4_3 Specifying Single Board Computers

Contents

Criteria for Selection

https://www.curtisswrightds.com/news/blog/choosing-a-single-board-computer.html

Choosing the right single board computer (SBC) for an application requires many considerations. Following are the eight most important factors to address in your SBC selection process:

1. **Power** - Choose an SBC that matches the power requirements for the specific application. As a complement to power, make sure the thermal management capabilities of the system are up to the task of cooling the chosen SBC for the system.

2. **Form Factor** - Important in any decision is the form factor of available SBCs. Form factors common in COTS embedded SBCs are: VME, VPX, CompactPCI and ComExpress. In the past 6U VME has been the most commonly used, but that is slowly changing to VPX, with increased interest in 3U for SWaP reasons.

3. **Backward pin compatibility** - When choosing an SBC to be used for technology insertion in an existing system (either for obsolescence or increased performance reasons), make sure it is designed for the specific pinout of the existing backplane so as to avoid having to redesign or replace the backplane. Curtiss-Wright Defense Systems differentiates itself in the embedded systems market by maintaining consistent pinout. Curtiss-Wright can also create variants of it's SBCs to match the pin out requirements of existing systems.

4. **Processor choice** - The three primary choices seen in the embedded COTS market place are Intel, Power Architecture, and more recently ARM. Many customers choose a certain type of processor because of their experience in working with it, but the application may dictate a leaning to one over the other. Some of the considerations that follow will also influence processor choice.

5. **Memory** - With advancing technology, memory requirements have increased dramatically. Ten to 12 years ago, 512 MB of memory was considered sufficient. And a gigabyte of memory was unheard of. Today many Intel processors offer 16 to 32 GB of memory. The memory demand of an application can influence the processor choice. For instance, compared to Intel, Power Architecture and ARM typically offer less memory and with that less power.

6. **Operating system** - Operating systems many impact the processor and SBC choice due to availability on the chosen SBC. Typical OS-es available for embedded use are: Linux (of which there are many versions), INTEGRITY, GreenHills LynxOS, QNX, and Wind River VxWorks. A variety of processors support Linux. But not all processor families are capable of supporting the design tools of Wind River VxWorks 5.5 for developing safety and mission-critical applications certified to standards such as RTCA DO-178B/C, EUROCAE ED-12B/C and IEC 61508. For applications requiring these safety and mission-critical certifications choices include DDC-I Deos, GreenHills INTEGRITY-178, Lynx Software LynxOS-178 or Wind River VxWorks 653.

7. **I/O complement** - For a particular application, an SBC must provide the right I/O complement in the right types and quantities, such as Ethernet, DIO, SATA, USB, serial ports (232, 422, 485) as well as board interconnect (VME, SRIO, PCIe, Ethernet). Related to this consideration is available support for add-on of a mezzanine card to expand on I/O not provided by the base SBC.

8. **Performance** - Application requirements vary vastly from low performance (and with that low power), to extremely high performance applications like SigInt with terrflops of processing requirements. Choose your processor wisely, as there's no need to pay for more performance and power than the application calls for.

Survey of SBCs https://hackerboards.com/ A REALLY Large Selection!

Wiki https://en.wikipedia.org/wiki/Single-board_computer

Subcategories

This category has the following 5 subcategories, out of 5 total.

A ► **All-in-one desktop computers (1 C, 17 P)**

H ► **Handheld game consoles (14 C, 94 P, 1 F)**

L ► **Laptops (16 C, 68 P)**

N ► **Nettop (14 P)**

R ► **Raspberry Pi (7 P)**

Pages in category "Single-board computers"

The following **53 pages** are in this category, out of 53 total. This list may not reflect recent changes (learn more).

https://en.wikipedia.org/wiki/Comparison_of_single-board_microcontrollers

Name	Maker	opensource?	Processor		Format		Host interface		I/O								Release date	
			Processor	Frequency		Dimensions			Voltage	Flash (kB)	EEPROM (kB)	SRAM (kB)	Digital I/O (pins)	Digital I/O with PWM (pins)	Analog input (pins)	Analog output pins		
Arduino / Genuino MKR1000	Arduino	Yes	ATSAMW25 (made of SAMD21 Cortex-M0+ 32 bit ARM MCU, WINC1500 2.4 GHz 802.11 b/g/n Wi-Fi, and ECC508 crypto device)	48 MHz	minimal	61.5 mm x 25 mm	USB		3.3 V	256	No	32	8	12	7	1	Announced: April 2, 2016	
Arduino 101[1] Genuino 101	Arduino	Yes	Intel® Curie ™ module[2] two tiny cores, an x86 (Quark SE) and an ARC	32 MHz	Arduino / Genuino	68.6 mm × 53.4 mm [2.7 in × 2.1 in]	USB		3.3 V	196		24	14	4	6		October 16, 2015	Contain
Arduino Zero[3]	Arduino	Yes	ATSAMD21G18A[4]	48 MHz	Arduino	2.7 in × 2.1 in [68.6 mm × 53.3 mm]	USB	Native & EDBG Debug	3.3 V	256	0 to 16 Kb emulation	32	14	12	6		Released June 15, 2015[5] Announced May 15, 2014[6] Listed on some vendors list Mar 2015	Beta tes
Arduino Due[8][9]	Arduino	Yes	ATSAM3X8E[10] (Cortex-M3)	84 MHz	Mega	4 in × 2.1 in [101.6 mm × 53.3 mm]	USB	16U2[11] + native host[12]	3.3 V	512	0[13]	96	54	12	12	2	October 22, 2012[14]	The first 12-bit D and 96 I is not 5
Arduino Yún[15]	Arduino	Yes	Atmega32U4,[16] Atheros AR9331	16 MHz, 400 MHz	Arduino	2.7 in × 2.1 in [68.6 mm × 53.3 mm]	USB		5 V	32 kB, 16 MB	1 kB, 0 kB	2.5 kB, 64 MB	14	6	12		September 10, 2013[17]	Arduino the Atm Linino, a
Arduino Leonardo[18]	Arduino	Yes	Atmega32U4[16]	16 MHz	Arduino	2.7 in × 2.1 in [68.6 mm	USB	32U4[16]	5 V	32	1	2.5	20	7	12		July 23, 2012[19]	

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Single Board Computer Benchmarks

As part of my work at Lockheed, I did extensive benchmarking of minicomputers at first and later microcomputers. We were interested in vibration and acoustic analysis that required a great deal of FFT processing. Wow - did I learn from that experience!

https://learn.sparkfun.com/tutorials/single-board-computer-benchmarks/all

Table: CPU and GPU

Device	Processor	Architecture	CPU Speed	Cores	GPU
Raspberry Pi 2	Broadcom BCM2836	ARM Cortex-A7	900 MHz	4	Broadcom
BeagleBone Black Rev C	TI Sitara AM335x	ARM Cortex-A8	1 GHz	1	PowerVR SGX530
Intel Edison	Intel Atom Z34XX	Silvermont x86	500 MHz	2	None
pcDuino3	Allwinner A20	ARM Cortex-A7	1 GHz	2	Mali-400MP2
Acadia	Freescale i.MX6	ARM Cortex-A9	1.2 GHz	4	Vivante GC2000

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