Open Software Updates for IoT

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SYSTEMS

Remember IE6?

Microsoft had a platform monopoly in the 90's

Remember how terrible IE6 was?

A 2020's Google monopoly won't be any better

No to Platforms!

No to lock-in!

Platforms are not the answer

Many platform wannabees, much $

All based on vendor lock-in

Instead want tools that solve

problems

Mission: OTA

Me = OTA

I care about Software Updates

Every device needs one

Not currently a solved problem

RPM / DEB?

Just use rpm or dpkg?

+ Easy
- Unsafe during power-off
- Dependency Resolution

```
sudo apt-get update && sudo apt-get dist-upgrade
```

This results in the follow error(s):

```
The following packages have unmet dependencies:
 lsb-base : Breaks: upstart (< 1.12.1-0ubuntu8)
            Breaks: upstart:i386 (< 1.12.1-0ubuntu8)
 plymouth : Depends: initramfs-tools but it is not going to be installed
            Recommends: plymouth-theme-ubuntu-text but it is not going to be installe
                        plymouth-theme
 udev : Depends: initramfs-tools (>= 0.92bubuntu63) but it is not going to be install
        Depends: util-linux (> 2.15~rc2)
E: Error, pkgProblemResolver::Resolve generated breaks, this may be caused by held pa
```

What do I need to do in order to fix these errors?

Dual Bank?

Dual Bank

+ Safe

- Partition flash during manufacture

- R/O root not trivial

- Hard to reuse/share

Bootloader	Rootfs A (R/O)	Rootfs B (R/O)	User data (R/W)

OSTree

"It's like git for a filesystem"

OSTree

- Like git for a filesystem

- Commits are a rootfs

- 1 flash partition

- Multiple systems (chroots)

- From Colin Walters / Gnome

  Continuous

OSTree

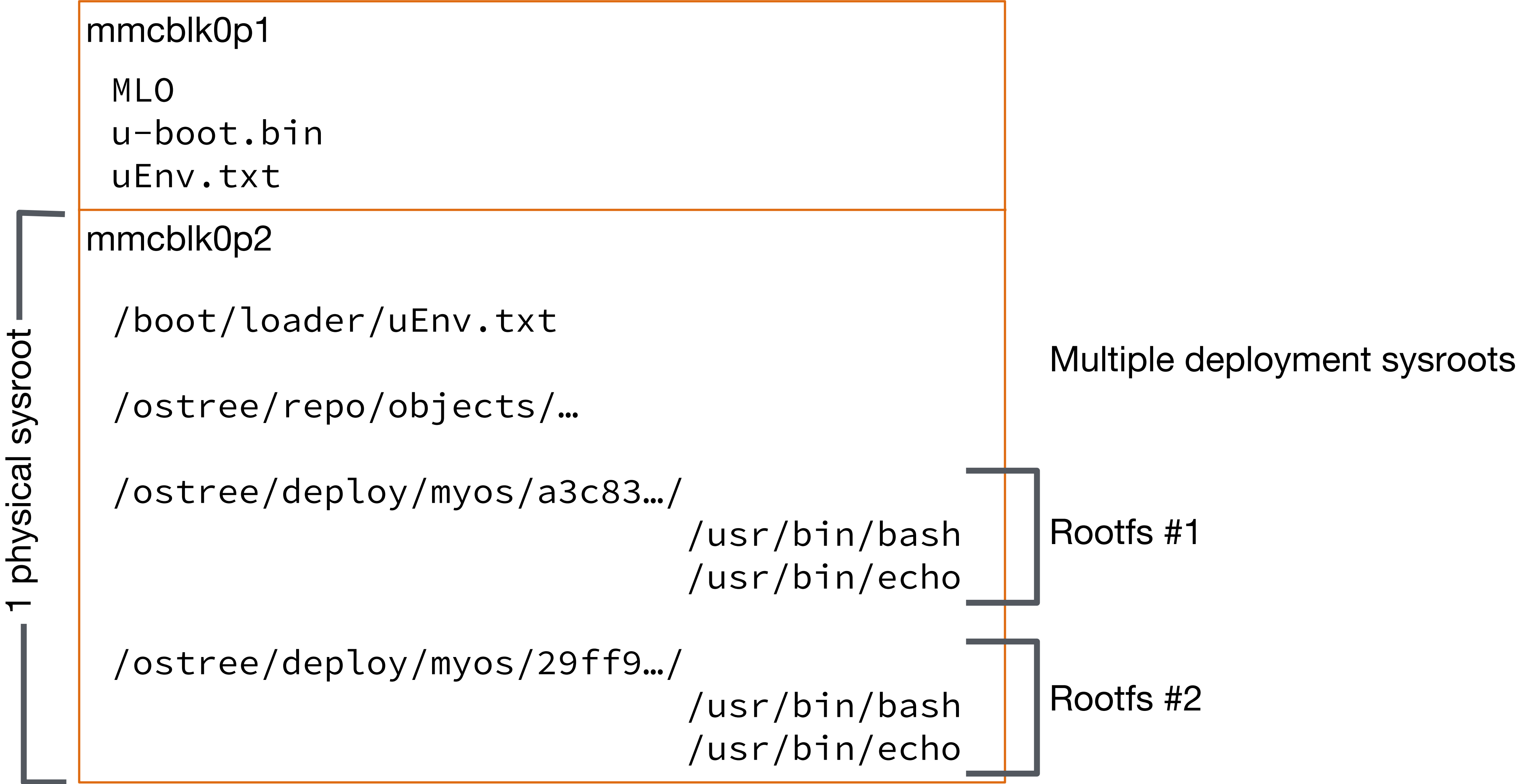## "It's like git for a filesystem"

OSTree

- Incremental fetches (like git pull)

- Hardlink identical files

- Not actually git: Extended Attributes for selinux/smack

OSTree basics

mmcblk0p1

```
MLO
u-boot.bin
uEnv.txt
```

mmcblk0p2

```
/boot/loader/uEnv.txt

/ostree/repo/objects/…

/ostree/deploy/myos/a3c83…/
                    /usr/bin/bash
                    /usr/bin/echo

/ostree/deploy/myos/29ff9…/
                    /usr/bin/bash
                    /usr/bin/echo
```

1 physical sysroot

Multiple deployment sysroots

Rootfs #1

Rootfs #2

OSTree Hard link trees

Files shared using hard links:

/ostree/repo/4b/cdef…

　　　　/b2/…

/ostree/deploy/osname/v1/etc/…

　　　　/usr/bin/bash

　　　　…

/ostree/deploy/osname/v2/etc/…

　　　　/usr/bin/bash

bash

Inside userspace

As a userland application, looks like a normal Linux root:

/usr/bin   - Read only, gets updates

/var   - R/W storage for user data

/var/home - Home directories

/etc   - Magically 3-way merged

/sysroot/   - Physical filesystem root

U-Boot > Kernel > OSTree initrd > /sbin/init

Boot Process

- Bootloader picks deployment

- Boot kernel
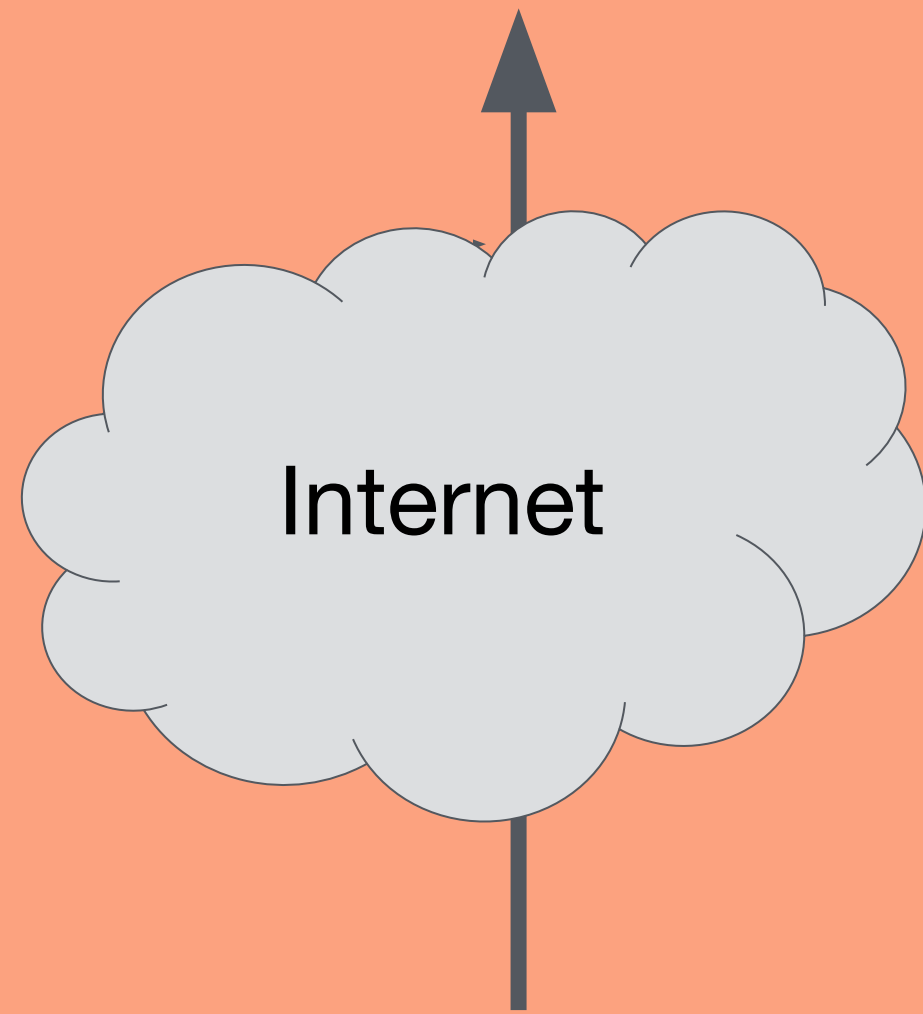
- initrd chroots to correct deployment

Update Process

Update Process

Updates run in background

1. Download objects

2. Deploy into new chroot

3. Flip active deployment in bootloader

4. Wait for reboot

Update Server

Internet

Update Client

OSTree

Server-side component

OSTree handles mechanics

But still need to:

- Serve Updates

- Choose who gets what version

- Provision new devices

Update Server Options

Already have server/client for updates?

=> Just shell out to 'ostree' tool

Otherwise rvi_sota_server and rvi_sota_client

=> Both OSS (MPL2)

=> Scala server, runs in Docker

ATS Garage SaaS

=>20 devices free

Integration - meta-updater

meta-updater

Seamless integration into Yocto build

Build rootfs as an OSTree commit

Initial bootable flash image

Pushing OSTree commits to server (incrementally)

meta-updater-<board>

Bootloader integration for specific hardware

Today: Qemu, Rasberry Pi, Minnowboard Max/Turbot

Demo Time

Ats

ATS GARAGE

Future Plans

Support more boards out-of-the-box

Super-fast incremental rootfs creation

Boot watchdog/rollback

Links

OSTree: https://github.com/ostreedev/ostree

Meta-updater: https://github.com/advancedtelematic/meta-updater

Quickstart with meta-updater and Raspberry Pi:

https://github.com/advancedtelematic/garage-quickstart-rpi

Questions?

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OSTree basics: sysroot

/boot/

    /loader/uEnv.txt

/ostree

    /deploy/os/deploy/da3045…

    /deploy/os/deploy/4eda05…

    /deploy/os/var

/ostree/repo/objects/4eda...4.commit

/ostree/repo/objects/c4b5...5.dirtree

/ostree/repo/objects/805d...a.file

/ostree/repo/objects/7d11…0.file

bootargs=ostree=/ostree/deploy/os/deploy/4eda...4/

Deployment sysroot

/bin -> /usr/bin
/lib -> /usr/lib
/var
/usr
    /lib
        /libostree-1.so.1