GENIVI Android Automotive Special Interest Group

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GENIVI Virtual Technical Summit | May 12, 2020

GENIVI Alliance

Why is GENIVI Alliance working on Android Automotive?

GENIVI has promoted Open shared software and standards and created business opportunitites in the automotive industry for over 10 years

- **2009-2015 –** Linux acceptance in automotive. Infotainment platform software and standards.
- **2016-2017 –** Cross-Domain Interaction, adapting to Multi-OS reality, safety demands
- **2018-... –** Multi-OS, Connected Cockpit, Virtualization,
  = Integration technologies for diverse, distributed and cloud-connected EE architectures.
- **2020-… –** Big-picture, end-to-end integration, adapt to latest industry trends

Example: Android Automotive Special Interest Group

PROJECT CHARTER - Android™ Automotive Special Interest Group (SIG)

Opportunity Statement
Automotive OEMs are increasingly adopting Android Automotive (embedded) as a solution for their IVI stack. This adoption has introduced a series of challenges around integrating the Android Automotive embedded solution into existing legacy software and into other systems present in the vehicle (security, vehicle data, etc.).

Through a GENIVI-hosted Android Automotive SIG project, OEMs, their suppliers and the broader cockpit software ecosystem can discuss requirements, identify gaps and provide an aligned, community voice for discussion with the Google Android Automotive team.

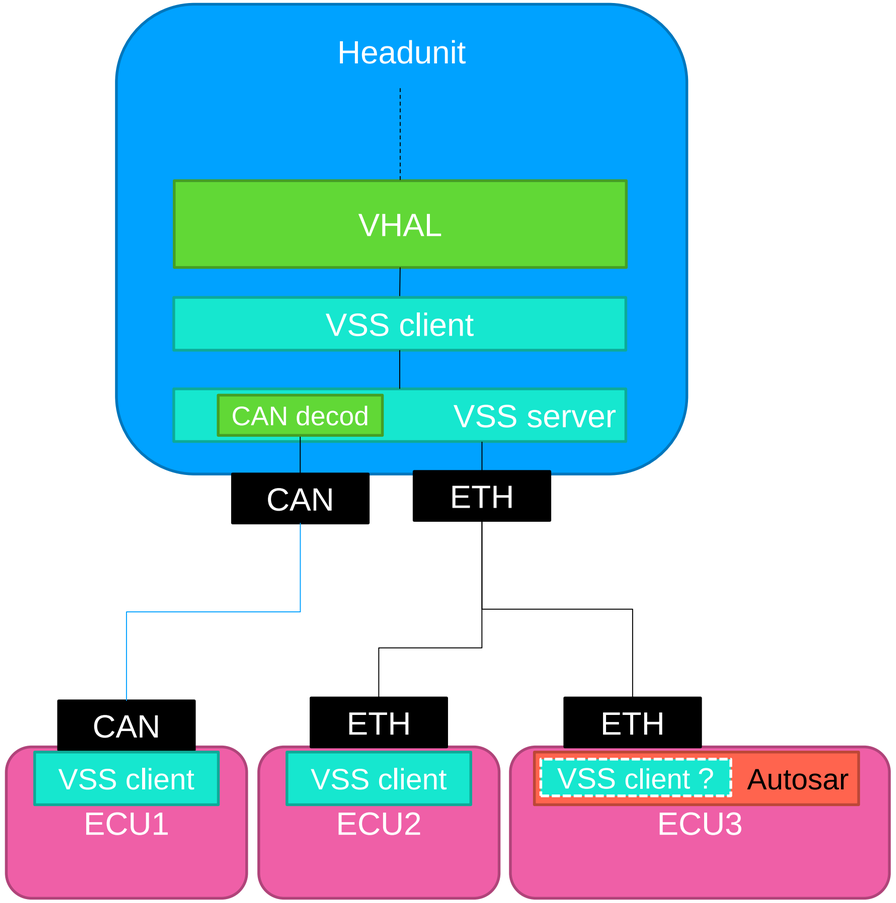
Current Project Focus:
- **Vehicle HAL / Vehicle Data APIs project**
  - System Level Architecture for accessing vehicle data
    - Including integration with the « rest » of the vehicle, using e.g. Some/IP
  - Software Architecture / API definition, including authentication of app
  - Proof-of-concept implementation
- **Audio HAL project**
  - System Level Audio
  - Software Architecture / API definition
  - Proof-of-concept implementation

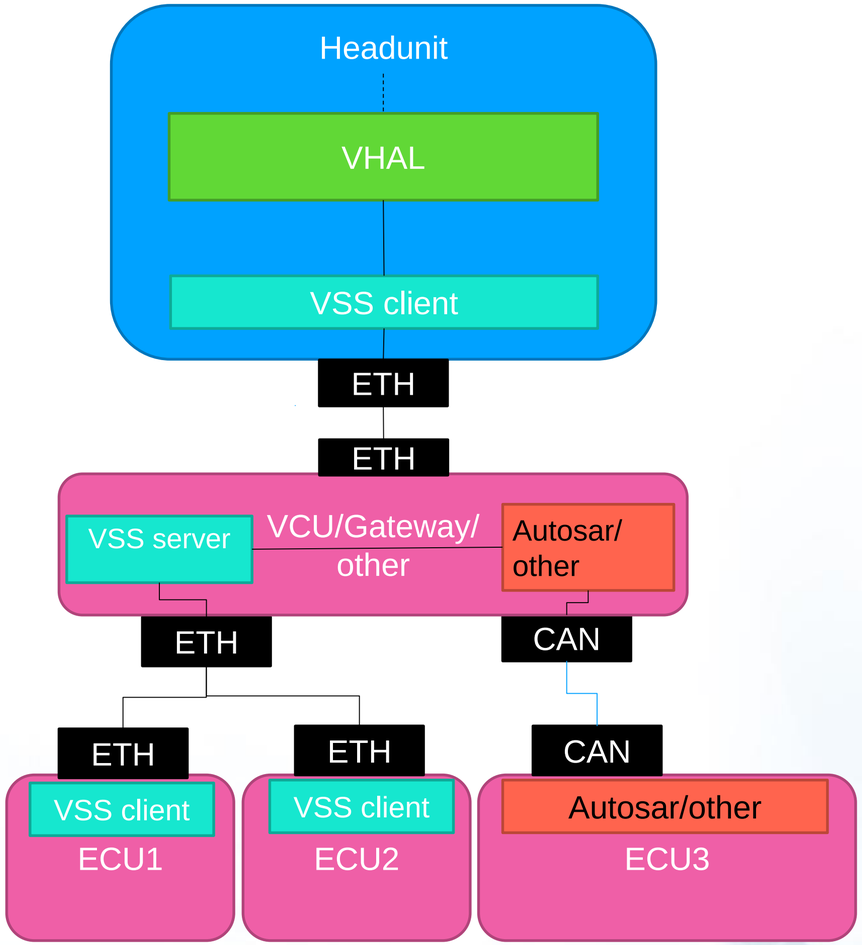
Proposed Areas of Project Focus
- List of extensions required for Android in an automotive environment
  - location-based services - capability to plug in “other” navigation engines in Android Automotive considered as important
    - looking for a topic owner
  - multi-display support with Android and non-Android systems - analysis in-progress by the graphics sharing team
  - lifecycle, diagnosis and health monitoring
- Long-term maintenance
  - Defining boundaries where Tier 1s / OEMs must take primary responsibilities over Google Android Automotive team support
  - Keeping an automotive system updated to support new versions of Android

Vehicle Data APIs / VHAL Report

Android Automotive SIG - Vehicle Data APIs - VHAL – Report

System-level architecture for accessing vehicle data – starting point





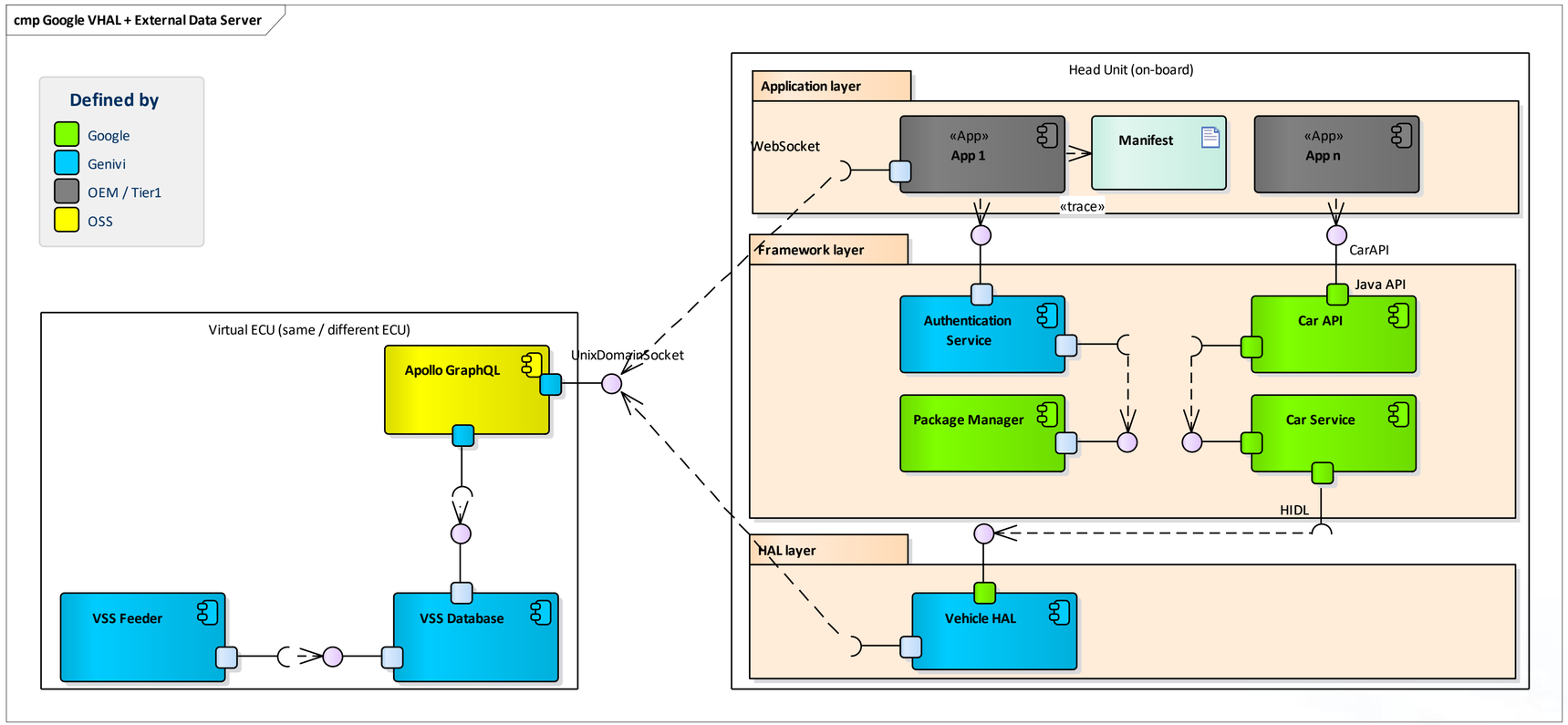
Different software architectures for accessing vehicle data

Main thread of work: Establish a unified way on accessing vehicle data

- **4 architectural concepts for accessing vehicle data identified**
  - External Data Server
  - Data Server inside the Framework (so-called Internal Data Server)
  - SomeIP stack inside the AOSP Framework
  - Google VHAL + OEM Extensions
- **Implementation in-progress for External Data Server concept** (see next slide)
  - Other concepts will be presented in the workshop on Day 2 – 13 May – 15:00-18:00 CET

Android Automotive SIG - Vehicle Data APIs - VHAL – External Data Server Concept

Design choices made by the group



- VSS adoption (Vehicle Signal Specification) – will be introduced in the CCS project report
- Coexistence of Google VHAL and Data Server
- Application authentication
- Interface with the « rest » of the vehicle, e.g. via Some/IP

Android Automotive SIG - Vehicle Data APIs - VHAL – Report

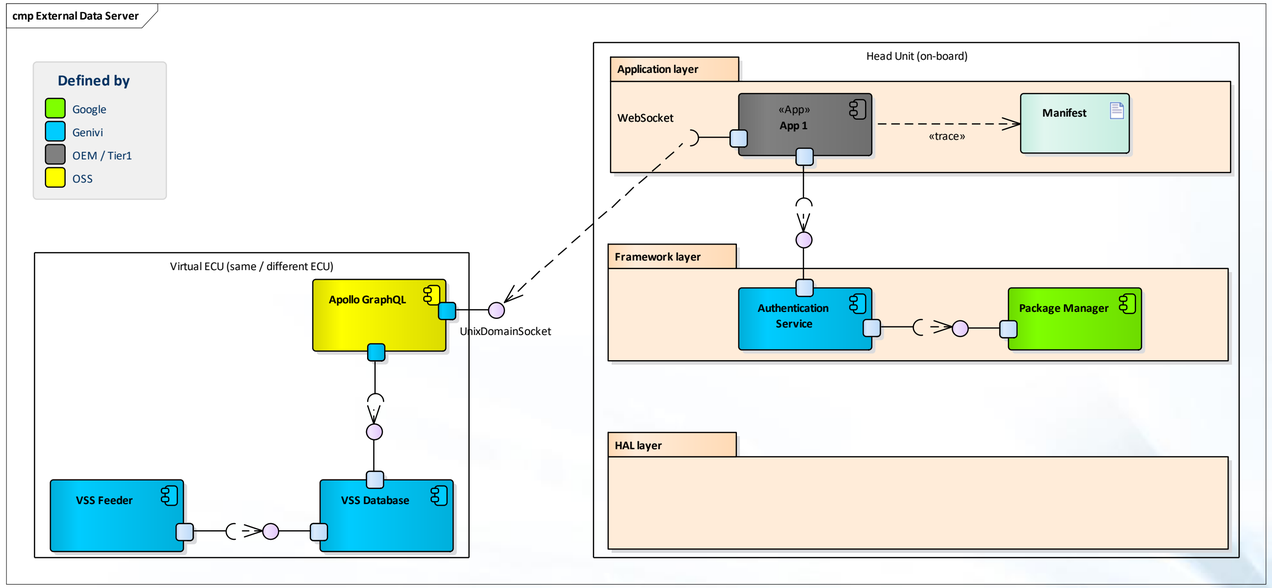
External Data Server Proof-of-Concept

Work breakdown structure is available, implementation in-progress

- Demo will be shown in the workshop
- Authentication Service implementation
  - Sources: https://github.com/stefanwysocki/aasig_dev_platform/tree/develop/vendor/genivi/modules/VssAuthenticationService
- External Data Server implementation
  - **Data server:** Publishing of GraphQL comprehensive example done
    - Sources: https://github.com/GENIVI/vss-graphql
  - **VSS feeder:** Basic functionality is working
    - Sources: https://github.com/GENIVI/vss-feeder

Several low-hanging fruit activities identified

call for volunteers !! Please contact the team



Android Automotive SIG - Vehicle Data APIs - VHAL – Report

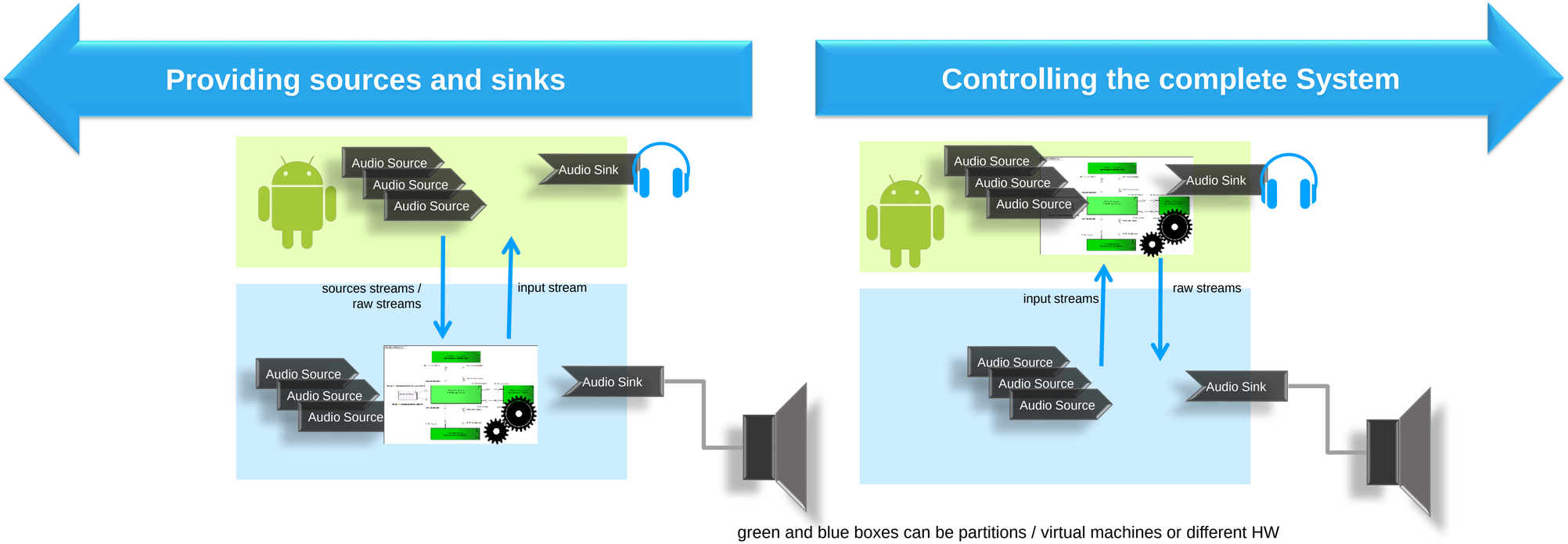
- Team participants: BMW, Daimler, Jaguar Land Rover, TietoEVRY, Bosch, EPAM

- Agenda for this week’s workshop :
  - Project overview & proof-of-concept demo
  - Topics discussion
    - Google Vehicle Properties Implementation based on GraphQL Service.
    - Permission groups specification.
    - Translation of permission groups.
    - JWT Token what will be included and how it will be done? And generation process?
  - Feature content definition for next milestones
  - Technical readiness level assessment and discussion on how and when to reaching out to Google

Audio HAL Report

Android Automotive SIG – Audio HAL – Technical Report

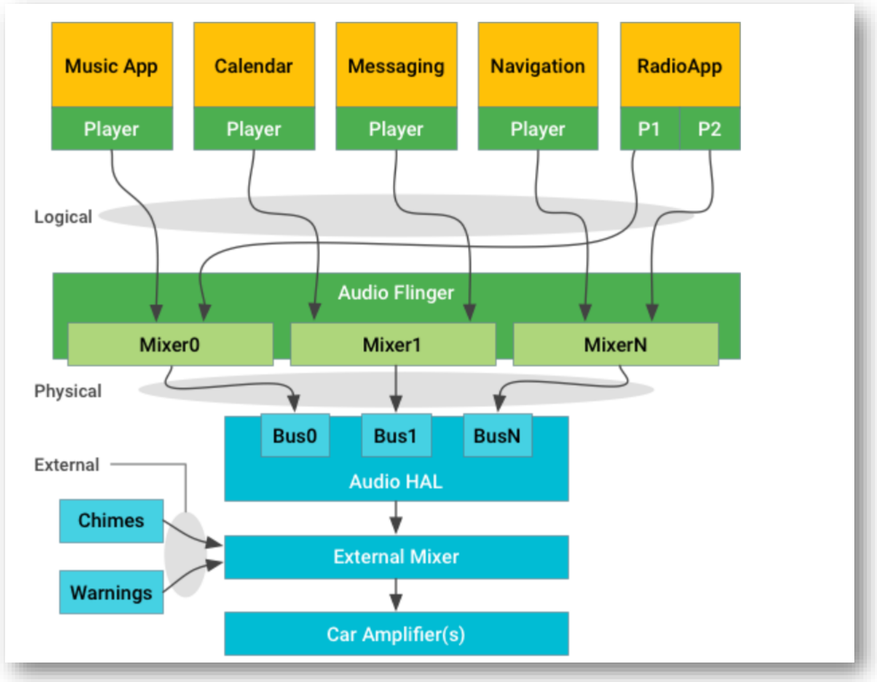
- Main thread of work - How to Control a Car Audio System with Android

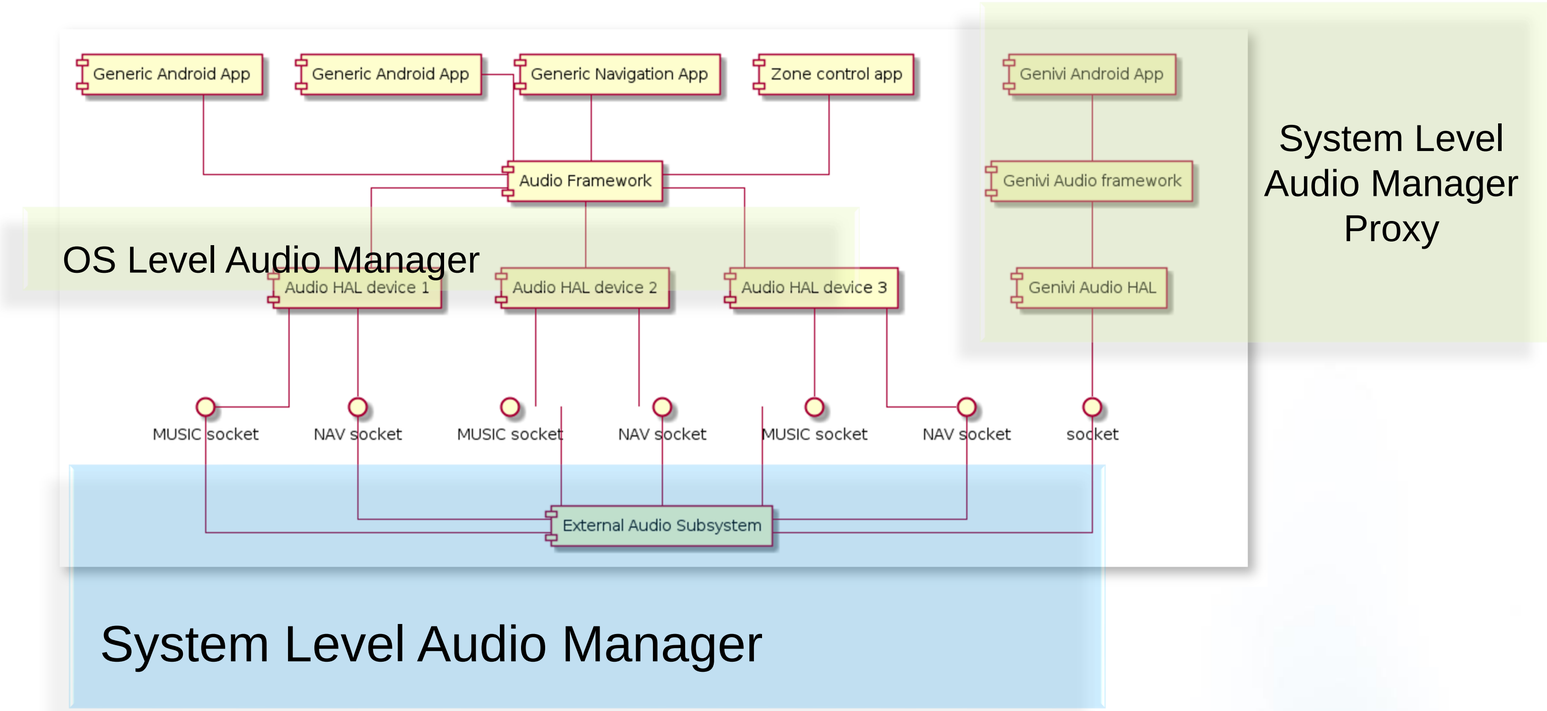


green and blue boxes can be partitions / virtual machines or different HW

- Both strategies have advantages and disadvantages
  - Relying on Android only does not fulfill some safety requirements
  - Considering Android as sources and sinks only does not take enough advantage of it
- Therefore each topic has to be analysed and assigned : inside or outside Android

Android Automotive SIG – Audio HAL – Technical Report
Proof Of Concept - Getting Raw Streams





- Reference design from Google side by side to the GENIVI Proof Of Concept proposal
  - Android design relies on an External System (Mixer, Amplifier, Safety signals,…)
  - GENIVI Proof Of Concept tries to provide an concrete instantiation of the Audio Control Split

Android Automotive SIG – Audio HAL – Management Report

- Team participants: BMW, Mobis, TietoEVRY, EPAM, Bosch, Analog Devices

- Main thread of work - How to Control a Car Audio System with Android
  - 1st proof-of-concept implementation started - Getting raw streams out of Android
    - Demo will be shown in the workshop
    - Source code repository in preparation

- Agenda for this week's workshop :
  - Project overview & proof-of-concept demo
  - Proof-of-concept details discussion
    - Feature content definition for next milestones : Audio Manager integration, avoiding Audio Manager modifications and long term API support strategies
    - Proof-of-concept prerequisites (external raw streams, injecting input streams)
  - Going through list of prioritized topics for and refining the priorities asking participants about their opinion and feedback
  - Technical readiness level assessment and discussion on how and when to reaching out to Google
  - Backup topics: Early Audio, Audio Calibration / Equalization, Controlling Audio Effects (Google might improve it in next version)

Contributing

Timeline

- Milestone 1 – **GENIVI Virtual Technical Meeting** (12-14 May)
- Milestone 2 - Internal milestone (early Q3 - July)
- Milestone 3 - Fall All Member Meeting, Leipzig, Germany (last week of October)
- Milestone 4 - CES 2021, Las Vegas, USA (early January 2021)

- **GENIVI Virtual Technical Meeting**
  - AASIG VHAL Session : Wednesday 13 May – 15:00-18:00 CET
  - AASIG Audio HAL Session: Thursday 14 May – 9:00-12:00 CET.

Contributing

- **Weekly telcos**
  - Tuesdays – 17:00 CET (US friendly time) – Vehicle Data APIs / VHAL
  - Thursday - 11:30 CET (India & Asia friendly time) – Audio HAL
  - Mailing list: http://genivi.emwd.com/mailman/listinfo/aa-sig_lists.genivi.org

- **Wiki**
  - Android Automotive Project Wiki : https://at.projects.genivi.org/wiki/x/XgA4Ag
  - Vehicle Data Access / VHAL - External Data Server Proof-of-Concept Work Breakdown Wiki
    https://at.projects.genivi.org/wiki/x/RgXYAg
  - Audio HAL - System Level Audio Wiki
    https://at.projects.genivi.org/wiki/x/BAIyAw

Thank you!

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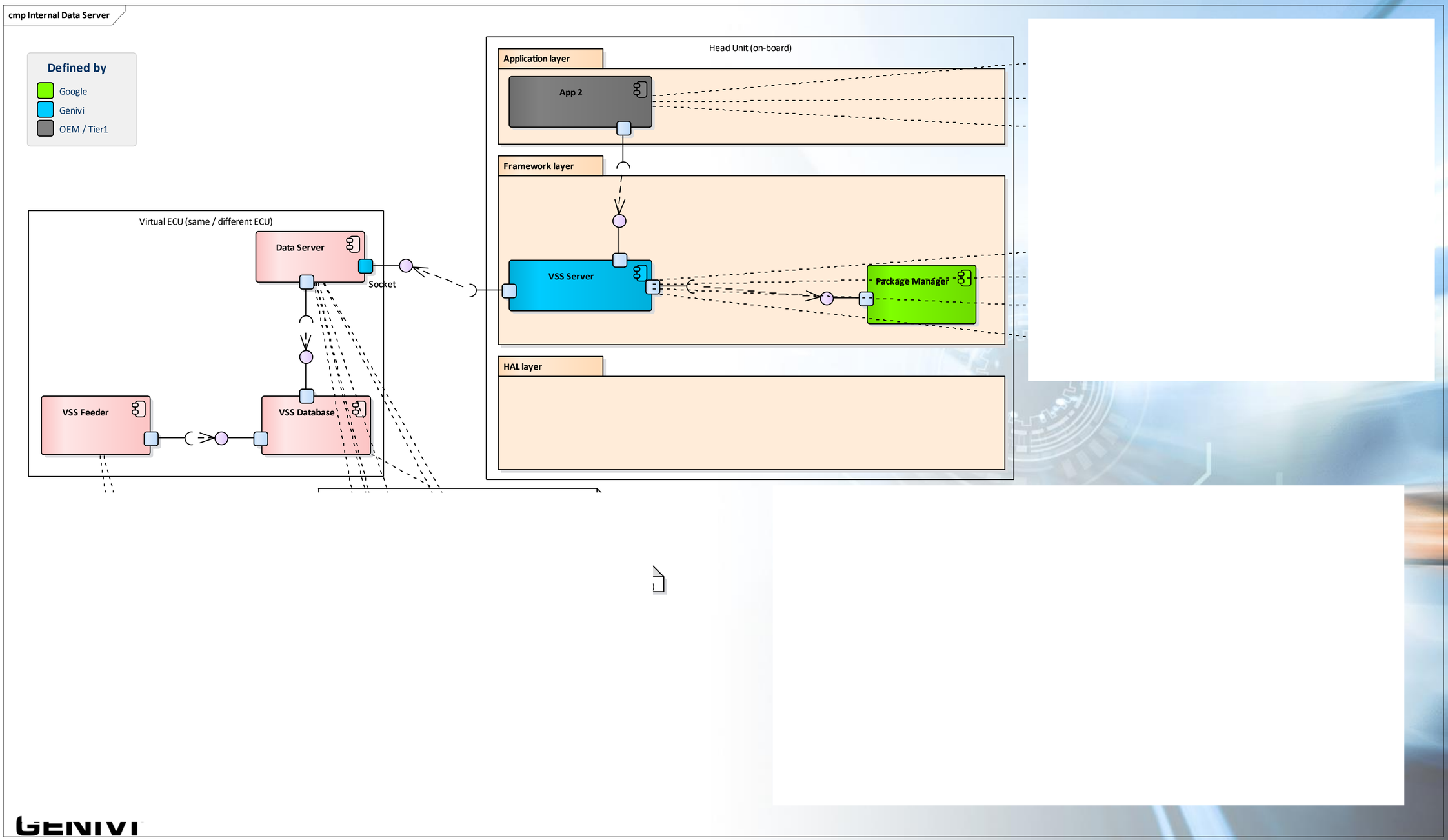
http://projects.genivi.org

Contact us:

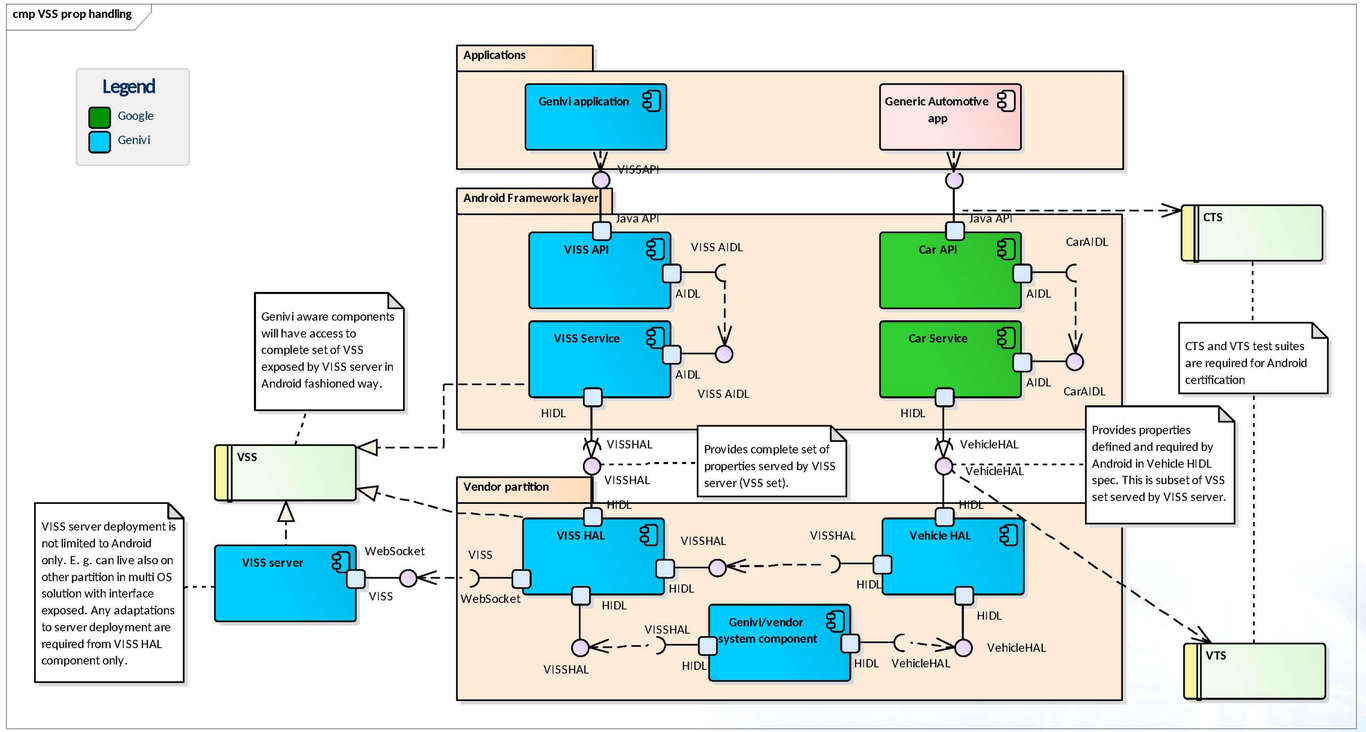
help@genivi.org

Vehicle Data Access - via Internal Data Server implementation



Vehicle Data Access via Customized HAL - Google VHAL + OEM Extensions inside

Architectural proposal I (via custom HAL)



Vehicle Data Access – via Some/IP Service - SomeIP stack inside the Framework

Look at vsomeip port to AOSP : https://github.com/GENIVI/vsomeip/pull/107

Architectural proposal III (via Global SomeIP Service)