GNU/Linux on ARM
for $50-$100

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What is goal of this presentation?

Explore capabilities of small ARM devices as GNU/Linux home servers without spending serious amount of cash - a year in review

- unbrickable - important for experiments
- GNU Linux distribution (apt-get, armhf)
- Explore connectivity options
  - USB, LAN, WIFI, bluetooth, SATA, IRDA, CEC
- What can we connect to it
  - UART, I2C, GPIO
- Focus on hackable devices with active community
Raspberry Pi - BCM2835 - $35
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- not for profit - great community
  - http://elinux.org/RPi_Hub
- hidden cost: SD, cables, power supply
- breakout board for BCM2835
  - Videocore IV is really DSP with ARM attached to it
    - https://github.com/hermanhermitage/videocoreiv
- bare-metal ARM - use as microcontroller
  - http://elinux.org/RPi_Hardware
    - https://github.com/dwelch67/raspberrypi (JTAG...)
    - https://github.com/sarfata/pi-blaster (PWM)
- standard 2.54 mm pins, composite video
Cubieboard - A10 1GHz - $55
Cubieboard - A10 1GHz - $55

- unbrickable: A10 boots first from SD
- First available A10 board with SATA
- Active Linux SUNXI community
  - [http://linux-sunxi.org/Cubieboard](http://linux-sunxi.org/Cubieboard)
- board schema available
- 2mm (metric!) pins for GPIO
- JTAG on uSD card slot
- Linux kernel 3.4.29
- Mali Open Source GPU code (runs Q3A)
  - [http://limadriver.org/](http://limadriver.org/)
MK808 - RK3306 2*1.2GHz - $42

- Unbrickable - rkflashtool for flash peek/poke
- **UG802** better hw or **MK808B** with bluetooth
- TTL serial console only (with soldering)
- Linux kernel 3.0.8
- A lot of updates, including Android 4.2.2
- Ubuntu 11.10
  http://www.cnx-software.com/2013/03/25/ubuntu-11-10-image-for-hi802-gk802-is-now-available-for-download/
- Newer quad-core Rockchip cores have PowerVR and not Mali!
GK802 - i.MX6 4*1.2Ghz - $90
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- unbrickable - two uSD cards (one internal)
  - [https://github.com/boundarydevices/imx_usb_loader](https://github.com/boundarydevices/imx_usb_loader)
- TTL serial, I2C pins
- great community
  - [https://github.com/imx6-dongle/wiki/wiki](https://github.com/imx6-dongle/wiki/wiki)
- Ubuntu 12.04 image (GPU with blob)
  - [http://www.cnx-software.com/2013/04/05/preliminary-ubuntu-12-04-rootfs-for-gk802hi802-mini-pc/](http://www.cnx-software.com/2013/04/05/preliminary-ubuntu-12-04-rootfs-for-gk802hi802-mini-pc/)
- Freescale HDMI Dongle reference design
  - [https://community.freescale.com/docs/DOC-93821](https://community.freescale.com/docs/DOC-93821)
- GPU open source work-in-progress
  - [https://github.com/laanwj/etna_viv/wiki](https://github.com/laanwj/etna_viv/wiki)
<table>
<thead>
<tr>
<th></th>
<th>Raspberry Pi B</th>
<th>Cubieboard</th>
<th>MK808</th>
<th>GK802</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>price</strong></td>
<td>$35</td>
<td>$55</td>
<td>$42</td>
<td>$90</td>
</tr>
<tr>
<td><strong>SOC</strong></td>
<td>BCM2835</td>
<td>A10</td>
<td>RK3306</td>
<td>i.MX6</td>
</tr>
<tr>
<td><strong>core type</strong></td>
<td>ARM11</td>
<td>Cortex A8</td>
<td>Cortex A9</td>
<td>Cortex A9</td>
</tr>
<tr>
<td><strong>nr. of cores</strong></td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td><strong>CPU clock</strong></td>
<td>700 Mhz - 1 GHz</td>
<td>1 GHz</td>
<td>1.2 GHz</td>
<td>1.2 GHz</td>
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<tr>
<td><strong>GPU</strong></td>
<td>VideoCore IV</td>
<td>Mali 400</td>
<td>Mali 400MP4</td>
<td>Vivante GC2000</td>
</tr>
<tr>
<td><strong>RAM</strong></td>
<td>512 MB @ 400 MHz</td>
<td>1 Gb @ 480 Mhz</td>
<td>1 Gb DDR3</td>
<td>1 Gb DDR3</td>
</tr>
<tr>
<td><strong>built-in NAND</strong></td>
<td>-</td>
<td>4 Gb</td>
<td>8 Gb</td>
<td>no, 8 Gb uSD</td>
</tr>
<tr>
<td><strong>USB</strong></td>
<td>2</td>
<td>2 + OTG</td>
<td>1 + OTG</td>
<td>1 + OTG</td>
</tr>
<tr>
<td><strong>storage</strong></td>
<td>SD</td>
<td>uSD, SATA</td>
<td>uSD</td>
<td>2 * uSD</td>
</tr>
<tr>
<td><strong>Ethernet</strong></td>
<td>100 Mbit/s (on USB)</td>
<td>100 Mbit/s</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><strong>Audio</strong></td>
<td>out</td>
<td>line in/out</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><strong>Wifi</strong></td>
<td>-</td>
<td>-</td>
<td>802.11bgn</td>
<td>802.11bgn</td>
</tr>
<tr>
<td><strong>Bluetooth</strong></td>
<td>-</td>
<td>-</td>
<td>model MK808B</td>
<td>yes</td>
</tr>
<tr>
<td><strong>pins</strong></td>
<td>12 GPIO, UART, SPI, I2C, CSI, DSI</td>
<td>2 * 48 pin I2C SPI RGB LVDS CSI FM-IN ADC VGA SPDIF-OUT R-TP</td>
<td>UART</td>
<td>UART, I2C</td>
</tr>
<tr>
<td><strong>power</strong></td>
<td>5V 700mA micro B</td>
<td>5V 2A 4mm</td>
<td>5V 2A</td>
<td>5V 2A</td>
</tr>
</tbody>
</table>
UDOO - i.MX6 + Arduino - $109/$129


Honorable mention only, SATA needs quad-core i.MX6!
No Android left behind!

- BotBrew Basil EXPERIMENTAL
  - emdebian in chroot (requires root)
- stop Android stack and use X11
- libhybris - bionic HW drivers with glibc
  - [https://github.com/libhybris/libhybris](https://github.com/libhybris/libhybris)
  - Mer on cubieboard [http://martinbrook.blogspot.co.uk/2013/04/adventures-with-libhybris-and-andriod.html](http://martinbrook.blogspot.co.uk/2013/04/adventures-with-libhybris-and-andriod.html)
http://www.bunniestudios.com/blog/?p=918
https://wiki.linaro.org/WorkingGroups/KernelArchived/Projects/FlashCardSurvey