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# KernelCI: a new dawn

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# Kernel testing landscape

- Developers: contributors to upstream, maintainers  
→ Only run tests on their workstations / dev boards

# Kernel testing landscape

- Developers: contributors to upstream, maintainers
  - Only run tests on their workstations / dev boards
- Users: distros, OEMs, SoC/CPU vendors
  - Only run tests on their own hardware
  - Don't necessarily send fixes upstream

# Kernel testing landscape

- Intel 0-Day and Linux Kernel Performance<sup>[1]</sup>  
→ Only run tests on Intel x86

<sup>[1]</sup> <https://01.org/lkp>

# Kernel testing landscape

- Intel 0-Day and Linux Kernel Performance<sup>[1]</sup>  
→ Only run tests on Intel x86
- Linaro Kernel Functional Tests<sup>[2]</sup>  
→ Only run tests on Linaro member platforms

<sup>[1]</sup> <https://01.org/lkp>

<sup>[2]</sup> <https://lkft.linaro.org/>



**Total test coverage**

**=**

**On the beaten tracks**

# KernelCI: off-road testing

- Run on all CPU architectures
- Test coverage aiming to grow over the whole kernel
- Run all tests on a wide range of hardware platforms

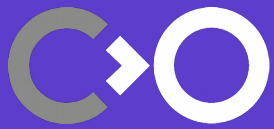


# KernelCI: a ghost project?

- Initiated by Linaro in 2014
- Targeting ARM ecosystem
- Only did boot testing
- Limited community
- Needs a new home

# KernelCI: a new dawn

- KernelCI now becoming part of the Linux Foundation
- Collabora to be a Premier member
- Filling gaps in kernel test coverage
- Big companies are investing
  - Google and Microsoft sponsored servers
- Funding, structure, maintenance, sustainability...

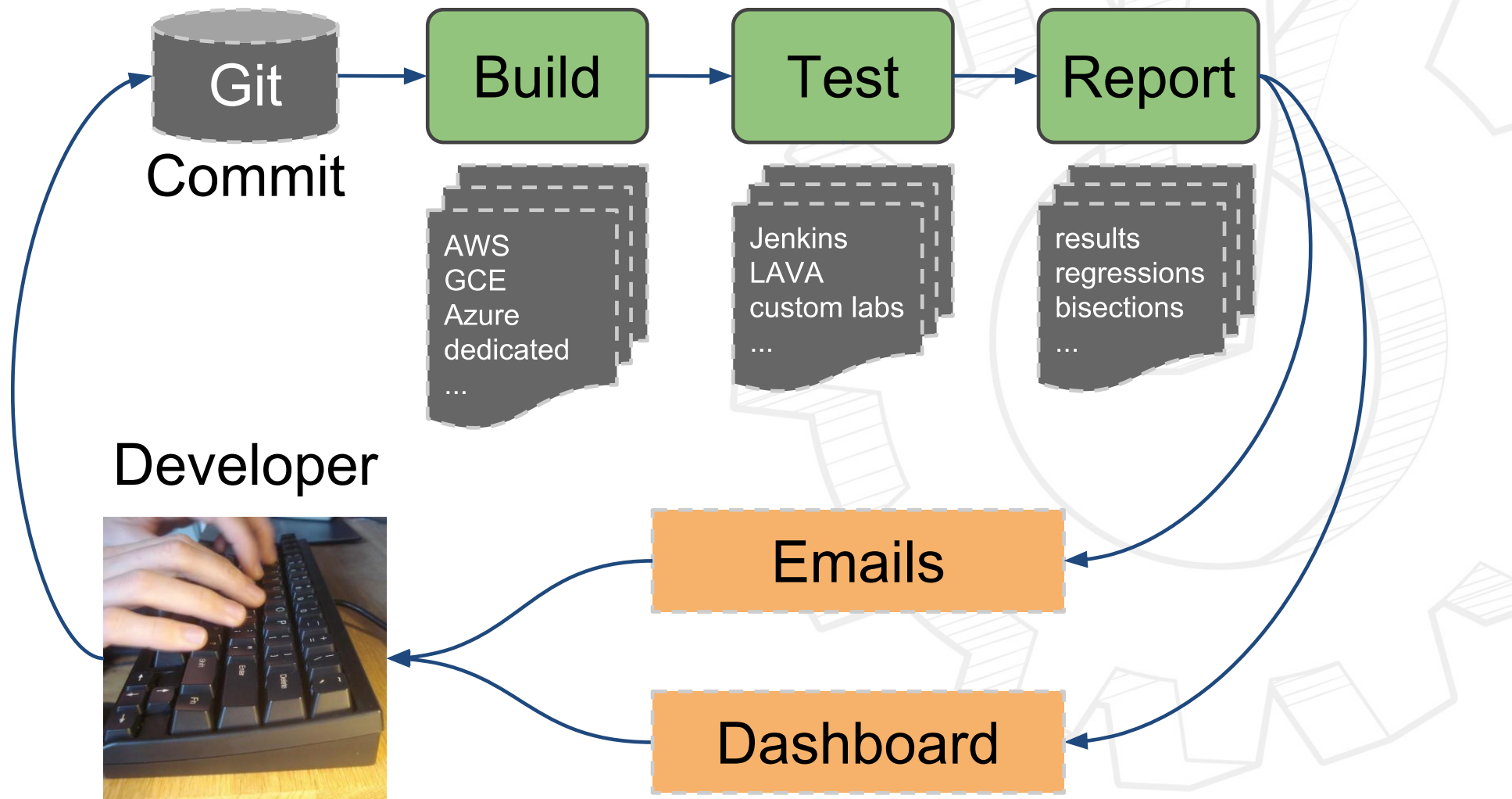


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**Where are we now?**

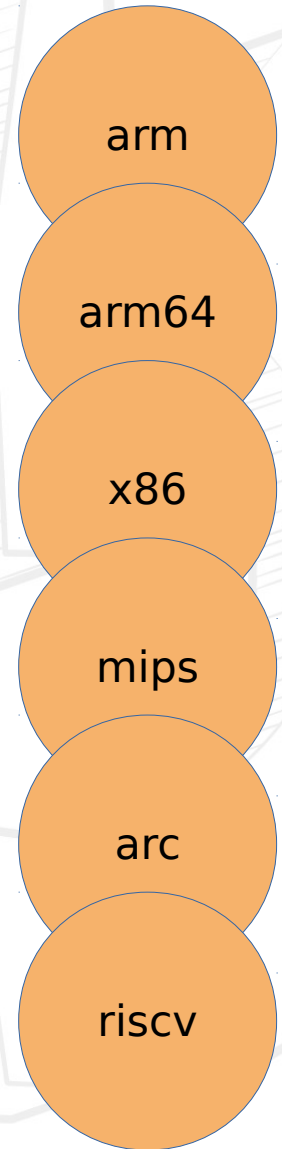
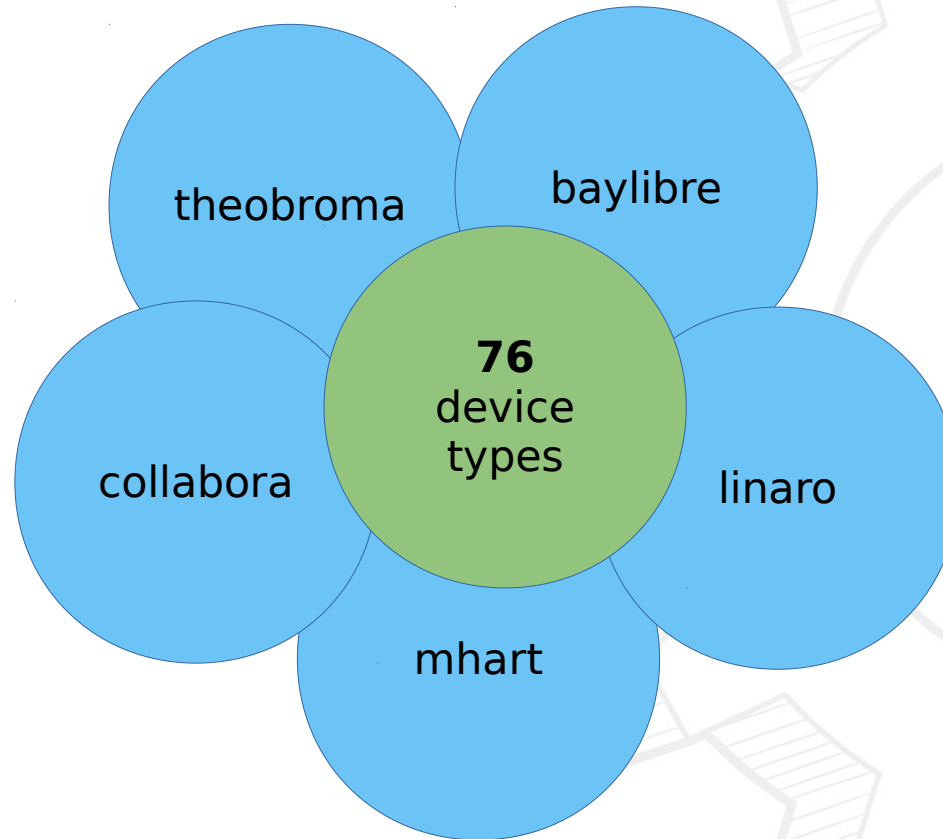
# The KernelCI loop



# KernelCI in numbers

1 **build**  
every  
**24**  
seconds

1 **boot**  
every  
**40**  
seconds



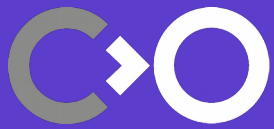
# Automated boot bisection

- For all boot regressions found on:
  - mainline
  - stable branches
  - linux-next
  - some subsystems' and maintainers' trees
- A few noteworthy results:
  - QEMU x86 boot failure on linux-4.14.y  
<https://lists.linaro.org/pipermail/kernel-build-reports/2018-January/thread.html#27424>
  - Peach Pi Chromebook deadlock on v4.15-rc3  
<https://lists.linaro.org/pipermail/kernel-build-reports/2017-December/thread.html#26688>
  - Big-endian arm64 preempt count bug on next-20181210  
<https://git.kernel.org/pub/scm/linux/kernel/git/next/linux-next.git/commit/?h=akpm&id=7faa313f05cad184e8b17750f0cbe5216ac6debb>

# Functional tests



- Graphics: IGT (DRM/KMS)
  - Subset run on a handful of devices, gradually expanding
- Media: v4l2-compliance
  - Full test suite run on hardware and QEMU (vivid driver)
- Power: suspend / resume
  - Run on many boards, finding issues regularly
- USB: smoke test
  - Check that the USB subsystem is initialised



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**What's next?**

# Joining the Linux Foundation

- Membership scheme
- Sustainable funding
- KernelCI as a service
- Premier members:
  - Collabora
  - *...waiting for official project launch*



# More build power

- Microsoft Azure builders
- Google Compute Engine builders
- Linux Foundation membership can help too
- Adding more trees: subsystems, stable “autosel”
- Adding multiple compiler support (LLVM/Clang...)

# Horizontal / Vertical testing

depth

long tests on few configurations

LKFT with LTP

KernelCI with boot testing

short tests on many configurations

width

# Horizontal / Vertical testing

depth

long tests on few configurations

**LKFT and KernelCI starting to join forces**

short tests on many configurations

width

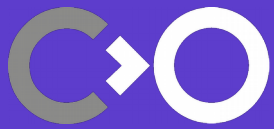


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# Mapping test areas of the kernel

- Drawing a map of all the kernel surface to test
- Gradually expanding coverage
  - Adding source trees for each part of the kernel
  - Adding test suites to target each specific part
  - Adding hardware to test architectures and drivers
- Digging out issues found in “terra incognita”



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# Case Study

## The media subsystem

# Media subsystem as a pilot

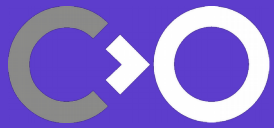
- Building media subsystem master branch
- Expanding v4l2 test plan
- Enabling QEMU with virtual video (vivid driver)
- Working with the developers to get feedback
- Improving test results
- Tracking regressions
- Improving email reports

# Issues found with UVC driver

- The USB Video Class driver is for standard webcams
- Has been in mainline since v2.6.26
- Enabled testing on rk3399-gru-kevin Chromebook
- Found out that it fails v4l2-compliance:

Total: 48, Succeeded: 44, Failed: 4, Warnings: 9

- Full details:  
<https://lava.collabora.co.uk/scheduler/job/1328514>  
[https://lava.collabora.co.uk/results/1328514/0\\_v4l2?search=&length=50#table](https://lava.collabora.co.uk/results/1328514/0_v4l2?search=&length=50#table)

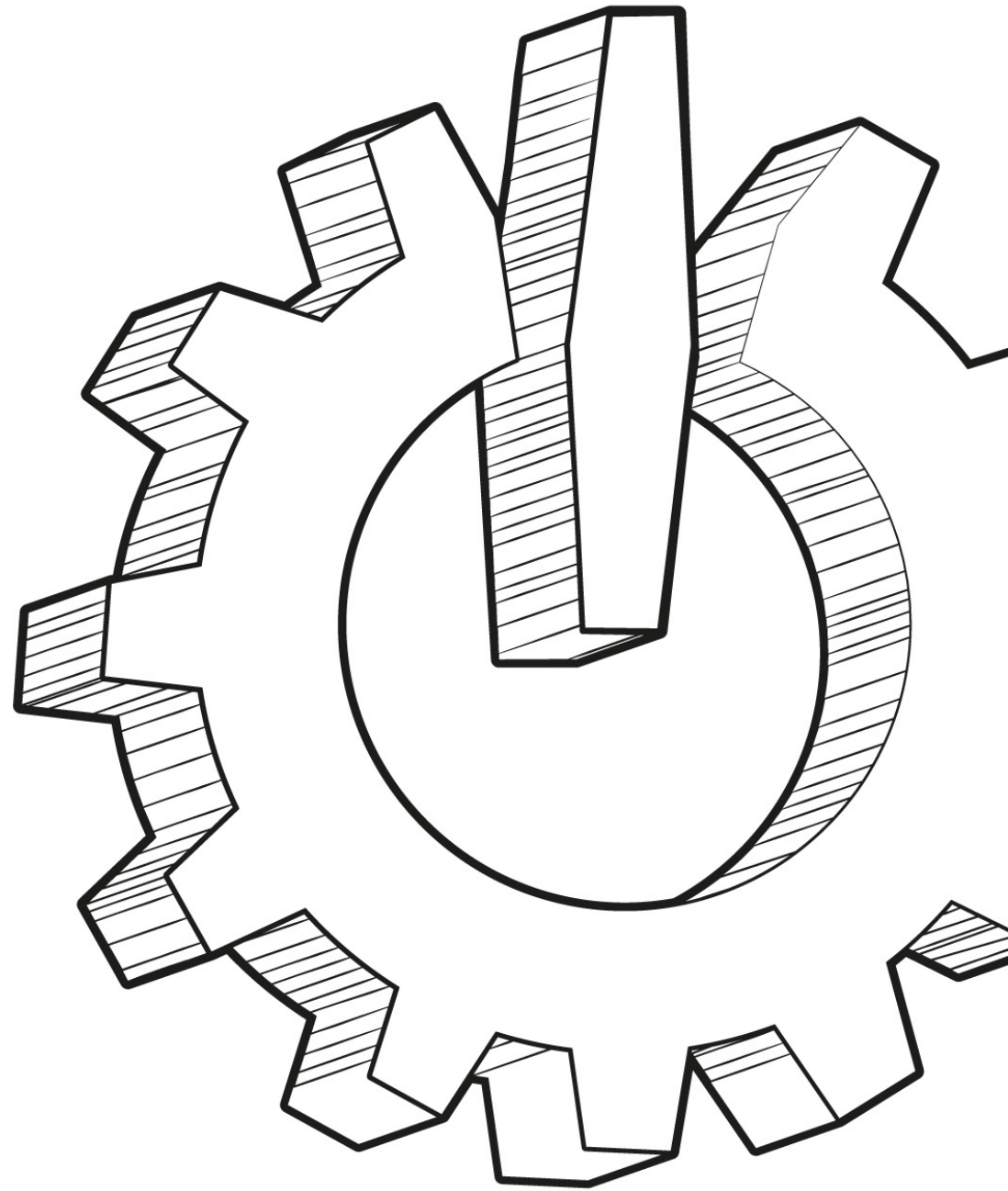


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**Showing failures  
prompts developers  
to fix them**

## Thank you!

### Any questions?



# Photo credits

- 1. dawn: <https://www.nasa.gov/content/sunrise-from-the-international-space-station>
- 2. landscape: <https://www.flickr.com/photos/hemlit/8212362709/>
- 6. sand: <https://www.flickr.com/photos/156754622@N02/23962149187/>
- 7. truck: <https://www.flickr.com/photos/surfergirl30/44110720615/>
- 8. haunted house: <https://www.flickr.com/photos/adriensifre/7344166962/>