Introduction to SMARC

The New OPEN Industry Standard
Abstract

With the advent of RISC technology, embedded computing can look towards new horizons and can contribute to the computing world in ways never imagined before. However a lack of standardized approach can jeopardize the potential that RISC technology has to offer to the computing industry. The development of SMARC has streamlined and standardized the RISC based embedded technology benefitting the manufacturers and the end users and creating a conducive environment for expansion and adaptation of RISC.
The Challenges in the RISC Embedded Computing Industry

Embedded computing has come a long way in the last thirty years. Embedded technology has enabled a large variety of systems and applications. Embedded form factors have catered to a wide range of computing requirements. However;

- RISC industry is very demanding and the requirements change often, causing regular technology upgrades. Adopting these changes, meeting industry demands and upgrading the systems take a lot of time. In the absence of a RISC standard, the time to market was very high.
- Lack of standards for RISC based boards were creating complications for both end users and manufacturers. Each manufactures’ RISC boards were having wide difference in terms of specifications and form factors. Thus creating inflexibility and making it very hard to diversify in the market place. In the absence of a standard, it was very hard for end users to only upgrade their CPU board and keep their existing carrier board the same, forcing users to redesign the whole board, wasting both time and money.
- There is a growing demand for greener/leaner RISC based embedded boards to conserve cost and resources. To achieve this, modular approach was required.

SMARC

Smart Mobility ARCHitecture (SMARC) is a versatile Ultra Low Power Computer-on-Module targeting applications that require high performance, low costs and low power. SMARC provides an open-standard definition for ARM-based embedded computing solutions. SMARC is an ideal solution for compact systems.

SMARC modules use ARM SoCs. Modules are available in two sizes 3.23” x 1.97” (82mm x 50mm) and 3.23” x 3.15” (82mm x 80mm). The PCBs comes with 314 edge fingers which can be connected to a low profile 314 pin 0.02” (0.5mm) pitch right angle connector.

ARM SoCs consume very little power as it does not need to support chips of a PC platform. Minimal space is required for power converters and power lines. This helps in reducing the size of the form factor allowing SMARC based modules to be used in any low-power, compact equipment. SMARC based modules draw only about 2W to 6W of power, which allows passive cooling and further reduces the design effort and overall cost.

SMARC Advantages

- **Standardization:** SMARC has ensured that RISC board developments are consistent throughout therefore enabling faster Time-to-Market to meet specific project demands.
- **Green Technology:** With SMARC’s modular design, users only need to upgrade SMARC board (a CPU board) and keep the application specific carrier board the same. Therefore conserving resources and fulfilling an organization’s green ambitions.
- **Win-Win:** A standardized approach (SMARC) enables manufacturers diversify their product portfolio, at the same time enables easy upgrade for end users. Therefore creating a win-win situation for both, the manufacturers and the users.
Higher Performance per Watts: With technological advancement in RISC technology, SMARC has a higher performance per watt output as compared to COM Express®.

Longer Product Life: The modular approach enables customers to retain their existing application specific carrier board the same, and only swop out the top CPU board (SMARC board)

Faster Time-to-Market: The standardization and modular approach enables faster adaptation of technological changes therefore reducing the time-to-market.

Advantech SMARC Solutions

Advantech is a major contributor to the development of SMARC modules. Advantech has developed off-the-shelf SMARC products for compact systems. Advantech ROM-5420 is a RISC SMARC module powered by Freescale™ ARM® Cortex™-A9 i.MX6 dual core high performance processor. Miniature in size, the ROM-5420 supports camera inputs, and battery power inputs of 3 to 5.25V, ideal for portable device development. The ROM-5420 is suitable for applications in HMI systems, gaming and infotainment, industrial tablets, medical devices, instrumentation and more. Advantech evaluation carrier board (ROM-DB5900) is also available for easy integration and hardware design reference.

Feature Highlights

- Security Protection: Unique design to authenticate hardware and software from being hacked
- Easy H/W Design for Lithium-ion battery: Allows operation from 3.6V nominal Lithium-ion battery packs
- Lower Power Consumption: Minimum under 0.3W
- Slim and Small Form Factor: Minimum module size 3.23”x1.97” (82mm x 50mm) and overall assembly height is less than 0.24” (6mm)

Modular and Extremely Compact Design with High Expansion Capability

The ROM-5420 is a highly scalable SMARC module of only 3.23” x 1.97” (82mm x 50mm) in size, and an overall assembly height of under 0.12” (8mm). Based on the Freescale™ ARM® Cortex™-A9 i.MX6 dual core processor, the ROM-5420 supports triple independent displays—Parallel, HDMI and LVDS; plus SATA-II, USB 2.0/OTG, 1 x PCIe, 1 x GBe LAN, 12 x GPIO, 2 x CAN bus, 5 x I2C, 4 x UART and 1 x MIPI camera input. Moreover, the ROM-5420 also supports lithium-ion batteries with +3 to 5.25V power input design and suspend mode under 0.3W, which makes it an excellent choice for portable applications.

Add-on Value on Security Protection

The ROM-5420 offers Security API, a software API for anti-copy protection that is included in the software program and protects the users image from unauthorized copying. What’s more, customers can tailor API and middleware development to their application and apply it to other Advantech RISC products. They won’t need to update the API once they upgrade their hardware platform in the future.
Here’s how Advantech Security API works on SPI level: The ROM-5420 provides unique security function with security code to authenticate hardware and software every time the system boots up. Users can program this security function into their systems to protect against hacking or unauthorized copying.

The ROM-5420 has a specific space reserved in the SPI ROM for users to enter a code. The same code should be used on the users’ boot loader (or their software). The OS will start, only if the two codes match, otherwise, the OS will not run. This is an API feature customers can incorporate into their OS or software so the ROM-5420 can authenticate every time it boots up.

**Streamlined RISC Design-in Support Services**

Advantech brings the ROM-5420 RISC-based Computer-on-Module to market together with their renowned RISC Design-in Support Services. A high value development process for modular designs include planning, design, integration, and validation phases; this streamlines the whole design procedure and helps customers rapidly develop their own innovations. In addition to standard OS support such as Embedded Linux v3.0.35, Advantech provides three-levels of software service: Evaluative Image, Board Support Package (BSP), and Custom Design Services. This helps customers reduce development time, design costs, and time-to-market.

**Features:**

- Freescale ARM® Cortex™-A9 i.MX6 Dual core 1GHz high performance processor
- Onboard DDR3 1GB memory and 4GB flash capability
- Supports LVDS, parallel and HDMI with Full HD 1080p hardware video codec engine
- Supports SATA-II, USB 2.0/OTG, 1 PCIe, 1 GBe LAN
- Supports 12 GPIO, 2 CAN bus, 5 I2C, 4 UART, 1 MIPI camera input
- Low-power and fan less design
- Linux kernel V3.0.35 BSP support
- RISC platform design-in services for hardware and software
Conclusion

SMARC is the future of embedded technology. SMARC is based on RISC technology, which is far more energy efficient than COM Express (based on x86 architecture). SMARC is the answer to the limitations that embedded technology is facing in terms of low power consumption and compact system requirements. SMARC standards have helped both, manufacturers and customers in terms of product standardization, faster time-to-market, low power consumption and ease of upgrade.

Advantech is a key contributor to the development of SMARC and is committed to expanding SMARC based products. With Advantech’s 30 years of experience in embedded technology and RISC design—in services, customers have an inherent advantage in choosing Advantech’s off-the-shelf SMARC products.

About Advantech

Founded in 1983, Advantech is a leader in providing trusted, innovative products, services, and solutions. Advantech offers comprehensive system integration, hardware, software, customer-centric design services, embedded systems, automation products, and global logistics support. We cooperate closely with our partners to help provide complete solutions for a wide array of applications across a diverse range of industries. Our mission is to enable an intelligent planet with Automation and Embedded Computing products and solutions that empower the development of smarter working and living. With Advantech, there is no limit to the applications and innovations our products make possible.

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