Improved Android Testing in LAVA with Docker

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Linaro TECH DAYS

Improved {Android, LKFT, QEMU} Testing in LAVA with Docker

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About me

- Antonio Terceiro
- Software Engineer at Linaro
  - SQUAD
  - LAVA
- Free software developer
  - Debian project member
  - Debian CI project founder
  - Drive-by patch contributor to *a lot* of projects

Agenda

- Very brief introduction to LAVA
- The use cases for using docker in LAVA
- Overview of current solution (LXC)
- Overview of the new solution (docker)
- Current status

LAVA

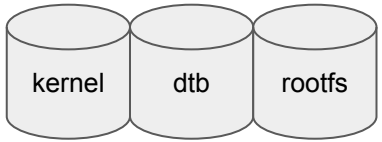
A brief introduction

LAVA

- **L**inaro **A**utomated **V**alidation **A**rchitecture
- Test execution system: **testing software** on **real hardware**
  - **Deploy, Boot and Test**
- Usages
  - Boot testing: kernelci
  - System level testing: lkft
  - Power consumption
  - Benchmarks
  - Multinode
    - Test with many devices
  - ...

LAVA
linaro.org/lava

Testing without LAVA

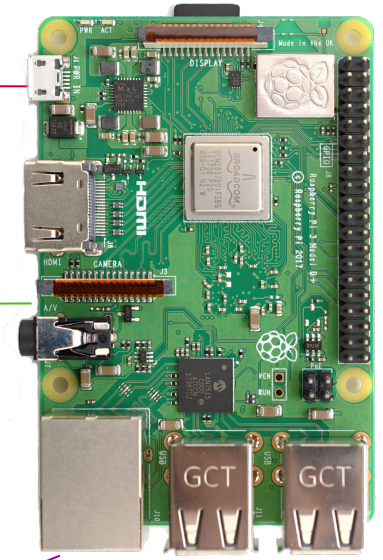


```
% power on board
% telnet localhost 2000
<enter>
=> dhcp
=> setenv serverip 10.3.1.1
=> […]
=> bootm 0x01000000 - 0x03f00000
[…]
raspberrypi3 login: root
# run-test.sh
[…]
% power off board
```

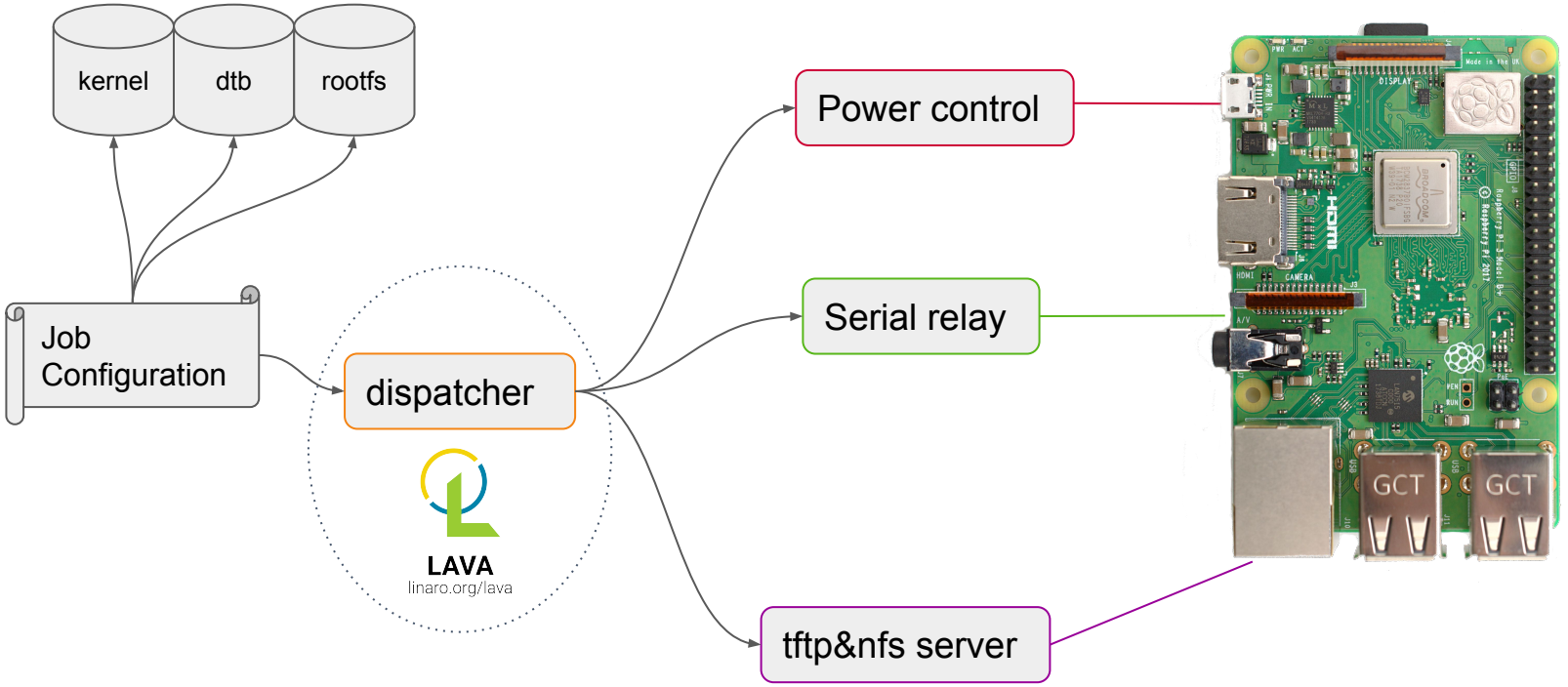
Power control

Serial relay

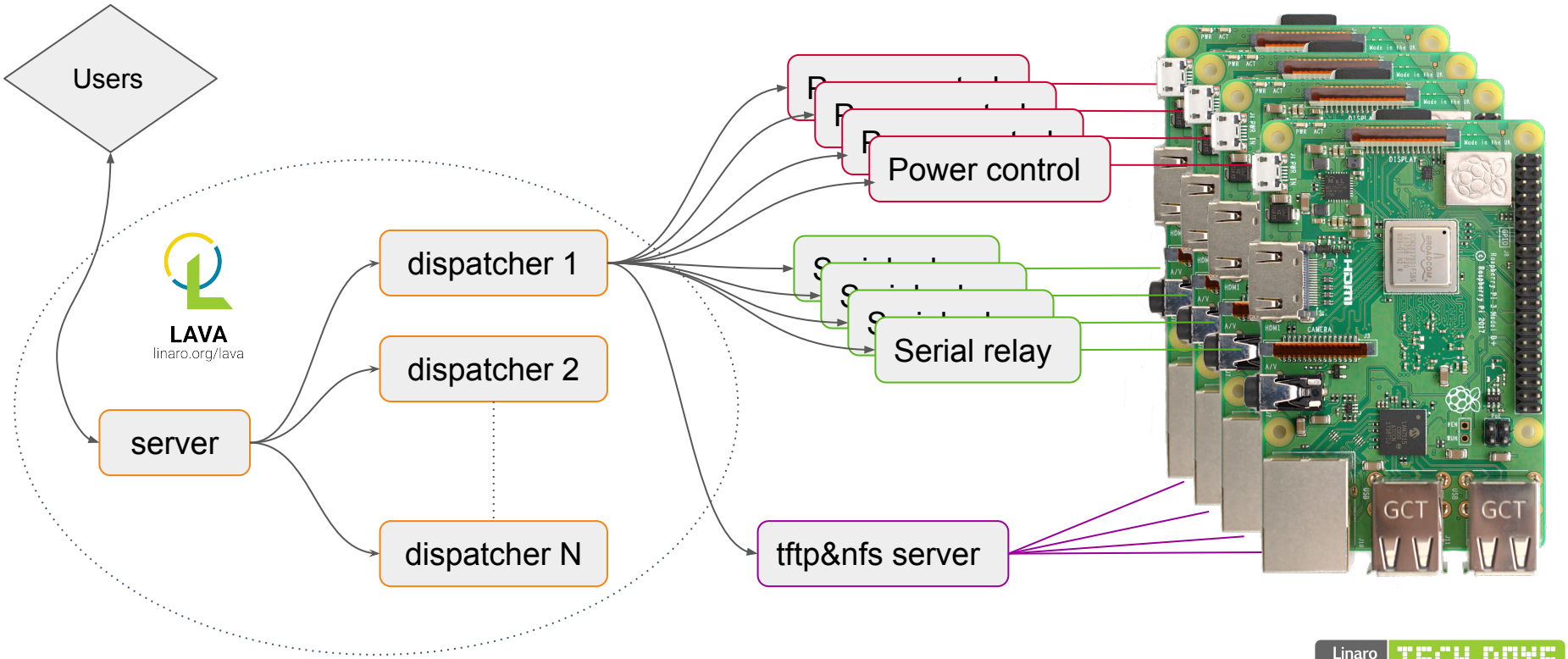
tftp&nfs server



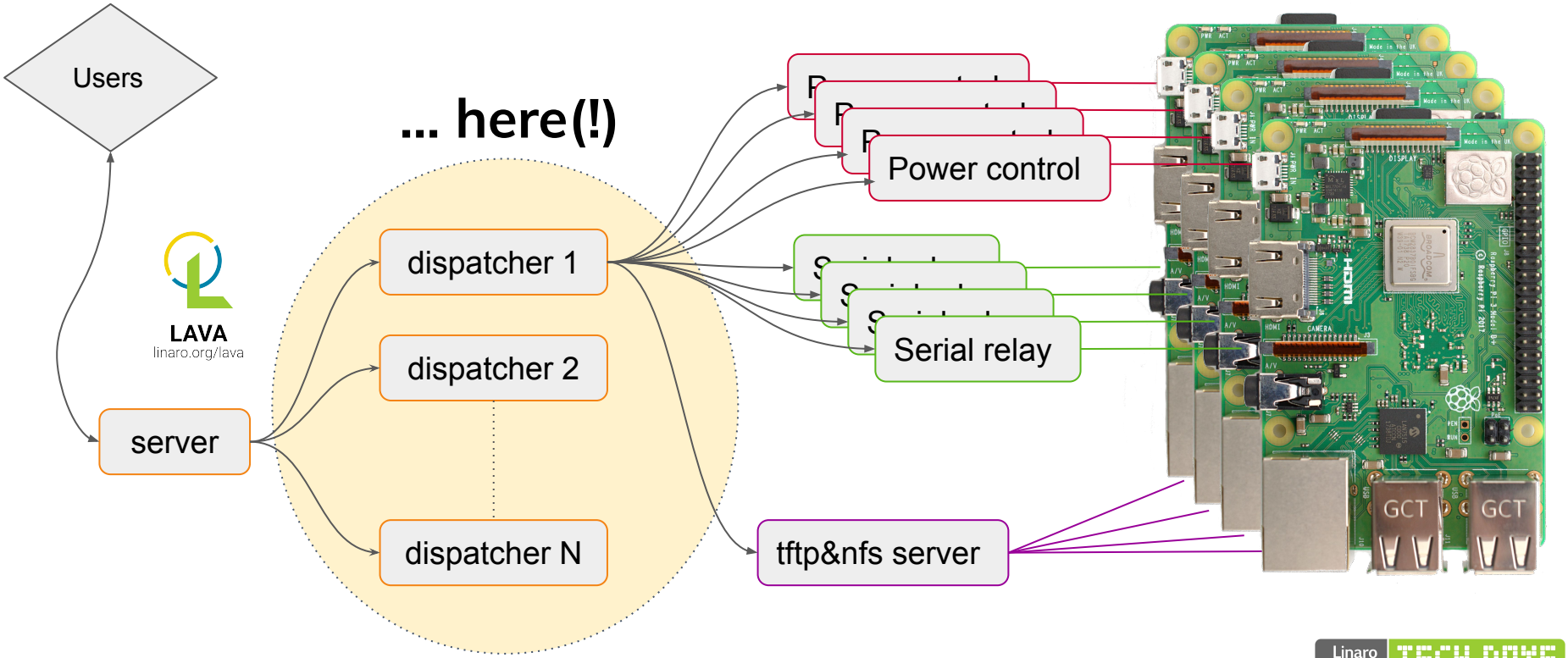
Testing with LAVA



LAVA architecture



The Use Case: Running arbitrary code ...



The Use Case: examples

- AOSP testing: connecting to DUT with adb
  - CTS/VTS
- Providing custom/specific adb/fastboot binaries for deploy and boot
- Manipulating downloaded images
  - E.g. Combining rootfs with kernel modules
- Providing custom QEMU binaries

Current support: LXC

- Requires to deploy and boot a LXC container
- Test job needs to contain explicitly instructions to install needed software (adb/fastboot/others)
- Job definition is long and complex
- Running CTS/VTS test suites against an Android build entails explicit actions to
  - Deploy lxc container
  - Boot lxc container
  - Install necessary tools inside lxc container
  - Deploy images to DUT
  - Boot DUT
  - Run tests from lxc container

LXC vs Docker

LXC

- Full system containers
  - They boot and have an init system
  - System services start
  - Containers look and feel like VMs
- Usually only vanilla OS images are distributed

Docker

- Application containers
  - Executes only one application
  - System services are not started
- Images with applications pre-installed are widely distributed
  - Based on vanilla OS images
- Curiosity: docker once used lxc as a container runtime under the hood.

New: docker support

Pros:

- Can use any available pre-built image, with dependencies already installed
- Test job is greatly reduced

Use cases supported:

- Run adb/fastboot inside docker for deploy, boot and test.
  - Status: available in **LAVA 2020.02**
- Manipulate images after download
  - Status: merged, will be available in **LAVA 2020.03**
- Provide custom QEMU binaries
  - Status: merged, will be available in **LAVA 2020.03**

Example 1:
Running adb/fastboot on docker

Example 1: running adb/fastboot on docker (1)

```
- deploy:
    to: fastboot
    docker:
        image: adb-fastboot
    timeout:
        minutes: 15
    images:
        boot:
            url: http://example.com/images/aosp/hikey/boot.img
            reboot: hard-reset
        # ...
```

Example 1: running adb/fastboot on docker (2)

```
- boot:
    method: fastboot
    docker:
        image: adb-fastboot
    prompts:
        - 'healthd: No battery devices found'
        - 'hikey: '
        - 'console:'
    timeout:
        minutes: 15
```

Example 1: running adb/fastboot on docker (3)

```
- test:
    docker:
        image: adb-fastboot
    timeout:
        minutes: 5
    definitions:
        -   repository:
                # [...]
            from: inline
            path: inline-smoke-test
            name: docker-test
```

Example 2:
Manipulating downloaded images

Example 2: manipulating downloaded images (1)

```
- deploy:
    to: downloads
    images:
        # [...]
        kernel:
            url: http://images.com/.../Image
        modules:
            url: http://images.com/.../modules.tar.xz
        rootfs:
            url: http://images.com/.../rootfs.ext4.gz
            apply-overlay: true
    postprocess:
        docker:
            image: terceiro/kir
            steps:
                - /kir/lava/board_setup.sh hi6220-hikey-r2
```

Example 2: manipulating downloaded images (1)

```
- deploy:
    to: fastboot
    docker:
        image: terceiro/kir
    images:
        ptable:
            url: downloads://ptable-linux-8g.img
            reboot: hard-reset
        boot:
            url: downloads://boot.img
            reboot: hard-reset
        system:
            url: downloads://rootfs.img
            apply-overlay: true
```

Example 3:
Running a custom QEMU binary

Example 3: running a custom QEMU binary

```
- boot:
    method: qemu
    docker:
        image: my-qemu-image
        binary: /path/to/qemu-bin # optional
    media: tmpfs
    prompts: ["root@debian:"]
    auto_login:
        login_prompt: "login:"
        username: root
    # [...]
```

Closing remarks

Closing remarks

- LAVA 2020.02
  - running adb/fastboot from docker (example 1)
- LAVA 2020.03
  - Manipulating downloaded images (example 2)
  - Custom QEMU binary from docker (example 3)
- Future
  - LXC/docker Migration guide
  - Improvements to running the entire dispatcher as a docker container

Questions?

Thank you

Accelerating deployment in the Arm Ecosystem

LAVA team IRC: #linaro-lava, #lavasoftware
https://www.lavasoftware.org/

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