DFI's "Industrial Pi" Single Board Computer leverages AMD Ryzen™ Embedded processors

Extreme computing performance at low power – in a tiny footprint.

AMD RYZEN EMBEDDED

CUSTOMER

DFI

APPLICATION

IIoT

CHALLENGES

The Raspberry Pi's ease of use, versatility and tiny size made it a breakthrough success for commercial applications, but it lacks the processing performance, durability and long lifecycle support required to support industrial applications. To underpin its own "Industrial Pi" SBC, DFI needed a high-performance processing platform with a thermal profile optimized for extremely compact IIoT systems.

SOLUTION

DFI's GHF51 SBCs leverage AMD Ryzen™ Embedded R1000 processors to provide industrial-grade computing horsepower and expansive I/O connectivity for IIoT apps, with minimal power consumption and TDP as low as 6W.

RESULTS

From highway safety to facial recognition applications and beyond, DFI GHF51 customers benefit from extreme design versatility and Ubuntu® IoT certified support – with a long product support lifespan.

AMD TECHNOLOGY AT A GLANCE

AMD Ryzen™ Embedded R1000 Processor

Optimized for IIoT devices, DFI's GHF51 provides industrial-grade performance and durability with Ubuntu Core support for seamless cloud-to-device synchronization.

The Raspberry Pi single-board computer (SBC) garnered widespread attention and acclaim upon its launch almost a decade ago, distinguished for its exceptional ease of use, versatility and ultra-compact, credit card-sized form factor. What began as an educational and prototyping platform quickly gained in popularity and crossed over into mainstream production for myriad industrial, IoT and robotics applications, thanks in part to the low cost, modularity, and open design of the Raspberry Pi platform.

The recent emergence of Industrial Internet of Things (IIoT) applications has again renewed interest in the Pi concept, but with a greater focus on processing performance, durability and longevity suitable for industrial domains. In terms of operating system (OS) and software support, a rich open-source software ecosystem is essential for continued IIoT innovation on a Pi-like platform, enabling secure devices while facilitating consistent, automated, and stable updates and orchestration, among other key benefits.

Designers have sought a practical, versatile successor to the Raspberry Pi that's optimized for industrial applications, and DFI's "Industrial Pi" was conceived to meet these needs head on for the modern IIoT. The AMD Ryzen™ Embedded R1000 processors at the heart of DFI's new GHF51 "Industrial Pi" SBCs provide the computing and graphics horsepower essential for modern IIoT applications, in an energy-efficient, thermally adept profile. Providing robust support for open-source software with Ubuntu® and Ubuntu Core certification, DFI's GHF51 makes it easy for IIoT devices at the edge to stay in close synchronization with the cloud for seamless orchestration and management.

VERSATILE, POWERFUL & DURABLE

DFI's "Industrial Pi" GHF51 SBC measures a mere 84 mm X 55 mm across and is the world's first 1.8" motherboard equipped with high-performance AMD Ryzen™ Embedded R1000 processors. Small in size but delivering extreme durability and exceptional processing power for such a compact footprint, DFI's highly durable GHF51 provides flexible expandability and I/O versatility to accommodate industrial application development, robotics, edge computing, AI-assisted vision systems and much more.

The onboard AMD Ryzen™ R1000 processor features two 14nm process "Zen+" x86 processor cores (four thread or dual thread) and three AMD RX "Vega" graphics cores, with a power efficiency profile enabling a TDP from 6W to 12W.

The GHF51 can be readily expanded through the full-size Mini PCIe® interface for easy installation of 3G/4G/5G/Wifi cards for wireless network connectivity, while providing a variety of I/O interfaces including HDMI™, USB 3.1, and Gigabit Ethernet connectivity. It's industrial-graded to support extreme operating temperatures from -20 to 70 degrees C operation, offering seamless reliability and durability in harsh environments – well beyond the reach of consumer-grade products. According to specification, it supports 460,000 hours of MTBF (52.56 years) at 60°C.

The GHF51 can be matched with a choice of 4GB or 8GB of single-channel 3200 MHz DDR4 memory, with storage options including 16, 32, and 64 GB of eMMC flash. The AMD RX "Vega" graphics cores support H.265 video encoding[1] with inclusion of compatible media players , and the built-in firmware TPM (fTPM) provides essential security capabilities for applications requiring high security.

FIGURE 1: DFI EC90A-GH powered by Pi-sized GHF51

FIGURE 2: Easy Wifi/LTE module installation design of EC90A-GH

BIG VALUE, LONG LIFECYCLE

DFI's GHF51 has proven its technical benefits and extreme versatility across a wide range of applications. Anywhere industrial-grade compute performance is required from the IoT to the edge – in harsh operating conditions, in a tiny physical footprint – DFI's "Industrial Pi" GHF51 is well suited for the task.

For highway safety and management applications, the GHF51 is powering advanced traffic supervision capabilities needed for the precise video tracking of tens of thousands of vehicles daily under all weather conditions. It's answering a need previously left unaddressed by consumer-class "Pi" SBCs that tend to compromise ruggedness and durability in order to support commercial cost structures. What's more, commercial-grade SBCs can be prone to short product support and longevity cycles, with serious consequences for long term maintainability.

The AMD Ryzen™ Embedded R1000-powered DFI GHF51 comprises the motherboard for traffic monitoring devices capable of reliable, long-term operations in outdoor environments withstanding high sun, wind and rain. In a recent use case, DFI's GHF51 is enabling high-performance cameras that take and process between 10,000 and 20,000 photographs daily, each of which is 200 to 300 KB in size. These smart cameras are counted upon to perform preliminary vehicle and license plate identifications locally at the camera system/server, even in peak congestion and/or high-speed traffic patterns.

DFI's "Industrial Pi" GHF51 again proved its value to some of the world's 500 largest companies that had previously relied on commercial-grade x86 stick-format SBCs to connect video cameras via USB to build an advanced facial recognition system. This consumer SBC was slated for a short support lifecycle and early end of life, however, compelling the customer to search for a true industrial-class SBC platform with a long product lifespan.

DFI's GHF51 met and surpassed the expectations set with the earlier commercial-grade stick SBC solution: the size couldn't exceed 2.5 inches, low power consumption is a must, and the I/O support must be expansive, spanning HDMI, USB 3.0, and TPM 2.0. Aligned to the lengthy support lifecycles offered by AMD for select processor solutions, DFI's GHF51 is slated for a 10 year supply period to early 2030, greatly simplifying deployment and maintenance for highway safety and facial recognition systems – and a long list of other targeted IIoT applications to come.

For developers who are looking for a solution as small as the Pi-sized GHF51 for faster integration, DFI also released the EC90A-GH mini PC, powered by GHF51. Benefiting from the miniature size of the GHF51, the EC90A-GH is one of the smallest computer with AMD Ryzen™ in the world. Enclosed within a sleek chassis, the EC90A-GH eliminates vibration and heat dissipation issues. The network expansion capabilities on this mini PC are also noteworthy in that its bottom cover can be easily opened up to slide in a Wifi or LTE module, making it a plug-and-play solution for edge applications.

UBUNTU IOT CERTIFIED

In accordance with the Ubuntu IoT certified hardware program, DFI partnered with Canonical to enable the GHF51 and EC90A-GH's support for well-rounded system updates and optimized software lead times for devices targeting the IIoT ecosystem.

DFI and Canonical leveraged Ubuntu Core, a minimal version of Ubuntu, as a modern, safe, and reliable OS designed for IoT devices deployed in production environments. It provides over-the-air (OTA), transactional software updates through a cloud-based CI/CD (Continuous Integration, Continuous Deployment) service which helps ensure that operations remain safe and uninterrupted.

Ubuntu certified devices like DFI's GHF51 and EC90A-GH support the ability to preload Ubuntu inside or simply download the Ubuntu OS image and install it in minutes virtually without system compatibility issues. The built-in Snap Store in Ubuntu makes it easy to access thousands of open-source software tools with just one single command.

As microservices and container technologies used in modern cloud data centers are gradually distributed closer to IoT and edge computing nodes, IoT-optimized, Ubuntu-certified devices like DFI's GHF51 SBC and EC90A-GH mini PC make it easy for IoT devices to synchronize with the cloud. AMD Ryzen™ Embedded R1000-powered DFI GHF51 SBCs and EC90A-GH mini PCs are optimally suited for these types of applications, delivering the intensive processing performance needed to absorb computing workloads outward to the edge and throughout the modern IIoT network.