Linaro Enterprise Group (LEG)

August 2015

Linaro Enterprise Group (LEG)

- Formed in November 2012
- Working on core open-source software for ARM servers
  - Boot architecture – UEFI/ACPI
  - Virtualization – KVM/Xen/containers
  - ARMv8 bringup & optimization
  - LAMP, OpenJDK, Ceph, Swift, OpenStack, Docker, Hadoop
- Eliminates fragmentation, reduces costs, accelerates time to market
- Members can focus on innovation and differentiated value-add

http://wiki.linaro.org/LEG

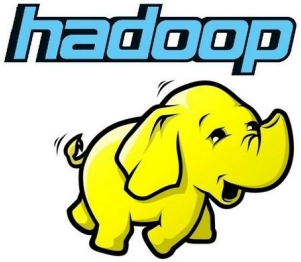
LEG Membership

- 13 Current members (March 2015)
  - LEG-SC (one vote per member) agrees work items
- Funding and resources provided by members
  - Each member contributes $ and assigned engineers
  - Two year commitment with 2y renewals
- Member fees fund additional engineering
  - 1 Linaro engineer for the LEG team
  - 1 Linaro engineer for core Linaro open source work
  - Other Linaro costs including engineering management, event organization etc.
- Current engineering team is 30 engineers
  - Linaro's total engineering team is >200 engineers

Engineering (1): enablement

- All patches already upstream or under deep constructive review
- Strong engagement with all maintainers

Engineering (2): workloads



Engineering I

- LEG projects agreed and prioritized by LEG Steering Committee
  - One representative per member, plus Linaro LEG Director
- ARM Boot Architecture
  - ARM Server Base System Architecture; ACPI, UEFI, Grub; ARM Trusted firmware
- KVM and Xen Virtualization
- Stable ARM kernel version based on upstream
- LAMP Stack optimization
  - HDFS CRC, LibTBB, CRC, Hugepages, OpenSSL
- Facebook HipHop JIT
- High performance OpenJDK for ARMv8 with C1 and C2 JIT

Engineering II

- Middleware and user-space stack testing
  - Hadoop, OpenStack, Ceph
- Testing through multinode CI validation in LAVA
  - ARMv8 Ubuntu, Fedora/Red Hat and OpenStack builds
- LEG also works with Linaro core working groups and can request resources through the Linaro Technical Steering Committee (TSC)
  - ARMv8 64 bit toolchain optimization
  - Multi-core power management
  - Security and Secure boot using Trustzone and ARM Trusted Firmware

Achievements (1)

- UEFI
  - Aligned ARM Tianocore to other architectures, boot as an EFI application, runtime services, pass ACPI tables from firmware, support for SMBIOS 3.0
  - Support GRUB and network boot
  - Ported GNUEFI to build EFI apps easily
  - Verified Tianocore Secure boot and ported the Shim layer to ARM
  - Ported UEFI to EL1 as a guest in KVM/QEMU and Xen hypervisors
  - Supported virtual mapping for Kexec
  - Established a monthly UEFI release rebased on Tianocore EDK2 + all Linaro patches, tested with UEFI SCT suite
  - Joined the luvOS initiative with Intel
  - Ongoing
    - Kernel clean up removing dependencies from /dev/mem
    - Boot from iSCSI, Update Capsule

Achievements (2)

- ACPI
  - Ported ACPICA core kernel support and tools to ARM, core peripherals up to MSI-X
  - Able to boot ARM FVP and Juno, AMD Seattle, Cavium Thunder-X, Qualcomm and HiSilicon via ACPI
  - Developed a PCC driver to support the new CPPC power management model
  - Ported all reference test suites to ARM, e.g. FWTS, ACPI API test, ACPI ASL test, etc.
  - RAS ACPI APEI support with perf and a user space RAS Daemon
  - SMMU, GICv3, NUMA support all in progress
  - Releasing an updated LEG ACPI kernel for every new weekly kernel 3.xx-rc

Achievements (3)

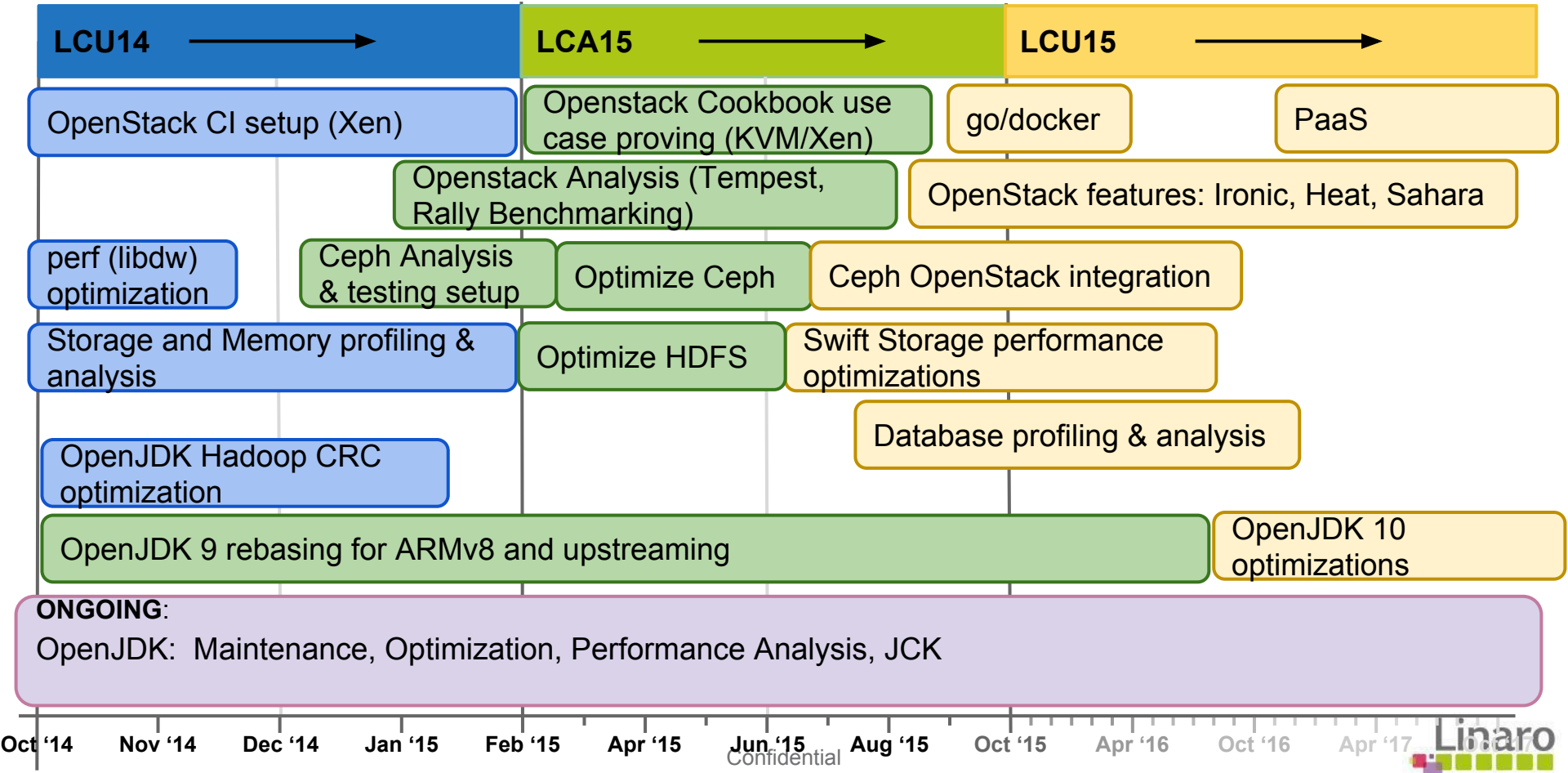
- OpenJDK
  - Excellent cooperation with Red Hat on OpenJDK C1 and C2 JIT
  - Driven by OpenJDK8, backported to OpenJDK7
  - JIT officially merged in OpenJDK9 trunk
  - On par with x86 as JIT performance vs interpreted code
  - About 30,000 tests executed every night: Mauve, JTREG, JCStress, SPECjbb2013
  - Hadoop TeraSort and Jenkins as functional testing workloads
- Optimisations for the LAMP Webserver workload
  - ARMv8 assembly tuning for OpenSSL and kernel crypto up to 16x speed up
  - Kernel CRC32, etc. up to 5x speed up
  - Hugepages, fast_gup, etc.

Achievements (4)

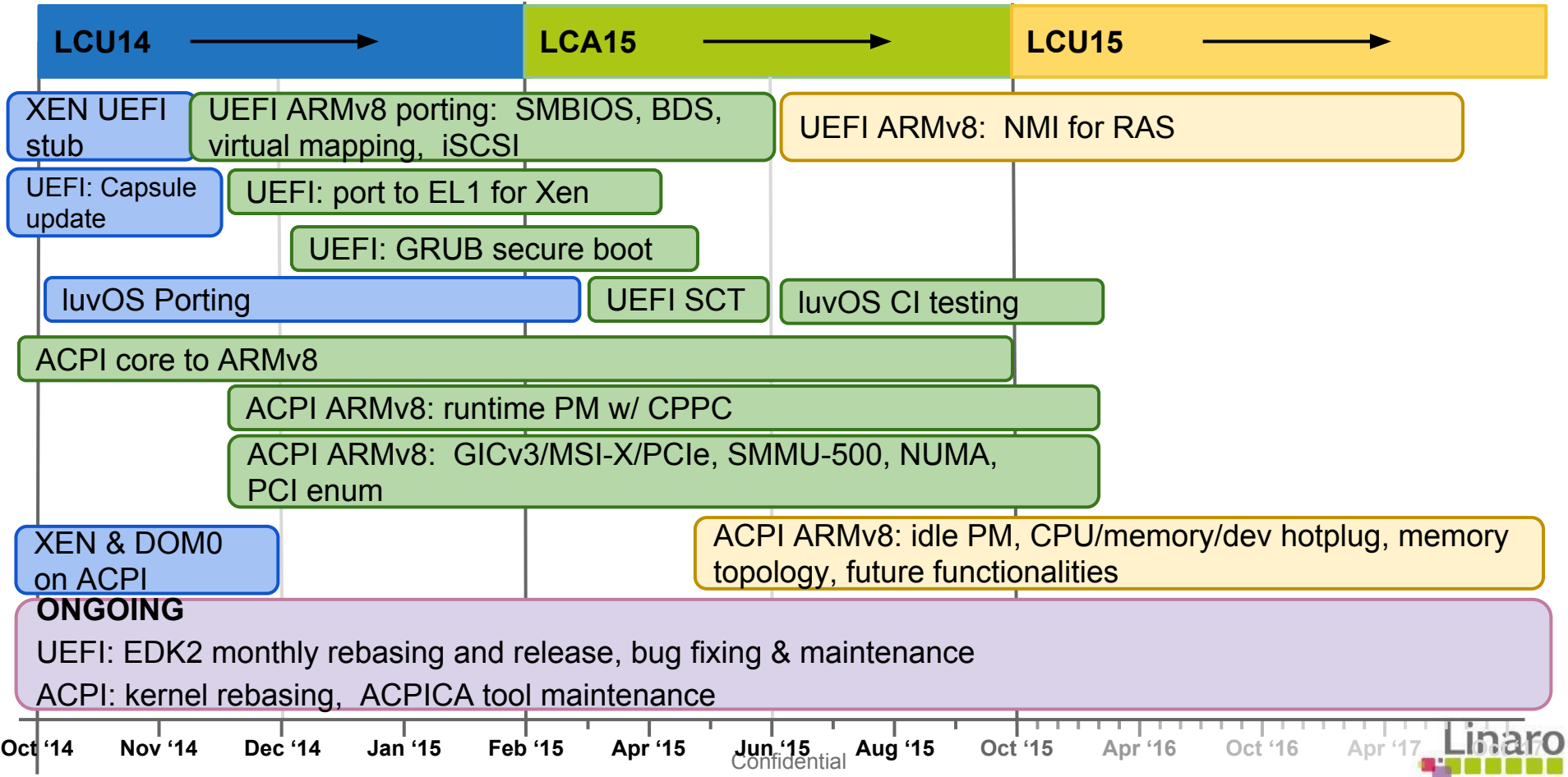
- Storage
  - Optimized Ceph CRC32 up to 4.5x speed-up, verifying Theutology and RADOS bench suites
  - Optimized Hadoop HDFS up to 11x speed-up
  - Next: Swift optimizations
- OpenStack
  - Built OpenStack on ARMv8 with KVM/QEMU and Xen
  - Running the Tempest test suite and the Rally benchmarking suite
  - Setting up an official 3rd party testing for OpenStack
    - target: aarch64 best-in-class citizen, official platform alongside x86
  - Functional test deploying multiple VM's to run Java JTREG testing in parallel
  - Next: Ironic bare metal provisioning and containers, Cloud Storage with Swift and Ceph
- Early proof of concept with Docker and Go

Next Steps

Key Server Applications - High Level Roadmap



Server UEFI/ACPI - High Level Roadmap



UEFI

- Q1 2015
  - FWTS and luvOS with UEFI edk2
  - fw update via update capsule
  - kexec with UEFI runtime services
  - boot from iSCSI
  - clean up from /dev/mem to /sys/firmware
  - GRUB support for secure UEFI boot
- Q2 2015
  - *"common"* platform enablement
    - e.g. BMC on I^2C bus
  - common issues to adding new SoC to Tianocore/ARM
  - contribute platform support code upstream to Tianocore
- Ongoing
  - maintenance mode
  - monthly EDK2 rebasing and releases
  - bringing new platforms into Linaro tree

ACPI

- 2015
  - PM tuning and stabilisation
  - upstream ACPI core patches and power management
  - develop prototypes for all proposals submitted to ACPI-next, align to the new spec (PPTT and more to come)
  - NUMA
  - more platform device and device driver support (HW dependent)
- Ongoing
  - continue kernel rebasing work and SBSA support
  - FWTS and LuvOS testing
  - continue updates to user space tools
  - continue involvement with ASWG to drive ARM needs

OpenJDK

- OpenJDK 8 and 9
  - continuous performance improvement
  - security fixes
  - support members with JCK certification

Storage

- Ceph
  - Theutology and RADOS bench suites
- Swift
  - CRC optimisation

Virtualization (shared team)

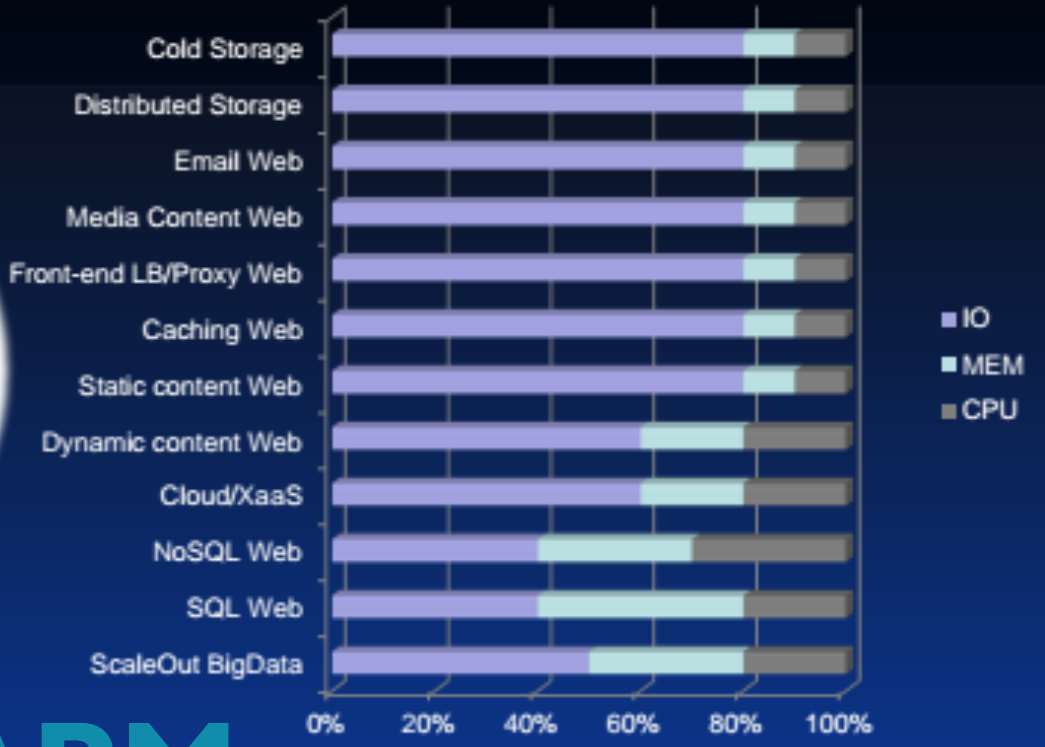
- Device assignment/passthrough (platform) for KVM/Xen
- Device assignment/passthrough (PCIe) for KVM/Xen
- Performance Monitoring support for KVM
- ACPI on Xen
- GICv3 support and improvements for both Xen/KVM
- Migration support for KVM on ARMv8-A
- Regular testing and CI loop for ARM virt. technologies
- QEMU EL2/EL3 emulation (TrustZone support)
- Containers

Workloads

- OpenStack
  - Tempest 3rd party CI testing → get official support for aarch64
  - Automated Rally benchmarking
  - Cloud storage with Swift and Ceph
  - Bare metal provisioning and containers

- BigData
  - HDFS, HBase, MapReduce
  - Spark and Scala

Scale-out Workloads – Performance Characteristics
Web-scale workloads largely built on open-source



Workload summary

Not analyzed yet	Knwon gap	Requested work
Available from distro's	Optimization ongoing	Optimized

Web Server front end	Storage	Database	Internet e-Commerce	IT Private Cloud	Big Data	SDN NFV
Apache	OpenStack	MySQL	Web Server	OpenStack	OpenJDK	
PHP	Ceph	MariaDB	Storage	Hypervisors	Hadoop	
Python	OpenJDK	OceanBase	Database	LXC	Spark	
NGINX	Hadoop HDFS	Couchbase	OpenJDK	Docker	mapR	
memcached	Swift	Cassandra		CloudFoundry	prestoDB	
haproxy		MongoDB		OpenShift		
Varnish		Riak		coreOS		
Squid cache		Percona		atomic		
io.js node.js		Redis		snappy		
		InfluxDB		management tools		

More about Linaro: www.linaro.org/about/
Linaro members: www.linaro.org/members