

MIPS

The other side of embedded

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Just me

- Free Software activist
- openSUSE advocate
- For some inexplicable reason, Imagination Technologies gives me a salary

Some information

- What does originally MIPS means?
 - Microprocessor without Interlocked Pipeline Stages
- Reduced Instruction Set Computer
 - Reduced is referred to complexity
- How many MIPS superset
 - MIPS I, MIPS II, MIPS III (64bit register in 1993), MIPS IV, MIPS32 (r1-r6), MIPS64 (r1-r6)
- Application Specific Extensions
 - SmartMIPS (security), MDMX, MIPS-3D, MIPS16e, microMIPS



MIPS now: microAptiv

- Highly-efficient
- Compact
- 2 possible configurations
 - Real-time embedded (microAptiv UC)
 - Linux microprocessor (microAptiv UP)
- DSP and SIMD functionality
- Industrial control, smart meters, automotive and wired/wireless communications.
- Example: Microchip PIC32MZ and PIC32MX

MIPS now: interAptiv

- Multiprocessor
- 9 stage pipelines
- Multithreading
- Smart gateways, baseband processing LTE, SSD controllers, automotive.
- Examples: Creator Ci40, Lantiq (Intel), Ikanos (Qualcomm)

MIPS new: Warrior

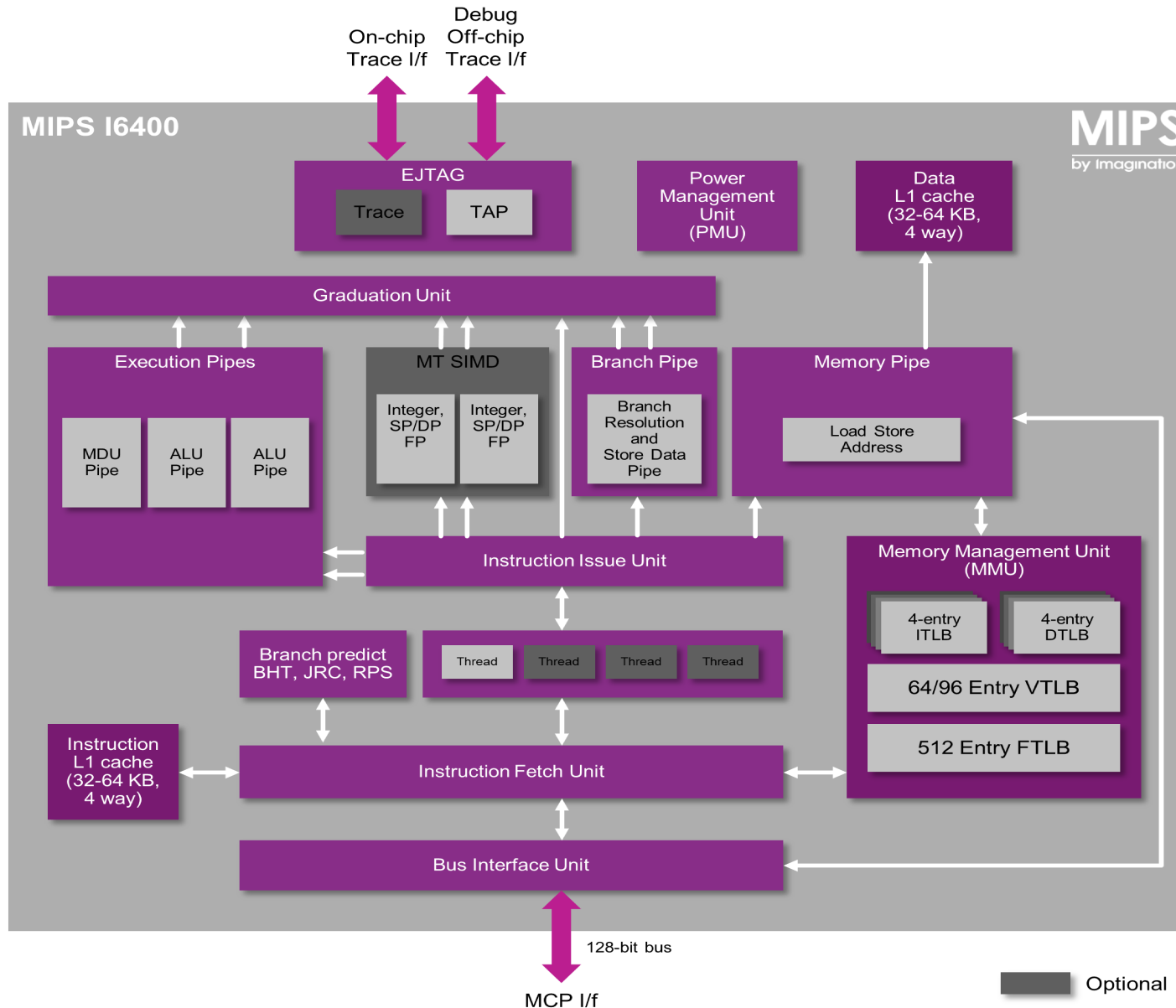
- Warrior M-Class
 - M51XX (r5) (Pic32MZ EF)
 - M62XX (r6)
 - Hardware Virtualization
 - MicroMIPS
 - 7 VMs (guest OS)
 - OmniShield security technologies
 - Embedded

28HPM 12T SVt	M6200	M6250
Freq (MHz)	750	750
Core Area	0.19	0.23
Power (uW/MHz)	60	62

MIPS new: Warrior

- Warrior I-Class (mid-range)
 - MIPS64 (r6)
 - 9 stage dual issue pipeline
 - MIPS32 superset
 - Dual issue FPU/SIMD (32x128bit)
 - Full Hardware virtualization
 - OmniShield security technologies
 - 15 VMs (guestOS)

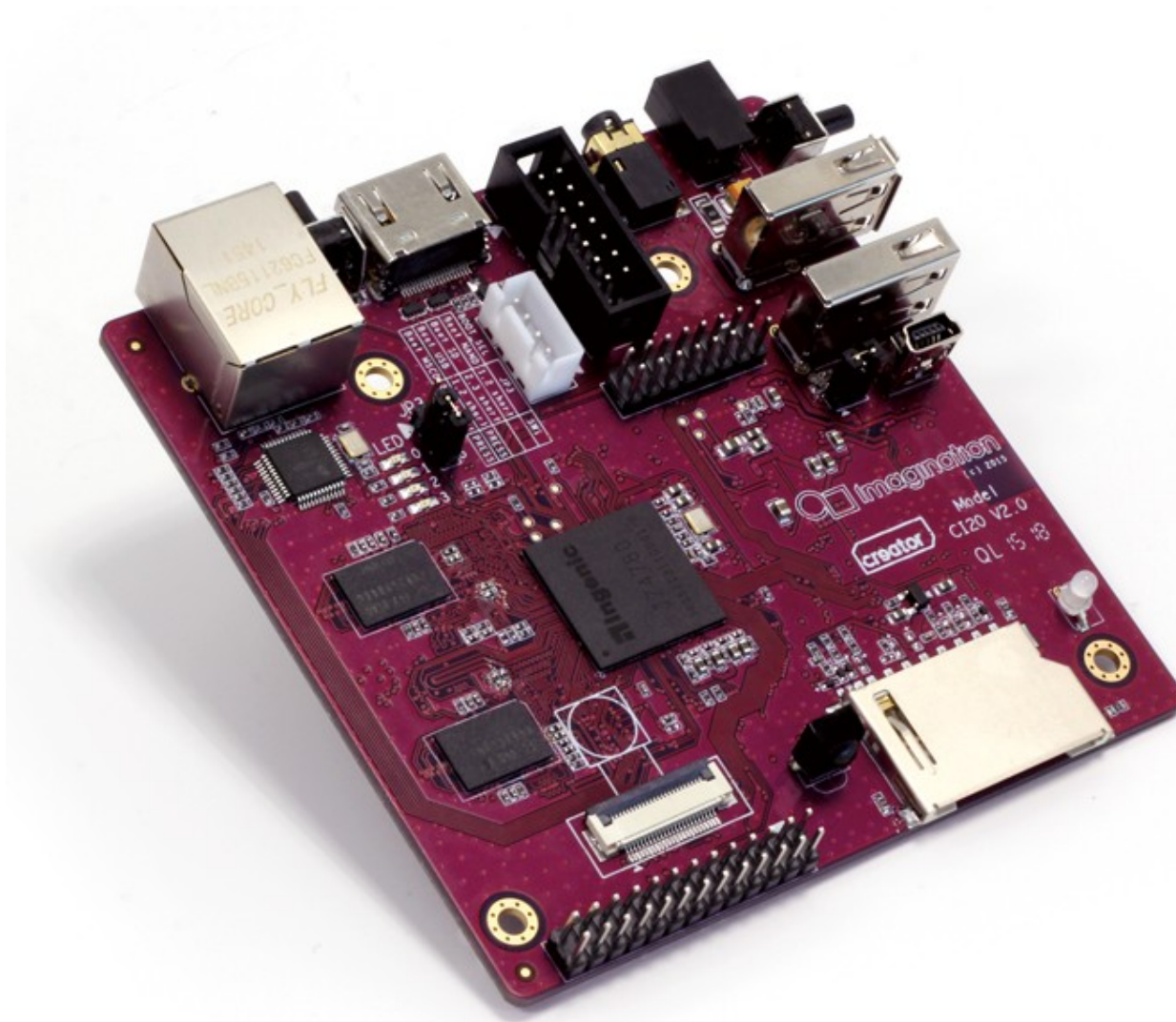
I6400 Block Diagrams



MIPS new: Warrior

- Warrior P-Class
- MIPS32r5 (P5600) and MIPS64r6 (P6600)
- OmniShield security technologies
- 40-bit Physical Addressing, direct 1 Terabyte (48-bit virtual)
- Optional dual-issue 128-bit SIMD Unit (32x128bit)
- From 1 to 2+ GHz target (TSMC 28HPM)
- 31 VMs (guest OS)
- Baikal T1

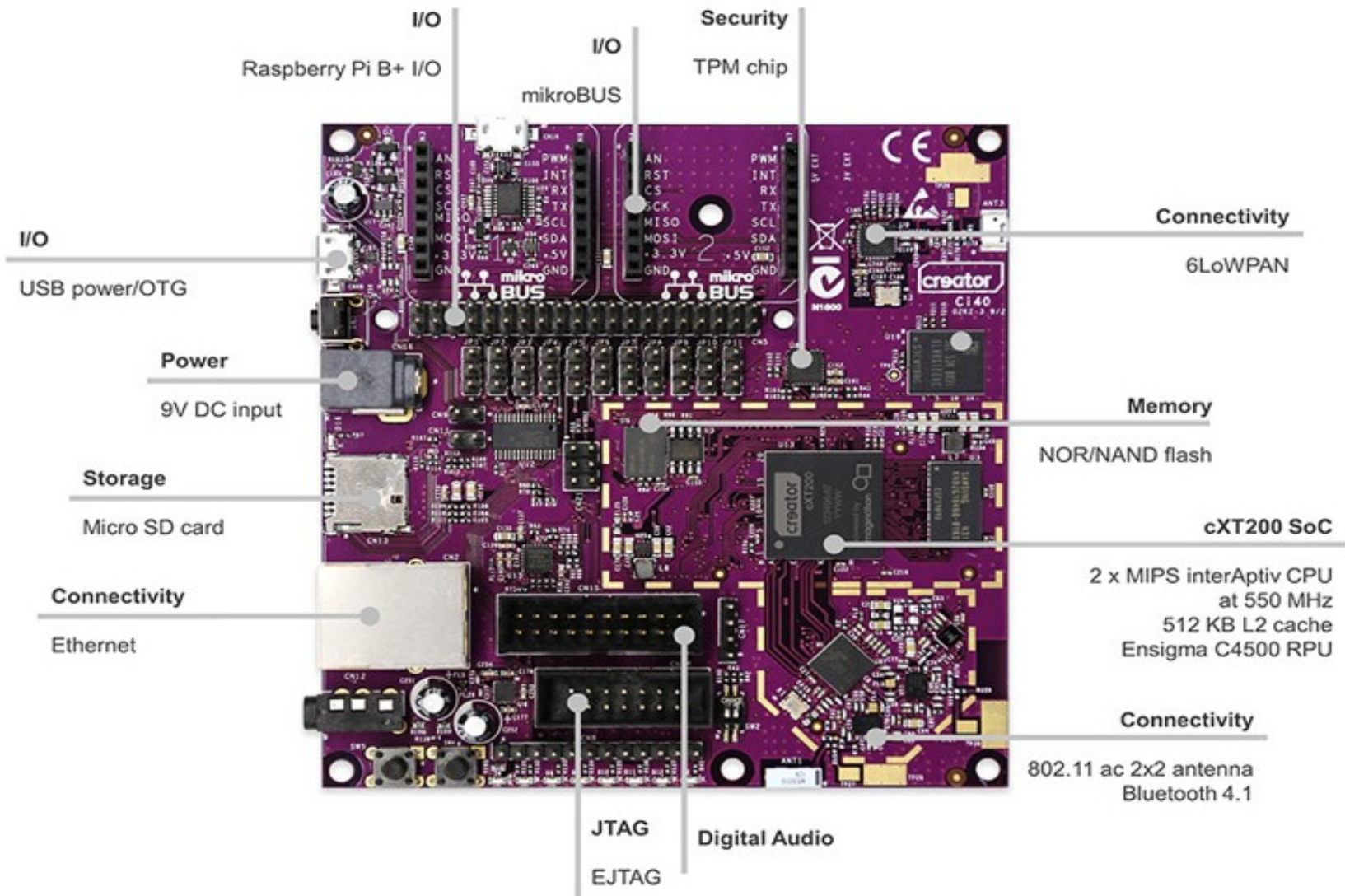
Ci20



Ci20 Specs

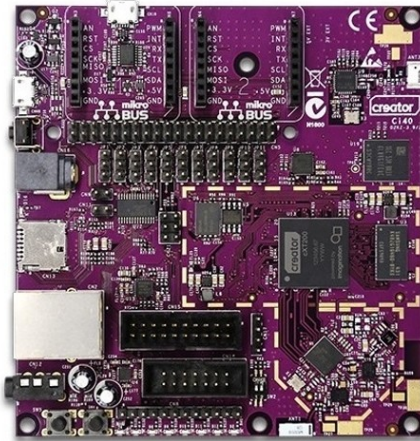
- Ingenic JZ4780, dual-core 1.2 GHz MIPS32 processor, PowerVR SGX540 GPU, 32k I&D L1 cache, 512k L2 cache
- IEEE754 Floating Point Unit
- 8 GB Flash, 1 GB DDR3 memory
- Video playback up to 1080p
- AC97 audio, via 4-pin input/output jack and HDMI connector
- Camera interface – ITU645 controller
- Connectivity – 10/100M Ethernet, 802.11 b/g/n, Bluetooth 4.0
- HDMI output up to 2K resolution
- 2 x USB – host and OTG
- 14-pin EJTAG connector
- 2 x UART, GPIO, SPI, I2C, ADC, expansion headers

Ci40

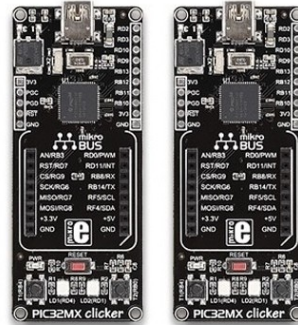


Ci40 kit

creator



Creator Ci40 development board



6LoWPAN Clicker expansion boards



THERMO 2 Click



RELAY Click



MOTION Click

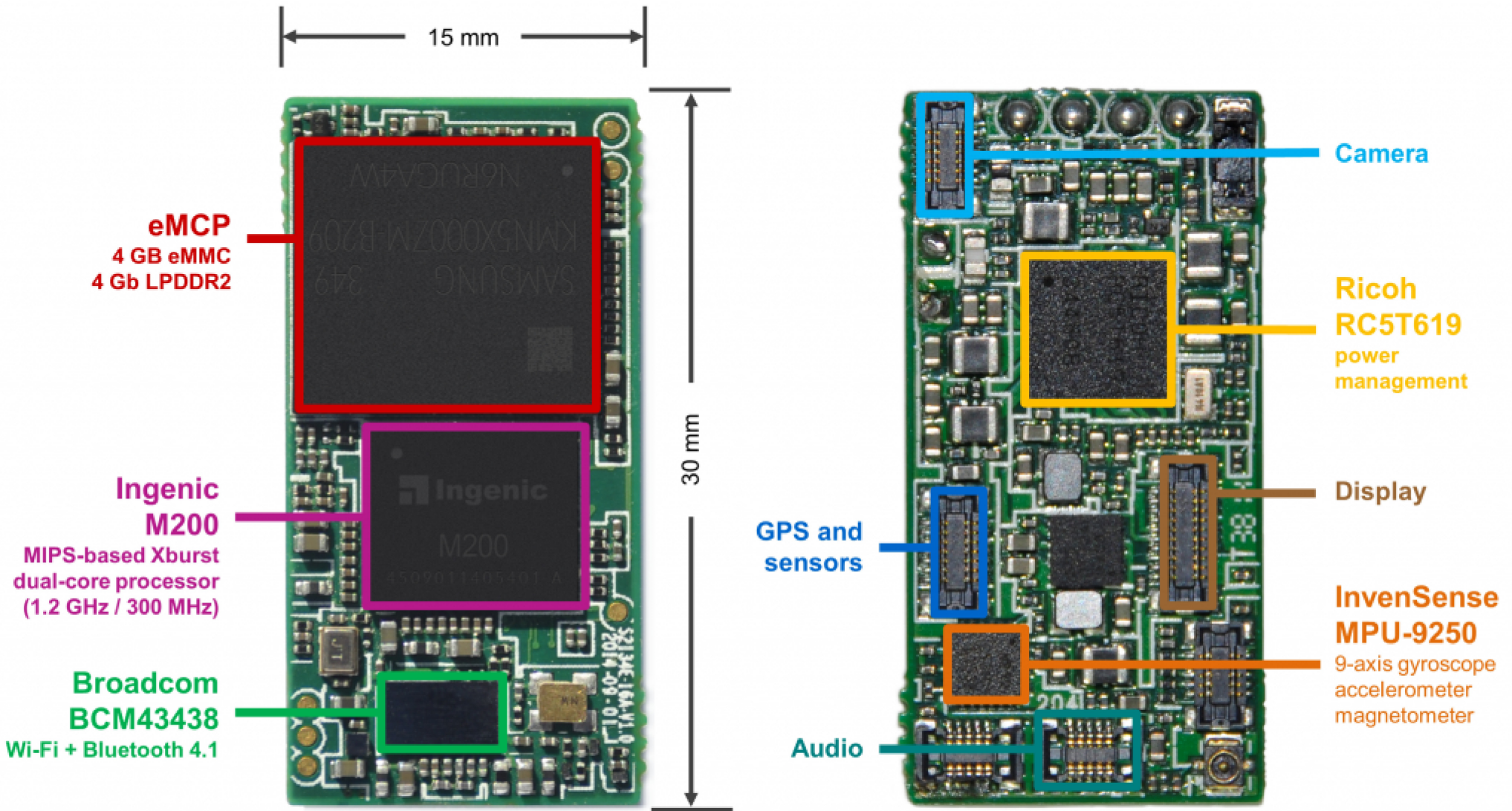
Click sensor boards

Software available

- Ci20: Debian, Android, Yocto, Buildroot and Gentoo
- Ci40: Debian, OpenWRT (buildroot), Brillo (IoT by Google)
- Fedora is working on MIPS version for creator board (MIPS32r2, MIPS64r5 both little endian)

Microchip PIC32MX

- 32-bit RISC MIPS32 M4K Core
- 120 MHz (up to)
- Single Cycle ALU
- 5-Stage Pipeline
- 32-bit Address and 32-bit Data Buses
- FMT – Fixed Mapping Translation Memory Management
- FMDU – Fast-Multiply-Divide Unit
- MIPS32®
- Compatible Instruction Set
- MIPS16e™
- Code Compression Instruction Set Architecture Support



Tool

- Codescape Debugger
 - Host: Windows, Linux, MacOSX
 - Debug: FreeRTOS, Linux, MEOS, Nucleus, ThreadX
 - Multicore, MultiVPE
 - Python scripting support
- Codescape MIPS SDK
 - Gcc, gdb, QEMU
- Upstream Kernel

Thank You

Have a nice FOSDEM

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