Hypervisor Project

Purpose and Rationale

The Hypervisor Project is producing a common open licensed **Automotive Standard Virtual Platform** specification based on VIRTIO, and other standards.

On the more general scope, the project investigates the wide scope of open- source and commercial hypervisor technologies, and addresses challenges in their use.

Through collaboration between all vendors, experts and adopters of virtualization technology we can lower the barriers to successful product development.

The project primarily drives requirements, standardization for Hypervisor APIs, and other types of investigations to facilitate ECU consolidation, price reduction, and management of mixed-criticality in systems for improved security and functional safety.

There are three primary work streams currently in development:

1. **Virtual Device API standardization, leading to the definition of the Automotive standard Virtual Platform**
   collecting and driving requirements for a standard platform based on VIRTIO, SCMI, and other existing standards.
2. *Multi-OS system design on Multi-Core SoCs* *(with/without virtualisation)*
3. **Investigate and recommend electrical/software architecture for automotive use-cases, when deployed using virtual-machine technologies.**

Next Meeting

Every Monday, 10:00 AM CET

Agenda:

- Planning deep-dive topic meetings to take a break from pure AVPS writing.

General backlog

- **AVPS** v2 completed --> AVPS JIRA tickets for tracking
- Whitepaper planning (dormant at the moment)
- Deep-dive Memory Buffer sharing (GPU) - suggested by Eugen Friedrich
- Update Milestones, deliverables, and workplan.
- **Use-cases, architectures and requirements** workstream (dormant)
- Re-review scope of workand synergy opportunities, AGL virtualization EG. Links to previous papers below.
- Establish scope of work and synergy opportunities for virtualization in AUTOSAR
- Android and Trout, evaluation and establish relationship to AVPS.

Zoom Meeting details:

- Registration link (if you do it before, it saves time)
- Join link
- Meeting password: **!hvws2020**

Meeting Minutes (use link)

Resources

Videos/recordings

- **Automotive World** / **GENIVI Webinar**: **Hypervisors in the vehicle: A standards-based approach to virtualization**
  by **Tero Salminen,** Senior Director Product: Virtualization, at **OpenSynergy,** and GENIVI Technical Lead **Gunnar Andersson.**
- **Linux Plumbers Conference, 2020**
  – Android Microconference : Android Automotive OS virtualization (Cuttlefish->Trout) – and related: Memory protection in KVM for Android,
  – Android BoF: Virtualization discussion
- **Platform Security Summit** May 23-24, 2018 - had several hypervisor related presentations – Youtube, (website)

Related publications and input

- Report (transcript) from Automotive World Webinar, **13 February 2020**
- **White paper from Mentor found under this link..**
- **Samsung Resarch - Automotive Virtualization**, presented at Xen Summit 2018.
- **VIRTIO v1.0 specification**
- **VIRTIO 1.1 specification (and newer git master)**

- What's new in VIRTIO 1.1 – FOSDEM 2018 presentation
- What's new in VIRTIO 1.1 – another at DPDK.org
- An update on VIRTIO - FOSDEM 2019
- **The AGL software defined connected car architecture** (a.k.a "AGL virtualization paper")
  - PDF (snapshot May 2018) ⚠️ ^^^ NOTE that is an **older** snapshot of a living paper, (Google Docs edit location).
  - Paper analysis/summary written by Nikola Velinov with intro paragraph by Gunnar Andersson – based on May 2018 snapshot.
  - **UPDATE:** Study this latest published version (June 2018) from AGL publication page

- **Ward's Auto** online magazine – GENIVI article**: A Better Managed Approach to Virtualization in Automotive**

Mailing list & Contribution

1. Discussion should use the general genivi-projects mailing list. ⚠️ Start the subject line using: **[HVWS]**
2. The Wiki is an open public collaboration area. Please contribute/improve it as needed. Improve text, add relate info, links, references! To edit the Wiki, log in or request an account.
3. Any other process question? - you can contact the *acting* project lead: **Gunnar Andersson**

Upcoming Events / F2F

GENIVI 20th All Member Meeting a Digital Experience

F2F Meetings (completed)

- Dates: 24-25 September 2019 (Tuesday, Wednesday)
- Location: Opensynergy, Berlin, Germany
- Agenda: Hypervisor Project F2F meeting 20190924-25
- Bangalore Technical Summit Agenda (2018 October)
- Munich AMM Workshop Agenda (2018 April)

Original topic-list (possible focus areas)

- APIs for security: Mandatory Access Control features (in virtualization environments, that is)
- VM management tool
- Instrumentation & tools
- Safety compliance: ISO26262
- Security compliance: Common Criteria, EAL
- System design to optimize Boot Time,
- Boot requirements, e.g. secure boot, integrity check,
- Agree on Terms / Nomenclature

Done / skipped / no longer on backlog

- Reactions to Samsung presentation
- Reference implementation: Should be based on which hypervisor(s)?
  - Answer: All are welcome. The companies that do the development will in practice affect the choice(s).

Project Pages summary

- [HV] Next Generation Multi-OS System Design Whitepaper
- Compute Platform - Project Proposal
- HV Project Deep-dive topics for 2021 June and forward
- HV - Webinar plan
- HVWS - Watchdog
- HVWS Workshop Schedule at Bangalore Tech Summit
- Hypervisor in Automotive - Critical Use cases
- Hypervisor Project - minutes
- Hypervisor Workshop Schedule at Munich AMM 2018
- Hypervisor Workshop Schedule at Munich AMM 2019
- Participation in Hypervisor Project
- Principles of meta/delta-specification (formal specification with reference/reuse)
- Virtual Platform definition for Automotive Hypervisor Environments

Topic Introduction:
Virtual Device standardization, a.k.a. Automotive Virtual Platform definition

Define common I/O devices for hypervisor guests with standardized features and interface, such that device drivers (and as a consequences systems, virtual-machines) become more portable.

Advantages:

- Device drivers (for paravirtualization) for the (Linux*) kernel don't need to be maintained uniquely for different hypervisors
- Ability to move hypervisor guests between different hypervisor environments
- Definite potential for shared experience and getting the right functionality into the APIs.
    - Heterogeneous cross-system testing will strengthen specs and implementation.
- *Some* potential for shared device driver *implementation* across hypervisors (dependent on licenses - open-source, closed-source)

*virtio also supported by BSD, Windows, Fuchsia, and others

Extending this: Standardizing a contract/standard between guest and hypervisor. Compare the OCI initiatives for containers. Container runtimes can we have standardized "hypervisor runtime environment" that allows a standards compliant virtual (guest) machine to run.

- Hypervisors can fulfil the specification (with local optimizations / advantages)
- Similarly, this specification is what guests can be engineered to.

Compare: Linux Device Tree – ability to discover and configure devices.

The work is documented here

(⭐ ^^ includes links to many topic presentations by the participants)