

Reference Hardware, System Architecture deals with various requirements from OEMs.

ALS(Automotive Linux Summit) 2017 Keynote



2017.06.02

SEIJI GOTO

Mazda Motor Corporation



ZOOM-ZOOM

MAZDA and LINUX, 2013-



Automotive-specific requirement:
Reliability
High-speed start/shutdown
Power supply management
Long life cycle
...



All of this will be a lot for one company to take on.

MAZDA joined AGL, 2016-

✓ What Mazda wants:

- **Improve quality and avoid failures**
- **Continuous innovation/renovation**
- **Improve Time-to-market speed**
- **Reduce the cost**

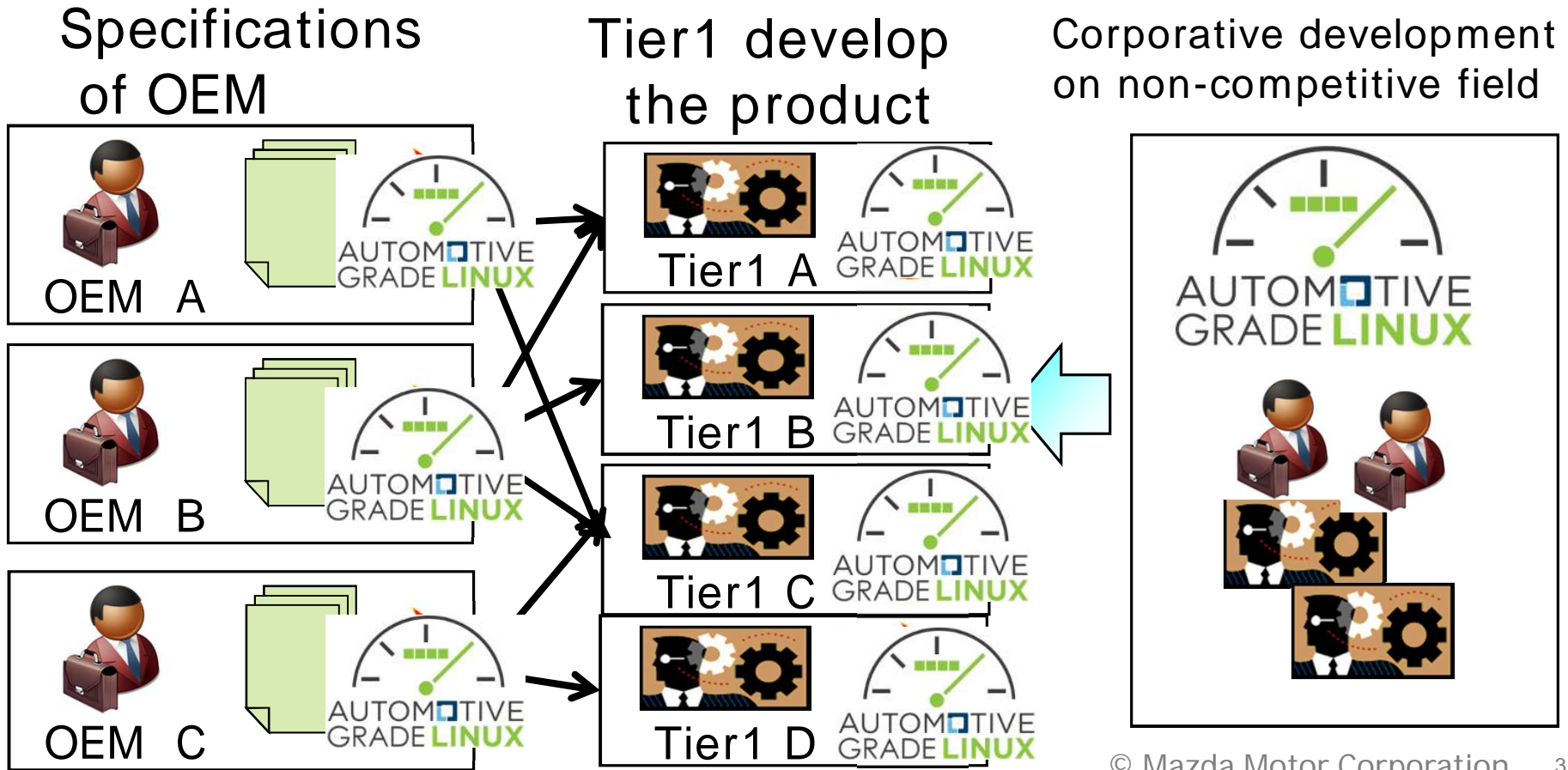
The goals of the Automotive Grade Linux Workgroup are to provide:

- **An automotive-focused core Linux operating system stack** that meets common and shared requirements of the automotive ecosystem with a **broad community of support** that includes individual developers, academic organizations and companies.
- **A transparent, collaborative, and open environment** for Automotive OEMs, Tier One suppliers, and their semiconductor and software vendors to create amazing in-vehicle software.
- **A collective voice** for working with other open source projects and developing new open source solutions.
- **An embedded Linux distribution** that enables rapid prototyping for developers new to Linux or teams with prior open source experience

Source : <https://www.automotivelinux.org/>

We sympathized with the goals of AGL, and became one of AGL's members.

Some IVI projects are going up in flames



“New” Expert Group together with OEMs

Reference Hardware System Architecture

Expert Group (RHSA EG)

HONDA

MAZDA

SUBARU

SUZUKI

TOYOTA



Multiple OEMs and Types of Cars

AGL OEMs

DAIMLER, FORD
HONDA, JLR, MAZDA
MITSUBISHI MOTORS
NISSAN, SUBARU
SUZUKI, TOYOTA

Types of Cars

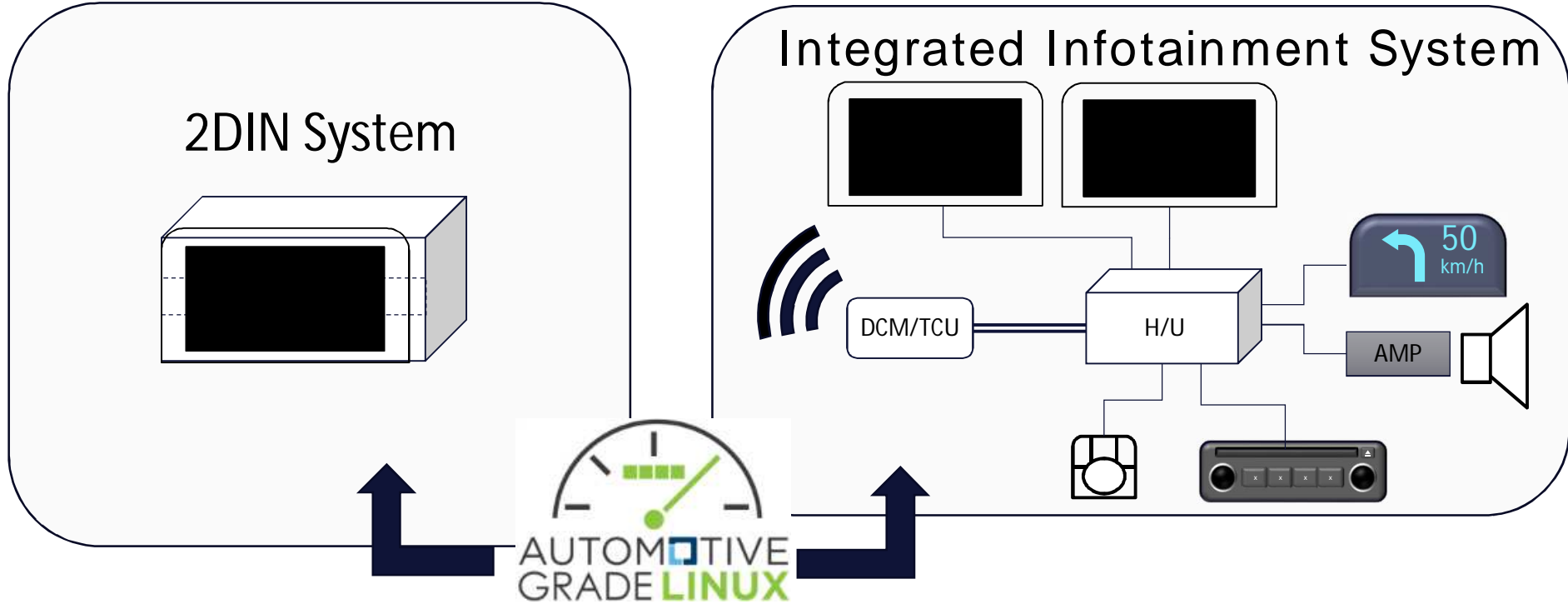
Compact · Sports · Luxury
Sedans · SUVs · Crossovers
Electric Cars, Hybrid Cars



The Diversification of IVI system configuration is inevitable.



Compatible with various IVI system



If AGL can work on both systems, (just like laptop and desktop) it will solve the problem of the current IVI development workload.

To be compatible with various IVI system

AGL UCB needs to be able to operate on various IVI system configurations.

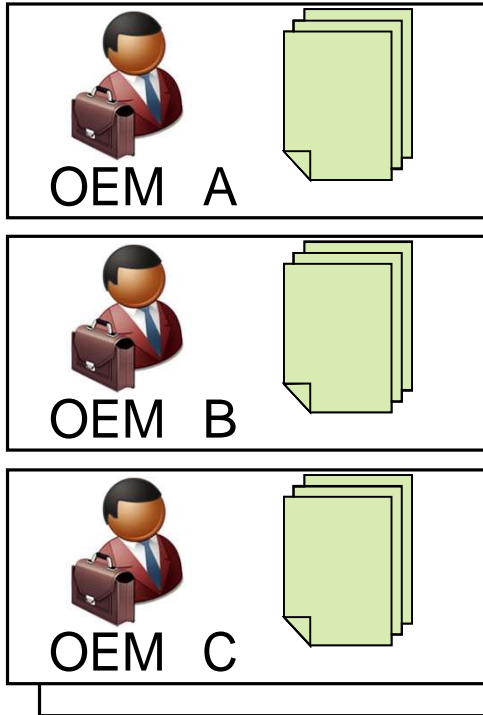
[For this, what we need is :]

- A system architecture compatible with various combinations of peripherals.
- Common reference hardware
- AGL platform independent from IVI system configurations.

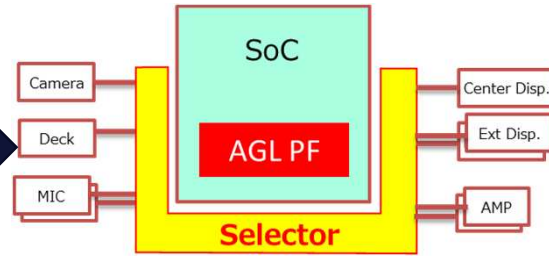


RHSA EG's Plan

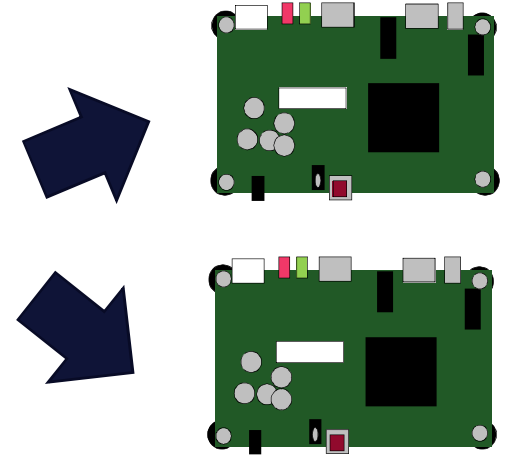
Collect hardware requirements from OEMs



Design system architecture compatible with various requirements



Define reference hardware deal with various requirements

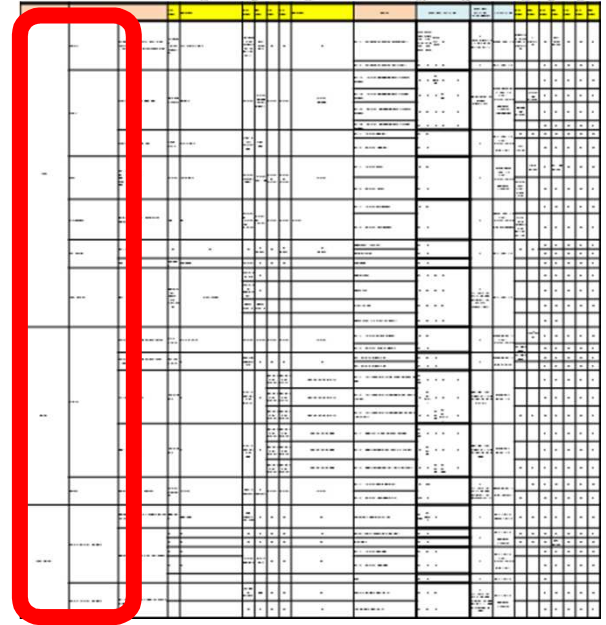


Collect hardware requirements from OEMs

Input Camera , Media, Tuner,
Microphone
Navi Sensor, Input device

Output Display, Amp/Speaker

Input/
Output Vehicle External Network
(ex. WiFi Bluetooth®, DCM/TCU)
Vehicle Internal Network
(ex. CAN)

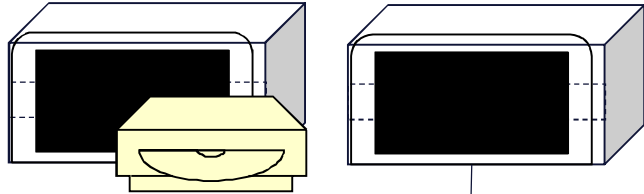


Item No.		Item Name		Item Description		Item Specification		Item Requirement		Item Status	
1	1.1	Camera	Front View	Resolution: 1920x1080	Frame Rate: 30fps	Field of View: 120°	Low Light Sensitivity	Standard	Required	Yes	Yes
2	2.1	Microphone	Interior	Frequency Response: 100Hz-20kHz	Sensitivity: -40dB	Signal-to-Noise Ratio: 60dB	Directional	Standard	Required	Yes	Yes
3	3.1	Navi Sensor	GPS	Accuracy: 5m	Update Rate: 1Hz	Power Consumption: 100mW	Wide Area Coverage	Standard	Required	Yes	Yes
4	4.1	Input device	Touchscreen	Resolution: 1920x1080	Response Time: 10ms	Multi-touch Support	Capacitive	Standard	Required	Yes	Yes
5	5.1	Display	Infotainment	Resolution: 1920x1080	Refresh Rate: 60Hz	Panel Type: LCD	Wide View Angle	Standard	Required	Yes	Yes
6	6.1	Amp/Speaker	Front	Power: 50W	Frequency Response: 20Hz-20kHz	Impedance: 4Ω	High Fidelity	Standard	Optional	No	No
7	7.1	Vehicle External Network	WiFi	Standard: IEEE 802.11n	Speed: 300Mbps	Range: 100m	Secure	Standard	Optional	No	No
8	8.1	Vehicle External Network	Bluetooth	Standard: Bluetooth 4.2	Range: 100m	Power Consumption: 100mW	Low Power	Standard	Optional	No	No
9	9.1	Vehicle External Network	DCM/TCU	Standard: CAN 2.0B	Speed: 500kbps	Range: 10km	High Reliability	Standard	Required	Yes	Yes
10	10.1	Vehicle Internal Network	CAN	Standard: CAN 2.0B	Speed: 500kbps	Range: 10km	High Reliability	Standard	Required	Yes	Yes

Collect hardware requirements from OEMs,
make it clear what is common and
what is different

Design system architecture "Selector"

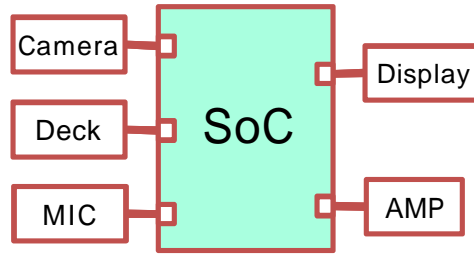
Internal / External



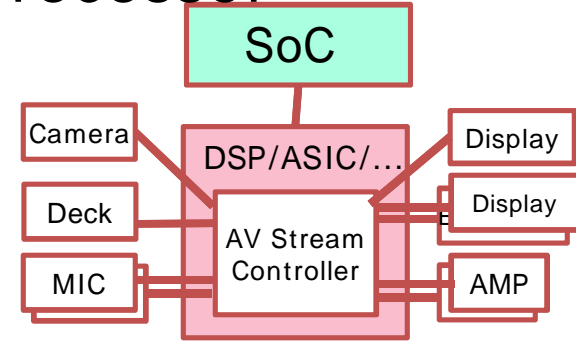
Internal Deck

External Deck

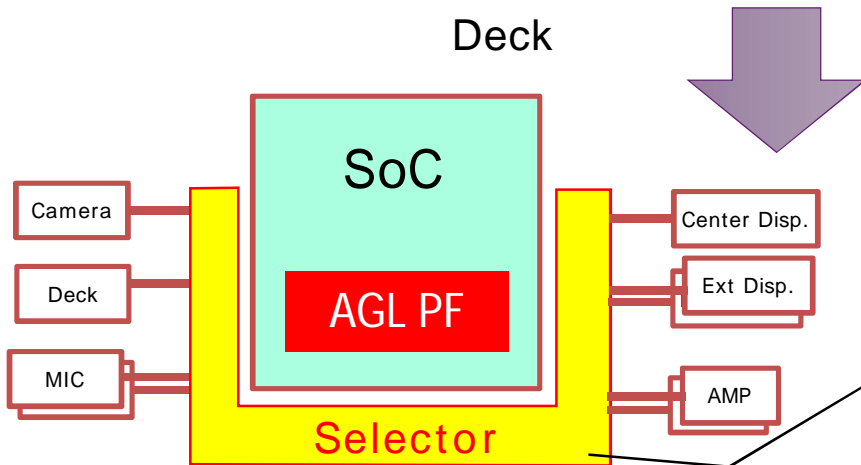
AV control processor



connected to SoC



Connected to AV control processor

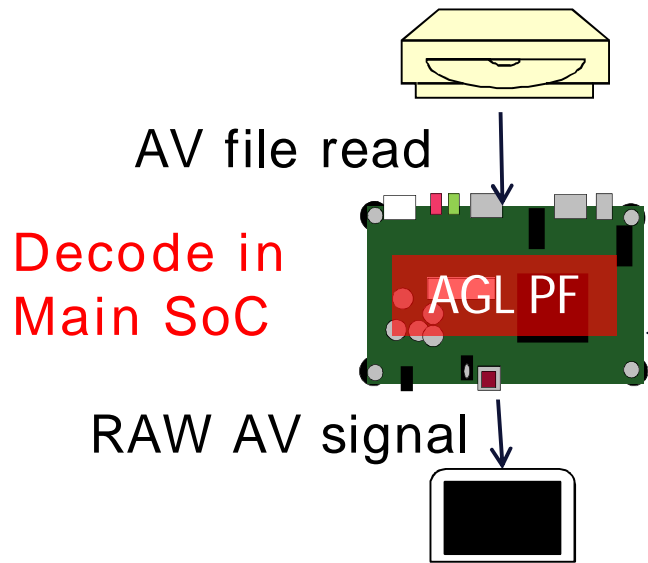


Selector :
Make AGL PF compatible
with Audio/Visual
hardware configurations

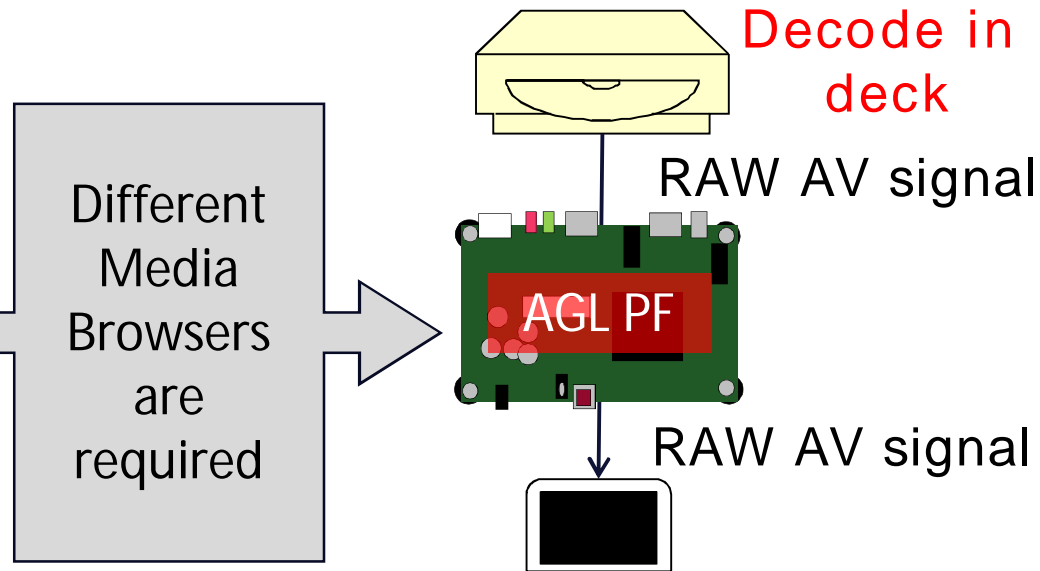


Design system architecture: function allocation

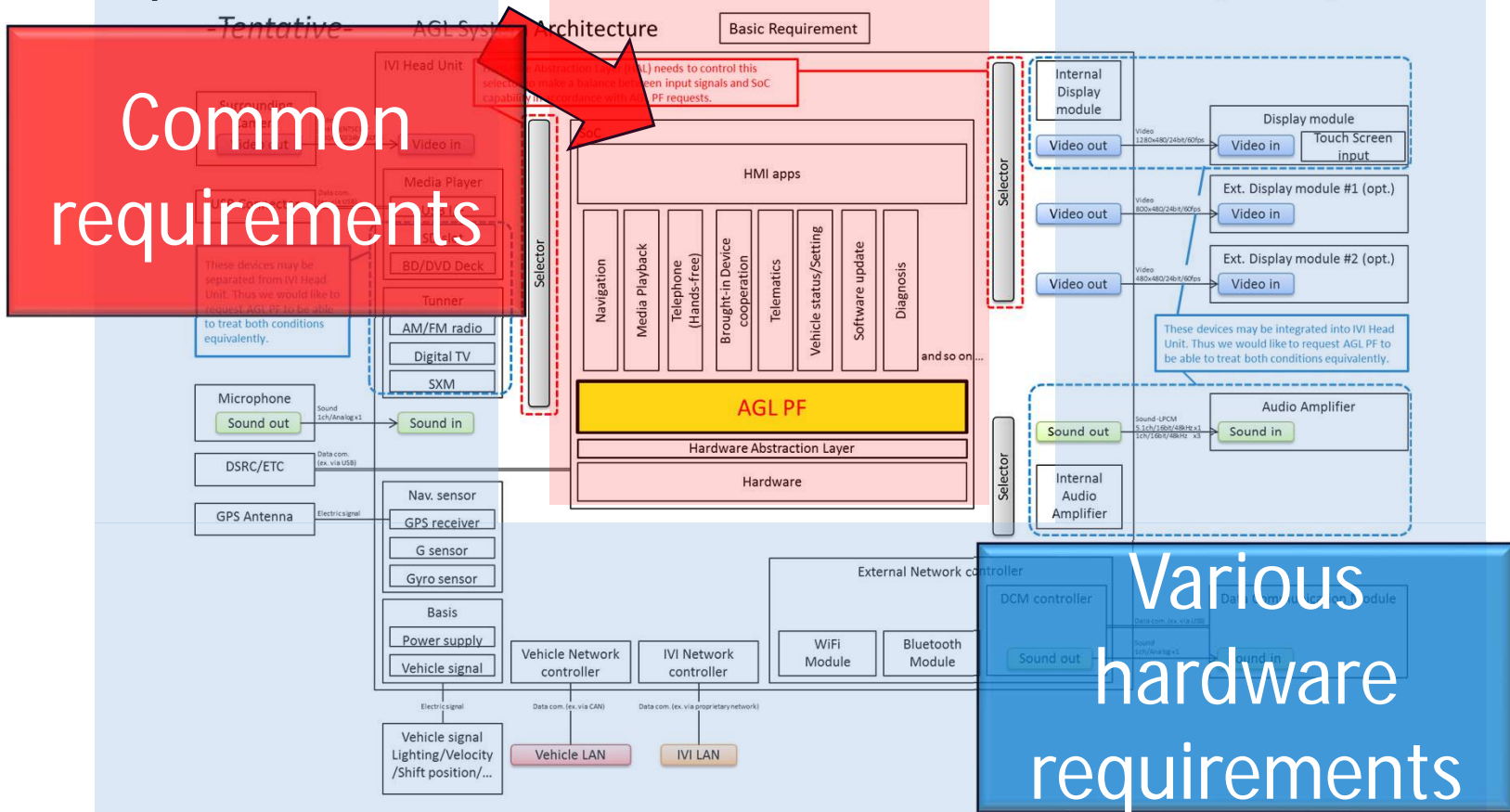
In SoC decode



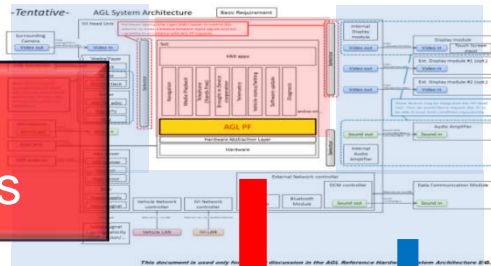
In-deck decode



Example of System Architecture compatible with various combinations of peripherals.



Define Reference Hardware



Common Requirements

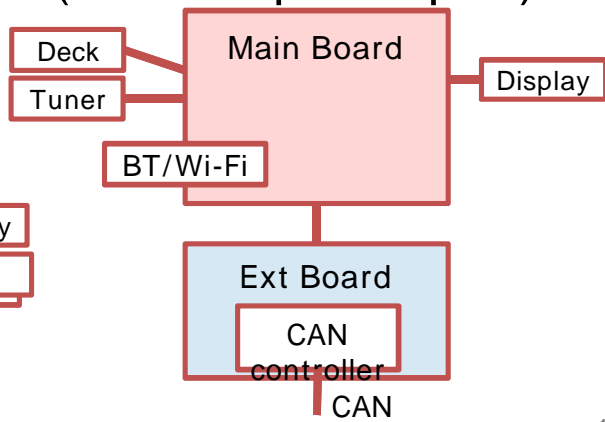
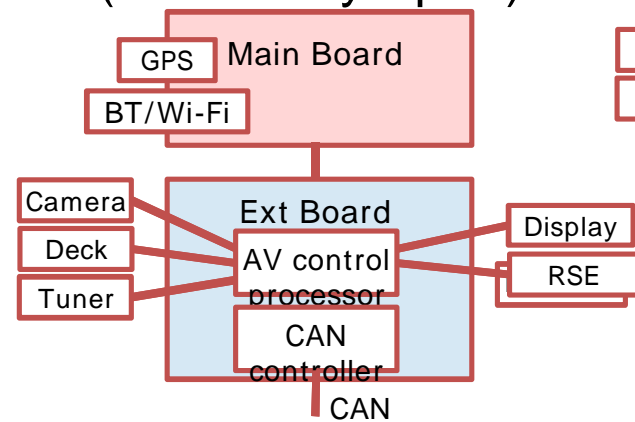
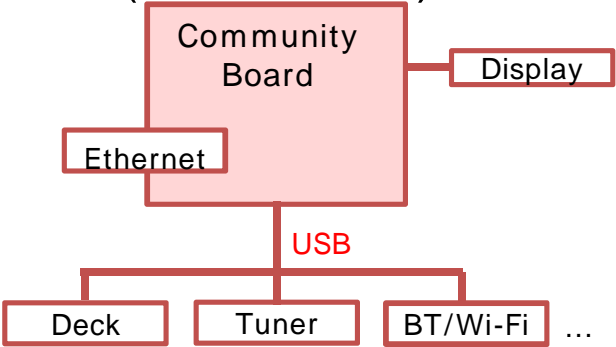
Various hardware requirements

Reference Hardware (for AGL PF)

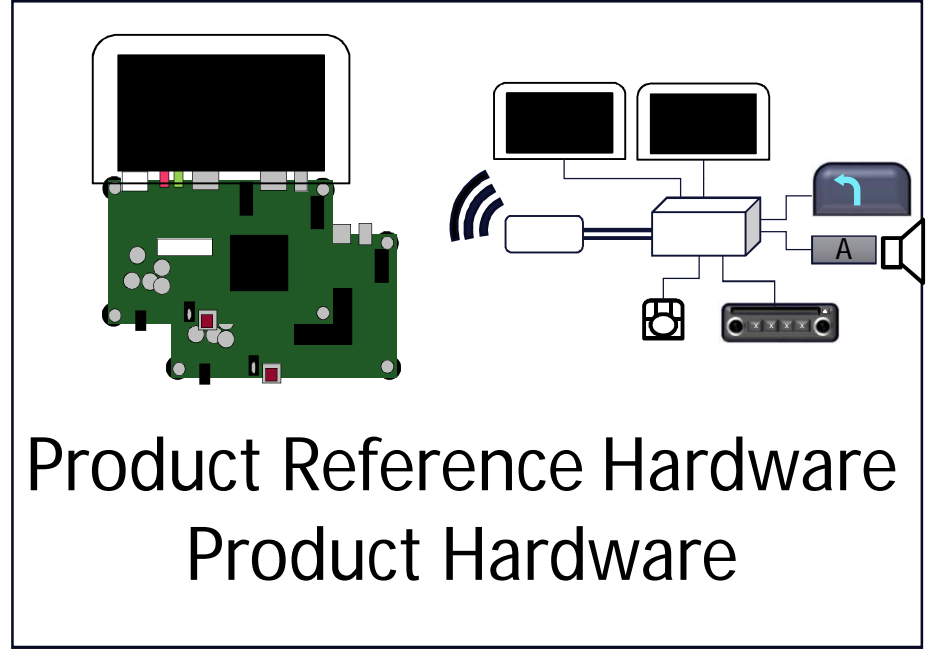
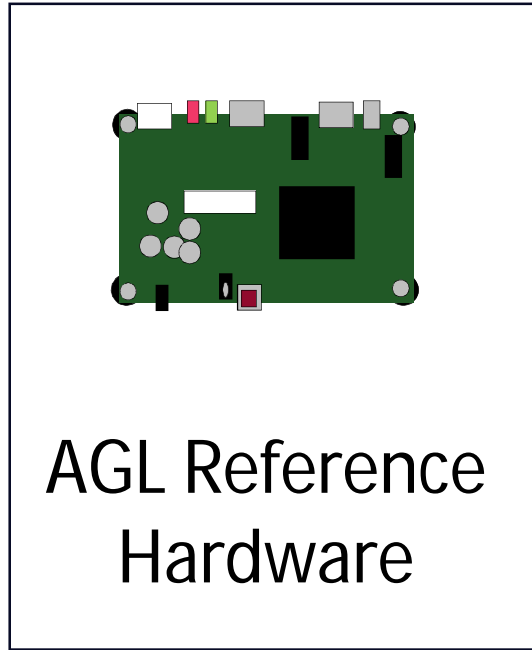
Reference Hardware (for luxury spec)

Reference Hardware (for compact spec)

Tentative



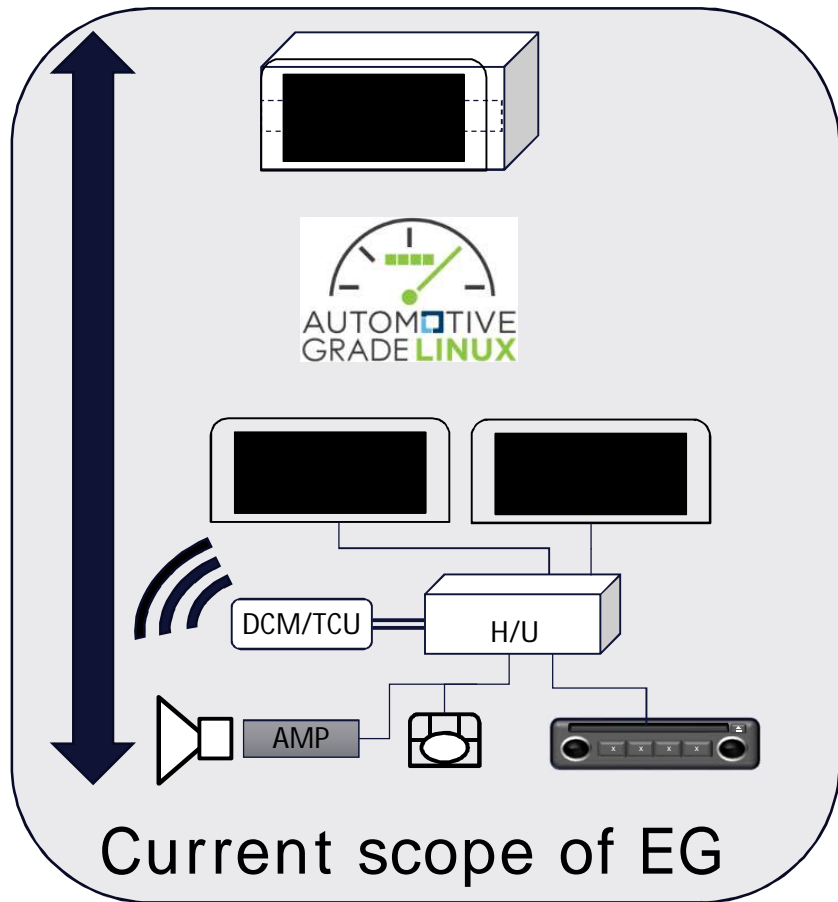
Reference Hardware



It is important to reduce this GAP!



In the near future



Communication with other
In-vehicle system.

THANK YOU.



zoom-zoom