Atmel intros 'deterministic' ARM7s

Atmel has developed two ARM7-based, flash MCUs with embedded 10/100 Ethernet MAC, CAN, full-speed (12 Mbps) USB 2.0 and a high speed AES/3DES encryption engine. Designed for extensively networked, real-time embedded systems, the AT91SAM7X128 and AT91SAM7X256 also have a 10-bit ADC, two SPIs, SSC, TWI, three UARTs, an 8-level priority interrupt controller, and a full complement of supervisory functions.

The two 50MIPS MCUs have 32- or 64Kb of SRAM and 128- or 256Kb of 25ns flash memory that supports deterministic processing as required for real-time control systems.

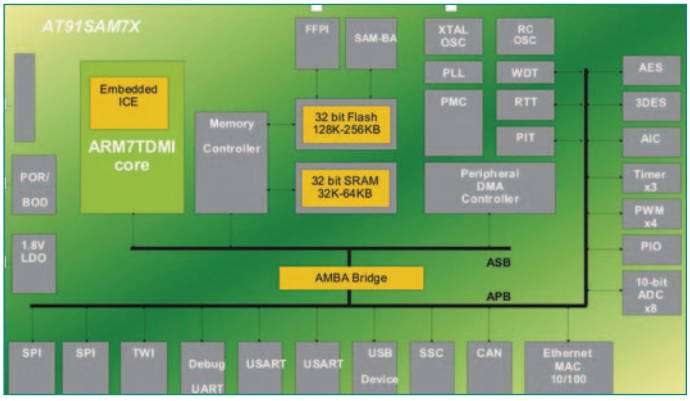
Increasingly embedded systems are networked together using Ethernet, CAN, 802.15.4 and other protocols. These embedded networks' are in turn networked to the outside world via Ethernet connections to intranets or the Internet.

The SAM7X architecture provides the connectivity, memory and processing resources to support communication protocols securely, while providing real-time features required in real-time systems, but not previously available on 32-bit MCUs.

A peripheral DMA controller (PDC) connects each SAM7X peripheral directly to on-chip memory, allowing high throughput data transfers without any processor overhead. Conventional ARM processors, which require the CPU to transfer the data one byte at a time, exhaust 55% of their processing resources at 2Mbps and 100% of it at 4Mbps. Higher data rates are not possible.

The SAM7X expends 2% of its cycles at 4Mbps and 4% of its cycles at 10Mbps. By allowing data streams to be encrypted/decrypted in hardware and assisted by DMA, the SAM7X offers 80Mbps AES encryption throughput, which is 20x faster than a software implementation.

Considering that the data rate for full speed USB 2.0 is 12Mbps, the CAN data rate is 1Mbps, Ethernet at 100Mbps and SAM7 SPI and USART peripherals can run at 25Mbps, it becomes clear that DMA and hardware encryption are mandatory for high throughput secure data transfers.



Configurable in full- or half-duplex modes, the SAM7X EMAC has programmable interpacket gap, support for virtual-LAN tagged frames and automatic-pause frame generation and termination.

A dual mode interface provides seamless Media Independent Interface (MII) for a selection of PHYs in Fast Ethernet applications, or a Reduced Media Independent Interface (RMII) which uses less I/O.

The SAM7X MCUs can be interfaced directly with POS-PHY Level 2/SPI-3-compliant devices, including standard network processors.

Lossless flow-control via on-chip system buffers, eliminates the need for external memory or flow-control mechanisms. Jumbo frames of up to 10240bytes are supported.

The processors have an embedded AES and Triple DES encryption engine which, in conjunction with the peripheral DMA controller, can encrypt or decrypt data at a rate of 80 Mbps for AES, 32.8 Mbps for DES and 20 Mbps for triple DES..

ARM MCUs are rarely used in control applications because the code shadowing they use to boost performance makes it impossible to accurately predict the exact clock cycle of any event.

Atmel has given the ARM7 core deterministic processing by adding 25ns flash NVM (128- or 256-Kb) that allows the processor to fetch instructions directly from flash, with no performance penalty, thus eliminating the need for code-shadowing, and providing predictable instruction execution.

Real-time applications are interrupt-intensive and require supervisory functions to guarantee reliable performance.

The conventional ARM7 architecture has only two interrupts, only one of which can be used for non-emergency interrupts. Nor do they have the supervisory functions typically found on 8- and 16-bit machines.

SAM7X processors have a suite of real-time peripherals and supervisory functions that include an 8-level priority interrupt controller, brownout detection, power-on-reset, single-supply voltage, watchdog timer, real-time clock, and RC oscillator.

Compilers, linkers and debuggers are available for the SAM7X MCUs from IAR, Green Hills, and Keil. An evaluation kit, the AT91SAM7X-EK, is available from Atmel.

CMX, Micrium and FreeRTOS offer RTOSs for the SAM7X processors. TCP/IP stacks available include uIP/lwIP (open source), Micrium µC/TCP-IP (royalty-free) and CMX MicroNet (royalty-free).

Atmel and u-blox work on low GPS signal tracking

Atmel (Heilbronn, Germany) and u-blox (Thalwil, Switzerland) have developed the SuperSense GPS weak signal tracking technology, which supports Atmel's ANTARIS GPS chipsets and GPS modules from u-blox. The software will enable accurate GPS navigation in building interiors, deep urban canyons, covered roads and other locations where GPS reception has previously been impossible.

SuperSense targets mass-market, automotive and handheld, FCC E-911 Phase II-compliant GPS product applications. An ANTARIS SuperSense-based products' sensitivity enables antennas to be moved to a vehicle's interior, allowing products with integrated antennas mounted in glove compartments and under seats, thus reducing automotive GPS installation costs when compared with systems requiring a separate, external antenna.

The ANTARIS GPS engine has been jointly developed by Atmel and u-blox and the 16-channel ANTARIS features 8,192 simultaneously operating time/frequency search windows. This improves acquisition sensitivity for stand-alone and A-GPS operation, enabling satellite search and position calculation in previously GPS-dead areas.

SuperSense combines tracking sensitivity beyond -158 dBm, lower power consumption and good navigation performance. It is available as beta release when purchasing the SuperSense Evalkit or the TIM-LH GPS module. It will support the complete ANTARIS GPS portfolio from Atmel as well as TIM-LH modules from u-blox.

The Atmel ANTARIS chipset (ATR0600, ATR0610, ATR0620) uses external Flash memory to control u-blox's SuperSense. The complete GPS electronics module can be integrated into a single platform applicable to multiple products thus eliminating redesign of critical RF electronics.