04-1 Booting & Toolchains

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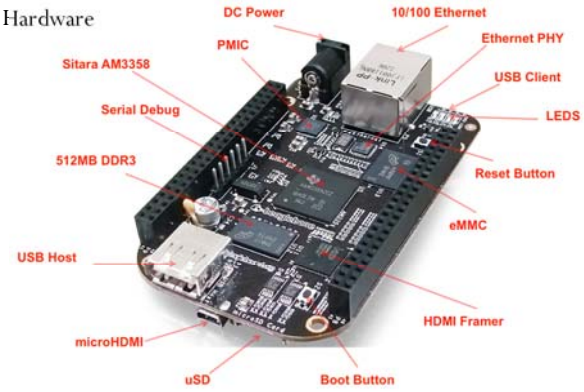
What's in the Beagle?

- Hardware



What's in the Beagle?

- Software
- What happens when the Beagle boots Linux?

```
Instruments X-Loader 1.4.4ss (Aug 19 2010 - 02:49:27)
Beagle xM Rev A
Reading boot sector
Loading u-boot.bin from mmc
```

What's in the Beagle?

- Software
- What happens when the Beagle boots Linux?

```
U-Boot SPL 2013.07-dirty (Sep 03 2013 - 13:49:10)
musb-hdrc: ConfigData=0xde (UTMI-8, dyn FIFOs, HB-ISO Rx, HB-ISO Tx, SoftConn)
musb-hdrc: MHDRC RTL version 2.0
musb-hdrc: setup fifo_mode 4
musb-hdrc: 28/31 max ep, 16384/16384 memory
USB Peripheral mode controller at 47401000 using PIO, IRQ 0
musb-hdrc: ConfigData=0xde (UTMI-8, dyn FIFOs, HB-ISO Rx, HB-ISO Tx, SoftConn)
musb-hdrc: MHDRC RTL version 2.0
musb-hdrc: setup fifo_mode 4
musb-hdrc: 28/31 max ep, 16384/16384 memory
USB Host mode controller at 47401800 using PIO, IRQ 0
OMAP SD/MMC: 0
mmc_send_cmd : timeout: No status update
reading args
spl: error reading image args, err - -1
reading u-boot.img
```

Seeing boot messages

- Attach FDTI cable
- Look for triangle and black lead
- Attach triangle to dot
- On Host

```
host$ chown yoder:yoder /dev/ttyUSB0
host$ screen /dev/ttyUSB0 115200
```

- Capture log file with

^A H

Baud rate

- Then reboot

```
host$ reboot
```

https://www.sparkfun.com/products/9717

What happens when the Beagle powers up?

```
U-Boot 2009.11-rc1 (Jan 08 2010 - 21:19:52)

OMAP3530-GP ES3.1, CPU-OPP2 L3-165MHz
OMAP3 Beagle board + LPDDR/NAND
I2C:   ready
DRAM:  256 MB
NAND:  256 MiB
In:    serial
Out:   serial
Err:   serial
Board revision C4
Die ID #5444000040000000040365fa1400e007
Hit any key to stop autoboot:  0
OMAP3 beagleboard.org # boot
mmc1 is available
reading uImage

2996196 bytes read
```

What happens when the Beagle powers up?

```
U-Boot 2010.03-dirty (Aug 20 2010 - 20:50:46)

OMAP3630/3730-GP ES1.0, CPU-OPP2, L3-165MHz,
OMAP3 Beagle board + LPDDR/NAND
I2C:   ready
DRAM:  512 MB
NAND:  0 MiB
*** Warning - bad CRC or NAND, using default
environment

In:    serial
Out:   serial
Err:   serial
```

What happens when the Beagle powers up?

```
U-Boot 2013.04-dirty (Jun 19 2013 - 09:57:14)
I2C:   ready
DRAM:  512 MiB
WARNING: Caches not enabled
NAND:  No NAND device found!!!
0 MiB
MMC:   OMAP SD/MMC: 0, OMAP SD/MMC: 1
*** Warning - readenv() failed, using default environment
musb-hdrc: ConfigData=0xde (UTMI-8, dyn FIFOs, HB-ISO Rx, HB-ISO Tx, SoftConn)
musb-hdrc: MHDRC RTL version 2.0
musb-hdrc: setup fifo_mode 4
musb-hdrc: 28/31 max ep, 16384/16384 memory
USB Peripheral mode controller at 47401000 using PIO, IRQ 0
musb-hdrc: ConfigData=0xde (UTMI-8, dyn FIFOs, HB-ISO Rx, HB-ISO Tx, SoftConn)
musb-hdrc: MHDRC RTL version 2.0
musb-hdrc: setup fifo_mode 4
musb-hdrc: 28/31 max ep, 16384/16384 memory
USB Host mode controller at 47401800 using PIO, IRQ 0
Net:   <ethaddr> not set. Validating first E-fuse MAC
```

What happens when the Beagle powers up?

```
cpsw, usb_ether
Hit any key to stop autoboot:  1  0
gpio: pin 53 (gpio 53) value is 1
Card did not respond to voltage select!
mmc0(part 0) is current device
mmc_send_cmd : timeout: No status update
Card did not respond to voltage select!
No micro SD card found, setting mmcdev to 1
mmc_send_cmd : timeout: No status update
mmc1(part 0) is current device
mmc_send_cmd : timeout: No status update
gpio: pin 54 (gpio 54) value is 1
SD/MMC found on device 1
reading uEnv.txt
26 bytes read in 4 ms (5.9 KiB/s)
Loaded environment from uEnv.txt
Importing environment from mmc ...
gpio: pin 55 (gpio 55) value is 1
3,343,496 bytes read in 633 ms (5 MiB/s)
gpio: pin 56 (gpio 56) value is 1
24,129 bytes read in 56 ms (419.9 KiB/s)
Booting from mmc ...
```

```
beagle$ ./findGPIO.js 54
Looking for gpio 54
{ name: 'USR1',
  gpio: 54,
  led: 'usr1',
  mux: 'gpmc_a6',
  key: 'USR1'
…
```

What happens when the Beagle powers up?

```
No EEPROM on expansion board
Beagle xM Rev C
Die ID #347800000610000000156166b0a02300a
Hit any key to stop autoboot:  0
mmc1 is available
The user button is currently NOT pressed.
reading boot.scr

687 bytes read
Running bootscript from mmc ...
## Executing script at 80200000
mmc1 is available
reading uImage

3193476 bytes read
```

What happens when the Beagle powers up?

```
## Booting kernel from Legacy Image at 80200000 ...
   Image Name:   Angstrom/2.6.32/beagleboard
   Image Type:   ARM Linux Kernel Image (uncompressed)
   Data Size:    3193412 Bytes =  3 MB
   Load Address: 80008000
   Entry Point:  80008000
   Verifying Checksum ... OK
   Loading Kernel Image ... OK
OK

Starting kernel ...

Uncompressing Linux.....................................................
[    0.000000] Linux version 2.6.32 (daniel@kids-laptop) (gcc version 4.3.3 (GC0
[    0.000000] CPU: ARMv7 Processor [413fc082] revision 2 (ARMv7), cr=10c53c7f
[    0.000000] CPU: VIPT nonaliasing data cache, VIPT nonaliasing instruction ce
```

What happens when the Beagle powers up?

```
## Booting kernel from Legacy Image at 80007fc0 ...
   Image Name:   3.8.13-bone27
   Image Type:   ARM Linux Kernel Image (uncompressed)
   Data Size:    3343432 Bytes = 3.2 MiB
   Load Address: 80008000
   Entry Point:  80008000
   Verifying Checksum ... OK
## Flattened Device Tree blob at 80f80000
   Booting using the fdt blob at 0x80f80000
   XIP Kernel Image ... OK
OK
   Using Device Tree in place at 80f80000, end 80f88e40

Starting kernel ...
```

What happens when the Beagle powers up?

```
Starting kernel ...

Uncompressing Linux... done, booting the kernel.
[    0.236706] omap2_mbox_probe: platform not supported
[    0.519048] tps65217-bl tps65217-bl: no platform data provided
[    0.595478] bone-capemgr bone_capemgr.8: slot #0: No cape found
[    0.632583] bone-capemgr bone_capemgr.8: slot #1: No cape found
[    0.669690] bone-capemgr bone_capemgr.8: slot #2: No cape found
[    0.706801] bone-capemgr bone_capemgr.8: slot #3: No cape found
[    0.726874] bone-capemgr bone_capemgr.8: slot #6: BB-BONELT-
HDMIN conflict P8.45 (#5:BB-BONELT-HDMI)
```

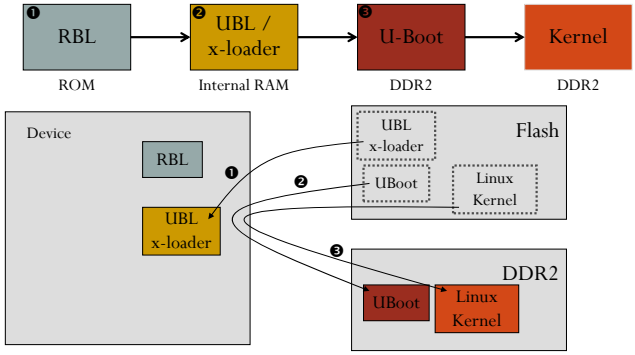
What happens when the Beagle powers up?

```
systemd-fsck[86]: Angstrom: clean, 67037/112672 files, 428853/449820
blocks
[    7.704042] libphy: PHY 4a101000.mdio:01 not found
[    7.709166] net eth0: phy 4a101000.mdio:01 not found on slave 1

.---o---.
|       |                .-.          o o
|   |   |-----.-----.------.| |   .-----..-----.-----.
|       |     | __  |  ---'| '--.|  .-'|     |     |
|   |   |  |  |     |---  ||  --'|  |  |  '  | | | |
'---'---'--'--'--.  |-----''----''--'  '-----'-'-'-'
                -'  |
                '---'
The Angstrom Distribution yoder-black-bone tty00

Angstrom v2012.12 - Kernel 3.8.13-bone27
yoder-black-bone login:
```

Booting Linux – ROM to Kernel



U-boot

- OMAP3 beagleboard.org # **print mmcboot**
  - mmcboot=echo Booting from mmc ...;
  - run mmcargs;
  - bootm ${loadaddr}
- OMAP3 beagleboard.org # **print mmcargs**
  - mmcargs=setenv bootargs console=${console} ${optargs} mpurate=${mpurate} buddy=${buddy} camera=${camera} vram=${vram} omapfb.mode=dvi:${dvimode} omapdss.def_disp=${defaultdisplay} root=${mmcroot} rootfstype=${mmcrootfs}

U-boot

```
U-Boot# help boot
boot - boot default, i.e., run 'bootcmd'
U-Boot# print bootcmd
  bootcmd=gpio set 53; i2c mw 0x24 1 0x3e; run
  findfdt; mmc dev 0; if mmc rescan ; then echo
  micro SD card found;setenv mmcdev 0;else echo No
  micro SD card found, setting mmcdev to 1;setenv
  mmcdev 1;fi;setenv bootpart ${mmcdev}:2;mmc dev
  ${mmcdev}; if mmc rescan; then gpio set 54; echo
  SD/MMC found on device ${mmcdev};if run
  loadbootenv; then echo Loaded environment from
  ${bootenv};run importbootenv;fi;if test -n
  $uenvcmd; then echo Running uenvcmd ...;run
  uenvcmd;fi;gpio set 55; if run loaduimage; then
  gpio set 56; run loadfdt;run mmcboot;fi;fi;

  prefetch abort
```

U-boot

```
U-Boot# help boot
boot - boot default, i.e., run 'bootcmd'
U-Boot# print bootcmd
  Reformatting
  bootcmd = gpio set 53;
  i2c mw 0x24 1 0x3e;
  run findfdt;
  mmc dev 0;
  if mmc rescan;
    then echo micro SD card found;
    setenv mmcdev 0;
    else echo No micro SD card found, setting mmcdev
  to 1;
    setenv mmcdev 1;
  fi;
  setenv bootpart $ {mmcdev}: 2;
  mmc dev $ {mmcdev};
  if mmc rescan;
```

U-boot

```
…
if mmc rescan;
  then gpio set 54;
  echo SD / MMC found on device $ {mmcdev};
  if run loadbootenv;
    then echo Loaded environment from $ {bootenv};
    run importbootenv;
  fi;
  if test - n $uenvcmd;
    then echo Running uenvcmd...;
      run uenvcmd;
  fi;
  gpio set 55;
  if run loaduimage;
    then gpio set 56;
      run loadfdt;
      run mmcboot;
  fi;
fi;
```

U-boot

- OMAP3 beagleboard.org # **run mmcargs**
- OMAP3 beagleboard.org # **print bootargs**
  - bootargs=console=ttyS2,115200n8 mpurate=1000 buddy=none camera=lbcm3m1 vram=12M omapfb.mode=dvi:640x480MR-16@60 omapdss.def_disp=dvi root=/dev/mmcblk0p2 rw rootfstype=ext3 rootwait