Virtualization infrastructure enhancement

Project proposal
Xen/Paravirtualized Android LBIs
Paravirtualized Android LBI

- Cuttlefish
- Linux
- VM Monitor
- Virtio
- Hypervisor
- Firmware
- Cortex A
Complex reality → LBI-40 (common infrastructure topics)

- **LBI-40/deliverable 3** (LEDGE-282: EBBR Bootloader)
- **LCG-2427**: performance
- **LBI-40/deliverable 1**: boot orchestration/partitioning
- **VIRT-366**: virtio devices
- **LCG-2425**: Android Bootloader

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- **VM services (virtio core…)**
- **Micro-architecture executor**
- **Low level services**
- **Firmware**

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- **Linux**
- **Cuttlefish**
- **AOSP**

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- **Virtio drivers**
- **Android frameworks**

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- **LCG-2424**: missing HALs
- **LCG-2426**: CTS/VTS compliance
- **LCG-2428**: VM agnostic Cuttlefish
- **LCG-2429**: missing HALs

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- **rust-VMM**
- **crosVM**

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- **VRT-366**: virtio devices
- **LCG-2427**: performance
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- **RTOS**
- **Firmware**
- **RT App**

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- **LBI-40/deliverable 2**: Safety/RT VMM
- **LCG-2428**: VM agnostic Cuttlefish
- **LCG-2426**: CTS/VTS compliance
- **LCG-2429**: missing HALs
Organizing activities

- **Cuttlefish: LCG team**
  - LCG-2424, LCG-2426
  - LCG-2427 (performance measurements)
  - LCG-2428: verify Cuttlefish can work on environment developed by Virt LP

- **Virtualization infrastructure enhancements: VIRT team**
  - VIRT-366: virtio devices
  - LBI-40/1: type-1 hypervisor boot orchestration
  - LBI-40/2: rust-VMM based VMM with safety island and Trust Zone components
  - LBI-40/3: optimized virtio; virtio over SPCI/OpenAMP; Android as virtio backend

Particular context: most members and potential project members have solved the engineering challenges. The main goal is to establish an ecosystem optimized solution. → No Linaro resources planned except Alex Bennée, some members may step up
From independent initiatives to project

- Led by Mike Holmes
  - Objective: ensure relevance through holistic approach
  - All VIRT-XXX and (/some aspects of?) LCG initiatives
  - Leverage/cooperate with other projects
    - System DT results
    - LEDGE-282: paravirtualized EBBR bootloader

- Complement it with project membership
  - Morph the technical project into membership project based on SmartNIC model
  - Ad hoc membership fees for non SoC vendors
    - Hypervisor companies: Panasonic, Green Hills, VoSystems, KernKonzept...
    - TrustZone vendors
Thank you

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Anatomy of a hypervisor

- Linux
- AOSP
- Cuttlefish
- Windows
- VM services (virtio core...)
- Micro-architecture executor
- Low level services
- Linux (type-2 hypervisor)
- UEFI (type-1 hypervisor)

- Qemu, crosVM, firecracker
  - rust-VMM...

- Job for Arm, not Linaro

Xen, KVM, Jailhouse, Hafnium...
KVM: VMMs & genealogy

● QEMU
  ○ Can emulate hardware (floppy, Intel e1000, intel PCH...)
  ○ Can emulate processors (run aarch64 on x64...)
● crosVM (Chrome OS VMM, Google led)
  ○ No hardware emulations, virtio only
  ○ Chrome OS focused
● Firecracker (fork from crosVM, Amazon led)
  ○ Lightweight VMM for servers
● Rust-VMM (inspired from crosVM/Firecracker by Google, Amazon, Intel, Red Hat)
  ○ VMM SDK: BYO-VMM
  ○ Rust based for security