babyIOC

- Envisioned for
  - For mobile end-stations.
- From past experience:
  - Had areaDetector-3-1 with Pilatus and several Prosilica IOCs running on Debian 8 6 y. old server with 2 GB of memory
- New technology should offer same or better hardware and small factor.

- First try was X15 from Beagle Bone with 2GB RAM
  - 32 bit ARM architecture

U.S. DEPARTMENT OF ENERGY | Office of Science

BROOKHAVEN NATIONAL LABORATORY | National Synchrotron Light Source II

Source	Product	Rekease Date	CPU	GPU	CPU speed	RAM	# Eth, GB	USB2	USB3	USB OTG	RS232	price ~$	Comments
https://en.wikipedia.org/wiki/Banana_Pi#Banana_Pi_BPI-R2	Banana PI BPI-R2	2018	MediaTek MT7623N, Quad-code ARM Cortex-A7	Mali 450 MP4 GPU		2G DDR3 SDRAM	1	NA	2	1		$100	
https://boundarydevices.com/product/nitrogen6x-board-imx6-arm-cortex-a9-sbc/	NITROGEN6X Nit6Q_2GB	2013	ARM Cortex™-A9 (1-4)	NA		2G	1	3	NA	1		$225	
https://www.pine64.org/	Rock64	2017	Rockchip RK3328 Quad-Core ARM Cortex A53 64-Bit	NA		up to 4GB 1600MHz LPDDR3	1	2	1	NONe?		$50	
http://www.nvidia.com/object/jetson-tk1-embedded-dev-kit.html	Nvidia Jetson TK1 dev kit	2014	NVIDIA 4-Plus-1 quad-core ARM Cortex-A15 CPU	NVIDIA Kepler GPU with 192 CUDA cores		2	1	1	1		1	$200	only stretch, no jessie
https://www.nvidia.com/en-us/autonomous-machines/embedded-systems-dev-kits-modules/	Nvidia Jetson TX1	?	4x ARM Cortex™-A15, Cortex™-M4 (Companion MCU)	Kepler GPU with 192 CUDA®cores	up to 2.1 Ghz	2	1		2 (1 OTG)				only stretch, no jessie
http://www.hardkernel.com/main/products/prdt_info.php?g_code=G145457216438 https://en.wikipedia.org/wiki/ODROID	ODROID-C2	2016	Amlogic ARM® Cortex®-A53(ARMv8) 1.5Ghz quad core CPUs	Mali™-450 GPU (3 Pixel-processors + 2 Vertex shader processors)		2	1	4		1		$46	There is Jessie, image, but very minimal. Customer suppofrt is deap in China
https://www.pcengines.ch/apu2.htm	PC engines apu2												totally cool, does not support Debian
https://www.embeddedarm.com/products/TS-7970 search ftp	TS-7970	2016	ArmNXP i.MX6 800 MHz Solo or 1 GHz Quad Core ARM CPU NXP i.MX6		1GHz	2	2	4 (?or)	4(?)	1	2	$250	Comes with Jessie by default
https://shop.udoo.org/usa/x86/udoo-x86-ultra.html?___from_store=other&popup=no http://www.seco.com/misk/UDOO_X86_datasheet.pdf	UDOO X86 Ultra	2016	CPU Intel Pentium N3710 2.56 GHZ x4 corse	ntel HD Graphics 405 Up to 700 MHz 16 execution units		8 GB DDR3L DUAL CHANNEL	1		3			$280	Any Linux Distribution for X86 platform

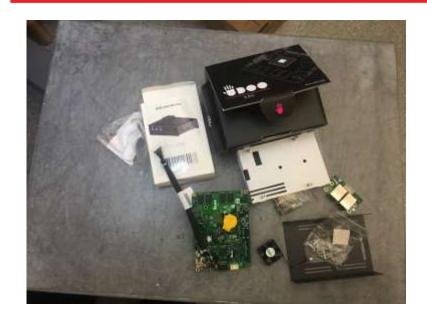| Source	Product	Rekease Date	CPU	GPU	CPU speed	RAM	# Eth, GB	USB2	USB3	USB OTG	RS232	price ~$	Comments
https://en.wikipedia.org/wiki/Banana_Pi#Banana_Pi_BPI-R2	Banana PI BPI-R2	2018	MediaTek MT7623N, Quad-code ARM Cortex-A7	Mali 450 MP4 GPU		2G DDR3 SDRAM	1	NA	2	1		$100	
https://boundarydevices.com/product/nitrogen6x-board-imx6-arm-cortex-a9-sbc/	NITROGEN6X Nit6Q_2GB	2013	ARM Cortex™-A9 (1-4)	NA		2G	1	3	NA	1		$225	
https://www.pine64.org/	Rock64	2017	Rockchip RK3328 Quad-Core ARM Cortex A53 64-Bit	NA		up to 4GB 1600MHz LPDDR3	1	2	1	NONe?		$50	
http://www.nvidia.com/object/jetson-tk1-embedded-dev-kit.html	Nvidia Jetson TK1 dev kit	2014	NVIDIA 4-Plus-1 quad-core ARM Cortex-A15 CPU	NVIDIA Kepler GPU with 192 CUDA cores		2	1	1	1		1	$200	only stretch, no jessie
https://www.nvidia.com/en-us/autonomous-machines/embedded-systems-dev-kits-modules/	Nvidia Jetson TX1	?	4x ARM Cortex™-A15, Cortex™-M4 (Companion MCU)	Kepler GPU with 192 CUDA®cores	up to 2.1 Ghz	2	1		2 (1 OTG)				only stretch, no jessie
http://www.hardkernel.com/main/products/prdt_info.php?g_code=G145457216438 https://en.wikipedia.org/wiki/ODROID	ODROID-C2	2016	Amlogic ARM® Cortex®-A53(ARMv8) 1.5Ghz quad core CPUs	Mali™-450 GPU (3 Pixel-processors + 2 Vertex shader processors		2	1	4		1		$46	There is Jessie, image, but very minimal. Customer suppofrt is deap in China
https://www.pcengines.ch/apu2.htm	PC engines apu2												totally cool, does not support Debian
https://www.embeddedarm.com/products/TS-7970 search ftp	TS-7970	2016	ArmNXP i.MX6 800 MHz Solo or 1 GHz Quad Core ARM CPU NXP i.MX6		1GHz	2	2	4 (?or)	4(?)	1	2	$250	Comes with Jessie by default
https://shop.udoo.org/usa/x86/udoo-x86-ultra.html?___from_store=other&popup=no http://www.seco.com/misk/UDOO_X86_datasheet.pdf	UDOO X86 Ultra	2016	CPU Intel Pentium N3710 2.56 GHZ x4 corse	ntel HD Graphics 405 Up to 700 MHz 16 execution units		8 GB DDR3L DUAL CHANNEL	1		3			$280	Any Linux Distribution for X86 platform

babyIOC, "Controls System in Box"

- From Italian startup *Udoo* funded through Kickstarter in 2016

- diskless SBC

- 64 bit Intel architecture
- x4 core 2.56 GHz and 8GB RAM
- x3 1Gbit Ethernet interfaces

- boots and runs from microSD

- New NSLS2 Debian distribution, compiled areaDetector-3-2, Prosilica IOCs, X2Go server.

- Building another system like this comes to copying the image to another card.

- *~$400*

babyIOC runs areaDetector-3-2 on XFP beamline with PVA ONLY!

We see it as a intermediate compromise solution for EPICS software upgrade at NSLS2 beamlines

What next?

- What we would like to have (please advise if you know)

  - Be ably to fully use microSD card of any size

    - When copying one SD card to another with *dd* command, the size of the target becomes always the size of the source, even if it is x10 bigger.

- Plan to clean up puppet and NSLS2 specifics and make the image available to the community with instructions.

Credits:

- Thomas Smith   babyIOC admin parent.

- Dennis Poshka babyIOC nurture technician

- Matt Cowan   babyIOC deployment caregiver