Embedded Linux Talk @ Hacker Dojo
8 OCTOBER 2019

- mender.io → OTA client + server update arch
- Silicon Valley Linux User group

millions of ways to Provision Linux
&
First image on a device

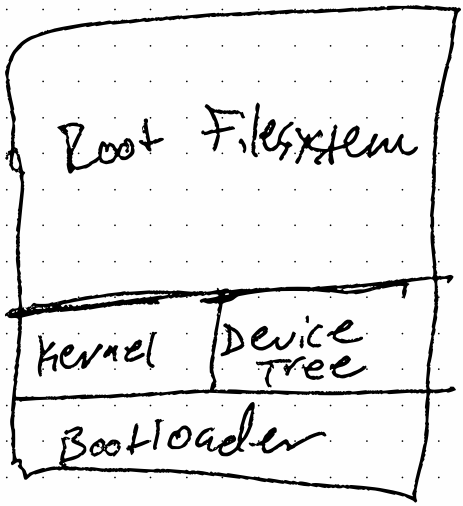
Challenges

- no "one way"
- mechanisms vary between dev/mfg/CI/QA
- mechanisms vary between boards/mfgrs
- ~~lots~~ & slow provisioning

Architecture

- BootHoader - init + scrub RAM
- setup power + clocks
- load everything else

(see slides)



Storage

Bootloader →
1) separate Flash/interface
2) MTD partition
3) Inter partition space (~~NAND~~ emmc)
4) UBI partition (NAND)
5) File in a partition

Kernel/DTB →
1) separate partition
2) Files IN a separate partition
3) Files IN the ROOT FS
4) Files over network – most boards

Root FS →
1) emmc/SD card – BB/RPi/etc
2) Raw NAND (w/ UBI for wear lvling)
3) USB Drive
4) SATA/SSD – NUC/PC
5) NFS – most boards

Yocto + QEMU

- see slides to see how to get shared state images from Yocto servers

- Emulation → good to test but has differences:
  1) No bootloader
  2) NO DTB
  3) Kernel loaded direct from FS
  - ↳ good for non-HW-specific bits

Provisioning model: SD card w/ RasPi3

- proprietary BL in ROM
  - ↳ Loads kernel or u-boot bin as file from FAT
  - ↳ DTB loads as file from FAT
- Root FS mounted from SD/mmc
- BMAP — Much faster block transfer than dd
- Image generated directly by Yocto

Prov model: EMMC w/ Pico Pi imx7

Load uboot image from build platform into RAM

→ # imx_usb SPL
imx_usb uboot.img

From RAM uboot, install new images

Board becomes USB gadget

Prov model: SPI + eMMC w/ Compulab IOT-GATE-imx7

- Jumper selection for SD vs emmc for
  - kernel
  - DTB
  - RFS

uboot into SPI Flash

RFS into eMMC

Prov model: Raw NAND w/ toradex Colibri IMX7 + Aster baseboard

- Boot into recovery mode
- Load uboot into RAM
- what is VIBIZ?
- all this shit happens w/ UBI ←

NAND w/ UBI is VERY FAST

Prov Model: Android Tools w/ Dragon Board 410C

uboot – Fastboot Flash boot bl.img
RFS – Fastboot Flash rootfs img.dragon.ext4

↳ Tend to have Tons (9–10) of partitions in Android.

(see slides For misc provisioning tools)

- Live installers
- Imaging tools
- Protocols

other considerations

- CI/CD integration
- sys devs vs app devs
- Heterogeneous targets → UMS on uboot

Product Dev

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manufacturing

- Unattended installation
- Per-board data
- Registration w/ infrastructure
- Burn-in test vs Production images
  - ↳ i.e. managing multiple image

SVLUG.org
↳ clusterfights talks