Testing with volcanoes

●●●

Fuego + LAVA
Embedded testing going distributed

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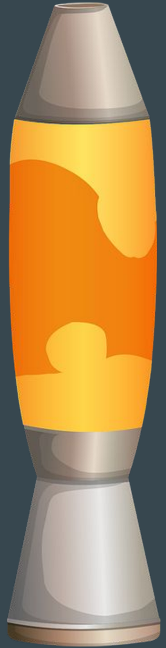

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Release Manager & CI and automated tests for Automotive Grade Linux (AGL)

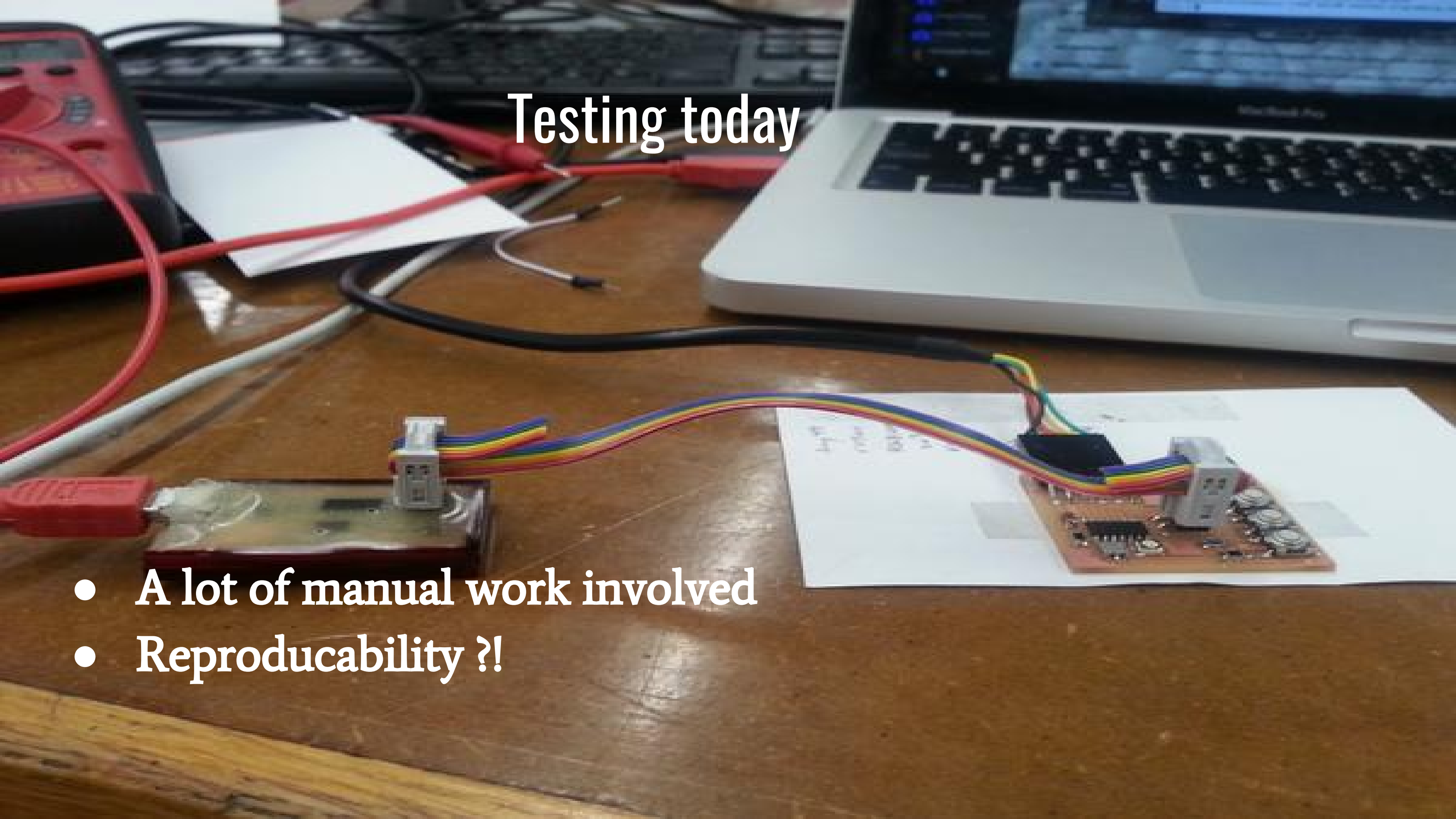
--> AGL ... what ? See us at the technical showcase !

Topics

- Testing today
- Existing Tools
- The problem with testing on HW !
- A solution …
- Demo
- HowTo
- Good/Bad
- Next
- QA ?!

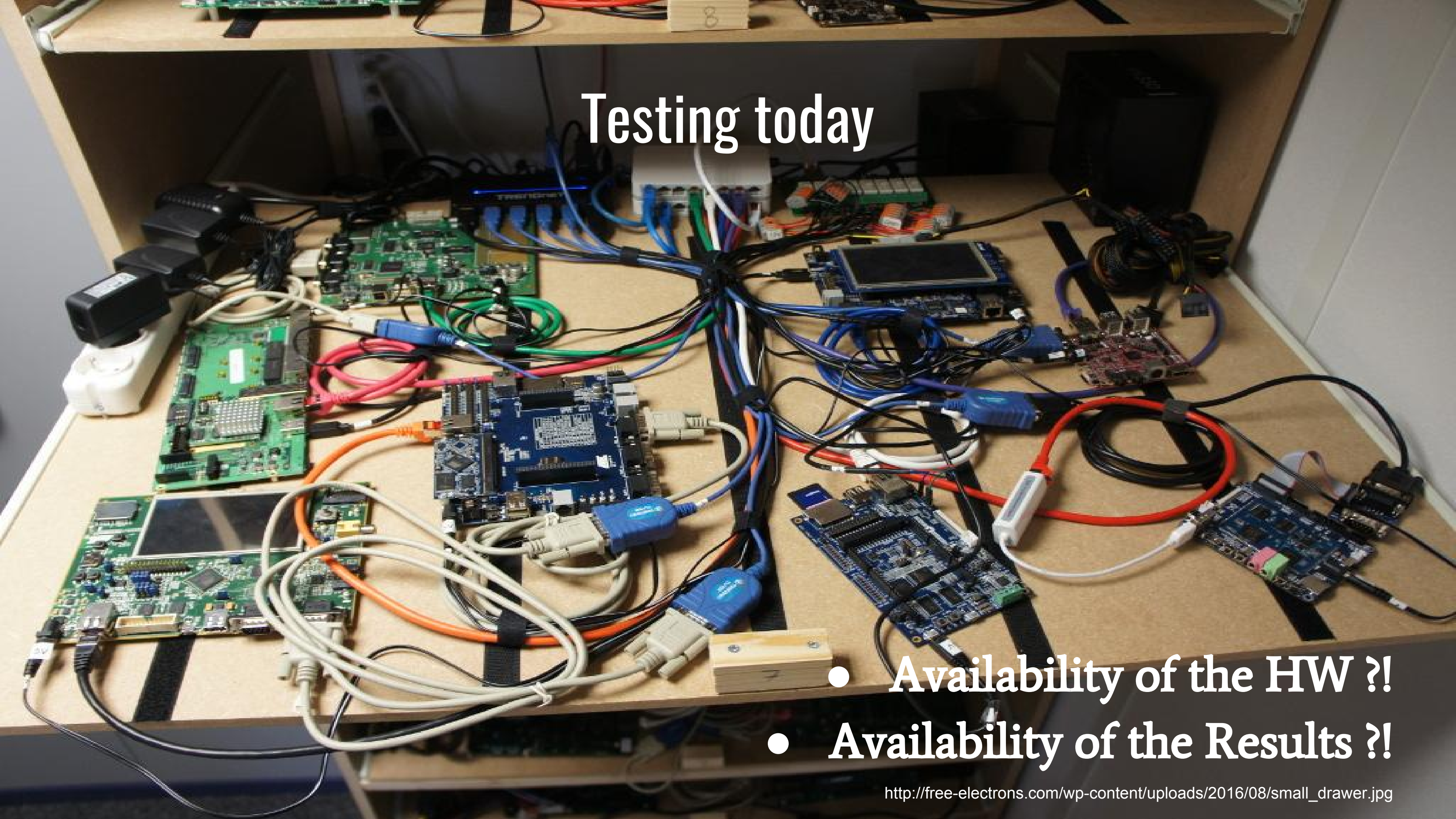
Image: https://upload.wikimedia.org/wikipedia/commons/a/ae/Pacaya-10.JPG

Testing today



- A lot of manual work involved
- Reproducability ?!

Testing today



- Availability of the HW ?!
- Availability of the Results ?!

http://free-electrons.com/wp-content/uploads/2016/08/small_drawer.jpg

Testing today

Ask yourself:

How do you develop code ?

-> distributed !

vs.

How do we test ?

(yes, it’s not that simple)

Image: Linaro/Youtube

Existing Tools, trends

- Autotest - https://autotest.github.io/
- Jenkins + homebrew
- manual

Distro / Server

“non-distributed”

Embedded

- **LAVA - http://validation.linaro.org**
- **Fuego - http://elinux.org/Fuego / http://bird.org/fuego/FrontPage**

“distributed”

- KernelCI - https://kernelci.org/

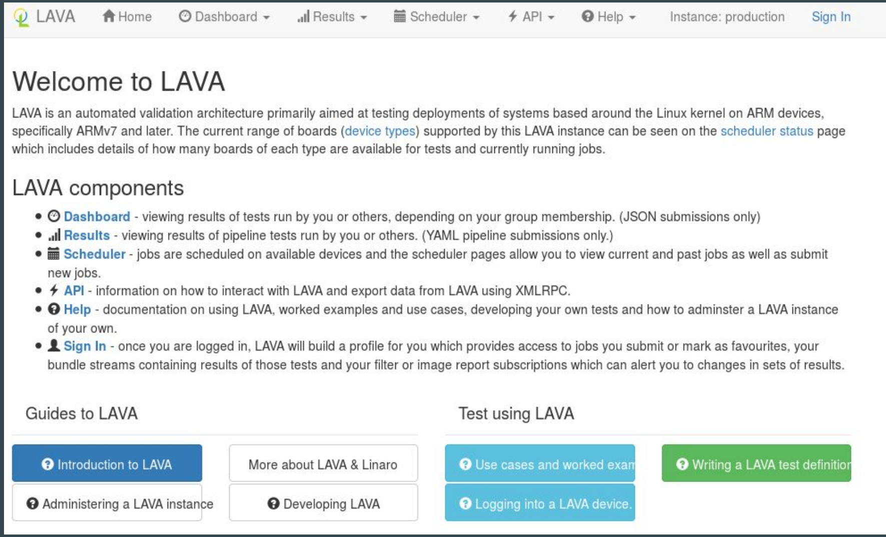
Aggregation/Frontend

LAVA

URL: http://validation.linaro.org

Framework to test on target hardware, evolved around the Linux kernel on ARM devices.

- + Very good support for board farms
- + A lot of boot and deployment mechanisms supported (u-boot/fastboot/pxe, nfs/tftp/usb)
- + Slave/Worker runs even on RaspberryPi
- - Initial learning curve quite steep, complex set-up
- - Debian packages only



Welcome to LAVA

LAVA is an automated validation architecture primarily aimed at testing deployments of systems based around the Linux kernel on ARM devices, specifically ARMv7 and later. The current range of boards (device types) supported by this LAVA instance can be seen on the scheduler status page which includes details of how many boards of each type are available for tests and currently running jobs.

LAVA components

- **Dashboard** - viewing results of tests run by you or others, depending on your group membership. (JSON submissions only)
- **Results** - viewing results of pipeline tests run by you or others. (YAML pipeline submissions only.)
- **Scheduler** - jobs are scheduled on available devices and the scheduler pages allow you to view current and past jobs as well as submit new jobs.
- **API** - information on how to interact with LAVA and export data from LAVA using XMLRPC.
- **Help** - documentation on using LAVA, worked examples and use cases, developing your own tests and how to adminster a LAVA instance of your own.
- **Sign In** - once you are logged in, LAVA will build a profile for you which provides access to jobs you submit or mark as favourites, your bundle streams containing results of those tests and your filter or image report subscriptions which can alert you to changes in sets of results.

Guides to LAVA
Test using LAVA
Introduction to LAVA
More about LAVA & Linaro
Use cases and worked exam
Writing a LAVA test definitio
Administering a LAVA instance
Developing LAVA
Logging into a LAVA device.

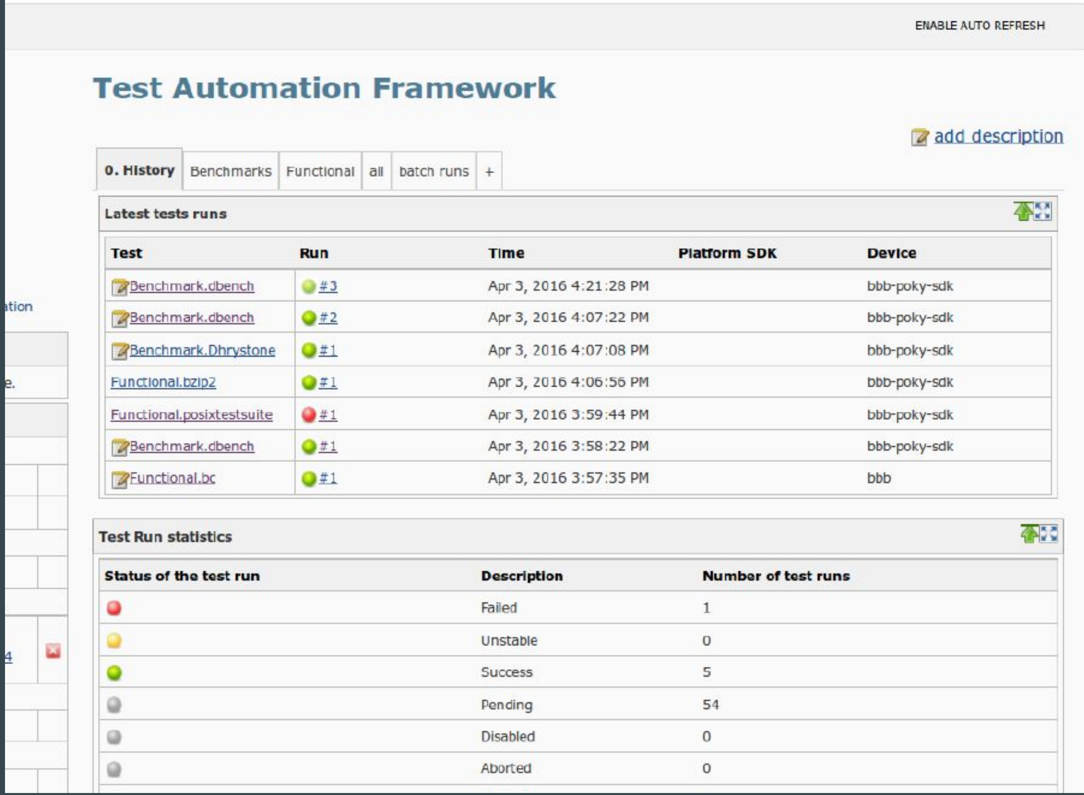
Fuego

http://elinux.org/Fuego

Fuego = (Jenkins + abstraction scripts + pre-packed tests) inside a container

Evolved out of LTSI-Kernel Project

- + Large number of tests
- + Reporting
- - heavy setup (jenkins/java)
- - “Local Lab” (not distributed)



Test Automation Framework

Latest tests runs

Test	Run	Time	Platform SDK	Device
Benchmark.dbench	🟢 #3	Apr 3, 2016 4:21:28 PM		bbb-poky-sdk
Benchmark.dbench	🟢 #2	Apr 3, 2016 4:07:22 PM		bbb-poky-sdk
Benchmark.Dhrystone	🟢 #1	Apr 3, 2016 4:07:08 PM		bbb-poky-sdk
Functional.bzip2	🟢 #1	Apr 3, 2016 4:06:56 PM		bbb-poky-sdk
Functional.posixtestsuite	🔴 #1	Apr 3, 2016 3:59:44 PM		bbb-poky-sdk
Benchmark.dbench	🟢 #1	Apr 3, 2016 3:58:22 PM		bbb-poky-sdk
Functional.bc	🟢 #1	Apr 3, 2016 3:57:35 PM		bbb

Test Run statistics

Status of the test run	Description	Number of test runs
🔴	Failed	1
🟡	Unstable	0
🟢	Success	5
●	Pending	54
●	Disabled	0
●	Aborted	0

Problem:

How to distribute tests and aggregate Results

We develop in a distributed manner, on platforms w/o access to all target hardware.

How can we make sure our changes work on target devices ?

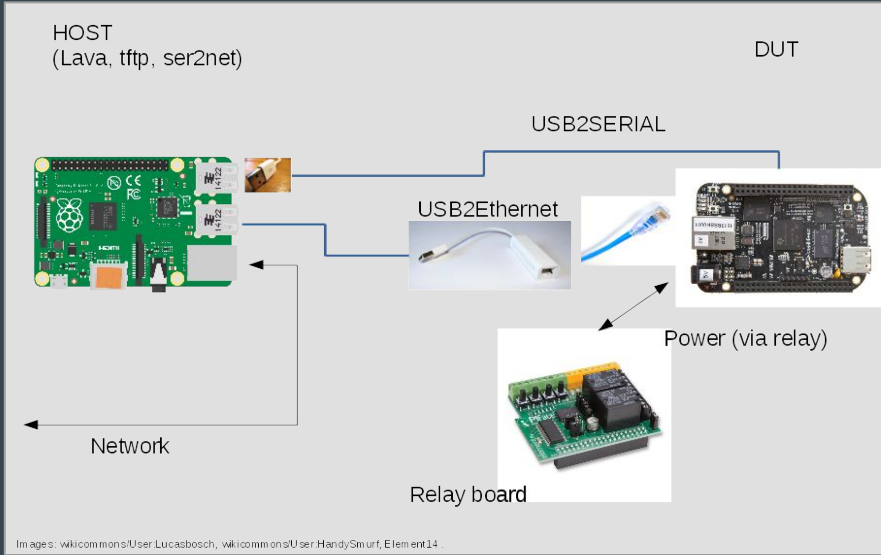
So: a) distribute the tests

b) aggregate results

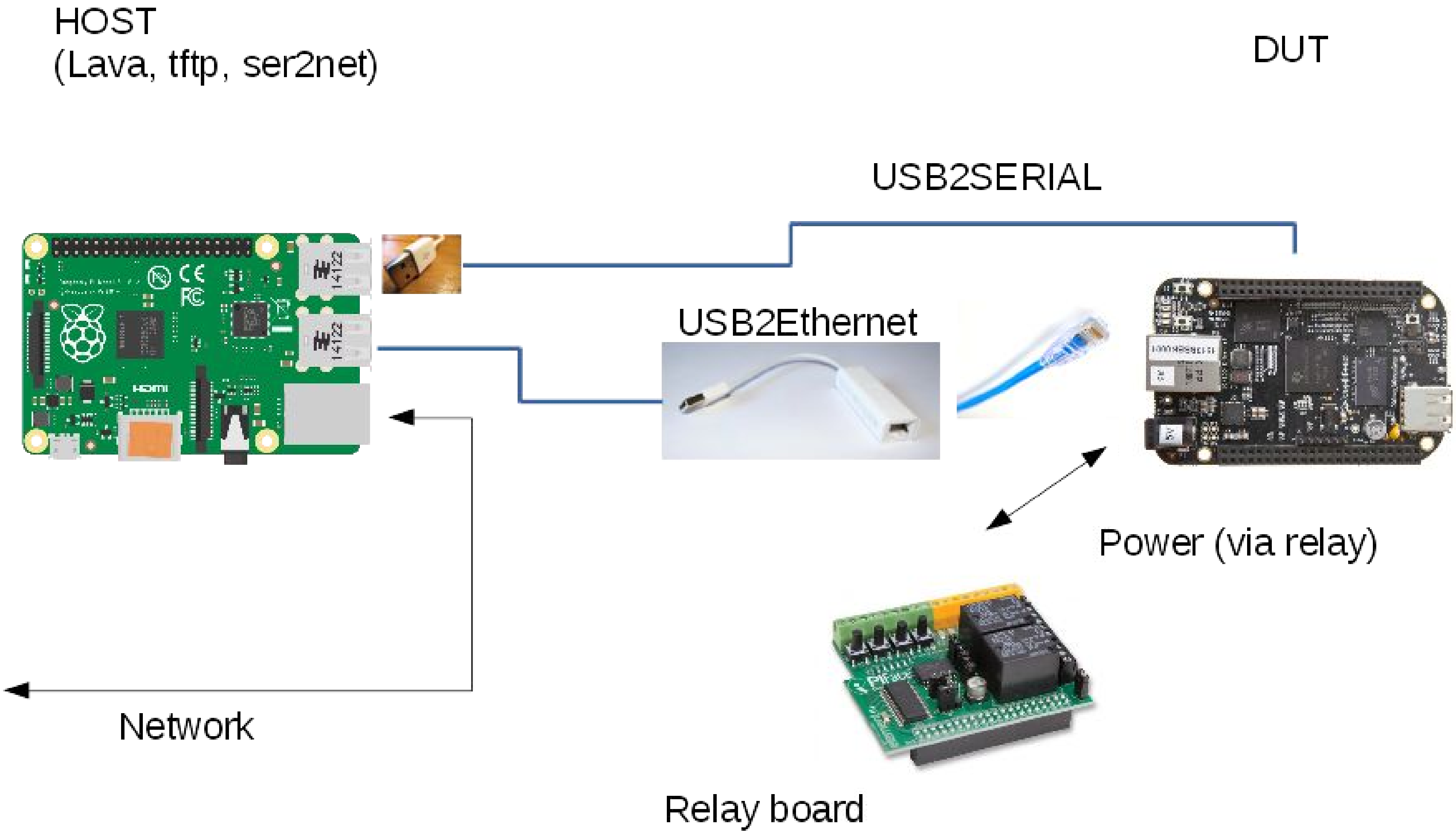
a) distribute the tests

- ✓ Latest LAVA has a new implementation “v2” or “pipeline”. This newer version enables slave-labs to attach to the master over an encrypted zmq pipe.
- ✓ This means we can have “Satellite Labs”
- ✓ No need to have all hardware in one place
- ✓ Only requirement is:
  - ○ (remote-) controlled power switch / relay
  - ○ serial
  - ○ network (int/ext)
- ✓ --> could become the

;) ;) “SETI-at-home” for tests on hardware



Images: wikicommons/User:Lucasbosch, wikicommons/User:HandySmurf, Element14 .



HOST
(Lava, tftp, ser2net)

DUT

USB2SERIAL

USB2Ethernet

Power (via relay)

Network

Relay board

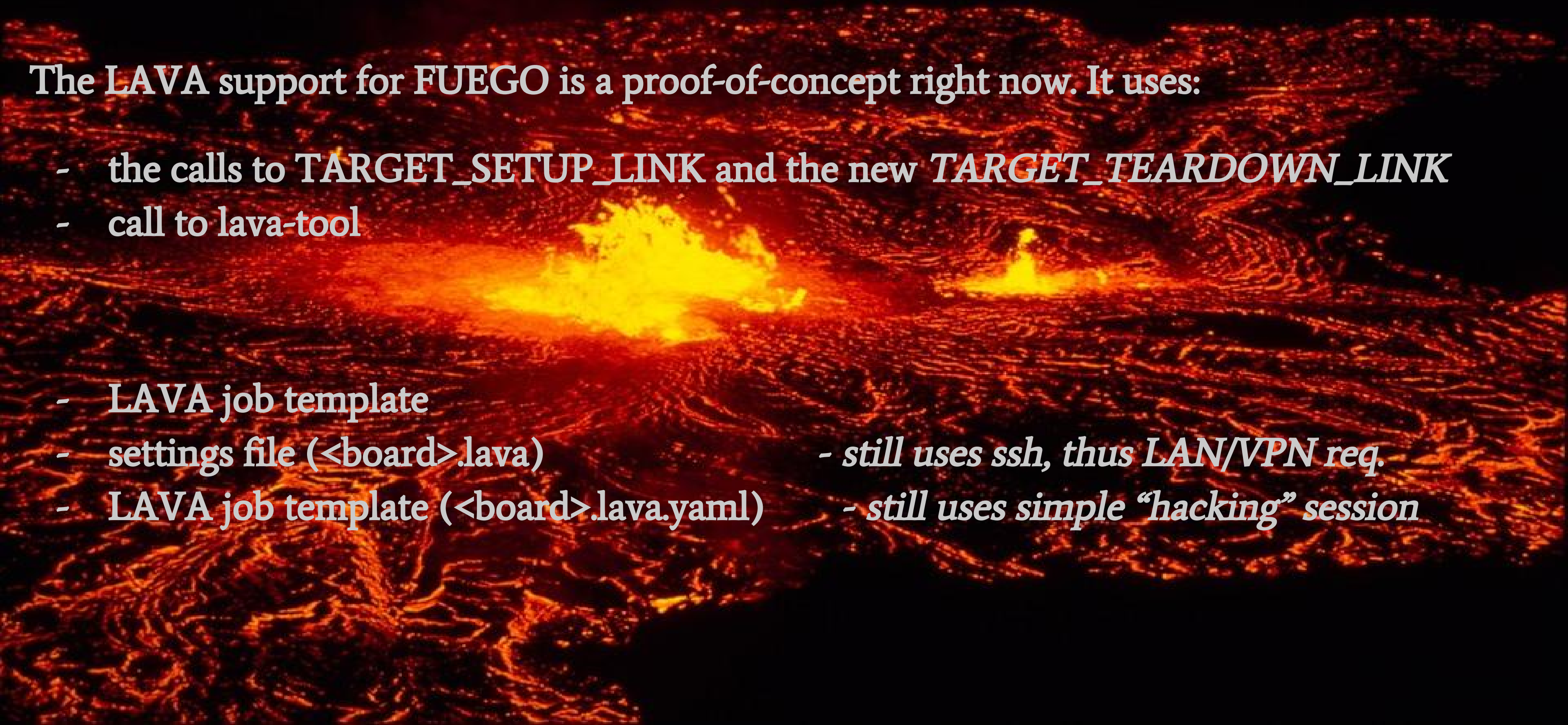
b) aggregate results

- Just running tests is not enough !
- The data needs to be parsed and aggregated and post-processed and stored

We give Fuego a spin here:

- ➢ Large set of built-in tests with existing parsers
- ➢ Possibility to post-process and aggregate the results

FUEGO + LAVA



The LAVA support for FUEGO is a proof-of-concept right now. It uses:

- the calls to TARGET_SETUP_LINK and the new *TARGET_TEARDOWN_LINK*
- call to lava-tool

- LAVA job template
- settings file (<board>.lava)
- LAVA job template (<board>.lava.yaml)

- still uses ssh, thus LAN/VPN req.

- still uses simple “hacking” session

DEMO

… pray to the demo gods …

HowTo

Check https://bitbucket.org/dl9pf/fuego branch “next”, AAA_QUICKSTART.md .

- setup LAVA, create user, create token
- git clone --branch next https://bitbucket.org/dl9pf/fuego.git
- git clone --branch next https://bitbucket.org/dl9pf/fuego-core.git
- cd fuego/ && ./install.sh
- ./fuego-host-scripts/docker-create-container.sh
- ./fuego-host-scripts/docker-start-container.sh
- fuego-create-node --board raspberrypi3 docker
- fuego-create-jobs --board raspberrypi3 --testplan testplan_default --distrib nosyslogd.dist
- You need to edit conf/boards/raspberrypi3.lava and conf/boards/raspberrypi3.lava.yaml for your setup

The the repo in a few days for updates … WIP

The Good

- The chosen path to create a new “session or job” for each test is quite reliable.
- LAVA board handling proves to be very stable and reliable
- Fuego works in this mode ‘out of the box’

The Bad

- Fuego:
    - There were predefined timeouts in Fuego -> now waaaay to small
        - These need to be done more fine-grained or dynamic
    - Fuego keeps the board ‘open’ even during compilation and postprocessing
        - That needs to be split into separate and independent execution phases

- LAVA:
    - lava tool should expose more information about the pipline progress
        - E.g. I would easily like to block until the login is up (and not until all is done)
    - Better way to expose the terminal to client/downstream applications.
        - Would be interesting to use the 0mq pipe -

Whats Next ?!

- Cleanup (PoC on-top of -next ;))
- Interaction with the Fuego transport layer/subsystem to allow multiple executors
- pool one lava session for multiple tests in a row (to save setup/bootup time!)
- alternative to ssh for the transport for the terminal
- ....
- add your's ...
- ....
- Join the FUEGO BOF on thursday !!

We need you !

- Try it yourself !

- Check out the projects like LAVA and Fuego
- Contribute to projects like KernelCI

My call to action:

- Let’s work out ways to test collaboratively and share the results !

Call to action:

- Let’s work out ways to test collaboratively and share the results !

- Regardless which $TESTSYSTEM you run in the end
- Aggregating results creates
  - a shared baseline to evaluate future results
  - rises the bar in the ecosystem as a whole

- Not reinventing the wheel:
- One common format is e.g. TAP (Test Anything Protocol)
  - https://testanything.org/

Links, References and Docs

Fuego: http://elinux.org/Fuego

LAVA: http://validation.linaro.org

KernelCI: http://kernelci.org

Automotive Grade Linux: www.automotivegradelinux.org

QA ?!

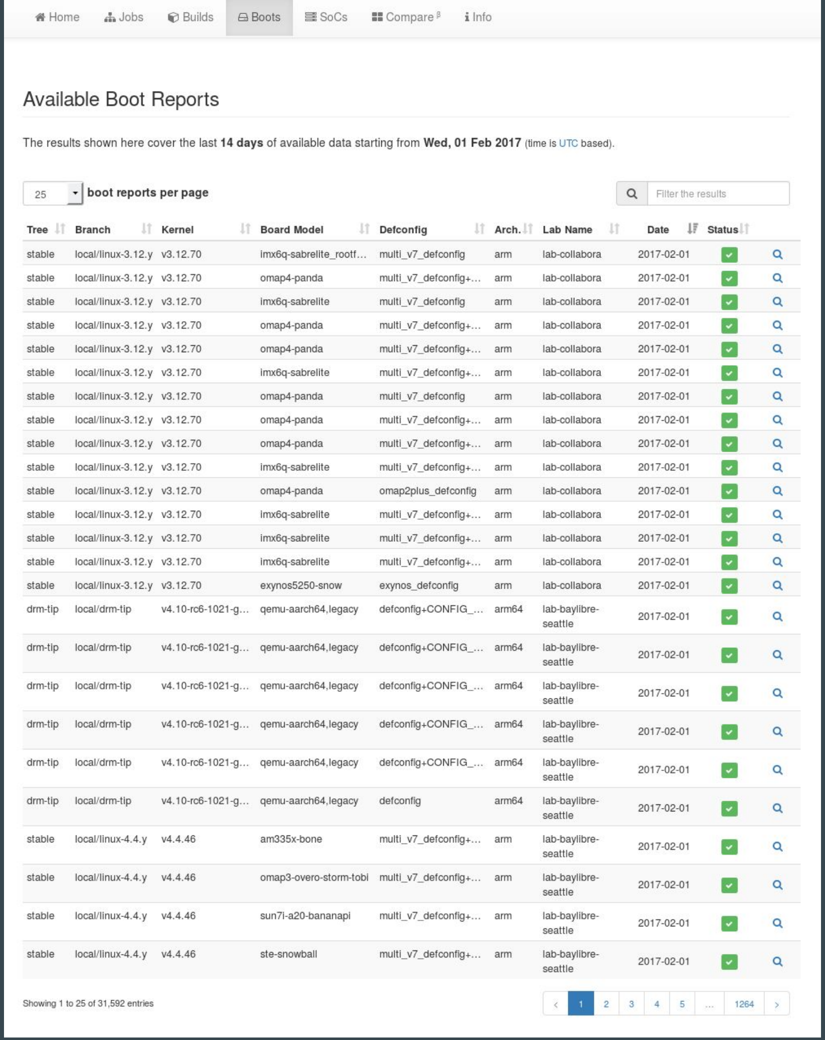
QA

KernelCI

www.kernelci.org

Frontend for aggregating tests, test-results across multiple combinations of:

- architecture (arm, aarch64, x86, amd64)
- Kernel Config options
- branches
- target boards



Available Boot Reports

The results shown here cover the last **14 days** of available data starting from **Wed, 01 Feb 2017** (time is UTC based).

25 **boot reports per page**

Tree	Branch	Kernel	Board Model	Defconfig	Arch.	Lab Name	Date	Status	
stable	local/linux-3.12.y	v3.12.70	imx6q-sabrelite_rootf…	multi_v7_defconfig	arm	lab-collabora	2017-02-01	✓	🔍
stable	local/linux-3.12.y	v3.12.70	omap4-panda	multi_v7_defconfig+…	arm	lab-collabora	2017-02-01	✓	🔍
stable	local/linux-3.12.y	v3.12.70	imx6q-sabrelite	multi_v7_defconfig	arm	lab-collabora	2017-02-01	✓	🔍
stable	local/linux-3.12.y	v3.12.70	omap4-panda	multi_v7_defconfig+…	arm	lab-collabora	2017-02-01	✓	🔍
stable	local/linux-3.12.y	v3.12.70	omap4-panda	multi_v7_defconfig+…	arm	lab-collabora	2017-02-01	✓	🔍
stable	local/linux-3.12.y	v3.12.70	imx6q-sabrelite	multi_v7_defconfig+…	arm	lab-collabora	2017-02-01	✓	🔍
stable	local/linux-3.12.y	v3.12.70	omap4-panda	multi_v7_defconfig	arm	lab-collabora	2017-02-01	✓	🔍
stable	local/linux-3.12.y	v3.12.70	omap4-panda	multi_v7_defconfig+…	arm	lab-collabora	2017-02-01	✓	🔍
stable	local/linux-3.12.y	v3.12.70	omap4-panda	multi_v7_defconfig+…	arm	lab-collabora	2017-02-01	✓	🔍
stable	local/linux-3.12.y	v3.12.70	imx6q-sabrelite	multi_v7_defconfig+…	arm	lab-collabora	2017-02-01	✓	🔍
stable	local/linux-3.12.y	v3.12.70	omap4-panda	omap2plus_defconfig	arm	lab-collabora	2017-02-01	✓	🔍
stable	local/linux-3.12.y	v3.12.70	imx6q-sabrelite	multi_v7_defconfig+…	arm	lab-collabora	2017-02-01	✓	🔍
stable	local/linux-3.12.y	v3.12.70	imx6q-sabrelite	multi_v7_defconfig+…	arm	lab-collabora	2017-02-01	✓	🔍
stable	local/linux-3.12.y	v3.12.70	imx6q-sabrelite	multi_v7_defconfig+…	arm	lab-collabora	2017-02-01	✓	🔍
stable	local/linux-3.12.y	v3.12.70	exynos5250-snow	exynos_defconfig	arm	lab-collabora	2017-02-01	✓	🔍
drm-tip	local/drm-tip	v4.10-rc6-1021-g…	qemu-aarch64,legacy	defconfig+CONFIG_…	arm64	lab-baylibre-seattle	2017-02-01	✓	🔍
drm-tip	local/drm-tip	v4.10-rc6-1021-g…	qemu-aarch64,legacy	defconfig+CONFIG_…	arm64	lab-baylibre-seattle	2017-02-01	✓	🔍
drm-tip	local/drm-tip	v4.10-rc6-1021-g…	qemu-aarch64,legacy	defconfig+CONFIG_…	arm64	lab-baylibre-seattle	2017-02-01	✓	🔍
drm-tip	local/drm-tip	v4.10-rc6-1021-g…	qemu-aarch64,legacy	defconfig+CONFIG_…	arm64	lab-baylibre-seattle	2017-02-01	✓	🔍
drm-tip	local/drm-tip	v4.10-rc6-1021-g…	qemu-aarch64,legacy	defconfig+CONFIG_…	arm64	lab-baylibre-seattle	2017-02-01	✓	🔍
drm-tip	local/drm-tip	v4.10-rc6-1021-g…	qemu-aarch64,legacy	defconfig	arm64	lab-baylibre-seattle	2017-02-01	✓	🔍
stable	local/linux-4.4.y	v4.4.46	am335x-bone	multi_v7_defconfig+…	arm	lab-baylibre-seattle	2017-02-01	✓	🔍
stable	local/linux-4.4.y	v4.4.46	omap3-overo-storm-tobi	multi_v7_defconfig+…	arm	lab-baylibre-seattle	2017-02-01	✓	🔍
stable	local/linux-4.4.y	v4.4.46	sun7i-a20-bananapi	multi_v7_defconfig+…	arm	lab-baylibre-seattle	2017-02-01	✓	🔍
stable	local/linux-4.4.y	v4.4.46	ste-snowball	multi_v7_defconfig+…	arm	lab-baylibre-seattle	2017-02-01	✓	🔍

Showing 1 to 25 of 31,592 entries