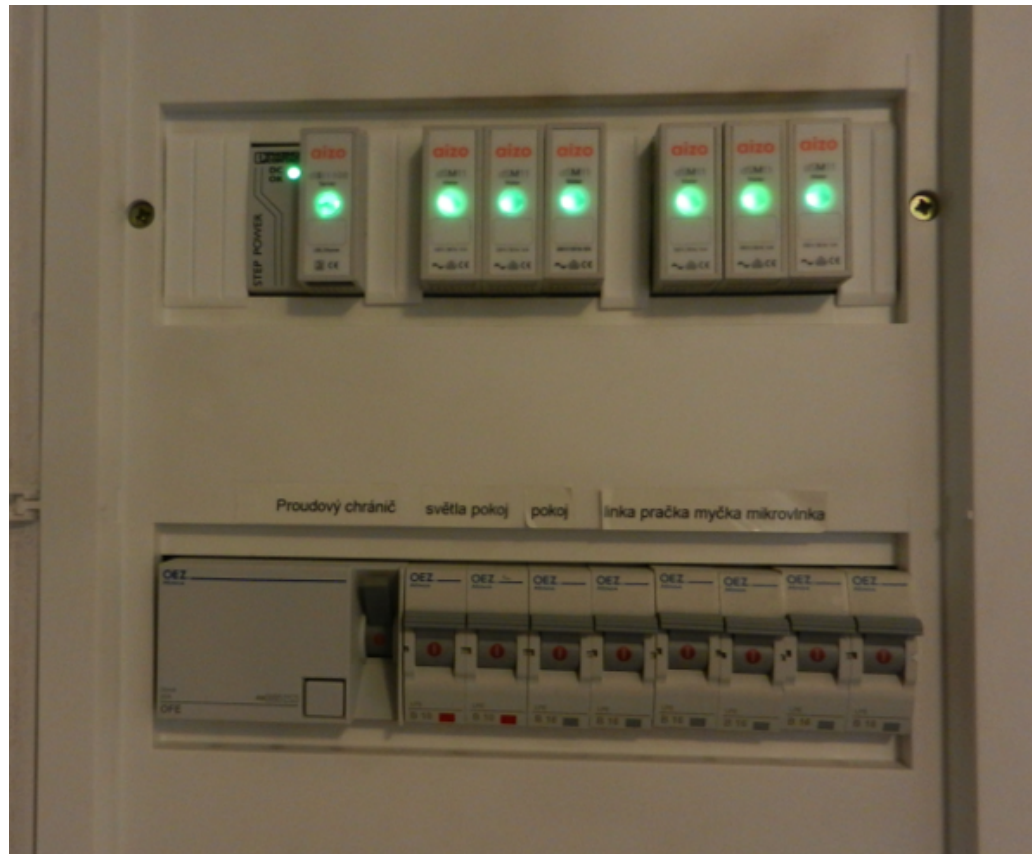


Generic system for safe rootfs/kernel upgrades without single-point of failure

Update hard to de-brick devices



Solution #1

- Download image to RAM erase / flash
- “Jump in the air and hope for a soft landing”
- + Fallback (USB recovery)

Solution #2/#3

- Rolling update (pkg based)
 - history matters (moved files, postinstall hooks)
 - Consistency of rootfs state (different upgrade paths, testing)
- Implement Upgrades in U-Boot
 - partition holds update / u-boot does the flashing
 - u-boot env as mailbox, communication rootfs/u-boot
 - Out-of-tree u-boot changes?

Bricking the Device

- **Power fail**
- External from the update process
 - More likely the longer the update takes
 - More likely the more devices in the field
 - More likely the more frequent the upgrades

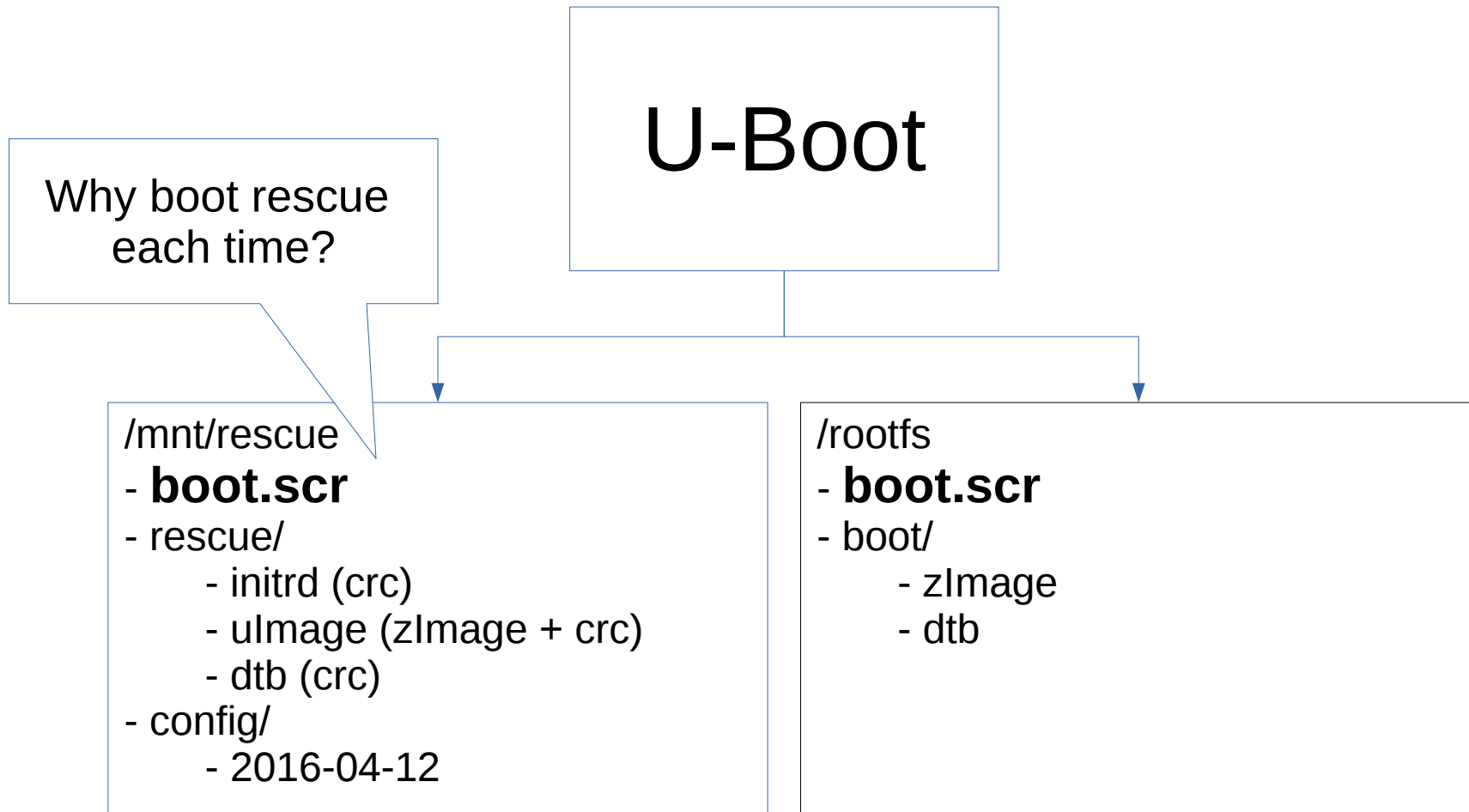
Presented Solution

- Rescue System
 - Minimal Linux system / ramdisk (initrd)
 - Logic to perform upgrades
 - Safely upgradeable

DEMO

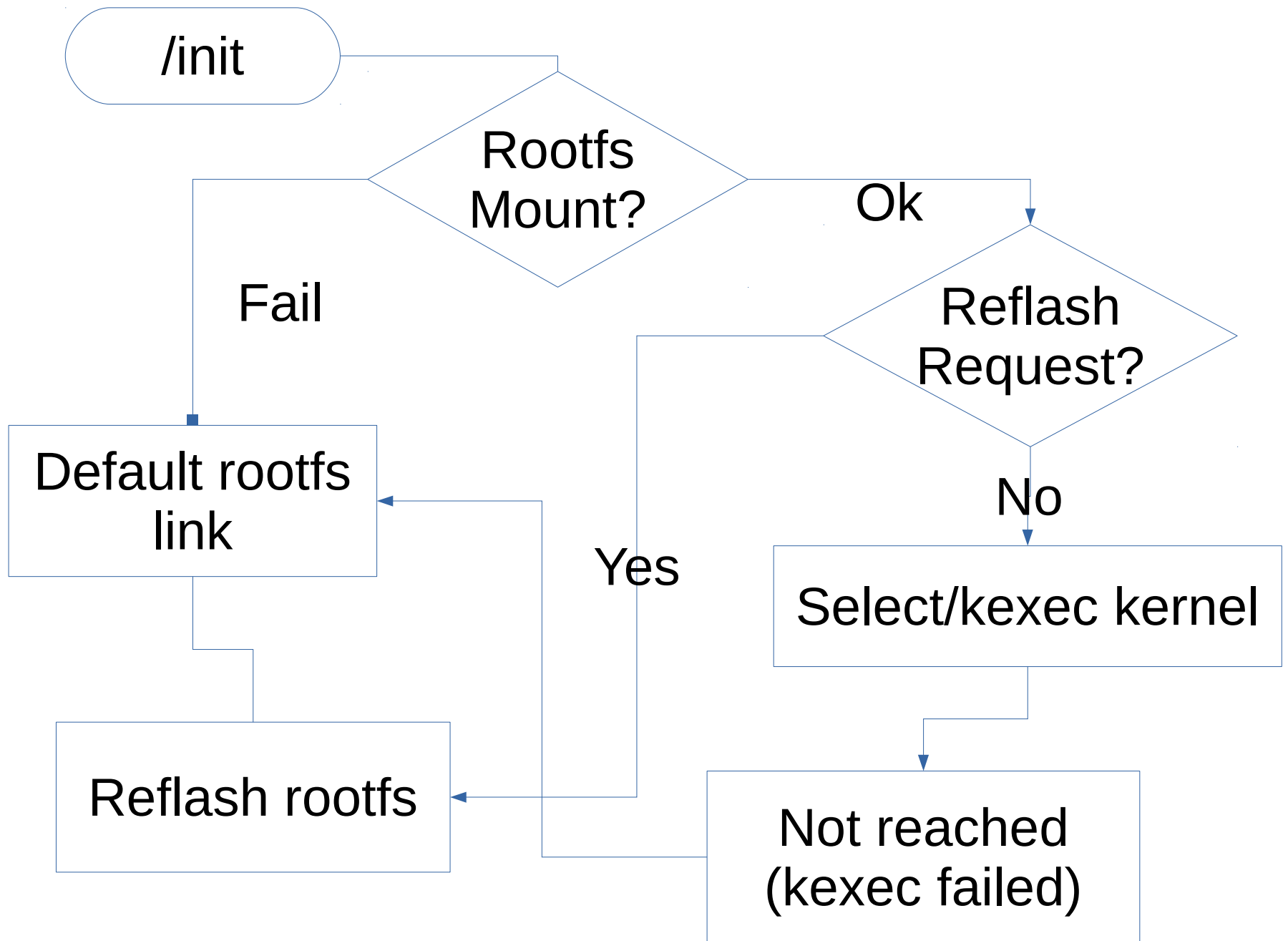
(boot order)

Boot Order



DEMO

(rootfs upgrade)



Why tiny Linux System?

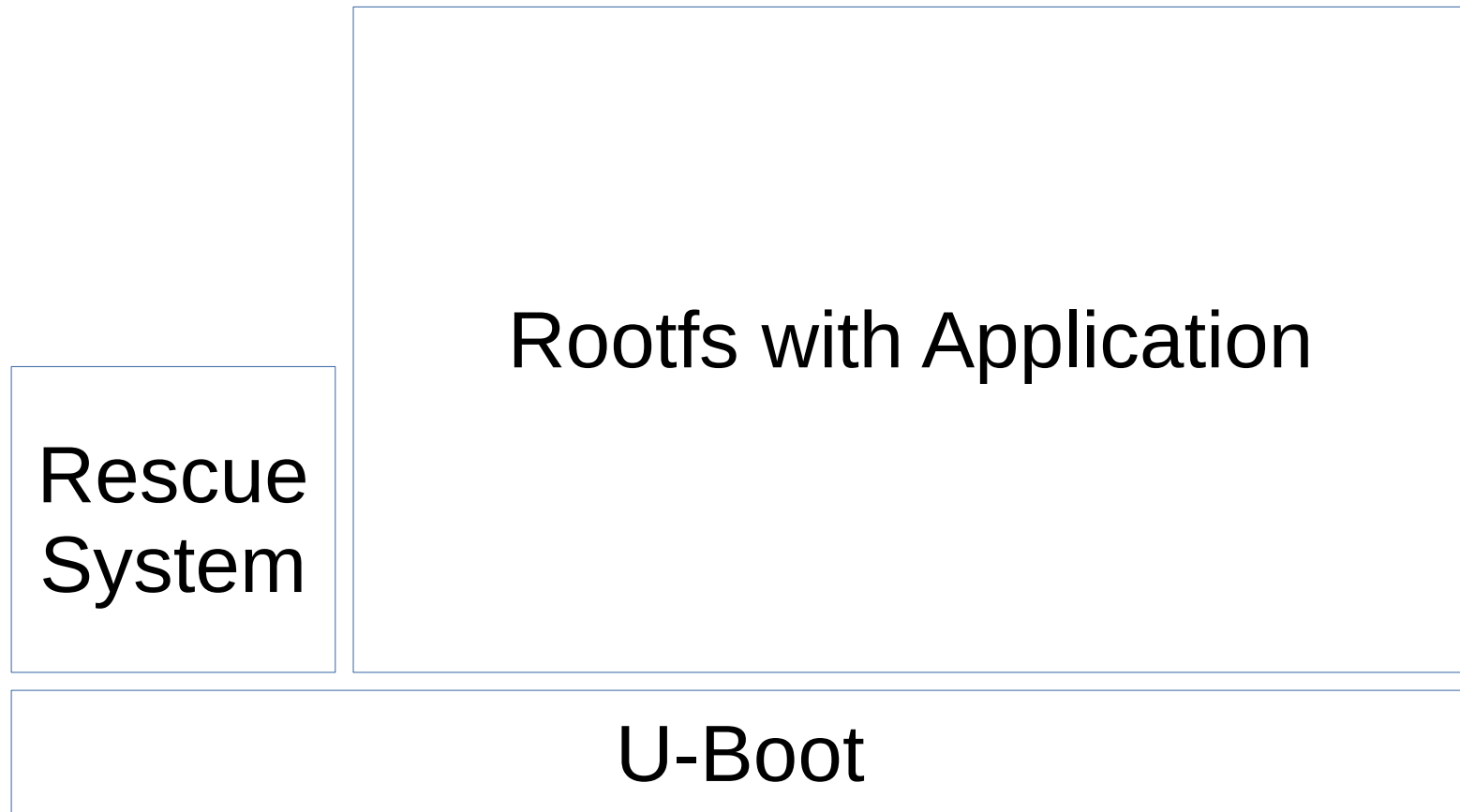
POSIX environment

GPG / HTTPS client

Deploy bug fixes / features

(Keyring updates)

Takes two legs to walk



Unit Tests – Test run

- Shell scripts
- Mock all used shell tools
- Collect output and compare to good version

Unit Tests - Sysroot

Remove Test Specific Files

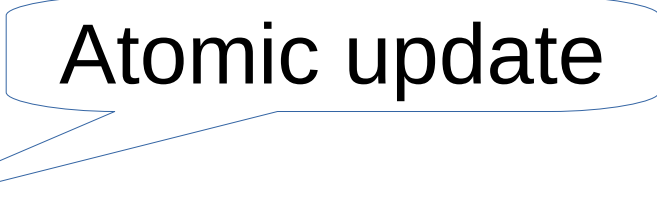
Add Test Specific Files

Machine Files

Common (skeleton) Files

DEMO

Kernel only upgrades

- Drop In configuration files
 - Text file in /boot/entry
 - Bundles zImage/dtb/initrd/cmdline
 - Signature & Checksum
 - <https://freedesktop.org/wiki/Specifications/BootLoaderSpec/>
 - Could be supported by u-boot as well
- 

Simplified boot-entry

/boot/entries/linux-4.1.19.conf

IMAGE_FILE=zImage-4.1.19

IMAGE_CHECKSUM=53bd741b10c91b04c34cd37d5abae...

DTB_FILE=devicetree-4.1.19-dss11-sdc.dtb

DTB_CHECKSUM=9f26ab6ed73e1f674b68075419cc7e...

/boot/entries/linux-2.6.32-fallback.conf

IMAGE_VOLUME_DEVICE=/dev/mtd4

IMAGE_FORMAT=ulimage

ATAGS=true

Roadmap

- Preload image into Partition/RAM if space available
- Handshake: Rootfs confirms it booted correctly, detect “bad/corrupted rootfs”
- Musl / tiny libc
- Mainline patches kexec/linux/yocto

Questions & Answers