

Embedded Linux Conference 2017: **Beagle BoF**



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Beagle BoF outline



- ELC tomorrow: talks and showcase
- BeagleBone OSHW ecosystem
- New: BB Wireless, BB Blue, BB X15
- Debian images
- Debian 9 (“Stretch”) planning
- U-Boot Overlays
- Development resources



ELC 2017: tomorrow!



- **ELC Technical Showcase**
 - BeagleBoard X15 & BeagleBone Blue
 - Wednesday, February 22, 5:10 pm - 7:00 pm
- **Educational Robotics Critical for the Future of Linux**
 - Jason Kridner, Texas Instruments
 - Wednesday, February 22 • 10:30am - 11:20am
- **Google Summer of Code and BeagleBoard.org**
 - Drew Fustini, BeagleBoard.org Foundation
 - Wednesday, February 22 • 11:30am - 12:20pm

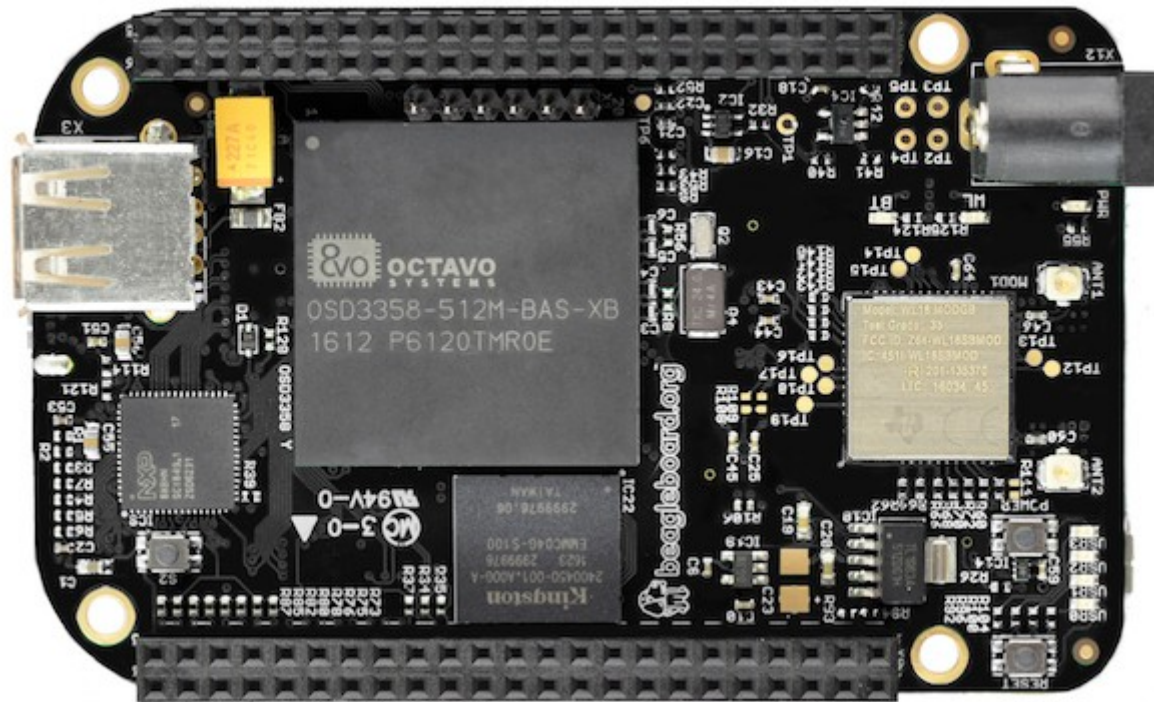


Open Source Hardware BeagleBone derivatives

	Capes	HDMI	Flash	Special
BeagleBoard.org BeagleBone	Y	N	N	JTAG
BeagleBoard.org BeagleBone Black	Y	Y	Y	-
Arrow BeagleBone Black Industrial	Y	Y	Y	Industrial
Element14 BeagleBone Black Industrial	Y	Y	Y	Industrial
SeeedStudio BeagleBone Green	Y	N	Y	Grove
SanCloud BeagleBone Enhanced	Y	Y	Y	1GB, 1Gbit, wireless
BeagleBoard.org BeagleBone Blue	N	N	Y	Robotics
BeagleBoard.org BeagleBoard-X15	N	Y	N	Big jump in CPUs and I/O



BeagleBone Black Wireless



- **WiFi 802.11b/g/n and Bluetooth 4.1 with BLE**
- **1st Beagle with Octavo System-in-Package (SiP)**
- **Designed in EAGLE (BBB was OrCad/Allegro)**



BeagleBoard.org BeagleBoard-X15

Jason Kridner

What is demonstrated

- Open hardware computer
 - ➔ Debian Linux system
 - ➔ Open source 2D graphics acceleration
 - ➔ Video acceleration
 - ➔ OpenCL C66 DSP support
 - ➔ Mainline kernel support
 - ➔ GCC compiler support
 - ✓ ARM Cortex-A15
 - ✓ ARM Cortex-M4
 - ✓ TI C66x
 - ✓ TI PRU

What was improved

- Fastest BeagleBoard available
- More cores and more types of cores
- Lots more I/O capability and bandwidth
- More RAM (2GB)
- Great open hardware ARM build platform



Hardware Information <https://bbb.io/x15>

Dual-core ARM Cortex-A15, dual C66x DSPs, quad programmable real-time units, 3×USB 3.0, PCIe, 2×GigE, 2GB RAM, 4GB eMMC flash.

Source code or detail technical information availability

<https://github.com/beagleboard/beagleboard-x15>
<https://github.com/beagleboard/linux>
<https://github.com/beagleboard/image-builder>



Debian images



- [BeagleBoard.org Latest Firmware Images](#)
 - 2016-11-06: Debian 8.6 (“Jessie”)
- [Debian Image Testing Snapshots](#)
 - 2017-02-12
 - Machinekit
 - Jessie Snapshot LXQT (*full desktop*)
 - Jessie Snapshot IoT (*smaller size*)
 - Jessie Snapshot console (*minimum size*)
 - Stretch testing (*the future!*)



Debian 9 (“Stretch”)



- root: password <blank> -> password "root"
- root: ssh access -> ssh access disabled
- debian: sudo doesn't ask for password -> sudo asks
- Device-tree-compiler: our v1.4.2-fork -> dtc git mainline
- Kernel: v4.4.x-ti/v4.9.x-ti
- U-boot: v2017.03+ with device tree overlays.
- U-Boot overlays by default with cape-universal overlay applied



U-Boot Overlays



- U-Boot now has Device Tree Overlay support
 - [debian testing: 2017-01-03 \(U-Boot Cape Manager edition\)](#)
- U-Boot Overlays is currently under development, while the items below may work on "last weeks" version
- Please report bugs to:
beagleboard/bb.org-overlays/issues
 - Always double check the version you are using for comparison.



U-Boot Overlays



- **Migration Guide: U-Boot Overlays**
- **U-Boot /boot/uEnv.txt configuration**
 - enable_uboot_overlays=1
- **U-Boot Disable onboard devices**
 - Disable eMMC: disable_uboot_overlay_emmc=1
 - Disable HDMI VIDEO & AUDIO:
disable_uboot_overlay_video=1
 - Disable HDMI AUDIO: disable_uboot_overlay_audio=1
 - Disable WL1835: disable_uboot_overlay_wireless=1



U-Boot Overlays



- **U-Boot Override external capes**
 - Cape device tree overlays: [beagleboard/bb.org-overlays](https://beagleboard.org/overlays)
 - `uboot_overlay_addr0=/lib/firmware/<file0>.dtbo`
 - `uboot_overlay_addr1=/lib/firmware/<file1>.dtbo`
 - `uboot_overlay_addr2=/lib/firmware/<file2>.dtbo`
 - `uboot_overlay_addr3=/lib/firmware/<file3>.dtbo`
 - Plus one custom cape: `dtb_overlay=/lib/firmware/<file4>.dtbo`
- **U-Boot Cape Universal**
 - Utilize [beaglebone-universal-io](https://beaglebone.org/overlays) config-pin
 - Enable in `/boot/uEnv.txt`: `enable_uboot_cape_universal=1`



U-Boot Overlays



- U-Boot overlay white list will continue to grow
 - [0002-U-Boot-BeagleBone-Cape-Manager.patch](#)
- If you have a cape, please test, and let's make sure everyone has a good out of box experience!



Development resources



- Mailing lists: bbb.io/discuss
- IRC: bbb.io/chat
- Kernel build:
 - [RobertCNelson/ti-linux-kernel-dev](https://github.com/RobertCNelson/ti-linux-kernel-dev)
- Kernel repo:
 - [beagleboard/linux](https://github.com/beagleboard/linux)
- DTB Rebuilder
 - [RobertCNelson/dtb-rebuilder](https://github.com/RobertCNelson/dtb-rebuilder)
- Device Tree Overlays for bb.org boards
 - [beagleboard/bb.org-overlays](https://github.com/beagleboard/bb.org-overlays)