Where's the H/W?

A guide to development labs / platforms available in Linaro and how to leverage them

Presented by

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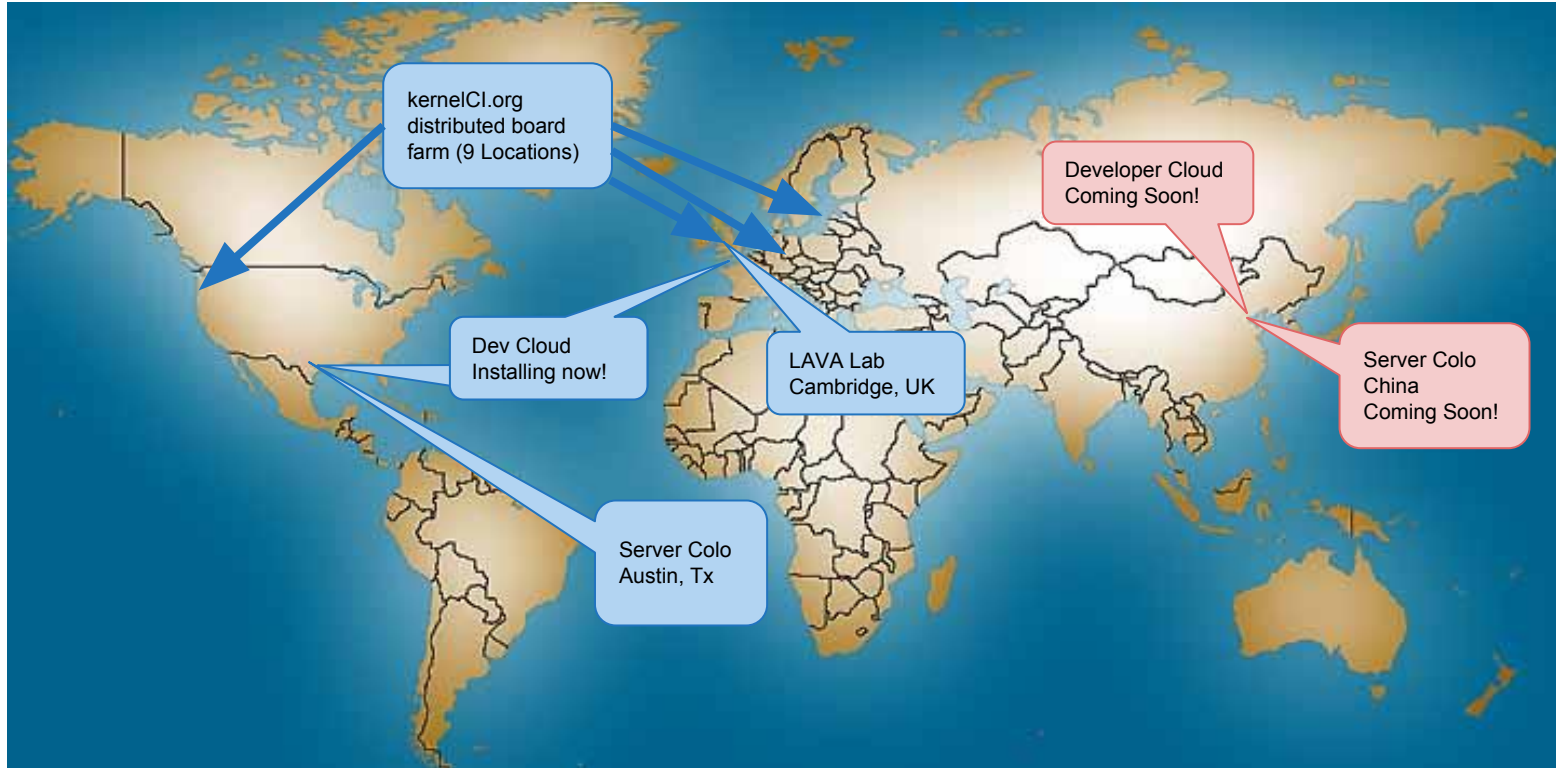**Date**

BKK16-213 March 8, 2016

Event

Linaro Connect BKK16

Agenda

- Overview
  - Types of hardware labs available to Linaro Members / Community
  - Locations of Linaro Labs

- kernelCI.org Labs
  - Overview, How to leverage, & How to get involved

- Server Colo's
  - Overview, How to leverage, & How to get involved

- LAVA Lab
  - Overview, How to leverage, & How to get involved

- What's next?
  - Developer Cloud

Overview: Lab Locations

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Overview: Linaro Board Farms/Labs and Targeted Usage

- kernelCI.org [Linaro Members and Community]
    - A distributed CI testing infrastructure to validate that upstream **kernel** trees build and boot on the Embedded platform variants in the kernelCI distributed board farms.

- Server Colo [Linaro Members and Community]
    - A 64 bit ARM Server lab that supports Members and Community to checkout nodes for application development and validation purposes

- LAVA Lab
    - Supports Member Engineering efforts for Linaro.   Contains Member hardware to support Linaro Engineering activities.
    - Runs production LAVA instances (http://validation.linaro.org)
    - Boards available to Linaro Members and specific Community Access on approval
        - Linaro / Member developers can access idle boards and run custom experiments on as-needed basis
    - Qualified w/ Usage Plans and Test Plans on per project basis

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Overview: Linaro Board Farms/Labs and Targeted Usage

- Developer Cloud
  - **Newest addition** to the Linaro hardware development labs!
  - Distributed Cloud lab setup for developing and validation of cloud applications on ARM64
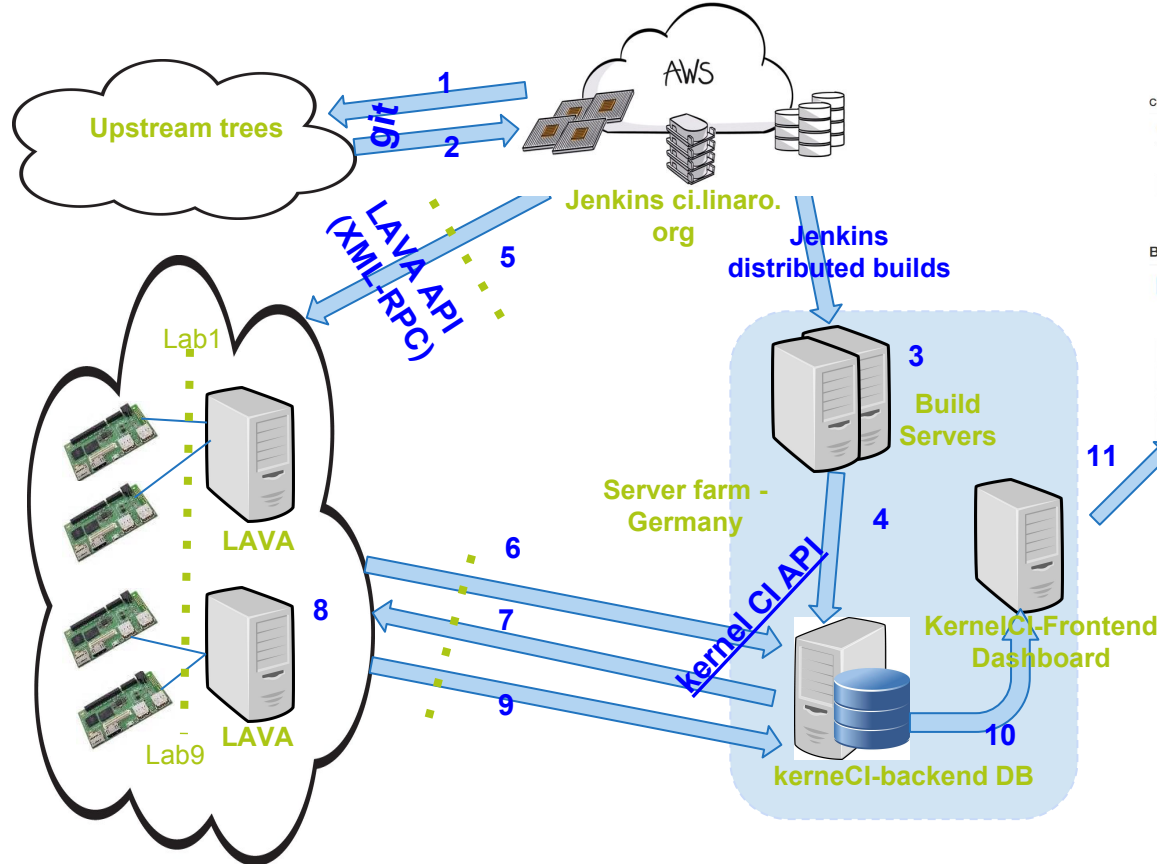
kernelCI { http://kernelci.org/ }
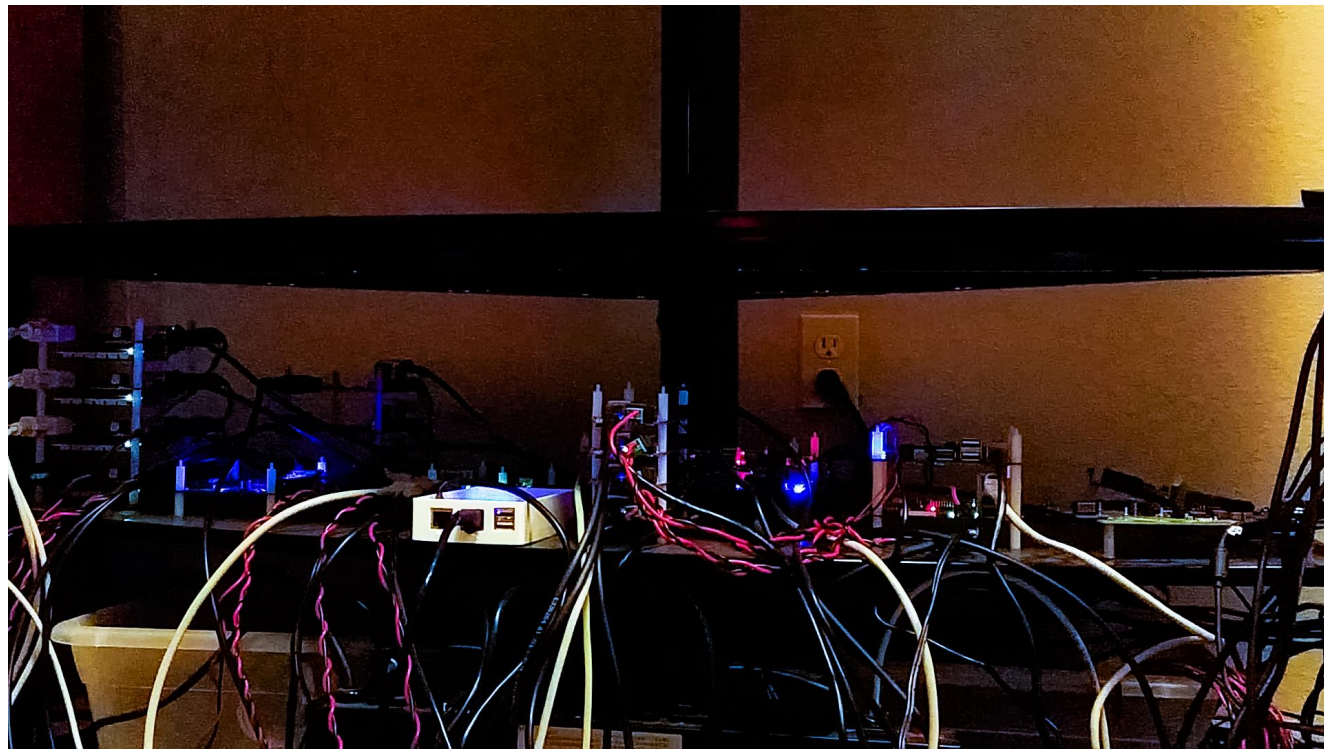
kernelCI Details

- Validates upstream **kernel** trees on boards and provides results daily as trees are "touched"
  - Bigger than just LTS / upstream. Other trees mapped in are shown here: http://kernelci.org/job/
- "Virtual" embedded platform validation farm.
  - Set up in multiple locations (currently 9) and is architected to be extensible for the easy addition of new Labs / Embedded Targets
- Primary purpose is to build and boot the various upstream kernel trees to assure they are regression-free.
  - As usage grows this may be extended to richer testing. See "BKK16-215: KernelCI beyond boot testing session" today.
- Not just Linaro
  - Multiple individuals and companies. Lab locations can be found here: http://kernelci.org/sponsors/

kernelCI Details cont'd

- Recommended Test Automation Framework (TAF) is LAVA but can support others to automate the tests.
  - More on LAVA: https://validation.linaro.org/
- Types of tests being run
  - boot tests
    - pass/fail tests
    - Formed last May, now **over 1 Million** boot tests have been executed on ~160 unique boards, 3 architectures and 29 unique SoCs across the board farms! And growing faster than ever.
  - Future
    - Extend to support
      - LTP
      - kselftests
      - Can add own
- Frequency of test runs
  - Boot tests run every time a tree changes

kernelCI System Overview

1 Upstream tree changed
2 Fetch git kernel tree repo
3 Build
4 Publish build to kernelCI-backend
5 Submits jobs to the Labs (LAVA)
6 LAVA request build download
7 Fetch jobs
8 Perform tests
9 Results pulled from LAVA
10 Pull from frontend
11 UI Dashboard

kernelCI "API" Pointers

- Pointers to "API" documentation from previous slide
  - LAVA API
    - https://validation.linaro.org/api/help/
  - Jenkins distributed builds
    - See Jenkins distributed builds info: https://wiki.jenkins-ci.org/display/JENKINS/Distributed+builds#Distributedbuilds-Howdoesthiswork%3F https://wiki.jenkins-ci.org/display/JENKINS/Downstream-Ext+Plugin
  - Kernel CI API
    - https://api.kernelci.org/
  - User Interface
    - Uses kernelCI-backend to accumulate results and kernelCI-frontend for UI at kernelci.org
      - https://github.com/kernelci/

kernelCI Getting Involved

- As an ARM embedded platform supplier, provide your ARM target hardware!
  - Linaro or Members of the labs will take it from there!
  - Contact information and requirements for what must be included can be found under the FAQ's here: http://kernelci.org/faq/
- Hard way: Set up your own lab! This presentation provides the links to getting started guides and other information related to this.
- To add a tree, requests sent to info@kernelci.org
  - Must be accountable to keep it maintained
    - Will receive email build reports from backend with warning/errors (summary for each tree change/build)
- Contribute to LAVA (Python Open Source Project)
  - https://validation.linaro.org/static/docs/deprecated/development.html?highlight=contributing#contributing-upstream
- Join and extend kernelCI. See the Upstream Kernel CI Project Wiki:
  - https://wiki.linaro.org/ProductTechnology/kernelci.org
- IRC: Freenode - #kernelci

LAVA Lab, Cambridge

Overview

- LAVA Lab is responsible for providing a wide variety of Linaro Member ARM SoC based hardware and software devices for the development and automated testing of the <u>engineering output of Linaro</u>, primarily through LAVA

- Leverages the same infrastructure as shown in the kernelCI System Overview slide earlier in this presentation

  - Goes beyond kernel/minimal user space and entire builds including user space can be verified

  - System integration testing - bringing work products from all Linaro teams together

- LAVA Lab is the central development lab for Member Hardware that is being used by the Linaro engineering teams for development

Overview

- Visible through http://validation.linaro.org

- Over 180 boards (device types) currently in the lab
  - Can be seen here: https://validation.linaro.org/scheduler/alldevices

- Supports Member Engineering efforts for Linaro.

  - Consists of Member hardware to support Linaro Engineering activities.
  - Runs production LAVA instances
  - Qualify w/ Usage Plans and Test Plans
    - developed per team

Leveraging the LAVA Lab

- Members can <u>access (most) idle boards</u> and use for development, validation, and test purposes.
  - To access idle boards and run own experiments, see hacking sessions documentation https://validation.linaro.org/static/docs/hacking-session.html
  - How do I know I can use a board?
    - https://validation.linaro.org/scheduler → note the restricted column
    - Some boards restricted, but still may be able to request permission
  - To use the lab hardware, must request access permission by sending email to automation@linaro.org asking for LAVA Lab Job Permission privileges

Leveraging the LAVA Lab cont'd

- Adding a platform to the LAVA Lab
  - Can be used for member builds and made available for download at http://www.linaro.org/downloads/
  - These platforms / builds can be integrated into various Working Groups
  - Note that platforms can be added w/ restricted access
  - How to request getting a platform added to Linaro CI
    - https://wiki.linaro.org/Platform/CI-bring-up

ARMv8 Server Cluster

Overview

- Allows vendors to build applications on ARMv8 hardware giving them a place to test / tune applications
- Location: Austin, Texas
- Buildout started in early 2015
- Populated with Linaro Member ARMv8 Server H/W
  - APM (Applied Micro - x-gene Cores) Systems [50 systems]
  - AMD Servers [6 systems]
    - Linaro Members can use, non-Members must sign an NDA
  - Others, and more coming…
- Bootloaders installed per rack
  - 1 rack is uboot, so primarily Ubuntu
  - 2nd rack is UEFI, so primarily for Redhat/Fedora

Overview cont'd

- Servers deployed with both Redhat/Fedora, CentOS, Debian, and Ubuntu OS's
  - RedHat - REL usage requires NDA as well
  - RPB (Reference Platform Build) to be supported soon
- Support Metal as a Service (MAAS) as well as VM's deployed using OpenStack
- Example Use cases
  - Debian project using three servers for native ARM 64-bit compilation for jessie release and onward. Key to Debian 8.0 64 bit support!
  - OpenStack validation by LEG
  - Ceph file system testing (LEG)
  - Researchers testing and porting server applications. See BKK-305a ARMv8 Server Lab Users BOF presented by Kitayama-san.
  - Node.js project leveraged to support ARM64 release.

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Overview cont'd

- Blog on the lab rollout here
  https://www.linaro.org/blog/armv8-server-lab/
- Blog on rack deployment challenges here
  https://www.linaro.org/blog/ubuntu-rack-deployment-within-the-armv8-server-lab/

Leveraging the Server Colo

- ISV's and Community members may apply for access here: http://www.linaro.org/leg/servercluster/
  - Linaro Members have priority
  - Private access to provisioned systems
  - 1-2 week leases for build and test (can be extended)
  - At no cost
  - Includes access to the "control node" to be able to power systems on and off and to gain access to serial terminal.
  - Only port that can get to lab is port 22
    - ssh -L8000:localhost:80 r1-a14.aus-colo.linaro.org   to get around it…
    - sshuttle is a "poor man's vpn" to not have to do port forwarding….

What's Next? Developer Cloud

Overview

- Deployment announced this week at Connect
  - Next phase extending the ARMv8 Server Cluster

- A 64-bit ARM server deployment for the purpose of evaluating, developing, and maturing ARM-based clouds

- Multiple Members have donated servers for the farm
  - Currently 5 members contributing servers
    - Initially 20 physical systems
    - Located in Cambridge and Austin labs
    - Starting out with ~200+ guest instances available for testing
      - Initially all KVM-based eventually adding containers
  - Dev Cloud is architected so that contributing Members can attain confidential feedback (metrics) on their deployed systems
    - From provisioning of compute nodes to supporting billing mechanisms, etc.
    - Support for debugging, profiling, porting and regression testing all on ARM Server instances

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Overview cont'd

- Will leverage
  - The Reference Software Platform (RSP) Lead Project
  - OpenStack as the Cloud Mgt foundation
  - Developers, ISV's and 3rd party software developers for porting, debugging and validation
  - Initial OS's to support are CentOS and Debian
    - Guest instances are up to end user
    - In the future, plan to extend to use others such as Ubuntu, Suse, REL and even Windows
      - May require partner agreements / SLA's
- An ideal proof-point for ARMv8 solutions

Overview cont'd

- Dev Cloud Security Considerations
    - Dev Cloud support of individual Data Centers will provide an easy way to create access controlled farms
    - Leverage OpenStack → Keystone Identity Services
        - Security policy, authentication, and authorization
        - Supports LDAP if needed
    - Provisioned as a Private Cloud
    - Will support multi-tenancy

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Getting Involved

- <u>Vision</u>: Extend the Dev Cloud into individual Data Centers. Linaro can help set these up, and these "distributed" Data Centers can federate extend the Dev Cloud.
- Linaro will support (provide the "bits" for) a Member or partner to create their own isolated test cloud (assumes on validated platforms)
- <u>Platform Provider</u>: Contact devcloud@linaro.org to add ARM servers to the Dev Cloud or begin the creation of own Data Center
- <u>ISV's</u>: Fill out the request that the following page: http://linaro.cloud
- Provide Member engineers to maintain / monitor the Dev Cloud, CI, QA tests, etc.
- Monitor this new deployment here: https://www.96boards.org/developercloud/

Q & A

- Ideas for follow-on sessions?
  - Next-level dive into specific areas such as Dashboard navigation, Member Builds, etc. ?