Low Cost Computing with Linux

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Low cost?
£25-160

Creator CI20
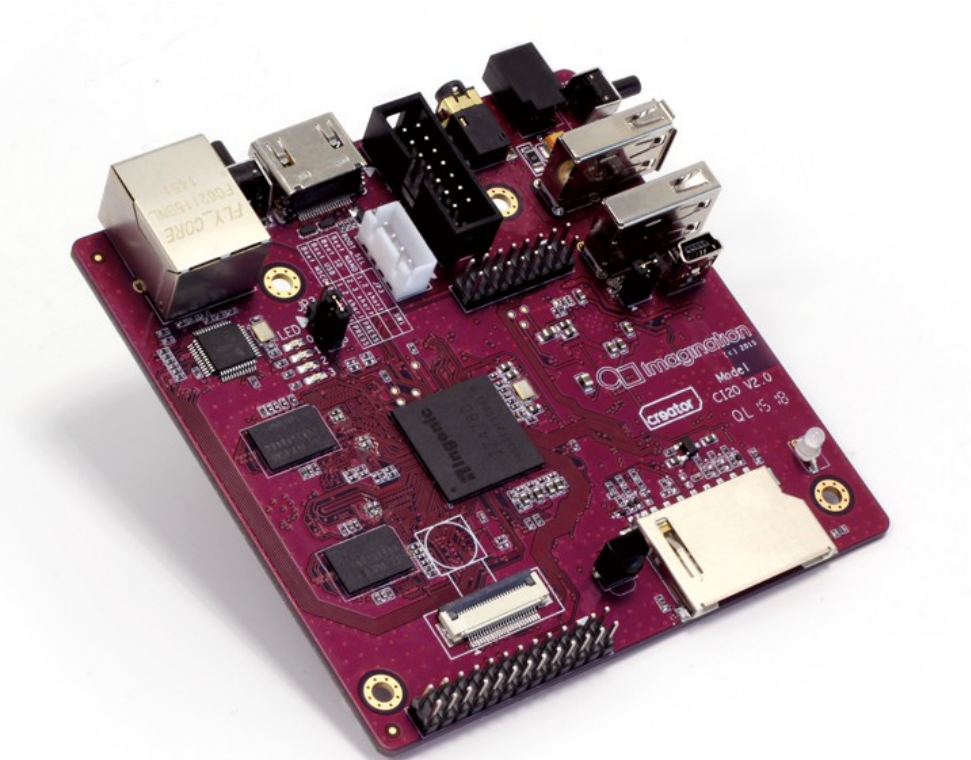
Image: http://elinux.org/MIPS_Creator_CI20

Creator CI20

Release date	May 2015 (v2)
Cost	£55-65
CPU	Dual core 1.2Ghz MIPS 512 KB L2 cache
GPU	PowerVR SGX540
RAM	1 GB
USB	2 ports (1 x OTG, 1 x Host)
Networking	10/100Mbps Ethernet 802.11 b/g/n wireless Bluetooth 4.0
Onboard storage	8 GB flash 1 x SD

MIPS

Microprocessor without Interlocked Pipeline Stages

Imagination Technologies – UK quoted company (LSE)

MIPS

Reduced Instruction Set Computer

32 and 64 bit

MIPS

Tend to be at the low/cheap end of the market

DSL routers often have a MIPS CPU (e.g. Technicolour TG582n)

Business model: License designs

Raspberry Pi

Image: https://www.raspberrypi.org/blog/raspberry-pi-3-on-sale/

Raspberry Pi B+

Release date	February 2012
Cost	£25-30
CPU	Single core 700Mhz ARM11 128 KB L2 cache (shared with GPU)
GPU	Broadcom VideoCore IV
RAM	512 MB (shared with GPU)
USB	4 ports (via on-board hub)
Networking	10/100Mbps Ethernet (USB)
Onboard storage	1 x SD

Raspberry Pi 2

Release date	February 2015
Cost	£25-30
CPU	Quad core 900Mhz ARM Cortex-A7 256 KB L2 cache
GPU	Broadcom VideoCore IV
RAM	1 GB
USB	4 ports (via on-board hub)
Networking	10/100Mbps Ethernet (USB)
Onboard storage	1 x MicroSD

Raspberry Pi 3

Release date	February 2016
Cost	£25-30
CPU	Quad core 1.2Ghz ARM Cortex-A53 512 KB L2 cache
GPU	Broadcom VideoCore IV (at higher clock frequencies than B+ and 2)
RAM	1 GB
USB	4 ports (via on-board hub)
Networking	10/100Mbps Ethernet 802.11 b/g/n wireless Bluetooth 4.1
Onboard storage	1 x MicroSD

RaspBSD

FreeBSD +
Rasperry Pi (1 + 2)
Raspbsd.org

BeagleBone Black

Image: http://elinux.org/BeagleBoneBlack
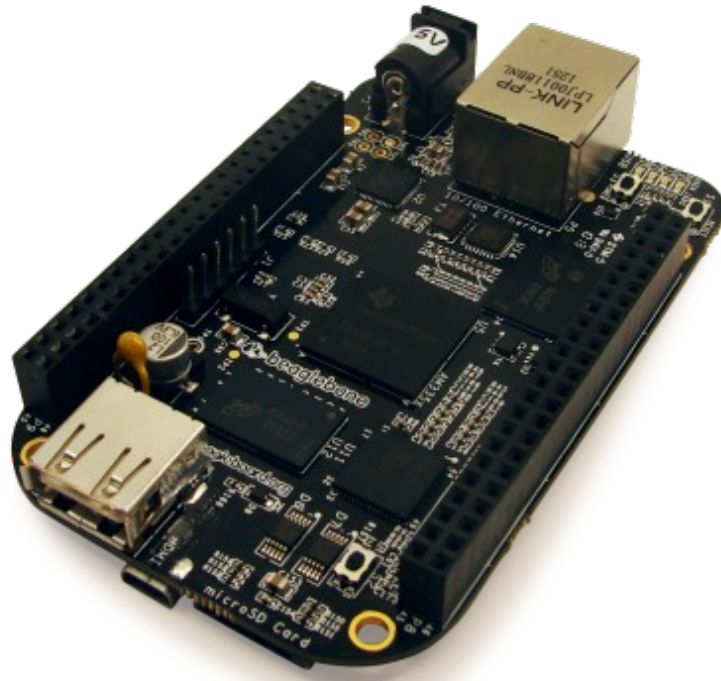
BeagleBone Black

Release date	April 2013
Cost	£50-60
CPU	Single core 1Ghz ARM Cortex-A8
GPU	PowerVR SGX530
RAM	512 MB DDR3
USB	1 x A host port 1 x mini B device port
Networking	10/100Mbps Ethernet
Onboard storage	2-4GB serial flash 1 x MicroSD

Zybo

Image:
https://www.flickr.com/photos/127815101@N07/16207132825/
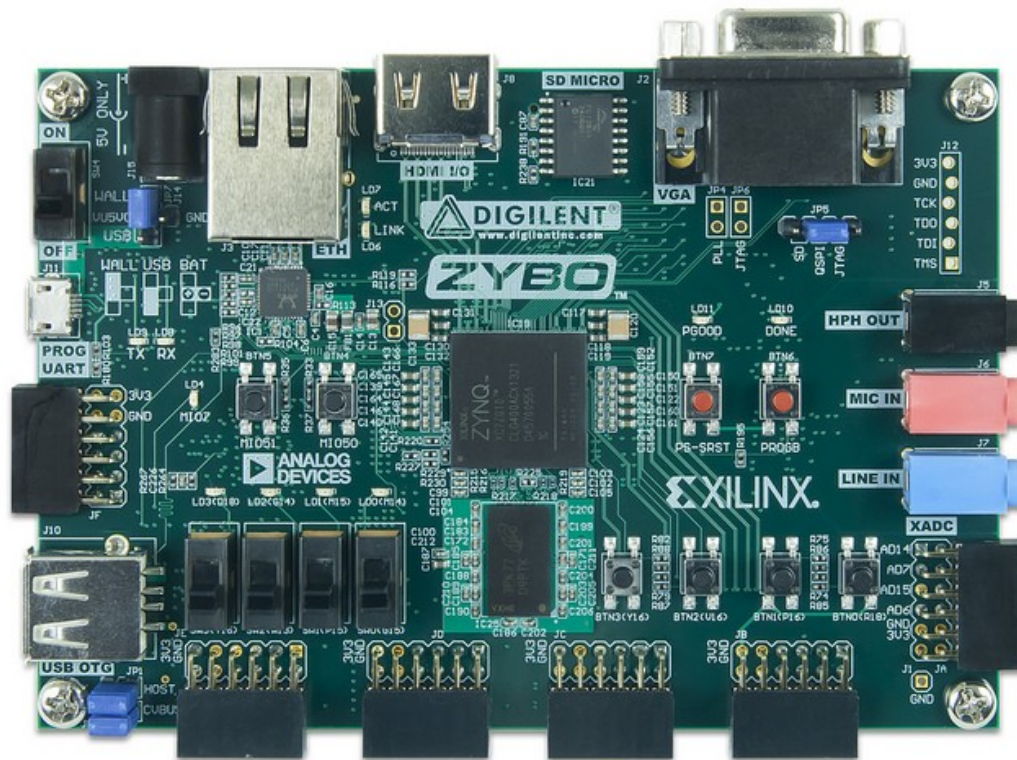
Zybo

Release date	2015
Cost	£160
CPU	Dual core 650Mhz ARM Cortex-A9
FPGA	4,400 logic slices
RAM	512 MB DDR3
USB	2 ports (one USB OTG)
Networking	10/100/1000Mbps Ethernet
Onboard storage	128MB serial flash 1 x MicroSD

FPGA

Field-Programmable Gate Array

Hardware speed, software flexibility (in theory)

FPGA

Build a 'soft core' CPU (UoMCS)

Design software: $3000+/user
(some free/evaluation options)

IP blocks: If you have to ask, you
probably can't afford them

ARM

Acorn (Advanced) Risc Machine

ARM – UK quoted company (LSE)

Steve Furber, Sophie Wilson etc.

ARM

Reduced Instruction Set Computer

32 and 64 bit (relatively new)

ARM

Found in almost every smartphone, tablet etc.

Low power over high performance (but see ARM in server space)

Business model: License processors (or co-design with IP)

Intel Galileo
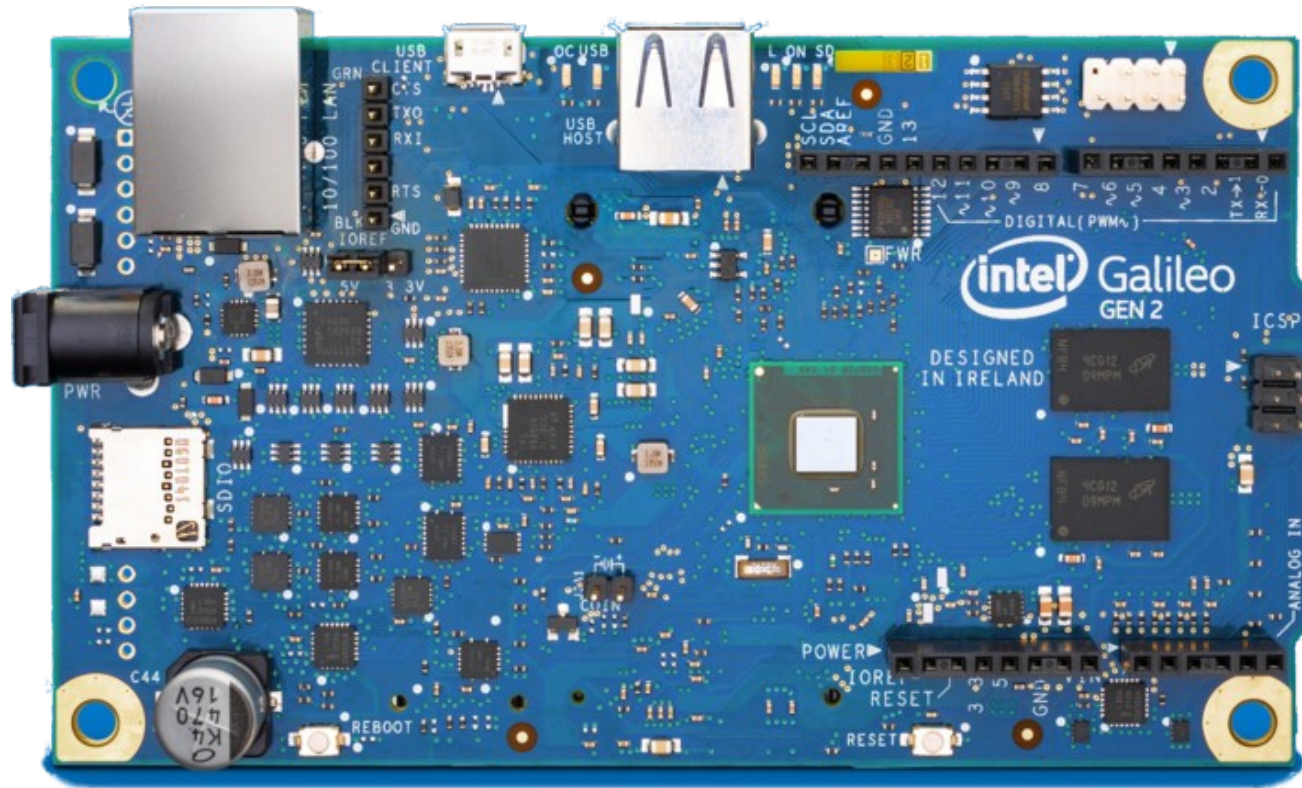
Image: https://en.wikipedia.org/wiki/Intel_Galileo

Intel Galileo

Release date	April 2014
Cost	£50-60
CPU	400 Mhz Quark X1000 (x86) 16 KB cache
GPU	
RAM	256 MB
USB	3 ports (2.0)
Networking	10/100Mbps Ethernet
Onboard storage	8 MB flash 1 x SD (max 32 GB)

Intel

X86 family

Intel Corporation – US quoted
company (NASDAQ)

Intel

Complex Instruction Set Computer

32 and 64 bit

Favours performance over power consumption (until recently)

Business model: Design + build

Resources

Elinux.org – Wiki covering all aspects of embedded Linux

Zync book (zyncbook.com) – Covers the Zybo and ZedBoard (free PDF, printed version available)

Questions?

www.yanone.de
tinyurl.com/slide-design-dev