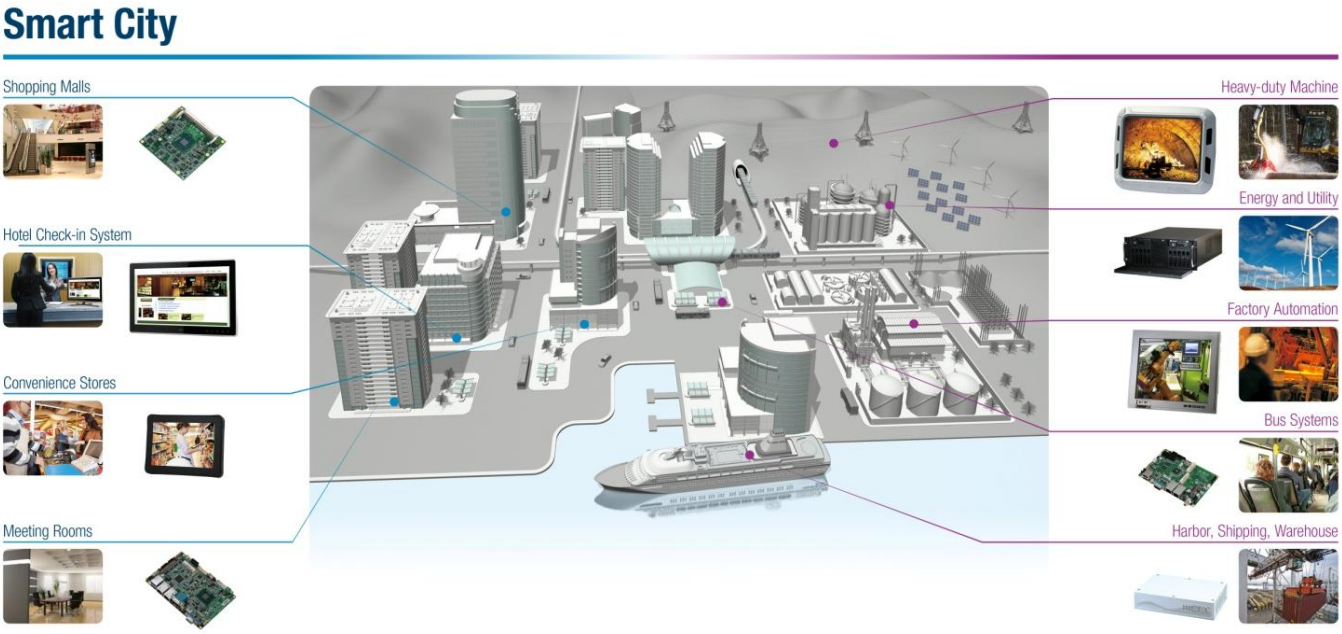
Overview

Ask people the definition for "Smart City" and you are likely to get a wide variety of answers. According to Wikipedia:

> "A city can be defined as 'smart' when investments in human and social capital and traditional (transport) and modern (ICT) communication infrastructure fuel sustainable economic development and a high quality of life, with a wise management of natural resources, through participatory action and engagement. … the smart city concept essentially means efficiency. But efficiency based on the intelligent management and integrated ICTs, and active citizen participation. … a new kind of governance, genuine citizen involvement in public policy." (Source: http://en.wikipedia.org/wiki/Smart_city#Definition)

For those of us entrenched in advanced connected embedded technology, the definition of a smart city (aka, digital city or intelligent city) is something similar, yet different. We might say that a Smart City is one that uses various Internet of Things (IoT) applications to continuously collect important data and organize it into actionable information that can be used to make real-time decisions. These decisions help city governments meet goals for compliance, process efficiency, safety, financial optimization, and much more.

The need for IoT applications to help build such smart cities is being heard loud and clear by AAEON. As a result, we are bringing board and system-level solutions leveraging the capabilities of the Intel® Atom™ processor E3800 product family to market that deliver many of the necessary features and functionality . These solutions include mobile devices for access or data input in the field, energy-efficient M2M gateways, network security solutions, and platforms for intelligent behavior analysis.



AAEON solutions powered by the Intel® Atom™ processor E3800 product family enable solutions that drive the next wave of advancements for Smart Cities.

Intel® Atom™ E3800 Processors: The Eco-Friendly Solution to Smart City Computing

Environmental friendliness is one of the important topics of today, even more so for smart cities. Being the “brain” behind any Smart City infrastructures, Energy efficiency for processors used in smart cities is crucial as various electronics, such as sensors and controllers, have to be operational 24/7 to ensure the smooth running of the city. While it is tricky to maintain certain levels of performance without increasing power consumption, the Intel® Atom™ E3800 Processors managed to strike that balance admirably.

As the first series of processors designed to be used in smart cities, the E3800 series processors features the latest 22nm process technology with 3-D Tri-Gate transistors to deliver significant performance and energy efficiency. Users may also choose from CPUs of up to 4 cores running up to 1.91GHz to best suit their needs. Other features include flexible I/Os connectivity and virtualization, making it excellent for any infotainment and visual display applications.

Intelligent and Energy Efficient Gateways

In the evolving Smart City environment, there are access devices of some type almost everywhere, collecting and communicating vast amounts of diverse sensor data via wired and wireless technologies. Where does this data go to transition from data into action? The answer is the intelligent gateway and aggregator devices that make up the second and third levels of M2M communication.

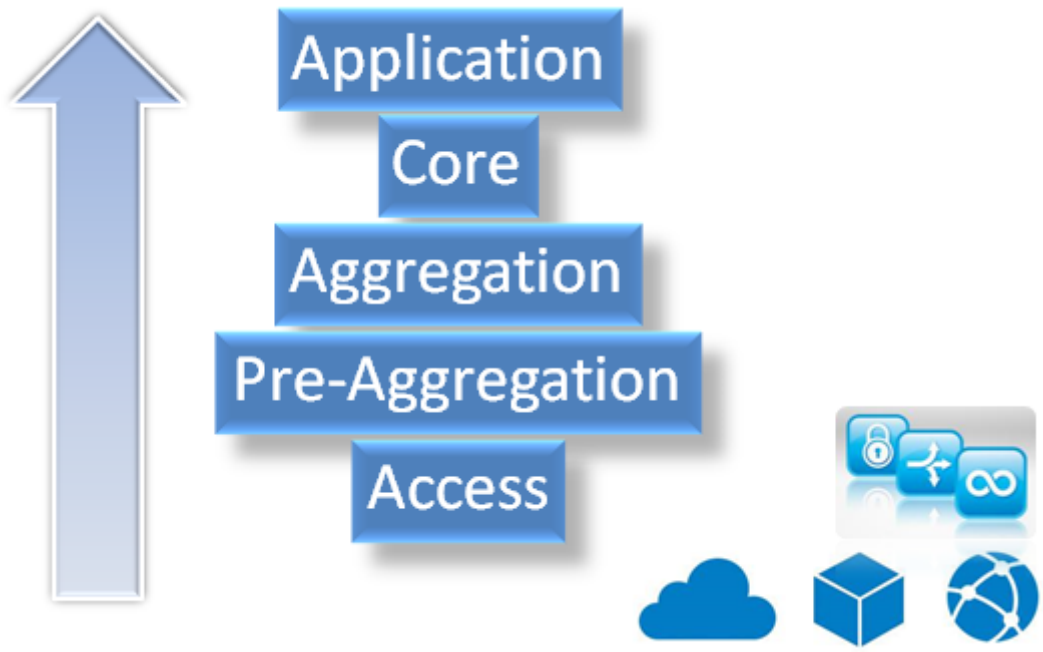


Figure 1- Layers of M2M Communication: Optimal data handling begins with intelligent gateway devices at the pre-aggregation and aggregation layers of complete end-to-end M2M solutions.

AAEON enables such devices with new additions to our COM Express computer-on-module (COM) and GENE 3.5" subcompact single board computer (SBC) families. Each of these board-level hardware offerings are compact and offer the flexibility and configurability that is essential for integrated or bolt-on intelligent gateway devices.

COM-BT: Power-efficient COM Express Compact Form Factor

Pin-Out Type 6 Module

The AAEON COM-BT represents a very versatile COM solution when paired with an application-specific baseboard. Using the E3800 processors, the AAEON COM-BT offers up to 3 X SoC performances than earlier Intel® Atom™ processor N2000/D2000 family. Milliwatt standby power and auto-sleep support further help maximize battery life.

For security, the COM-BT offers an optional Trusted Platform Module (TPM) for a hardware-based layer of security support to accompany any application-specific security software.

Figure 2 - The AAEON COM-BT fits the bill for use at the heart of intelligent gateways, offering extensive I/O support.

The AAEON COM-BT supports up to 8GB of DDR3L 1066MHz DODIMM memory to address a gateway's requirement for industrial temperature tolerance and long-term availability and low power consumption. Further setting the COM-BT apart is the module's flexible I/O support. USB 3.0 and 2.0 as well as PCIe plus COM ports are available in the standard module. Versatile mounting holes of the COM-BT's mechanical design aid in designing a reliable intelligent gateway solution, ensuring the module will maintain full functionality even when subjected to a degree of shock and vibration.

Though not essential for intelligent gateways, the COM-BT also facilitates flexible and dual simultaneous display support. The chip that is at the core of the COM-BT is the first Intel® Atom™ processor to take advantage of Intel® HD Graphics, providing 5X improvement in 3D graphics performance over the previous generation Intel Atom processors N2000/D2000 product family. This also means that the COM-BT is able to support DisplayPort, DVI, and HDMI (DDI1/DDI2), as well as 18/24-bit LVDS and VGA. This graphics capability makes the COM-BT ideal as well for addressing the needs of the various types of interactive infotainment solutions that play a role in the evolving Smart City.

GENE-BT05: Low-Power, Fanless Design Delivers Consistent Connectivity

Looking for a compact SBC to drive a low power bolt-on gateway or advanced ePOS solution? The AAEON GENE-BT05 has the feature set that delivers the target functionality while maintaining optimal power consumption.

Figure 3 - The GENE-BT05 offers a coastline of connectors that makes migration from legacy solutions simple and cost-effective.

The name of the game is connectivity. However, not all connectivity is the Wi-Fi type that has received so much hype for IoT. For solutions that will be built around the AAEON GENE-BT05, connectivity via USB (2.0 and 3.0) is integral, as is the available dual Gigabit Ethernet. Dual Gigabit Ethernet availability enables application redundancy, which helps to ensure that if one element goes down, all is not lost. For security purposes, the GENE-BT05 offers an optional Trusted Platform Module (TPM). This feature allows the GENE-BT05 to be able to utilize some of the advanced features of the Wind River Intelligent Development Platform (IDP) as well as McAfee's Embedded Control to support the security needs of Smart City applications. Wind River IDP provides secure remote Management, featuring customizable trusted boot, security for resource control, TPM secure key migration and integrity measurement. McAfee Embedded Control enhances resilience through dynamic whitelists and change control. The AAEON GENE-BT05 also sports a very rich I/O and expansion design to enable solutions, such as the one diagramed below, that provide a great deal of functionality and surpass previous designs that may have required separate subsystems to achieve the same functionalities.

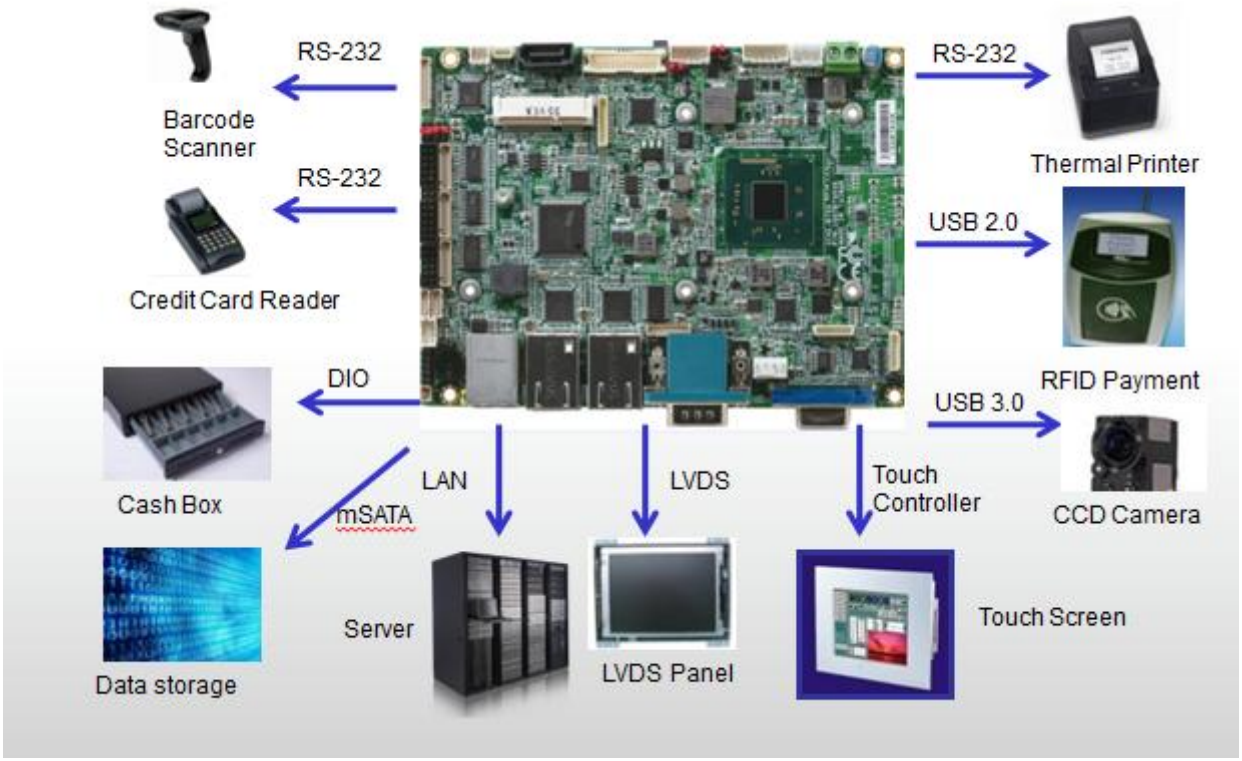


Figure 4 - The rich I/O and expansion features of the GENE-BT05 enable extended functionality for advanced connected POS terminals.

Network handling of Smart City Data

So far, we have discussed the collection of data and its initial handling. This merely scratches the surface of what happens to real-time actionable data collected by the vast number of sensors and end points. We now shift gears and address handling of the data at the core, as well as access layers of M2M communication serving ever-growing Smart City applications.

AAEON FWS-2250: Quad LAN Network Appliance for Multiple Network Applications

Rarely will you find a network appliance that can serve more than just one type of application. The AAEON FWS-2250 comes equipped with either the Intel® Atom™ processor E3815 (1.46GHz) or E3825 (1.33GHz) SoC to deliver a high performance design with built-in versatility.

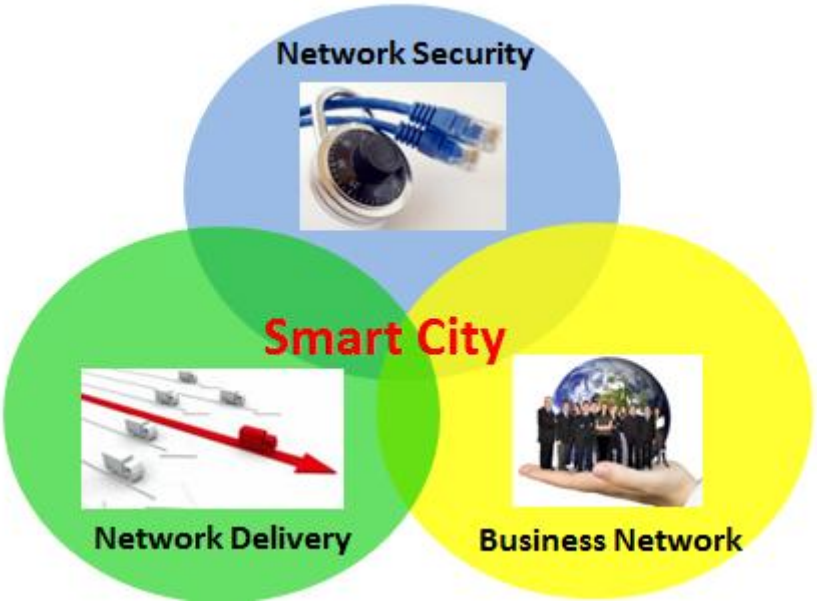


Figure 5 - With 4 LANs designed in, the AAEON FWS-2250 Network Appliance is flexible enough to serve these three types of data-handling applications.

One of the most necessary elements of data handling is maintaining network security and protecting the integrity of the data. This is just as important as ensuring the necessary data gets to where and when it needs to. Some of the key hardware features of the fanless FWS-2250 system that make this possible are:

- 4x 10/100/1000Base-TX Ethernet port (optional 1 pair bypass)
- 1x CF Card socket
- 1x RJ-45 console, 2x USB 2.0, 1x USB 3.0 (optional)

Figure 6 - Some highlighted connections available from the AAEON FWS-2250 powered by the Intel Atom E3800 SoC product family

To make the FWS-2250 installation-ready, all the solution developer needs to do is load the purpose-built software. Some of the target markets for the AAEON FWS-2250 include Unified Threat Management solutions (UTM), Virtual Private Network (VPN) appliances, and Intrusion Detection Systems (IDS) that enable early response to data attacks, as well as Intrusion Prevention Systems (IPS), that proactively safeguard data from malicious attacks. Performance for these solutions is made possible by security advances included in the Intel Atom E3800 processor product family. Intel® Advanced Encryption Standard New Instructions (Intel® AES-NI) helps eliminate the performance penalty for encryption and decryption features, making it easier to secure systems. Secure Boot defines an entirely new interface between operating system (OS) and firmware/BIOS, helping a system resist attacks and infection from malware by ensuring that only authorized software runs on a device. Detections are blocked from running before they can attack or infect the system. Intel® Virtualization Technology (Intel® VT) is a hardware-based technology that increases the performance and security of virtualized environments where multiple virtual machines run on the same physical hardware. In addition to enabling advanced malware defense, virtualization can be used to securely separate different applications. For example, developers can run McAfee Deep Defender in its own virtual machine to provide below-the-OS protection for applications running in the main virtual machine.

NVR-2350S: Achieving Intelligent Behavior Analysis for Smart City Surveillance

A smart city needs to run smoothly and be able to adjust as conditions change. These needs are driving new advances in vehicle/fleet management and advanced security video surveillance. Though each has unique requirements, there is a commonality: intelligent behavior analysis. To keep a smart city smart, intelligent behavior analysis performs real-time monitoring, event detection, license plate recognition, as well as patron counting and recording.

Figure 7 - Safety applications that the AAEON NVR-2350S supports to help keep Smart Cities flowing smoothly.

The AAEON NVR-2350S is an ideal platform for developers to use for new systems that serve the access layer of M2M communication for Smart Cities. Based on the Intel® Atom™ processor E3845, the NRV-2350S delivers integrated security features enabled by the SoC, plus excellent display support, as well as facilitating easy software management. This application ready box-PC also offers plenty of storage capacity with connections for up to 4x SATA III (6.0Gb/s) and 2x SATA II (3.0Gb/s). Additionally, 2x 10/100/1000 Base-XT ports and 2x COM ports are standard inclusions for the NVR-2350S. For I/O expansion purposes, 4x USB 2.0 ports are available on rear face of the system.

Figure 8 - AAEON's NRV-2350S can serve as the enabling system at the core of a city command center to support event monitoring, social security, danger source tracking, and more. System Dimensions: 249mm (W) x 240mm (H) x 280mm (D)

Figure 9 - Just a few of the benefits made possible by the NVR-2350S

The AAEON NVR-2350S brings together functionality that once would have rqeuired multiple systems. As a result of this higher degree of integration, the NVR-2350S helps cities meet goals of cost optimization and simpler, more compact design.

Adding to and utilizing IoT Data with the AAEON RTC-900B

We have addressed tools that work behind the scenes for IoT applications in the evolving Smart City ecosystem. There are some tools that serve dual roles: accessing data in addition to serving as a point of data input. This is the evolving role of tablets.

Figure 10 - AAEON RTC-900B rugged tablet delivers reliable functionality for a full typical work shift (approx. 8 hour battery life between charges).

However, not all tablets are equal when it comes to playing a contributing part of Smart Cities. Battery life, readability in bring sun, overall dimensions and weight, as well as compatibility with core operating systems is essential. In addition, a tablet must have an appropriate degree of ruggedness without compromising usability. AAEON RTC-900B has rated IP65 for its high level of resistance against water, dust and shock, making them ideal devices for harsh environments and applications.

The AAEON rugged tablet RTC-900B offers new features including a Micro USB 3.0 port for high speed information transmission and a pre-loaded Microsoft Windows 7 or Windows 8 operating system. The USB 3.0 is ideal for supporting a Smart Card Reader, 2D Bar Code Reader, and more.

RTC-900B can be used to address field applications related to shipping/receiving logistics, cargo monitoring and truck management, power plant equipment service monitoring and scheduling, forest surveillance, emergency ambulance-patient information synchronization, military operations, public safety functions, first responder dispatch, gas station management, and running water service control, just to name a few.

System	
Processor	Intel® Atom™ E3800 Series Processor 1.33 GHz or 1.6GHz
System Memory	DDR3L SDRAM, 2 GB (Up to 4GB)
LCD Display	10.1" WXGA (1280 x 800) 16:10 TFT LCD with Projected Capacitive Multi-Touch screen
Communication	WiFi 802.11 b/g/n, Bluetooth® 2.1+EDR (Bluetooth® Keyboard/Mouse support), 3G modem module (optional)
I/O Port	DC-in Jack x 1, Mini USB Port x 1, Mini HDMI x1, Micro SD Card Slot x 1, 3.5 mm stereo headphone jack x 1,Built-in Speaker & Microphone, SIM Card Slot x 1
Storage	60GB/ 120GB mSATA MLC
Navigation	GPS, AGPS
Camera	Front camera: 2Mega, Real camera: 5Mega
Other	Built-in Light Sensor, Built-in G-Sensor
OS	Windows® 8
MTBF (Hours)	—
Mechanical	
Color	Black
Dimension	10.65" x 7.42" x 0.96" (270.4mm x 188.4mm x24.29 mm)
Gross Weight	2.4 lb (1.1 Kg)
Environmental	
Operating Temperature	-4°F ~ 131°F (-20°C ~ 55°C)
Storage Temperature	-67°F ~ 131°F (-55°C ~ 55°C)
Water & Dust Proof	IP65 compliance
Vibration	Meets MIL-STD 810G-514.6, Procedure I Cat. 24, Fig. 514.6E-1 & 514.6E-2 (Unit is non-operating), ASTM 4169-99 Truck Assurance Level II, Schedule E (Unit is operating)
Drop	26 drops of 48 inches height to 2 inches plywood over concrete with unit off, MIL-STD 810G-516.6, Procedure IV
ESD	Air +/- 8KV, Contact +/- 4KV
EMC/ Safety	CE / FCC Class B / UL

Figure 11 - The specification of the RTC-900B has been developed with the requirements of connected digital healthcare personnel in mind especially that of first responders for medical, police and fire

The rugged AAEON RTC-900B is powered by the Intel Atom processor E3825, a dual-core running at 1.33GHz. This ultra-low wattage processor (TDP at 6W) helps ensure that a user can expect up to 8 hours continuous usage with this tablet and supports up to 4GB of system memory. This tablet is embedded with 10.1 inch, capacitive multi-touch screen equipped with Gorilla glass which has a resolution of 1280 x 800 pixels (16:10 aspect ratio). The tablet comes with both rear-facing 5.0 MP and front-facing 1.2 MP cameras. Users will appreciate its compact size and weight whether viewing documents or data dashboards in either landscape or portrait mode. The RTC-900B reserves one USB 3.0 interface to customize for customer application such as those mentioned previously.

Complete your IoT environment with AAEON AIOT-X1000

As much as what AAEON has to offer, nothing will be realized without a reliable gateway to bring all of them together as one integrated package, continuously gathering data and communicating with the datacenter in a secure manner. Also, as newer technology develops, it is equally important to continue support for legacy hardware. The AIOT-X1000, AAEON's first Intel® Quark™ SoC gateway, will tackle all that.

Figure 12 – AAEON AIOT-X1000 Gateway with Intel Quark Solution in Factory Automation

As a part Intel® Gateway Solutions for the Internet of Things solution, the AIOT-X1000 comes equipped with pre-validated hardware and software for connectivity, remote provisioning, device management, and security. The software includes drivers for a number of hardware vendors' products and software to support ZigBee, 3G, Bluetooth, USB, and Wi-Fi, providing a perfect interoperable solution for both existing as well as future smart city devices. It is also preinstalled with industrial features like wide voltage input, RS-485, onboard memory, DIO, and analog I/O. To cater to the needs of different users, the device is build to operate under a very wide range of temperatures, from -40°C to 85°C, making it the most ideal contender for IoT environments of almost any industries.

Conclusion

Taking full advantage of the advancements made possible by the Intel Atom processor E3800 product family, AAEON is able to address the IoT needs of evolving applications such as those building evolving smart cities. Whether it is a mobile device for access or data input in the field such as the RTC-900B, an energy-efficient M2M gateway using the GENE-BT05 or COM-BT at the core, a solution for network security (such as the FWS-2250) or even a NVR-2350S system for intelligent behavior analysis, and the vital gateway AIOT-X1000, AAEON has products matched to a number of the layers of M2M communication.

About AAEON

AAEON is a leading manufacturer of advanced industrial and embedded computing platforms. Committed to innovative engineering, AAEON provides integrated solutions, hardware and services for premier OEM/ODMs and system integrators worldwide. Reliable and high quality computing platforms include industrial motherboards and systems, industrial displays, rugged tablets, PC/104 modules, PICMG half-size and full-size boards and COM modules, embedded SBCs, embedded controllers and related accessories. AAEON also offers customized end-to-end services from initial product conceptualization and product development on through to volume manufacturing and after-sales service programs. AAEON is a GSA contract holder (#GS-35F-0470Y) serving the Federal, State & Local government sectors. AAEON is also an Associate member of the Intel® Internet of Things Solutions Alliance. From modular components to market-ready systems, Intel and the 250+ global member companies of the Intel Internet of Things Solutions Alliance provide scalable, interoperable solutions that accelerate deployment of intelligent devices and end-to-end analytics. Close collaboration with Intel and each other enables Alliance members to innovate with the latest technologies, helping developers deliver first-in-market solutions.