Porting Android Automotive on Xen

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Introduction

- As a part of automotive project, the goal is to identify the gaps associated with running Android Automotive OS in a virtual machine using the Xen hypervisor.
- The objective was to leverage the Android Cuttlefish VM as a Xen hypervisor guest with using virtio based virtual device emulations. That involved:
  - Host is Yocto based distro: TRS or SoC vendor’s distro (includes Xen, Linux kernel, and QEMU, etc)
  - Guest is Android Open Source Project (AOSP), built on master branch with aosp_cf_arm64_auto-userdebug* target
  - The proof of concept is in part based on work done by EPAM
- Tested on 3 hardware platforms:
  - ADLink AVA Platform (Ampere Altra SoC, 32 Arm Neoverse N1 CPUs)
  - Telechips Dolphin5 automotive platform (Arm Cortex-A76 x 4 + Cortex A55 x 2)
  - Rockpi 4b (Arm Cortex A72 x 2 + Cortex A55 x 4) (Jun Nie)

* It was renamed as aosp_cf_arm64_auto-trunk_staging-userdebug in Oct, 2023
Screenshot ;-)
Current status

- Support Xen virtual machine in Android U-boot [patches - merged]
- Support Xen fundamentals and frontend drivers in Android common kernel [patch - no plan for upstreaming]
- Support Xen virtual machine in Android Cuttlefish device folder ($android/device/google/cuttlefish)
  - Set display finder mode as “drm” [patch - merged]
  - Support booting on Xen virtual block device [patch]
  - Fix console hvc0 regression [patch]
- Maintain Xen and QEMU repositories for support virtio devices on Xen / Arm64
- Known issue: Cuttlefish’s secure_env is absent on Xen, file system encryption, oemlock and other security services have been disabled.

- Demo: Booting Android automotive OS on Xen virtual machine
Next steps

● Upstream Android Cuttlefish patches for better support Xen virtual machine.
● Support virtual devices with vhost based backends
  ○ Develop vhost user based backends in a hypervisor-agnostic way: vhost-device
    RNG, I2C, GPIO, SCSI, sound (WIP), input (WIP), etc.
  ○ Vulkan support for virtio-gpu
● Any suggestions are welcome!
Thank you!