

Revolutionize edge computing with IPMI support

Abstract

To help customers verify application-level functionality of edge computing solutions, ADLINK is delivering a COM Express Type 7 Express-VR7 computer-on-module development kit based on the AMD Ryzen V3000 and RunBMC-AST2600 module with an ASPEED BMC SoC for IPMI support.

Introduction: Why Edge Computing needs IPMI/BMC support

Edge computing delivers many benefits, but it also presents a challenge. By moving computing power closer to where data is generated, edge devices are spread out over a wide geography, far from centralized IT support. Sometimes, they are installed in hard-to-reach locations like the top of a wind turbine or aboard an ocean-going vessel.

This raises the question: How can end customers remotely monitor and manage their systems? In the server world, this question has been answered through Intelligent Platform Management Interface (IPMI) technology and Baseboard Management Controllers (BMCs). Using these technologies, server administrators can remotely power cycle systems, monitor hardware health, update firmware, and diagnose problems – even when the operating system is unresponsive.

Until recently, IPMI and BMC capabilities were rarely seen in embedded computing systems. This is because their high cost prevented many mid-sized companies from designing them in. The ADLINK RunBMC-AST2600 module is changing this by making it easy to add server-grade remote management capabilities to embedded and edge computing applications with low costs.

Moving IPMI and BMC to a Module

IPMI is an industry-standard specification for system monitoring and control. It requires a specialized microcontroller called a BMC that operates independently from the main CPU. The BMC connects to various system components and sensors, allowing it to monitor hardware health and control basic functions like power and reset, even when the main system is powered down or frozen.

Traditionally, BMCs have been integrated directly into the motherboard, which introduces several challenges. This approach requires significant engineering resources – not only for hardware design, but also for firmware development.

For mid-sized companies targeting edge computing, creating and maintaining BMC firmware in-house can be prohibitively expensive. Additionally, a motherboard-integrated BMC cannot be easily replaced, which makes redesigns and upgrades difficult. Here again edge computers can borrow technology from the server domain. The Open Compute Project (OCP) is an open standard initiative with an eye on developing more efficient, interoperable data center solutions. OCP working groups would eventually specify RunBMC, which defines a modular approach to BMC implementation.

The RunBMC specification describes the physical dimensions and pinout of BMC modules that utilize a DDR4 SO-DIMM socket for pluggable integration (as shown Figure 1). This modular approach allows BMCs to be easily installed, upgraded, or replaced without extensive hardware redesign.

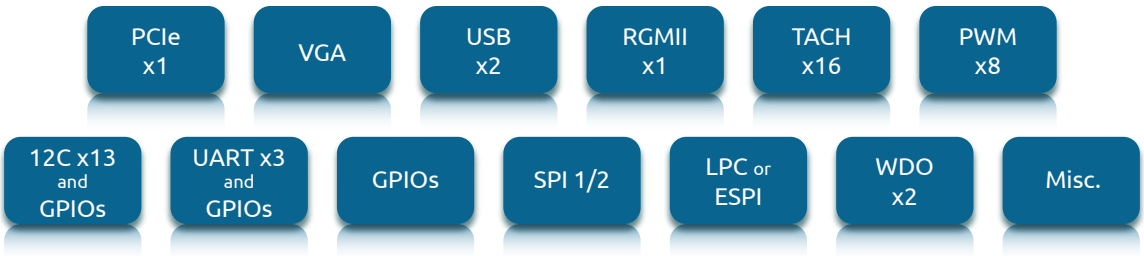


Figure 1. The RunBMC standard specifies the physical dimensions and pinout for BMC modules.

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The ADLINK RunBMC-AST2600 module brings this concept to edge computing. It features the highly capable ASPEED AST2600 BMC and pre-built firmware for easy integration (Figure 2). This firmware provides a full suite of remote management features such as power cycling, hardware monitoring, and system diagnostics. This approach minimizes the need for custom firmware development, reduces overall development costs, and offers flexibility for future upgrades.

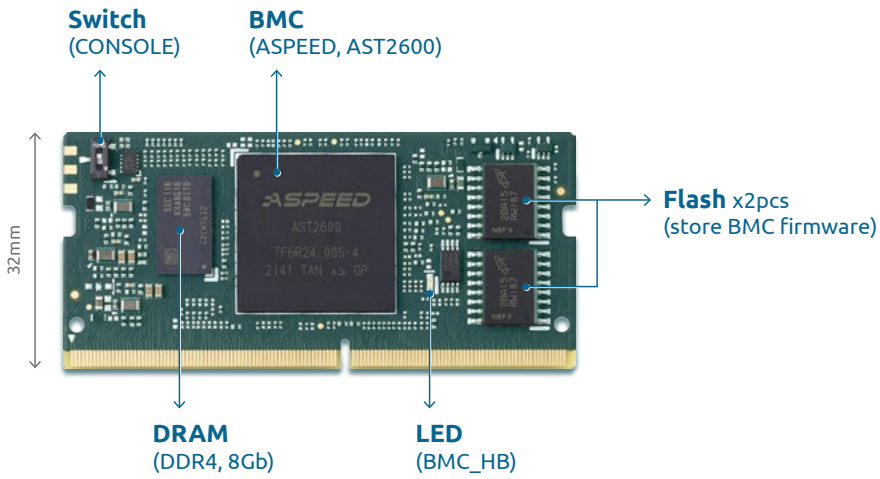


Figure 2. ADLINK RunBMC-AST2600 module complies with the RunBMC Rev 1.4.1 specification.

Easy Implementation with RunBMC-AST2600 Module

Designed to interface seamlessly with host systems, the RunBMC-AST2600 connects through numerous interfaces including PCIe and USB for keyboard/video/mouse (KVM) functionality and UART for Serial over LAN (SOL) communication (Figure 3). It can also use the Intelligent Platform Management Bus (IPMB) for real-time monitoring of system parameters including CPU temperature, voltage, current, and other critical performance indicators.

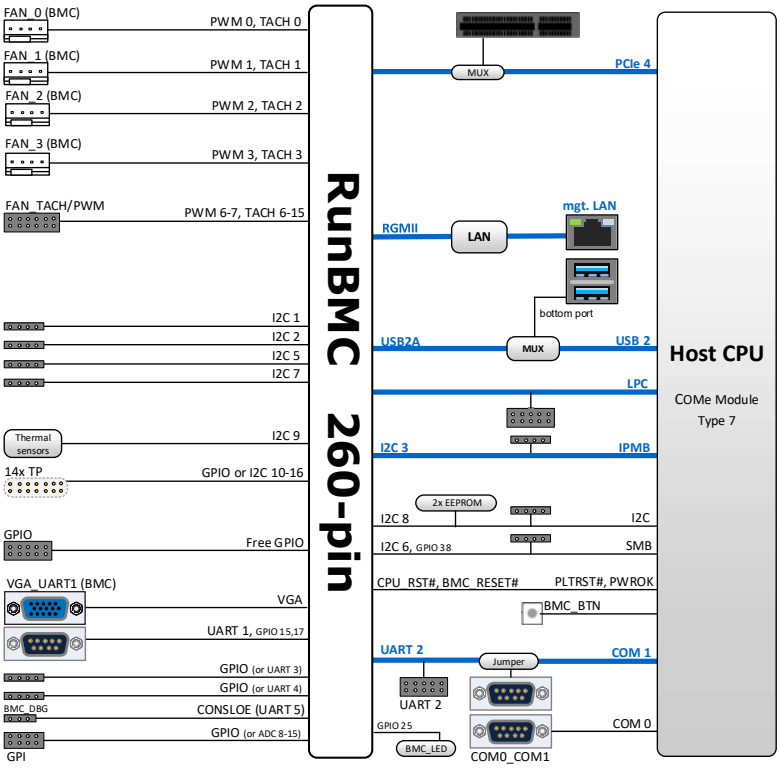


Figure 3. The RunBMC-AST2600 COM Express Type 7 module.

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To support robust system management, the module incorporates several hardware interfaces, including multiple I²C channels, LPC, GPIOs, and SPI. These interfaces facilitate communication with external devices and enable coordination among multiple BMCs if required. Furthermore, the module fits into a standard DDR4 SO-DIMM socket, ensuring compatibility and simplifying system upgrades.

The ASPEED AST2600 BMC SoC itself features a dual-core Arm Cortex-A7 processor, delivering enhanced processing power compared to previous BMC generations. Additionally, an embedded Arm Cortex-M3 core ensures long-term support and stability. The module supports up to 8 GB of DDR4 RAM and includes dual flash memory for firmware storage, enabling efficient management and fast recovery in case of system failures.

Other key features of the RunBMC-AST2600 include remote server power control, remote KVM access for graphical console management, remote BIOS and BMC updates, and secure out-of-band management through shared or dedicated LAN. These capabilities allow system administrators to monitor and manage edge devices without requiring on-site access, reducing maintenance costs and improving operational efficiency.

By leveraging the RunBMC-AST2600 module, system integrators can streamline development, ensure compatibility with industry standards, and future-proof their designs against evolving requirements, all while reducing total cost of ownership.

Development Kit Reduces Time-to-Market

To accelerate development of remotely-managed edge computing solutions, ADLINK offers a development kit that combines two key technologies: the RunBMC-AST2600 module and the Express-VR7 COM Express Type 7 module powered by AMD's Ryzen V3000 processor. Both modules slot into a carrier board that provides the peripherals needed to form a complete system (Figure 4).

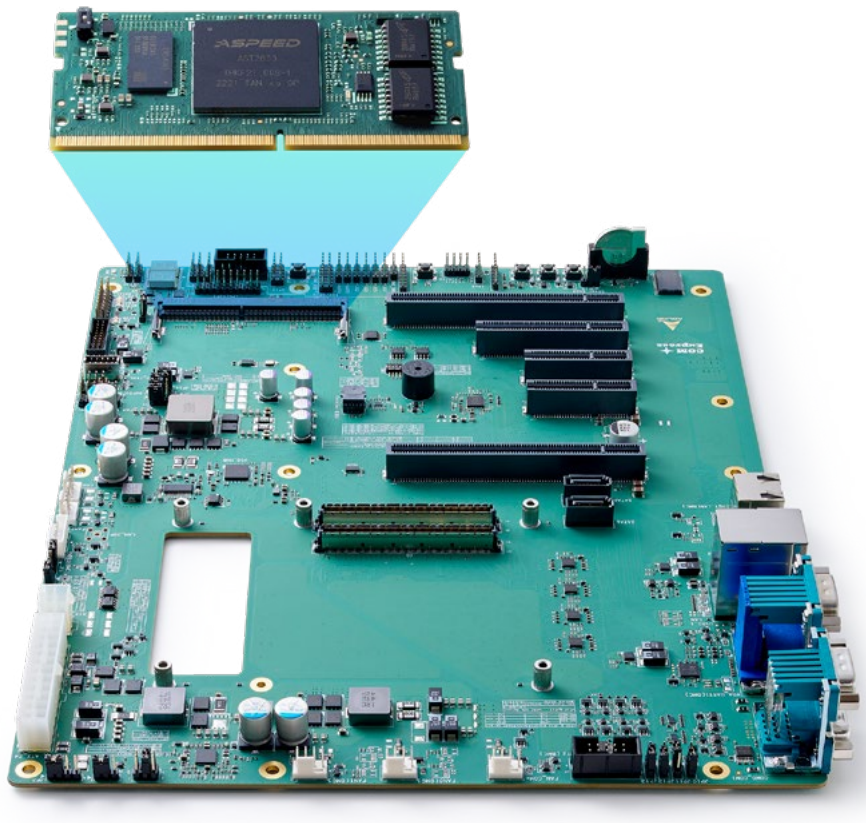


Figure 4. The ADLINK development kit is based on a carrier board (bottom) that accepts the RunBMC-AST2600 module (top left) and the Express-VR7 COM Express Type 7 module (not shown).

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The AMD Ryzen V3000 processor is particularly well-suited for edge computing applications, delivering exceptional performance per watt. With configurations up to 8 cores while maintaining a low 15W TDP, it enables powerful edge computing solutions that don't compromise on energy efficiency. When combined with the comprehensive remote management capabilities of the RunBMC-AST2600 module, this creates an ideal platform for developing and prototyping edge computing applications.

As a whole, the development kit provides:

- **Simplified Integration:** The RunBMC-AST2600 connects via a DDR4 SO-DIMM socket, eliminating complex PCB redesign and accelerating hardware integration.
- **Remote Management:** IPMI support enables out-of-band management, allowing administrators to monitor and control edge devices from any location.
- **Reduced Development Costs:** The modular design avoids the need for custom BMC implementations, while firmware support ensures compatibility across platforms.
- **Efficient Power and Performance:** The AMD Ryzen V3000 CPU provides high performance with low energy consumption, optimizing system efficiency without compromising capability.
- **Flexible Design:** Developers can quickly upgrade or replace the BMC module as new versions become available, ensuring long-term system support.

The combination of the Express-VR7 and the RunBMC-AST2600 allows system integrators to rapidly prototype and deploy edge computing solutions without the complexities of traditional BMC integration. This approach reduces development cycles while ensuring robust remote management, making the kit ideal for edge servers, industrial automation, and other distributed computing environments.

By leveraging this development kit, engineers can focus on their core applications while relying on the modular ADLINK BMC platform to handle system management, security, and maintenance, further enhancing time-to-market and overall product efficiency.

Conclusion

Managing edge computing systems presents unique challenges due to their remote and often inaccessible deployment locations. Without on-site IT support, monitoring system health, performing maintenance, and addressing failures can be time-consuming and costly. Traditional approaches to integrating BMCs complicate development further, requiring complex PCB designs, firmware integration, and inflexible system architectures.

The ADLINK RunBMC-AST2600 module, paired with the Express-VR7 compute platform, addresses these challenges through a modular, plug-and-play solution. By leveraging the Open Compute Project RunBMC standard, the kit simplifies integration, facilitates remote management via IPMI, and ensures compatibility. This approach reduces development complexity, accelerates time-to-market, and enables cost-effective system upgrades.

With robust remote management, efficient power consumption, and flexible deployment options, the ADLINK development kit empowers engineers to focus on their core applications while ensuring secure, reliable, and scalable edge computing solutions.

Tel: +886-3-216-5088
Fax: +886-3-328-5706
Email: service@adlinktech.com
www.adlinktech.com

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