ADLINK
Leading EDGE COMPUTING

Whitepaper

Apollo Lake

Power Efficient Solutions for IoT and Industrial Applications

COM Express®
SMARC®
QSEVEN®
Mini-ITX



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The New Intel® Atom™ Family Power Efficient Solutions for IoT and Industrial Applications

Executive Summary

This paper describes benefits and new features of the latest generation of the Intel® Atom™ Processor family in their 7-year-available embedded version. ADLINK as a long term premium Intel® partner makes this new technology immediately available to its customers. The new generation SoC processors (formally named ApolloLake-I) come now with the new Goldmont microarchitecture, Intel® Gen9 LP (low power) graphics with up to 18 execution units which support 4k Video and several new features including an inbuilt heat spreader. As their predecessors (formally known as Braswell) they are manufactured in Intel's most current 14nm technology. The advanced processors within the Goldmont microarchitecture are named Celeron and the high-end processors Pentium as they have been named in earlier generations, too.

Introducing Next Generation Technology to the Atom™ Family-Flexible Performance with New Features in 14nm Technology.

Intel's Atom™ family was introduced in 2008 and has been focused on low power computing at a highly competitive pricing. Its available for different markets with different demands, namely mobile, desktop and embedded. For its customers' demands ADLINK is focusing on the embedded versions which offer special industrial features e.g. optional extended temperature range and extended lifetime cycle support of at least 7 years. The Apollo Lake SoC family introduces the new and faster Goldmont microarchitecture and powerful 4k- graphics with up to 3 independent displays at a competitive power dissipation of approximately 6 to 12 Watts. It also offers a range of scalable processors for flexible performance. Enhanced turbo mode boosts the Pentium CPU up to 2.5 GHz. New advanced security functions, an integrated sensor hub and a wide scalability on application, pricing- and performance demands make these SoCs a perfect choice for industrial, IoT, IIoT, and general mobile computing devices. Full Intel® VT support (VT-x and VT-d) enables safe and reliable entry level client computing for industrial applications.

ADLINK Presents Goldmont microarchitecture based Solutions for Embedded Applications

The embedded challenge

Embedded Systems come with lots of challenges. They are often running in environments where failure or malfunction can cause severe material damages or even human injuries. Many Embedded Systems must run flawlessly 24 hours a day, 365 days a year and we all depend on their proper function. Typical applications are industrial manufacturing systems, medical systems, traffic and infrastructure control systems as well as automotive and aerospace systems. It's not always the big computing power that is required however safety and security are not tradeable even with low budgets and less demanding requirements. What is needed to maintain affordable quality for the specific demands is a wide scalability in performance and features. Also latest technology should be available and supported. Intel® has built up an impressive portfolio over the years and ADLINK is a long-term Intel® premier partner. While most focus of the past years was put on building always faster and more powerful computers there are lots of scenarios out in the wild where less power is required and companies would like their programs and apps on energy saving or mobile devices without moving their code to a new platform. Many computing tasks are now processed within a cloud environment so that there is less demand for sheer computing power and more demand for graphics processing to handle highly sophisticated graphical user interfaces.

The solution

Intel® as a long-term market leader have upgraded their industrial low power, low cost Atom™ Platform with feature transfers from their more expensive high end core i-series and Xeon platforms. Implemented in latest, power-saving 14nm technology Intel´s latest Atom™ processors are now equipped with the latest Intel® Trusted Execution Engine (TXE 3.0) and the firmware architecture has been reworked with security as the key baseline. Also a new, converged security engine has been implemented in the SoC. Secure boot from eMMC (5.0) has been implemented as well as various other advanced security features. Other feature transfers from the latest generation of core-I series processors include Gen9 graphics execution units supporting DX12 and OpenGL 4.2. All new is the Goldmont CPU Microarchitecture which executes up to 30 % faster than the Silvermont architecture of the Bay Trail generation. It also comes with further expansions like specific real-time features supporting time coordinated computing (TCC) and an integrated sensor hub allowing direct connecting and hardware supported evaluation for various sensor types.

So this Intel® Atom™ family scales perfectly to less computing-intensive tasks at mobile and passive cooled applications. Low power consumption and the integrated sensor hub make it an excellent fit for edge devices in fog or cloud computing. Other well-fit applications may be passive cooled or mobile real-time computing with legacy Intel® code or high-end and mobile HMI devices supporting 4k Video and H265 Hardware codec.

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Performance and New Features Build Next Gen Value Vectors

Faster Processor and Graphics Engine with 4k Support

Intel® claims that the CPU executes code up to 30 per cent faster per cycle than Silvermont with the new Goldmont architecture. Up to 18 Gen9 Graphic Execution Units plus a new 4 Vector Unit Image Processing Unit make the Graphics run up to 3 times faster than a comparable Bay Trail SoC.
DirectX 12 and OpenGL 4.2 are supported with Windows 10. Up to 3 independent displays are supported: Single Internal: eDP 1.4 or MIPI* DSI up to 4096×2160 @ 60 Hz. Dual External: DisplayPort 1.2a (up to 4096×2160 @ 60 Hz) or HDMI 1.4b (up to 3840×2160 @ 30 Hz).

TXE 3.0 and new Security Features

- New firmware architecture –security as key baseline
- Converged security engine –based on Skylake architecture
- Boot Guard 2.0 –Authenticate FW components during boot
- Boot from eMMC
- Secure Tokens
- Supports PAVP, HDCP 2.2 wireless (source & sink)
- Supports PlayReady* 3.0

Integrated Sensor Hub

The Intel® Integrated Sensor Hub is a combination of integrated silicon IP and firmware dedicated to managing inertial and external environmental sensors, performing sensor fusion and supporting advanced algorithms, to add innovative new sensor-enhanced capabilities to your platform. Intel® ISH Firmware supports all standard algorithms for both Windows and Android OS.

Windows Optional Sensors include:
- Ambient light sensor (ALS)
- 3D accelerometer
- 3D gyroscope
- 3D gyro
- Inclinometer
- Device orientation3D compass
- Shake Event Threshold (Accelerator)

Windows 10 Optional Sensors include:
- Proximity, Pressure, Temperature, Humidity
- Linear Acceleration, Gravity
- User Activity
- Wake on Voice triggers

Time Coordinated Computing

User benefits are:
- Improved determinism from Fabric & Memory
- Quality of Service.
- Extreme coordination of sensing & actuation
- Unified Timekeeping between CPU & PCIe Device via
- PTM Hardware

Time Coordinated Computing (TCC) is a foundation that creates a deterministic environment. The new Intel® Atom™ SoCs provides CPU time that spans across the SoC and peripherals (USB, Audio, Camera, PCIe devices). TCC dovetails with the Time Sensitive Networking and IEEE 1588 Precision Time Protocol (PTP) ecosystems. TCC features a software development Kit (SDK) that includes the following components: OS support, drivers and firmware. Time is coordinated via Precision Time Management (PTM): PTM makes CPU time available to supporting PCIe devices and other latest generation processor to reduce latency and jitter.

How does it work?

Intel's latest processor technology first measures the relationship between the clocks within SoC and peripherals. Then it uses those measurements to translate the CPU time (accurately and immediately) to the corresponding peripheral time without stalling the CPU. Key element of the Time Synchronization is to synchronize CPU with network and I/O (e.g. PCIe Precision Time Measurement) with PTP / IEEE 1588 and/or IEEE 802.1-TSN Time Sensitive Networks without polling or jitter.

Flexible Memory Support

ADLINK supports cost efficient DDR3L and LPDDR3 memory with up to 1867 MT/s in single and dual configurations with the latest Intel processor architecture. This enables a memory bandwidth increase of 40% compared to the Bay Trail platform.

ADLINK supports the following memory configurations with the Apollo Lake family:
- DDR3L @ 1867 + dual channel ECC
- LPDDR3 up to 1867 MT/s (Adopt SKUs)
- SODIMM & Memory Down
- Max 8 GB (Memory Down); 8 GB (SODIMM)

The memory Bandwidth has increased up to 29.9 GB/s with DDR3L-1867 RAM (while Bay Trail was up to 21.3 GB/s with DDR3 RAM). eMMC 5.0 with 400 GT/s doubles the bandwidth of the predecessor with EMMC4.5.

ADLINK Product Offerings

Small Form Factor Computer-on Modules (COM)

Due to its highly integrated SoC which includes even more functions than its predecessors, the Apollo Lake family is a perfect fit for compact and ultra-compact COMs. Low thermal dissipation and the on-chip heat spreader support hassle-free passive cooling even under highest load conditions. All ADLINK COMs and SBCs based on Intel‘s latest processor architecture feature SEMA Cloud® functionality with online monitoring functions and are ready-to use for Internet of Things (IoT) and Industrial Internet-of Things (IIoT) applications.

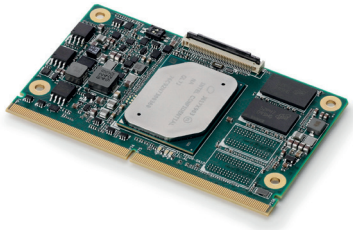
SMARC

ADLINK as a leader in embedded technology has implemented the LEC-AL, one of the first Intel-based SMARC COMs with the short SMARC form factor with a module size of just 82 x 50 mm.

ADLINK LEC-AL

The SMARC („Smart Mobility ARChitecture“) is a versatile small form factor computer Module definition targeting applications that require low power, low costs, and high performance. The modular approach allows scalability, fast time to market and upgradability while still maintaining low costs, low power and small physical size.

ADLINK’s new LEC-AL computer-on-module takes advantage of several improvements over the previous generation of Intel® Atom™ processors, including improved graphics performance with support for Gen 9 LP (18x EUs) and 4K/UHD displays, added virtualization capabilities with full support for Intel® VT-x/VT-d, high-speed DDR3L memory and eMMC 5.0 flash storage. Out latest SMARC® module utilizes these features to target industrial automation, medical and infotainment applications that require compact, rugged forms factors for harsh, space constrained environments.



ADLINK‘s latest SMARC 2.0 computer-on-module: LEC-AL.

Qseven

ADLINK Q7-AL

Qseven is a Computer-on-Module (COM) standard for small sized and highly integrated systems adopted by SGET. The Qseven concept is an off-the-shelf, multi-vendor, Computer-on-Module that integrates all the core components of a common PC and is mounted onto an application specific carrier board. Qseven modules have a standardized form factor of 70 mm x 70 mm or 40 mm x 70 mm and have specified pinouts based on the high-speed MXM connector. ADLINK´s Q7-AL offers triple display support for graphics intensive applications and supports high-speed USB 3.0 interfaces, two SATA 3 6GB/s and the latest LPDDR4 memory. The ADLINK Q7-AL computer-on-module with built-in SEMA Cloud functionality is ready-made for Internet of Things (IoT) applications. The Q7-AL is able to connect legacy industrial devices and other IoT systems to the cloud, extract raw data from these devices, determine which data to save locally and which to send to the cloud for further analysis. The results these analyses can provide valuable information for policy decision making and generate innovative business opportunities.

COM Express Type 10

ADLINK nanoX-AL

COM Express has been in the market for more than ten years now and is the most popular COM standard. The ADLINK nanoX-AL comes as COM Express Type 10 module enabling the COM Express mini form factor with a module size of just 84 x 55 mm. Even with this small size the nanoX-AL can carry up to 8 GB of fast and cost-efficient DDR3L-1867 RAM and supports its rich set of native I/O interfaces.



ADLINK´s smallest COM Express computer-on-module which is basen on latest Intel® Atom™ SoC: nanoX-AL.

COM Express 2.1 Type 6

ADLINK cExpress-AL

COM Express 2.1 Type 6 with its two module connectors features 440 signal pins, supports up to 24 PCI Express lanes and is the most popular module standard selling in the highest numbers. ADLINK’s cExpress-AL module here represents the perfect pin and form-factor compatible, passive-cooled, low-power, lowcost COM. It supports up to three independent 4k Displays as well as legacy VGA and is equipped with fast and cost-efficient DDR3L-1867 RAM. The new “Time Coordinated Computing” features make it a very attractive option for Intel-based realtime systems which do not require maximum computing performance. It’s also the perfect passive cooled energy-saving update for module-based industrial controls

and human interface devices with Intel® architecture. With the Goldmont´s microarchitecture full Intel® VT virtualization and security capabilities the ADLINK cExpress-AL can offer a cost saving core-I module replacement in less computing intensive applications.



ADLINK's high performance COM Express computer-on-module: cExpress-AL

Thin Mini-ITX Embedded Board

ADLINK Thin AmITX-AL-I

Thin Mini-ITX is a compact, 170 x 170 mm measuring form factor with just 25mm in height demand and low power consumption for singleboard industrial and embedded PCs. The ADLINK AmITX-AL-I features one HDMI, two DP and optional LVDS/eDP graphics interfaces, a rich set of onboard interfaces (7 USB and 6 COM Ports, 2 SATA3 and 1 mSATA, PCIe and dual GbE) and a feature connector with 10 GPIO, SMBus, I²C, an optional SIM card slot and a microSD card slot.

It supports embedded features such as hardware monitor and watchdog timer. ADLINK's Mini-ITX computers are long-time available, robust, reliable and offer an excellent value proposition with low TCO. The Am-ITX-AL-I is a perfect replacement for legacy Industrial and embedded PCs offering enhanced performance and up-to date Bios and OS Support for an attractive price and with a fraction of the previous energy consumption.

For more information

ADLINK Technology is enabling the Internet of Things (IoT) with innovative embedded computing solutions for edge devices, intelligent gateways and cloud services. For more information about ADLINK Technology, visit their web site at http://www.adlinktech.com

ADLINK is a Premier member of the Intel® Internet of Things Solutions Alliance. From modular components to market-ready systems, Intel® and the 400+ 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.
Learn more at: intel.com/iotsolutionsalliance

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