SPEAr family of embedded microprocessors

SPEAr: as *flexible* as you are

STMicroelectronics

SPEAr devices, based on ARM core architecture, offer substantial processing power and wide peripheral support

Embedded applications today demand increasingly higher levels of performance and power efficiency for computing, communication, control, security and multimedia.

ST's SPEAr® embedded MPUs meet these challenges head-on with state-of-the-art architecture, silicon technology and intellectual property, targeting networked devices used for communication, display and control of a broad range of applications.

The SPEAr family of embedded microprocessors are based on ARM cores: a single ARM926EJ-S core for the SPEAr300 series, dual ARM926EJ-S cores for the SPEAr600, and dual Cortex-A9 cores for the SPEAr1300 series.

Key features

- The family presents a scalable processing power range, depending on the type and number of cores used
- Within a series, each device targets a specific application segment, and offers peripherals and controllers in line with this specialization
- All SPEAr embedded microprocessors embed the external memory management function via a dynamic memory controller

Key benefits

- ST's low-power technology makes SPEAr microprocessors extremely power-efficient, permitting portable applications to run longer without recharging, saving operating costs for end customers and allowing your applications to meet the most stringent regulatory standards
- Standard core architecture is supported by a wide range of 3rd party tool providers, for easy development
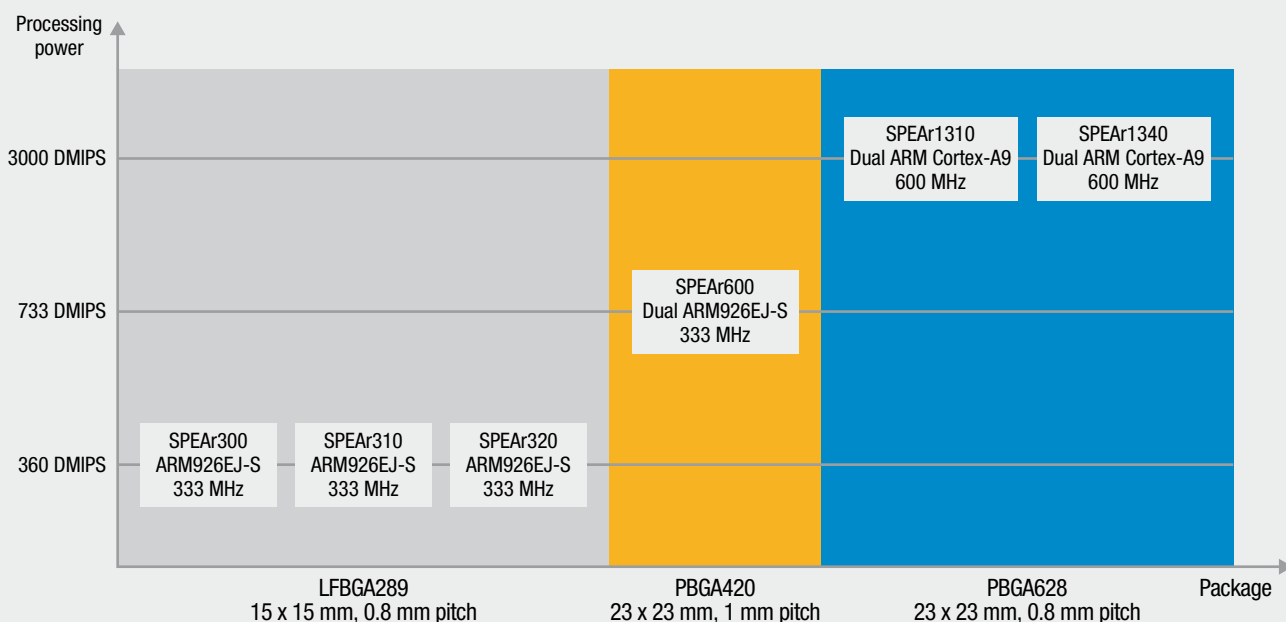
Device summary

SPEAr device	Core	Max CPU speed	Memories	Connectivity	Peripherals	Other functions
SPEAr300	ARM926EJ-S	400	LP_DDR2, DDR2, SRAM, NAND/NOR Flash	Ethernet, USB2.0 (3), I²C, I²S, FlrDA, SPI, UART, TDM	FPGA, SDIO/MMC card camera I/F, LCD controller, touchscreen controller, keyboard controller	Cryptography accelerator, JPEG, ADC, 62 GPIOs
SPEAr310	ARM926EJ-S	400	LP_DDR2, DDR2, SRAM, NAND/NOR Flash	Ethernet (5), USB2.0 (3), I²C, SPI, UARTs, TDM, HDLC, RS485	FPGA	Cryptography accelerator, JPEG, ADC 102 GPIOs
SPEAr320	ARM926EJ-S	400	LP_DDR2, DDR2, SRAM, NAND/NOR Flash	Ethernet (2), USB2.0 (3), I²C, I²S, IrDA, SPIs, UARTs, CAN(2)	FPGA, SDIO/MMC card, LCD controller, touchscreen controller	Cryptography accelerator, JPEG, ADC, PWM 102 GPIOs
SPEAr600	Dual ARM926EJ-S	400	DDR1, DDR2, SRAM, NAND/NOR Flash	Giga-Ethernet, USB2.0 (3), I²C, I²Ss, IrDA, SPIs, UARTs	LCD controller, touchscreen controller	Ext local bus, JPEG, ADC, 10 GPIOs
SPEAr1310	Dual ARM Cortex-A9	600	DDR3, DDR2, SRAM, NAND/NOR Flash, OTP	Giga-Ethernet (2), Ethernet (3), PCIe/SATA (3), USB2.0 (3), CAN (2), TDM, HDLC, UARTs, I²S, I²C, SPI	Memory card, LCD controller, touchscreen controller, keyboard controller	Cryptography accelerator, JPEG, ext local bus, ADC, GPIOs
SPEAr1340	Dual ARM Cortex-A9	600	DDR3, DDR2, SRAM, NAND/NOR Flash, OTP	Giga-Ethernet, PCIe/SATA, USB2.0 (3), UARTs, I²S, I²C, SPI	Memory card, LCD controller, touchscreen controller, keyboard controller, camera I/F, video input	Mali 200 GPU, HW HD video encoder and decoder, cryptography accelerator, JPEG, ADC, GPIOs

Design support

SPEAr embedded microprocessors are supported by many 3rd party development tools, including:

- ARM (www.arm.com)
- Green Hills Software (www.ghs.com)
- IAR (www.iar.com)
- Lauterbach (www.lauterbach.com)
- Mentor Graphics (www.mentor.com/embedded)
- Wind River (www.windriver.com)

Our SPEAr evaluation kits are designed to:

- Speed up the software development/debug process
- Familiarize you quickly with SPEAr eMPU features – each evaluation kit offers all of the interfaces that the SPEAr device can manage
- Act as a starting point for your final application board development

Device	Board part number	Description
SPEAr300	EVALSPEAR300	Evaluation kit
SPEAr310	EVALSPEAR310	Evaluation kit
SPEAr320	EVALSPEAR320CPU EVALSPEAR320PLC EVALSPEAR320HMI	Evaluation kit comprised of CPU + PLC boards, for industrial applications Single board evaluation kit for generic applications Application board for HMI applications (CPU board is required – order separately)
SPEAr600	EVALSPEAR600 EVALSPEAR600FPG	Evaluation kit Evaluation kit with FPGA for system development

Note:
SPEAr1300 series evaluation boards will be available from Q3 2011

SPEAr products

SPEAr300

The SPEAr300 delivers everything you want for low power consumption, high-connectivity applications, such as IP phones, human-machine interfaces and security applications.

Application specific functions
- Camera interface
- LCD controller
- 9x9 keyboard
- JPEG codec accelerator
- C3 crypto accelerator
- ADC (8-channel, 10-bit)
- 1 bit DAC
- Codec/SLIC I/F
- GPIOs

Memory interfaces
- FSMC
- Dithered DDR clock
- Dynamic memory controller
- Serial Flash I/F
- SDIO/MMC card I/F

Core / System
- ARM926EJ-S @ 333 MHz
- Dithered system clock
- Vectorized interrupt controller
- Real-time clock
- Watchdog
- 6 x 16-bit timers

AMBA bus 2.0 / Connectivity interfaces
- 2 x USB 2.0 Hosts + PHYs
- Low jitter USB PLL
- USB 2.0 device + PHY
- MII Ethernet MAC 10/100
- UART
- IrDA
- I²C
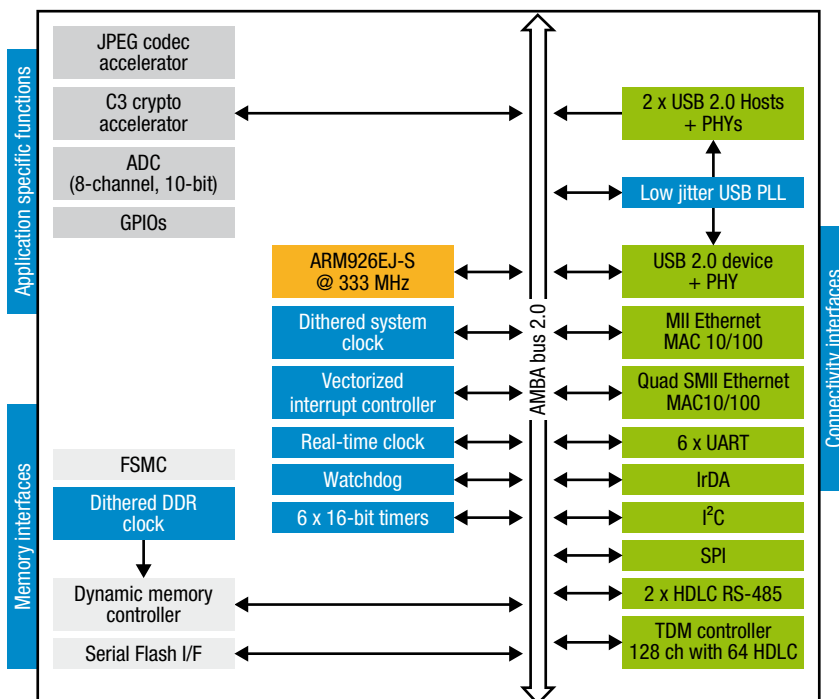- I²S
- SPI
- TDM controller 512 timeslots

Key features
- ARM926EJ-S core, 400 MHz
- High-performance 8-channel DMA
- Connectivity:
  - USB 2.0 (2 hosts, 1 device)
  - Fast Ethernet (MII port)
  - SPI, I²C, I²S, UART and fast IrDA interfaces
  - Up to 8 I²C/SPI chip selects
  - TDM bus (512 timeslots)
- Peripherals supported:
  - Camera interface (ITU-601/656 and CSI2 support)
  - LCD controller (resolutions up to 1024 x 768 and up to 24 bpp)
  - Touchscreen support
  - 9 x 9 keyboard controller
  - Glueless management of up to 8 SLICs/codecs

SPEAr310

The SPEAr310 targets telecom and networking applications with its high number of Ethernet ports (1 MII and 4 SMII ports), and 2 HDLC ports.

Application specific functions
- JPEG codec accelerator
- C3 crypto accelerator
- ADC (8-channel, 10-bit)
- GPIOs

Memory interfaces
- FSMC
- Dithered DDR clock
- Dynamic memory controller
- Serial Flash I/F

Core / System
- ARM926EJ-S @ 333 MHz
- Dithered system clock
- Vectorized interrupt controller
- Real-time clock
- Watchdog
- 6 x 16-bit timers

AMBA bus 2.0 / Connectivity interfaces
- 2 x USB 2.0 Hosts + PHYs
- Low jitter USB PLL
- USB 2.0 device + PHY
- MII Ethernet MAC 10/100
- Quad SMII Ethernet MAC10/100
- 6 x UART
- IrDA
- I²C
- SPI
- 2 x HDLC RS-485
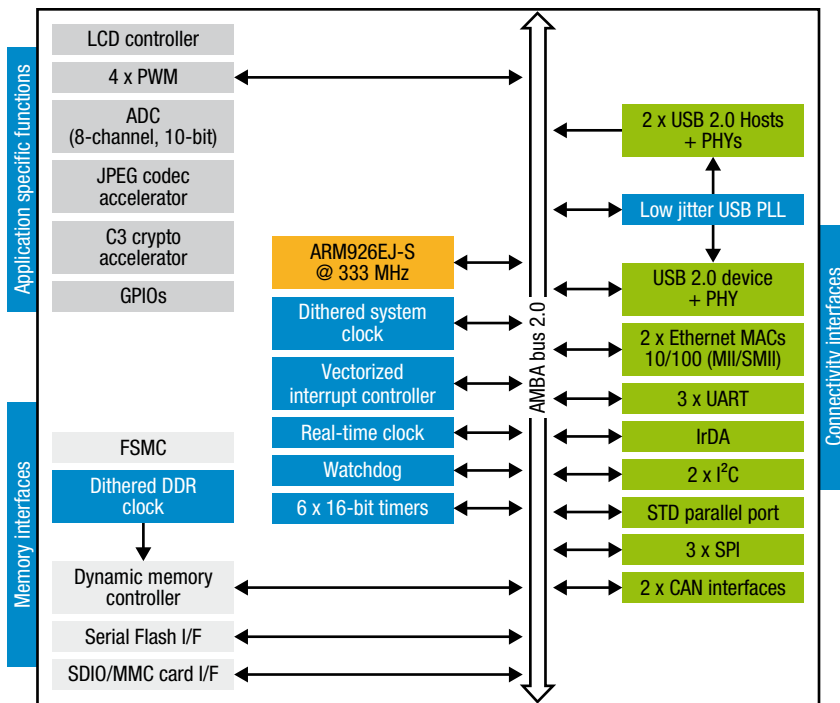- TDM controller 128 ch with 64 HDLC

Key features
- ARM926EJ-S core, 400 MHz
- High-performance 8-channel DMA
- Connectivity:
  - USB 2.0 (2 hosts, 1 device)
  - 1 fast Ethernet MII port
  - 4 fast Ethernet SMII ports
  - SPI, I²C and fast IRDA interfaces
  - 6 UART interfaces
  - TDM bus (128 timeslots with 64 HDLC channels)
  - 2 HDLC ports with RS-485 support
- Miscellaneous functions:
  - Integrated real-time clock, watchdog and system controller
  - 8-channel, 10-bit ADC, 1 MSPS
  - JPEG codec accelerator
  - 6 general-purpose 16-bit timers with capture mode and programmable prescaler
  - Up to 102 GPIOs with interrupt capablility

SPEAr320

The SPEAr320 targets factory automation and consumer applications, with an integrated LCD controller (resolution: 1024x768) and touchscreen support, as well as a host of ports and interfaces.

Application specific functions:
- LCD controller
- 4 x PWM
- ADC (8-channel, 10-bit)
- JPEG codec accelerator
- C3 crypto accelerator
- GPIOs

Memory interfaces:
- FSMC
- Dithered DDR clock
- Dynamic memory controller
- Serial Flash I/F
- SDIO/MMC card I/F

ARM926EJ-S @ 333 MHz
Dithered system clock
Vectorized interrupt controller
Real-time clock
Watchdog
6 x 16-bit timers

AMBA bus 2.0

Connectivity interfaces:
- 2 x USB 2.0 Hosts + PHYs
- Low jitter USB PLL
- USB 2.0 device + PHY
- 2 x Ethernet MACs 10/100 (MII/SMII)
- 3 x UART
- IrDA
- 2 x I²C
- STD parallel port
- 3 x SPI
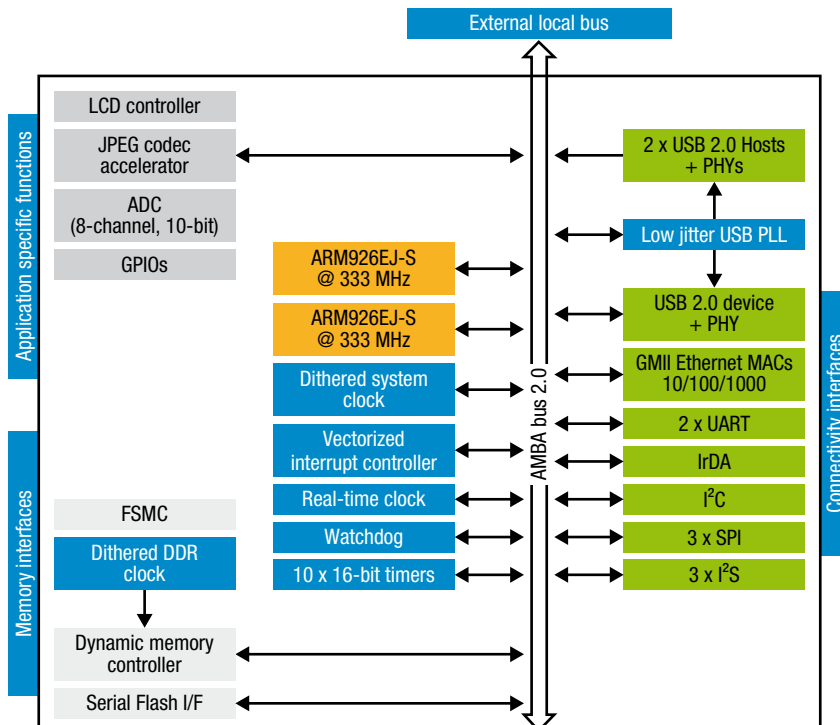- 2 x CAN interfaces

Key features
- ARM926EJ-S core, 400 MHz
- High-performance 8-channel DMA
- Connectivity:
  - USB 2.0 (2 hosts, 1 device)
  - 2 fast Ethernet ports (MII/SMII ports)
  - 2 CAN interfaces
  - I²S and fast IRDA interfaces
  - 3 SPI ports
  - 2 I²C interfaces
  - 3 UART interfaces
  - 1 standard parallel device port
- Peripherals supported:
  - LCD controller (resolutions up to 1024 x 768 and up to 24 bpp)
  - Touchscreen support
- Miscellaneous functions:
  - Integrated real-time clock, watchdog and system controller
  - 8-channel, 10-bit ADC, 1 MSPS
  - JPEG codec accelerator
  - 6 general-purpose 16-bit timers with capture mode and programmable prescaler
  - Up to 102 GPIOs with interrupt capablility

SPEAr600

High-performance dual 32-bit ARM926EJ-S CPU cores make this device the right choice for cost-sensitive applications that require extra computational power.

External local bus

Application specific functions:
- LCD controller
- JPEG codec accelerator
- ADC (8-channel, 10-bit)
- GPIOs

Memory interfaces:
- FSMC
- Dithered DDR clock
- Dynamic memory controller
- Serial Flash I/F

ARM926EJ-S @ 333 MHz
ARM926EJ-S @ 333 MHz
Dithered system clock
Vectorized interrupt controller
Real-time clock
Watchdog
10 x 16-bit timers

AMBA bus 2.0

Connectivity interfaces:
- 2 x USB 2.0 Hosts + PHYs
- Low jitter USB PLL
- USB 2.0 device + PHY
- GMII Ethernet MACs 10/100/1000
- 2 x UART
- IrDA
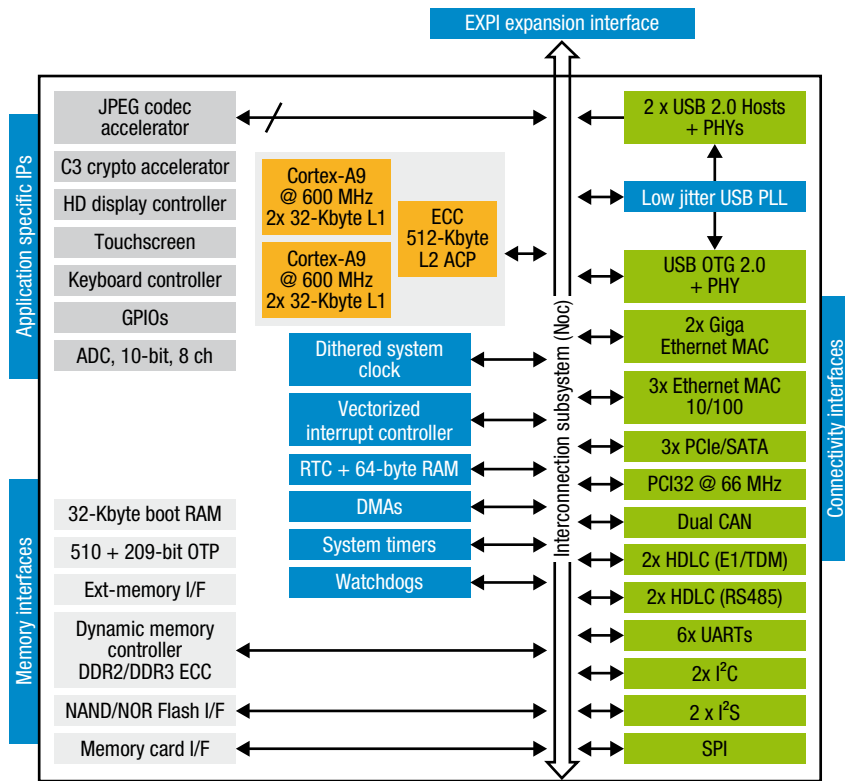- I²C
- 3 x SPI
- 3 x I²S

Key features
- Dual ARM926EJ-S cores, 400 MHz
- High-performance 8-channel DMA
- Up to 733 DMIPS
- Connectivity:
  - USB 2.0 (2 hosts, 1 device)
  - 1 Giga Ethernet port (GMII port)
  - I²C and fast IrDA interfaces
  - 3 SPI ports
  - 3 I²S interfaces (1 stereo input, 2 stereo outputs)
  - 2 UART interfaces
- Peripherals supported:
  - LCD controller (resolutions up to 1024 x 768 and up to 24 bpp)
  - Touchscreen support
- Miscellaneous functions:
  - Integrated real-time clock, watchdog and system controller
  - 8-channel, 10-bit ADC, 1 MSPS
  - JPEG codec accelerator
  - 10 general-purpose 16-bit timers with capture mode and programmable prescalers
  - 10 GPIOs with interrupt capablilities
  - External 32-bit local bus

SPEAr1310

The SPEAr1310, with dual ARM Cortex-A9 cores and a DDR3 (third-generation, double-data-rate) memory interface, offers an unprecedented combination of processing performance and advanced power reduction control for next-generation communication appliances.

SPEAr1310 targets cost and power sensitive networking applications for the home and small businesses as well as telecom infrastructure equipment, with lowest overall leakage under real operating conditions. The device integrates ARM's latest generation ARMv7 CPU cores, ST's proven C3 security coprocessor, and advanced connectivity interfaces and controllers.

EXPI expansion interface	

Application specific IPs
- JPEG codec accelerator
- C3 crypto accelerator
- HD display controller
- Touchscreen
- Keyboard controller
- GPIOs
- ADC, 10-bit, 8 ch

Cortex-A9 @ 600 MHz 2x 32-Kbyte L1
Cortex-A9 @ 600 MHz 2x 32-Kbyte L1
ECC 512-Kbyte L2 ACP

- Dithered system clock
- Vectorized interrupt controller
- RTC + 64-byte RAM
- DMAs
- System timers
- Watchdogs

Interconnection subsystem (Noc)

Memory interfaces
- 32-Kbyte boot RAM
- 510 + 209-bit OTP
- Ext-memory I/F
- Dynamic memory controller DDR2/DDR3 ECC
- NAND/NOR Flash I/F
- Memory card I/F

Connectivity interfaces
- 2 x USB 2.0 Hosts + PHYs
- Low jitter USB PLL
- USB OTG 2.0 + PHY
- 2x Giga Ethernet MAC
- 3x Ethernet MAC 10/100
- 3x PCIe/SATA
- PCI32 @ 66 MHz
- Dual CAN
- 2x HDLC (E1/TDM)
- 2x HDLC (RS485)
- 6x UARTs
- 2x I²C
- 2 x I²S
- SPI

Key features

- Dual ARM Cortex-A9 cores running at 600 MHz
- Supports both symmetric and asymmetric multiprocessing
- Bus: 64-bit multilayer network-on-chip
- Connectivity:
  - Giga/Fast Ethernet ports
  - 3x PCIe 2.0 / SATA
  - 3x USB 2.0 (Host/OTG)
  - 2x CAN 2.0 a/b interfaces
  - 2x HDLC RS485
  - I²S, UART, I²C and SPI ports

- Peripherals supported:
  - TFT LCD display up to 1920 x 1080 (60 Hz)
  - Touchscreen interface
  - 9 x 9 keyboard
  - Memory card interface

- Power saving:
  - Power islands for leakage reduction
  - IP clock gating for dynamic power reduction
 - Dynamic frequency scaling

SPEAr1340

ST's SPEAr1340 integrates a powerful ARM Mali-200 graphics processing unit to offer advanced 2D and 3D acceleration for user interfaces, navigation, browsing and gaming. This device also embeds a hardware video encoder and decoder supporting major compression standards (including H.264 and AVS), with video resolution up to 1080p and 30 frames per second. These capabilities also enable multiple concurrent video flows in applications like surveillance and video-conferencing. Hardware implementations of graphic and video capabilities in the SPEAr1340 result in state-of-the art multimedia performance at ultra-low power consumption. Meanwhile, the two Cortex-A9 cores are available to perform concurrent tasks as required. With its multiple interfaces, including I^{2}S and S/PDIF, the SPEAr1340 also provides excellent audio capabilities, handling up to 7.1 surround-sound configurations in both input and output paths.

In security, the SPEAr1340 integrates a multi-standard cryptographic engine and one-time programmable (OTP) registers for unique identification and external Flash memory anti-tamper protection.

Manufactured in ST's low-power 55 nm HCMOS (high-speed CMOS) process technology, this new microprocessor benefits from the state-of-the-art SPEAr1300 architecture, which combines the unrivalled low-power and multi-processing capabilities of two ARM Cortex-A9 cores with innovative network-on-chip (NoC) technology.

The SPEAr1340 has a dual ARM Cortex-A9 core and is optimized for user interfaces and multimedia in web-connected and industrial applications, including applications with high-resolution video-conferencing and security cameras.

It includes a Mali-200 2D/3D GPU and a multistandard HD video encoder and decoder. The device integrates ARM's latest generation ARMv7 CPU cores, ST's proven C3 security coprocessor, and advanced connectivity interfaces and controllers.
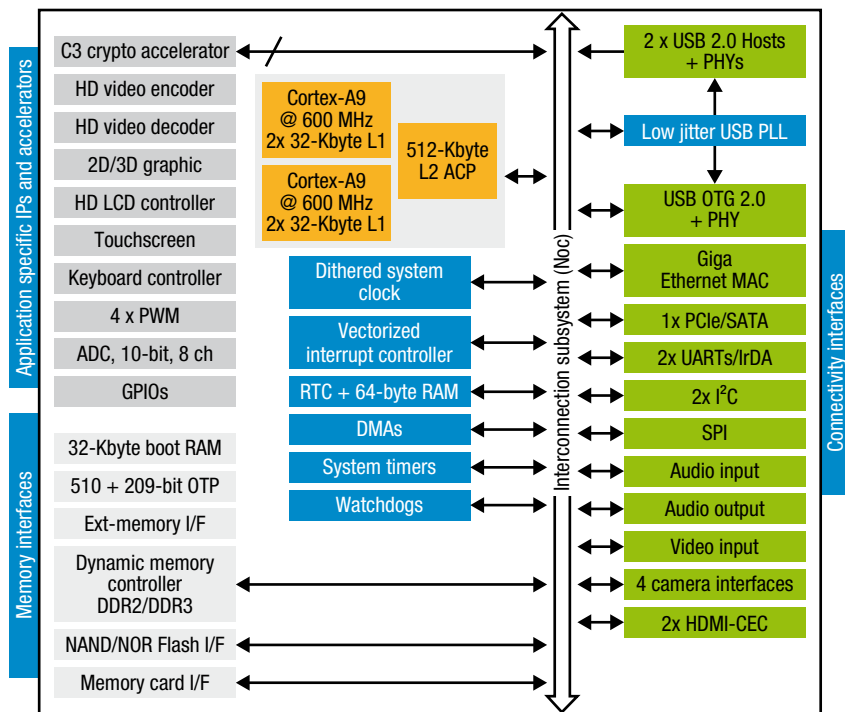
Key features

- Dual ARM Cortex-A9 cores running up to 600 MHz
- Supports both symmetric and asymmetric multiprocessing
- Bus: 64-bit multilayer network-on-chip
- ARM Mali-200 2D/3D GPU up to 1080p, OpenGL ES 2.0, OpenVG 2.0

- Multimedia:
  - Multi-standard HD video decoder and encoder, up to 1080p
  - Digital video port with alternate configuration for 4 camera interfaces
  - 7.1 multichannel surround audio
- Connectivity:
  - Giga/Fast Ethernet ports
  - 1x PCIe 2.0 / SATA
  - 3x USB 2.0 (Host/OTG)
  - I^{2}S, UART and I^{2}C

- Peripherals supported:
  - TFT LCD display up to 1920 x 1080 (60 Hz)
  - Touchscreen interface
  - 9 x 9 keyboard
  - Memory card interface
- Power saving:
  - Power islands for leakage reduction
  - IP clock gating for dynamic power reduction
  - Dynamic frequency scaling