Where the Arm Ecosystem collaborates on Open Source software

Over 300 engineers from companies across the world working together in over 70 Open Source Projects
What we do ...
GPL Cooperation Commitment

Jeffrey R. Kaufman
Open Source IP Counsel
Red Hat, Inc.
GPL Cooperation Commitment

Tell the world that you respect the good intentions of the open source community
Sign Up!

Visit: gplcc.github.io/gplcc/
-or-
Email: gplcc@redhat.com

Twitter: #GPLCC
Linaro, Arm & Open Source in 2018

Geopolitics
Arm on Arm
Machine Intelligence
Automotive
96Boards
IoT & Edge
Geopolitics

Global Progress is not linear ...

... sometimes we take two steps forward and then one step back
Geopolitics

Tariffs, Sanctions, Protectionism
This too will pass, hopefully ... but ...

As a result business & governments are reviewing global supply chains and inter-dependence
Geopolitics

China is building out IT infrastructure using locally developed IP, from SoCs to the Cloud.
Key Global Partners

Computing Ecosystem
Collaborative Development
Why Open Source?

Because markets *are* global
Visible to all, no secrets, no boundaries
No country/corporate ownership
Everyone can contribute & improve

And then, commercial IP can be developed on top of
Open Source Platforms
Arm on Arm

Building software on Arm
Developing on Arm

Thunder-X2
SBSA/SBBR compliant
16 DIMM slots up to 1TB RAM

ThunderXStation™
The Linaro Developer Cloud

Martin Stadtler
Senior Director
Linaro Datacenter and Cloud Group - LDCG
Interoperable Arm based Cloud

Container-based - Linaro is leading the Arm aspect of the Kolla Project

With OpenStack Rocky, Linaro has passed the OpenStack Interoperability test-suite, with 100% pass rate.

This is the first pass for an AArch implementation - we are working with the Foundation to be listed as a certified OpenStack Powered Platform. This is the first upstream project available to all, that meets this interoperability compliance.
Linaro Developer Cloud

Mission - ecosystem access to the latest Arm based servers
Member supplied hardware and latest LDCG software
Instances in the US, UK and China
Now out of beta and a “production offering”
Charge to cover cost of the Colos and Cloud devops
Developing on Arm

Build native on Arm ...
Firmware - UEFI, UBoot, EBBR
Distros - Debian, Fedora, OpenSuSe, OpenMandriva

More to do ...
Yocto/OpenEmbedded, Zephyr, Other RTOSes
Machine Intelligence
Heterogeneous Compute

Compute at the edge

>100x power/performance improvement for dedicated processors - GPU, AR, ML algorithms

DSP, FGPA, GPU, NPU, Full custom
Heterogeneous Compute

Trend towards one or more dedicated HW engines on SoCs, for specific tasks

How do we efficiently allocate many different IP resources to workloads?
Linaro Machine Intelligence Initiative

Optimize AI/ML Deep Learning performance
Modular integration of open source or proprietary vendor-specific runtimes
Collaborative definition of a common framework with inference APIs
Cortex-A and Cortex-M heterogeneous SoC inference
Mercedes-Benz
FO15 Concept Car Interior

Automotive
Now

ADAS, Safety Isolation, IVI, ECU updates
Autosar, V2V, V2X, Vision

Automotive open source software collaboration
Core System Technologies Group (STG) - TSC
Open Source Autonomous Driving Software
Tier IV Autoware

- Localization, Route Planning & Mapping
- Object Detection
- Driving Control
Autoware & Simulation

https://github.com/lgsvl/simulator
Building Blocks for PoC

Goal: Linaro Connect Spring 2019

- Foundries.io Linux microPlatform
- AGL
- OSRF ROS 2.0
- Tier IV Autoware
- 96Boards Auto hardware
- StreetDrone Car
Rapidly Growing Ecosystem
Some Recent Boards

**CE**
- ROCK360 MODEL C RK3399 CE Board
- Geniatech Dragon Board Qualcomm 410, $59
- Hichips-Allwinner R18 3-Mic Far Field Development Kit

**IoT**
- BPI Zigbee BLE TI CC2560
- Rakwireless LoRaWAN tracker/ST
- uCRobotics IVY5661 802.11ac 2x2 BLE 5 - UniSoc 28nm 416MHz M4
- BPI Quectel NB-IoT ST MCU

**EE**
- FICUS V1.1 RK3399 EE Board w/Dual SATA/RAID support, PCIe x4, $99
-Globalscale KAVAboard MSTAR K7 96Board TV AOSP 4Kx2K 60FPS HDMI 2.2
IoT

Towards a trillion devices
Billions of Edge interfaces

Core Engineering - Security, Tools, Infrastructure
LITE - Software for IoT devices
LEDGE - Software for the Edge
LDCG - Software for the datacenter & cloud
Beyond LTS

Extended LTS (6 years), CIP (10+ years!)

- Today - customized LTS+ product kernels
  - Firmware, Security, Updates
- Shared testing only for LTS itself
  - No benefit from end product testing
- Not scalable across thousands of companies building IoT products
- Fragmentation, lack of security, and high cost of maintenance across the ecosystem
This is the result ...

2017 Model Mass Market Car

IVI System with Bluetooth uses kernel version 3.1.10
Released January 18th 2012, this build Jun 9th, 2015
Fragmentation of Platform Software

Reduces Security

Increases lifetime maintenance costs

OTA updates are not an optional feature
Linaro Mission

Collaboration in the Ecosystem to accelerate deployment of Arm-based solutions

With good CI, the latest software is the most stable, the most secure, and the most functional

With OTA updates in place, rather than LTS we could align on a single upstream-aligned code base and keep it always updated, always improving

Then we could scale a single code base across multiple products
In memoriam
Alan K. Bennett
Fulfill the promise of IoT by delivering continuously-updated software platforms for a secure, connected world.
microPlatforms for IoT & Edge Connected Devices
OTA updatable, Secure firmware, RTOS & Linux
Continuously updated
End to End tested
Tyler Baker
Foundries.io CTO
What makes an OTA update secure?

- Proper use of encryption, digital signatures, and one way hash functions to ensure immutability, privacy, and verification.
- Keys can be compromised, but there exists a mitigation to regain control of devices deployed in the field.
- The code for all of this is open, and auditable by a 3rd party.

How the microPlatform implements OTA?

- TuF/Uptane to manage the image manifest encryption, signing, and hashing.
- OSTree to deliver a delta based image layer.
  - Updates bootloader, kernel, userspace.
Identical embedded microservices deployed seamlessly across Arm and x86
Zephyr RTOS microPlatform

- Customer Application
- Middleware options: Thread, IoTivity
- Zephyr Kernel
- MCU HAL
- mcuboot Secure Bootloader
- Secure OTA Updater
- TLS/DTLS
- IPv4/v6 TCP/UDP
- IPv6 6LoWPAN
- Ethernet, WiFi, BLE, 802.15.4, LoRa, NB-IoT, LTE-M

Zephyr: the “Linux of RTOS”

Linux OE microPlatform

- Customer Application
- Optional Legacy distribution or Safety Critical RTOS
- Zephyr Kernel
- MCU HAL
- mcuboot Secure Bootloader
- Secure OTA Updater
- Optional microKernel/Hypervisor
- Secure Firmware
- UEFI, ARM Platform Security Architecture
- Container Management
- microPlatform Services
- UEFI, ARM Platform Security Architecture

Linux: Secure OTA updates & Containers
What we just saw

Linux microPlatform on Arm & Intel
Embedded Google Assistant controlling Zephyr LwM2M lights
Containerized graphics
Secure OTA update of Linux microPlatforms
Applications are in Containers and can be updated separately as needed

Same software on Arm & x86 for Containers and Operating System
Foundries.io microPlatforms

- Cloud and Device Management agnostic
- Try them out today on Raspberry Pi 3, DragonBoard, Beaglebone Black and others
- $10/month for a personal/evaluation subscription from the website
- Continuous releases
- No lock in - stop subscribing and keep all the software

Foundries.io delivers secure, over-the-air updatable software platforms for embedded product development. Get started with source and binary builds for popular development boards, or jump straight to using them on your own product. Choose the Linux microPlatform for container-based Linux development, or the Zephyr microPlatform for RTOS-based applications. Differentiate your product—starting with the platform.
Coming soon ...

Wednesday
AI and Neural Networks on Arm Summit
Keynotes including Jem Davies, Arm

Thursday
Toshiyuki Shimizu, Fujitsu

Friday
Shinpei Kato of Tier IV
Fujitsu Silicon Announcement

- Seed the Post-K supercomputer ecosystem
- Accelerate deployment of Arm SVE
- A64FX is the first processor using the Armv8-A SVE architecture designed in the Post-K computer project
As we said ...

Open Source ignores boundaries and sanctions (mostly!)
Native Arm development is getting easier (and faster)
Arm is now in the Cloud
AI hardware IP is everywhere - let’s make it easier to use
Autonomous cars are coming with open source compute
The 96Boards ecosystem is growing rapidly
LTS may have had its day - upstream is the way
Also on the way is Post-K!
Working Together, Enjoy YVR18