

***DENSO***

Crafting the Core

# **Cockpit System: Collaboration with Applications in AGL Ecosystem**

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1. DENSO View of Cockpit system
2. Standard protocol of Graphic and Audio
3. Commercial applications for AGL
4. Plan for next AGL all member meeting

# 1.

## DENSO View of Cockpit system

# DENSO Approach to Cockpit System

## DENSO COCKPIT SYSTEM

Society

- ✓ Protect driver's assets using information management
- ✓ Protect driver's safety under the management of HMI
- ✓ Provide much more convenient environment using IT services

Big data

Society infrastructure

Infotainment

Mobility

ADAS



Infotainment



Mobility



ADAS

Human



HMI management

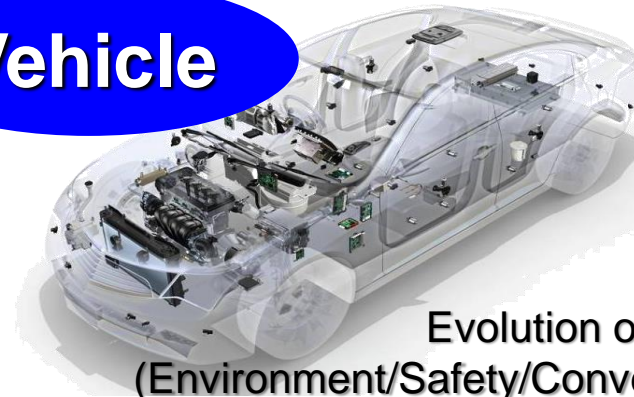
Services

Information management

- Vehicle control security access
- Vehicle information notification
- Cyber security
- Software Update/Maintenance

- Interaction / Communication
- Recognition of driver's condition
- Intelligent HMI

Vehicle



Evolution of vehicle (Environment/Safety/Convenience)

Focus point 2  
AGL Applications

Focus point 1  
HMI Management



Driver's Status

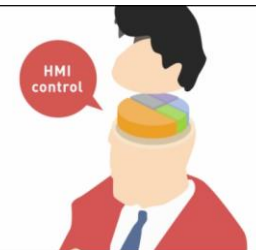


Face Direction



Driver's Driving Style

Adaption to Driver's status



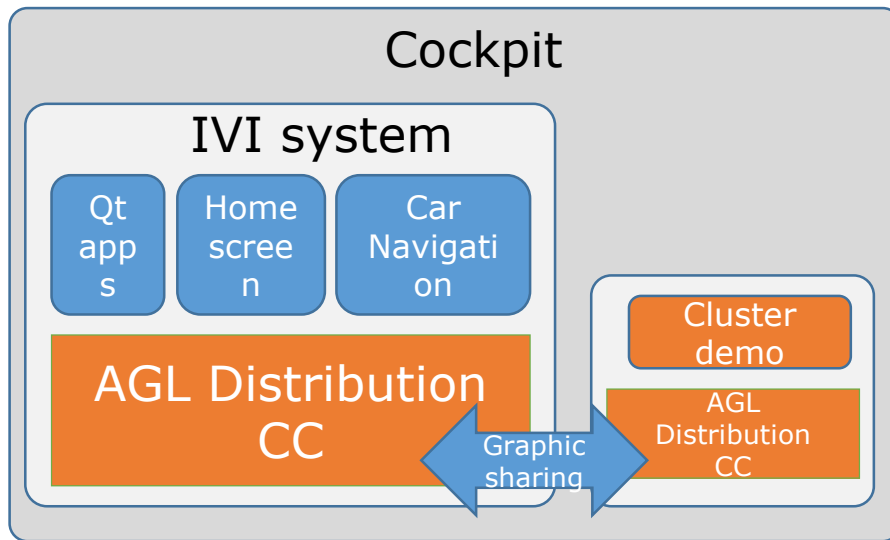
Use case of Cockpit is presented in 2016 AGL AMM, and ALS keynote from Kazuo Tsubouchi from DENSO



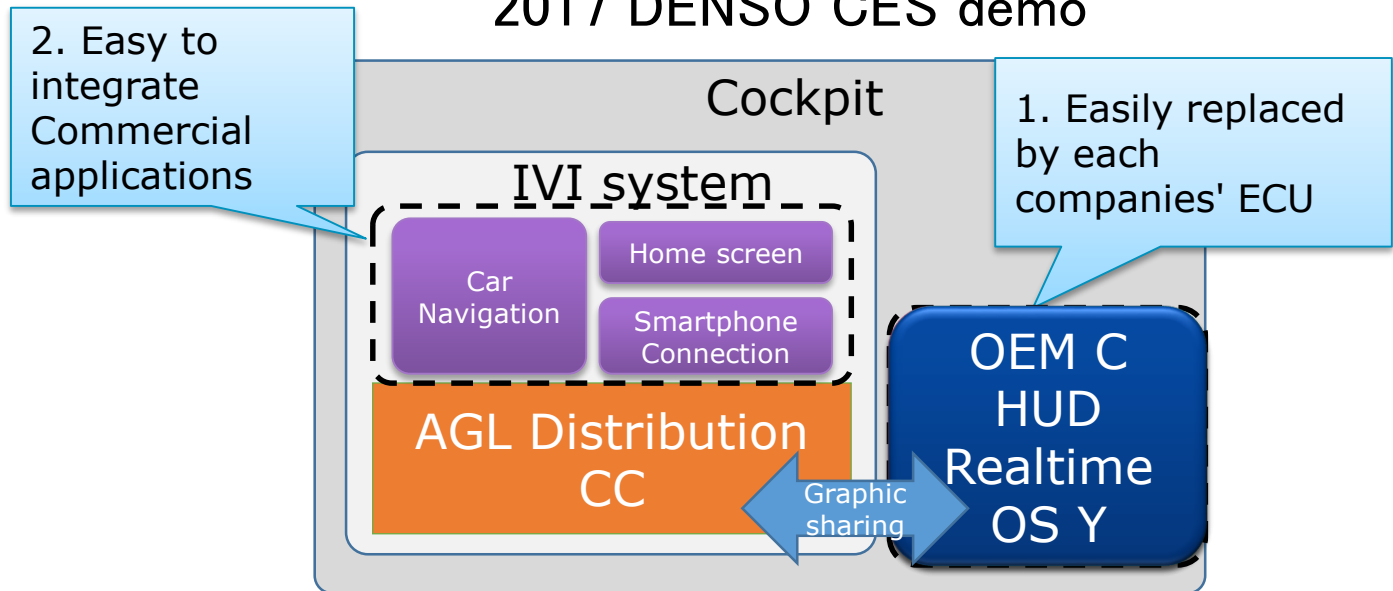
# Why AGL is the best place collaborating Cockpit system?

1. Prototyping of Graphic sharing was done: **Next steps, we shall standardize it as a common protocol**
  2. Several Commercial applications were integrated: **Next steps, Commercial applications enlargement.**
- AGL already has basement of 'Standard protocol' and 'Commercial applications enlargement'.**

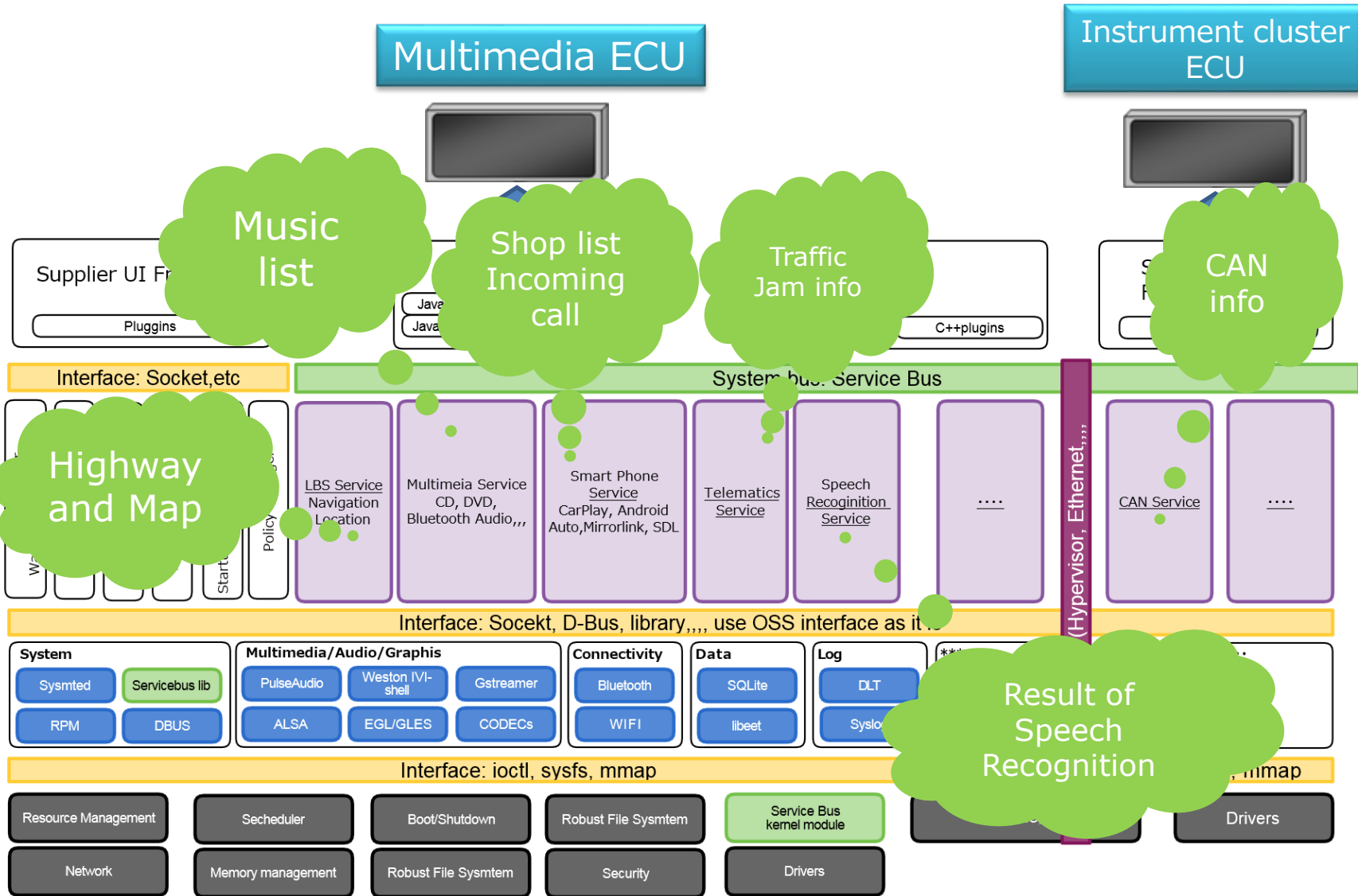
2017 AGL CES demo



2017 DENSO CES demo



# Focus points 1: HMI management

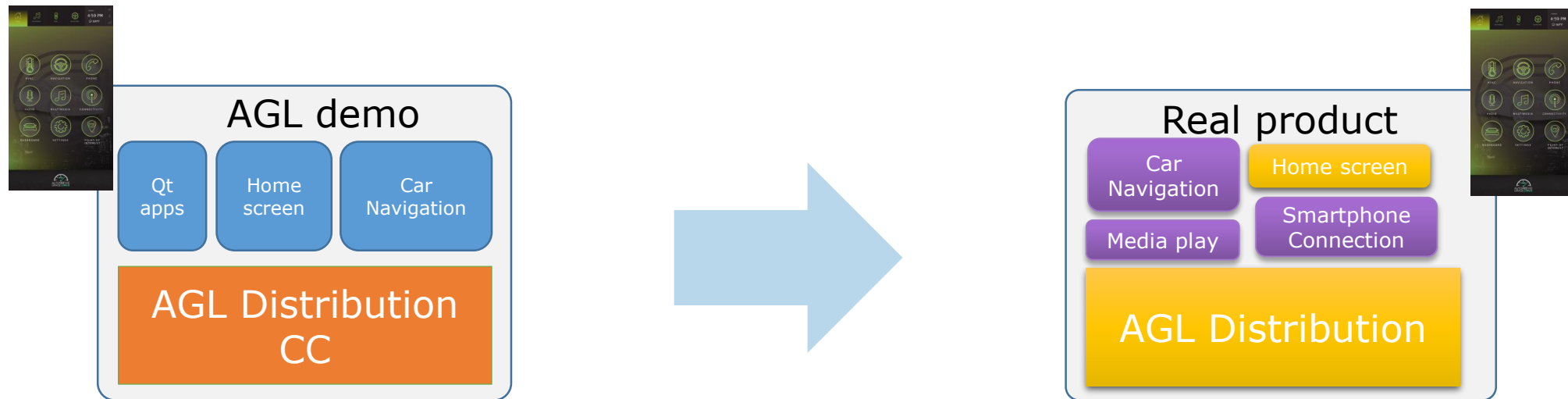


Information would flood in Cockpit system.

- More comprehensive HMI management is required
  - Not to disturb driver's view
- Instrumental cluster ECU would be replaced by each companies.

In AGL, at least, standard protocol shall be defined to easily replace cluster ECU.

# Focus points 2: AGL applications to real product



## Current status

- AGL v3.0: CC support Good distribution
- OSS application integrated
  - Home screen
  - Car Navigation

## To be real product

- Start discussion with Commercial Applications to support AGL
  - Validate applications in system
- Lead time of these steps overhead to release the latest technology... in market**

Require Commercial applications already supports AGL distribution to be easily integrated in real product.

# 2017 activities for cockpit system

Commercial applications



## HMI Management of Cockpit system

### Graphic and Audio

### IVI system

- Car Navigation
- Home screen
- Media play
- Smartphone Connection
- AGL Distribution DD

Easy to connect  
Via standard protocol

Meter Cluster on AGL, or each companies ECU



Head up Display on AGL, or each companies ECU



AGL would focus the following two items in 2017

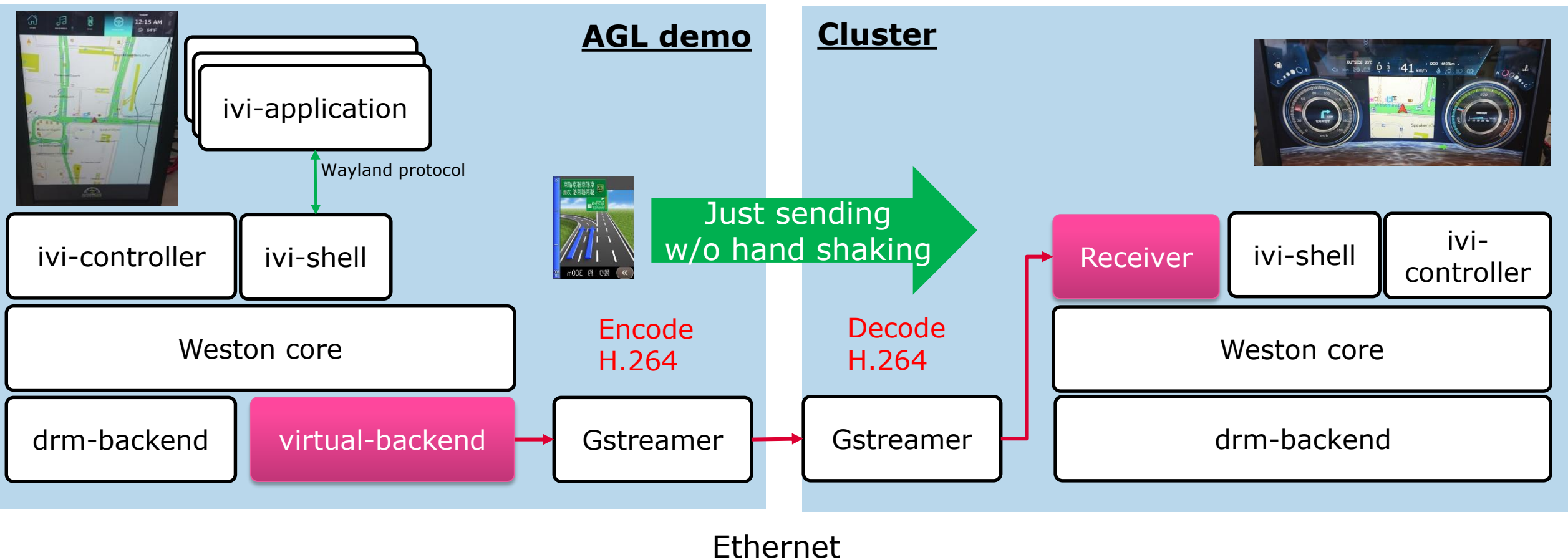
- Leading Standard protocol: Graphic and Audio to be shared between ECUs.
- Commercial application enlargement: AGL certified applications



# 3.

## Standard protocol of Graphic and Audio

# CES demo setup: AGL + Cluster



**Prototyping was done but there is no protocol: e.g. hand shake between ECUs.**

# Waltham: Wayland style network IPC

Waltham enable surface sharing between multi ECU

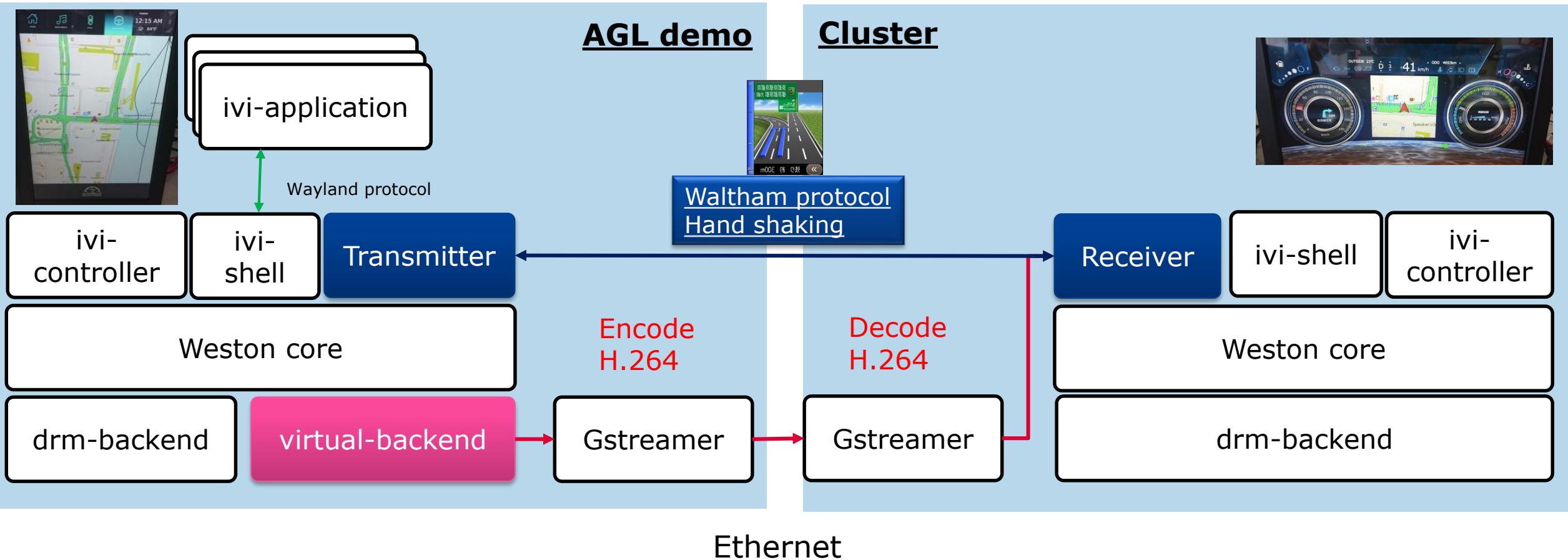
- Waltham is IPC library of Wayland
- <https://github.com/waltham/waltham>

DENSO is leading Waltham as standard protocol to be merged to Wayland/Weston

- Many developers contribute this community and upstream patches  
<https://wayland.freedesktop.org/>
- Wayland/Weston is now Automotive standard; Main stream



# Waltham protocol view



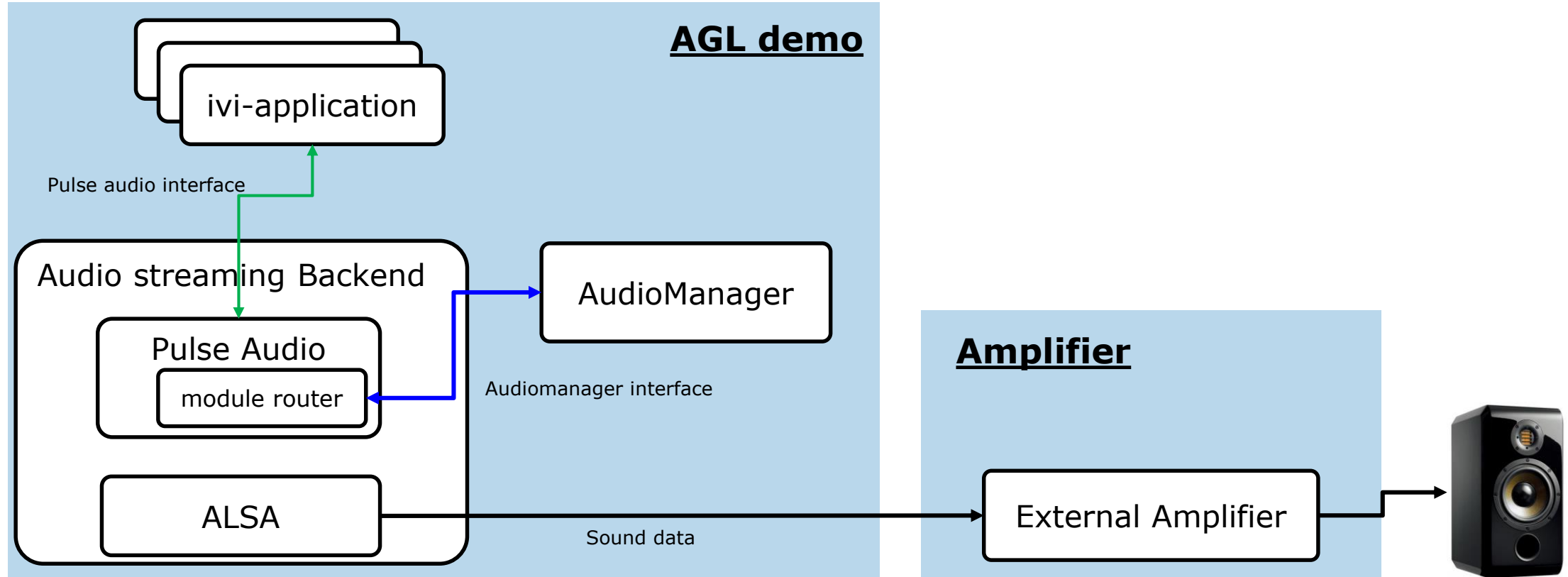
**Waltham protocol supports almost same as Wayland protocol inter ECUs.**

# Waltham protocol mapping to Wayland

Interface	Waltham original	Detail
wth_display		In wayland protocol it is wl_display
wthp_registry		The Group of global objects. In wayland protocol it is wl_registry
wthp_callback		The callback interface. In wayland protocol it is wl_callback
wthp_compositor		The compositor. In wayland protocol it is wl_compositor
wthp_blob_factory	○	It creates wthp_buffer. Wthp_buffer is used for row pixel transfer
wthp_buffer		The buffer. In wayland protocol it is wl_buffer
wthp_surface		The surface. In wayland protocol it is wl_surface
wthp_seat		The group of input devices. In wayland protocol it is wl_seat
wthp_pointer		The pointer device. In wayland protocol it is wl_pointer
wthp_keyboard		The keyboard device. In wayland protocol it is wl_keyboard
wthp_touch		The touch screen device. In wayland protocol it is wl_touch
wthp_output		The Compositor output region. In wayland protocol it is wl_output
wthp_region		The region interface. In wayland protocol it is wl_region

**Waltham protocol can be used similarly as Wayland protocol for sharing Graphic contents inter ECUs. DENSO leads this project as UI and Graphics EG!. (\*) This is still under development. Interface may be changed for improvement purpose**

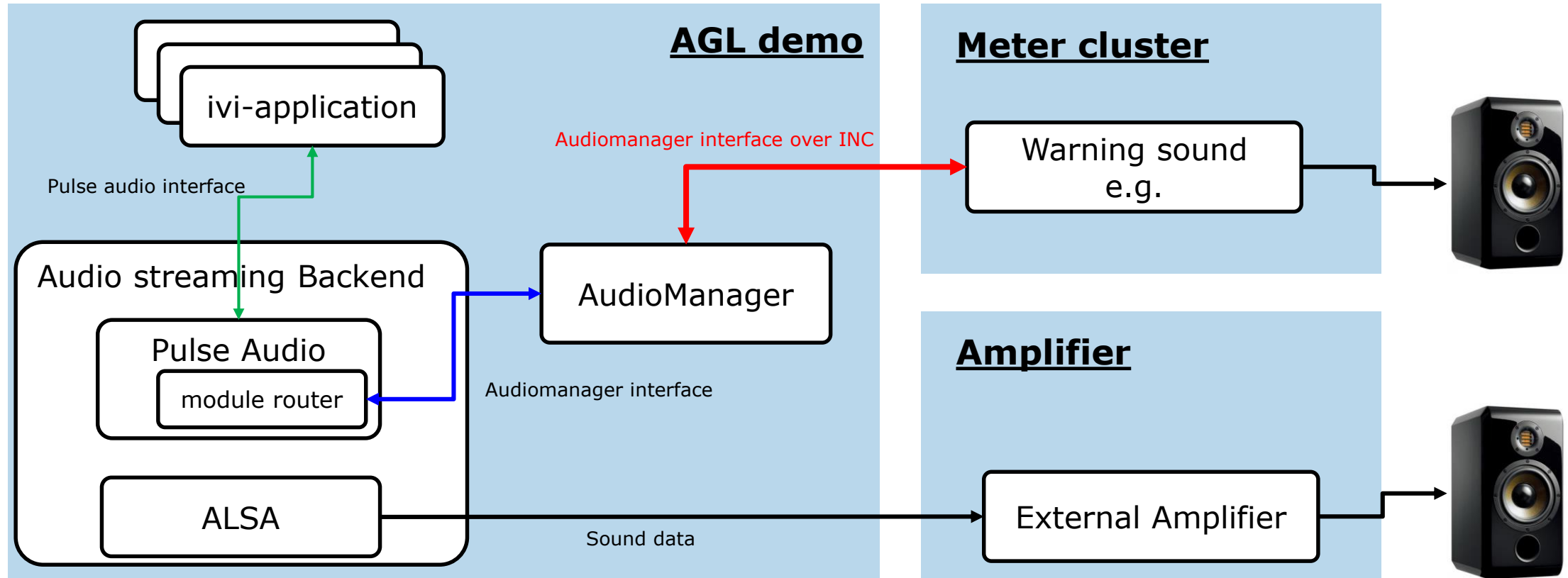
# CES demo : Audio Management



- iwi-application
  - Use both Pulse Audio and ALSA to playback/capture as audio streaming backend.
- Pulse audio
  - Easy to port various kind of consumer applications to IVI/Cockpit system.
  - Both streaming/control interfaces are implemented.
- Audio Manager
  - To apply product specific logic to Route Control request.

# Audio Management inter ECUs

To be modified more



- Audio Manager
  - To bridge other ECU/OS over Inter Node Communication
  - Inter "Domain" management for audio streaming is important between multiple ECU/PFs.

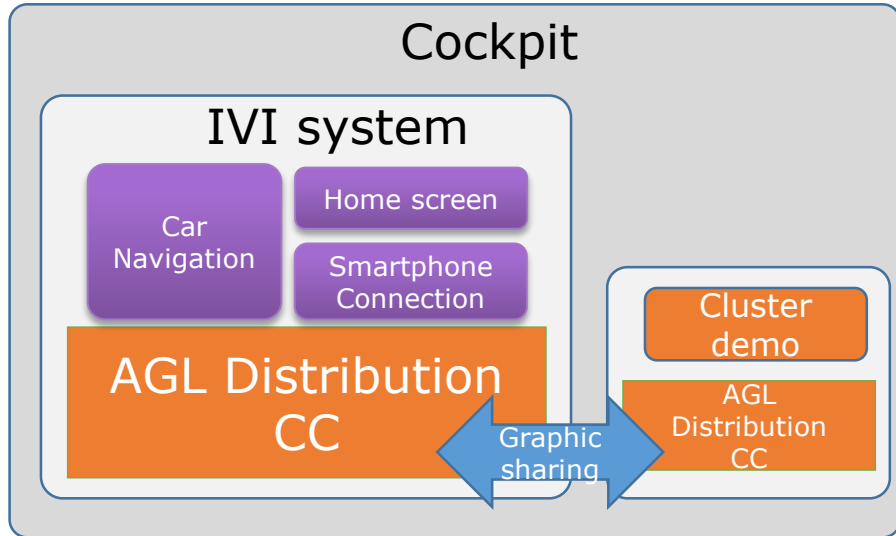
# 4.

## Commercial applications for AGL



# Commercial applications for AGL

## 2017 DENSO CES demo



AGL distribution become more ready for Linux Platform of Product development

- For DENSO CES demo, commercial applications were integrated within 3 months!!
- AGL distribution already supports functionality for current product development at least.

Thanks to AGL community, increasing contribution to AGL distribution.

However,,,

The number of Commercial application, who provide state-of-art functionality, on AGL may not be sufficient.

More state-of-the-art application are required to grows AGL ecosystem.

# Enlargement of Commercial applications


The AGL community grows now.

We don't know but there would be commercial applications which are,

- Already supports AGL distribution.
- Or plans to support soon.

**DENSO pushes AGL commercial application List, to be AGL certified applications, as AGL activity.**

The following commercial application vendor supports this proposal. Shall we kick off this activity to enlarge AGL ecosystem?

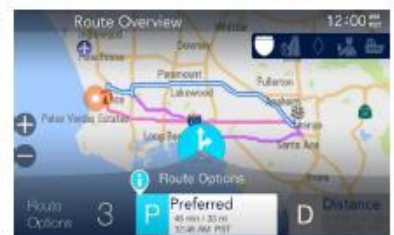
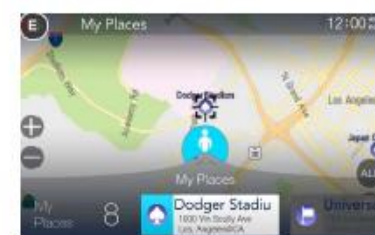
- Micware: Car Navigation 
- Xevo: SDL 
- Ubiquitous: Fastboot 
- SDTech/IVIS: Media player  
- Sasken: Media Player engine 
- Cinemo: Media Player 

**To motivate commercial application vendors, These applications to be introduced in this presentation.**

# Micware naviAZ /

- Supporting over 170 functionalities.
- Available as a pedestrian navigation
- Incremental map update  
-> Map Data : [HERE](#)

- Navigation API EG: Contributing Navigation API to AGL  
➤ Target to be enable in This year 2017.



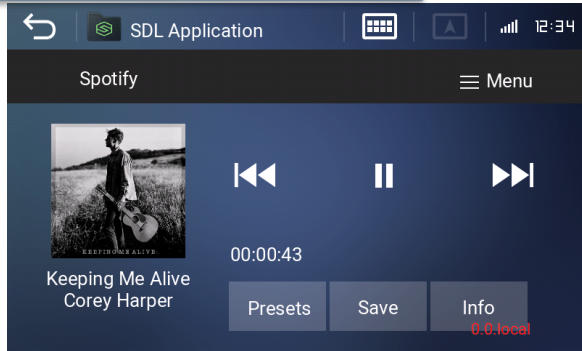
# Xevo Journeyware /

Xevo Journeyware, a comprehensive solution for SDL, is now ported to AGL.

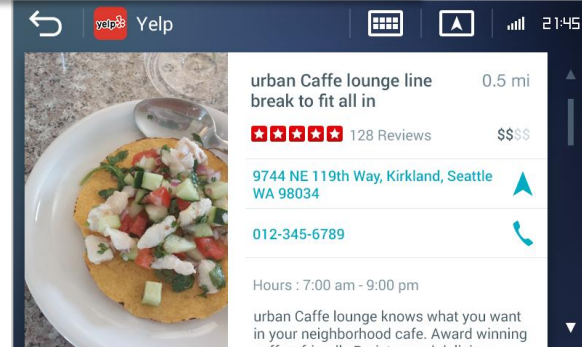
If you need more flexible UI, you can also use our unique frameworks (UJML, UMA).

Xevo's Journeyware technology has been adopted in all Lexus vehicles with the Enform App Suite 2.0 system, including the hotly anticipated Lexus LC 500. (<https://www.xevo.com/lexus-in-car-connectivity/>)

## Spotify (SDL app)



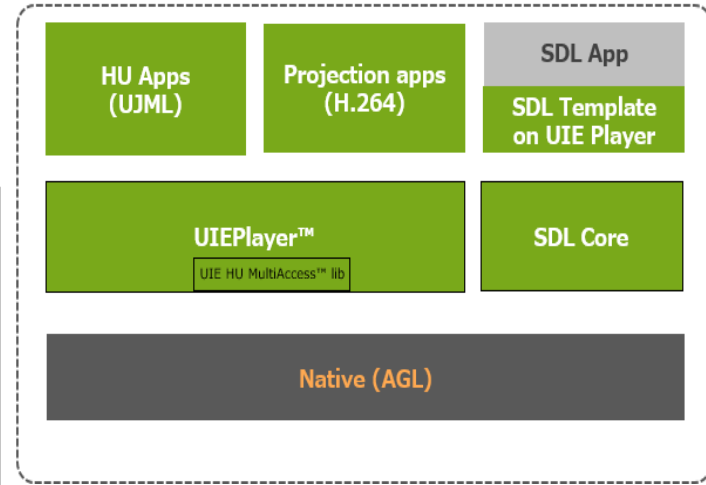
## Yelp (UJML app)



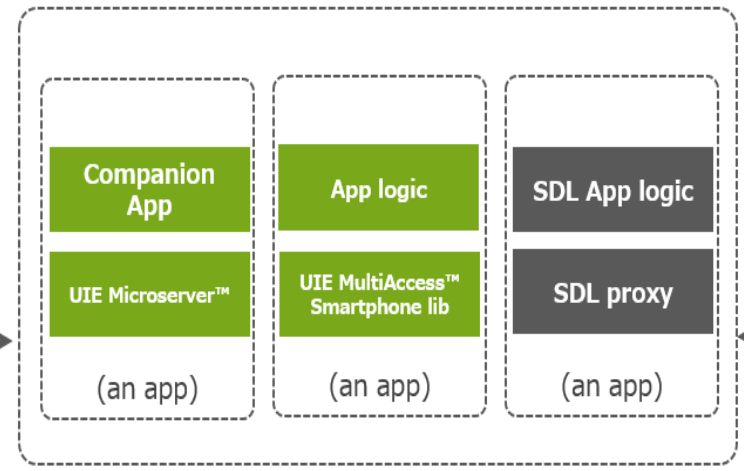
Xevo Provide Framework



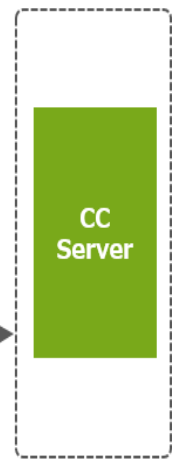
Head Unit



Smartphone



Server



## Intel GR-MRB based AGL 3.0 - Cockpit Controller Demo Solution: Approach & Architecture

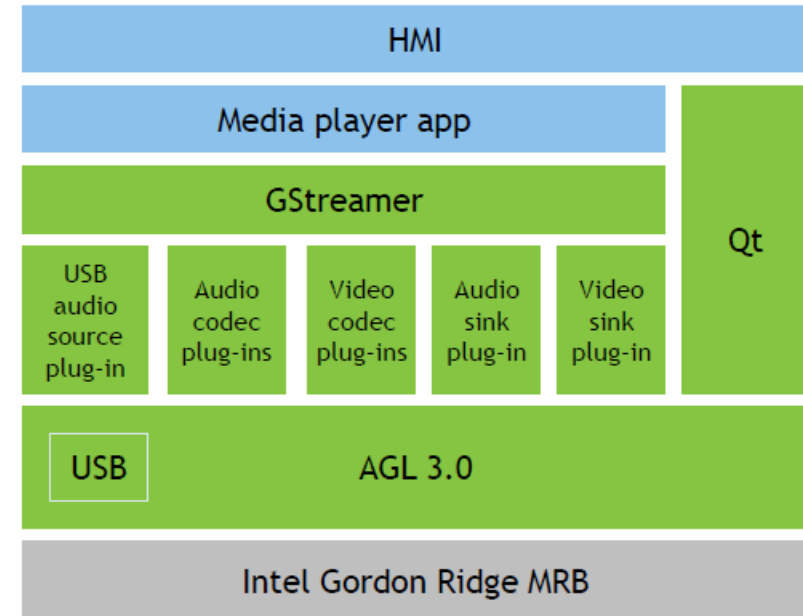
Sasken will integrate the Yocto Linux BSP of the Intel GR-MRB with the Yocto AGL 3.0 distribution



Sasken will integrate the following open-source components:

- GST plug-ins for the MP3 and HE-AAC audio decoders, including the MP3 and HE-AAC audio decoders
- GST plug-ins for accelerated H.264 decoder on Intel Apollo Lake
- GST plug-ins for video and audio sinks

Sasken will develop a basic media player application supporting the following features by Sept/Oct 2017

- playback of 1080p30 H.264 video and MP3/AAC audio from mass-storage device
- Play, pause and stop operations



 Open-source component  
 Sasken developed component

# Media Player solution by sdtech Inc. and IVIS Inc.

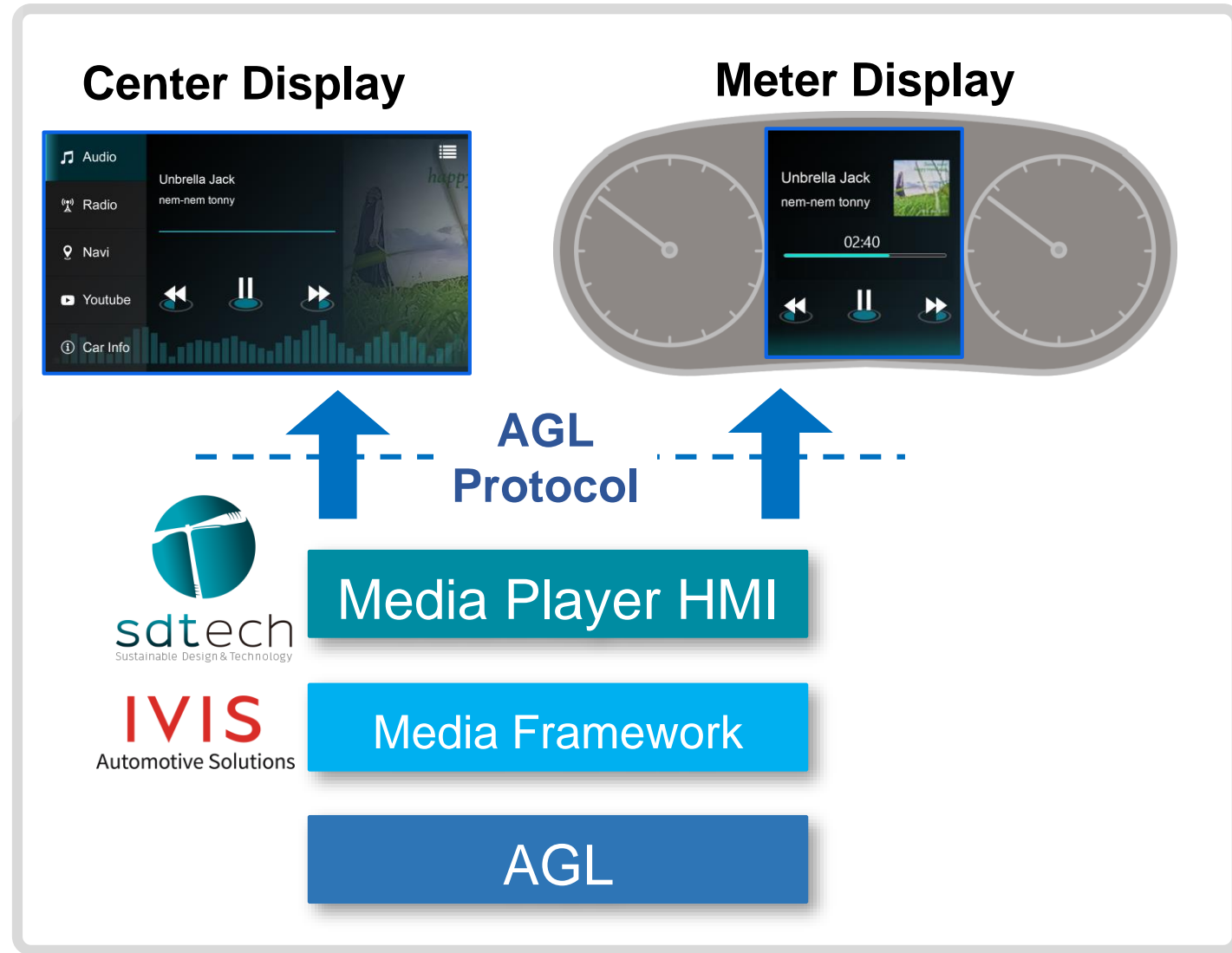
## sdtech Media Player HMI

- Support Adobe Photoshop/Animate for graphic design
- High flexibility for HMI Layout
- Connect to IVIS media Framework without coding.
- Support AGL display protocol
- Will support various HMI frameworks on AGL

## IVIS Media Framework

- Media device detection (USB)
- Media file indexing and media DB
- Playback, Browser, Playlist, Media meta info APIs
- IPC interface based on GENIVI CommonAPI
- Audio (mp3)
- Video (h264), the other codec is depend on SOC
- Image

**Will demonstrate the solution on AGL  
in October/2017**



# Ubiquitous QuickBoot™ / Ubiquitous Corporation

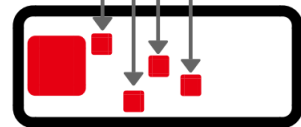


## Key features (key point)

- Advanced Hibernation Technology.
- Rapid Boot from a complete Power Down
- Delivered as a SDK.
- Proven Technology (10+M licensed) in IVI

## AGL support

- AGL CC supported/R-Car M3/H3
- Planning on AGL DD support

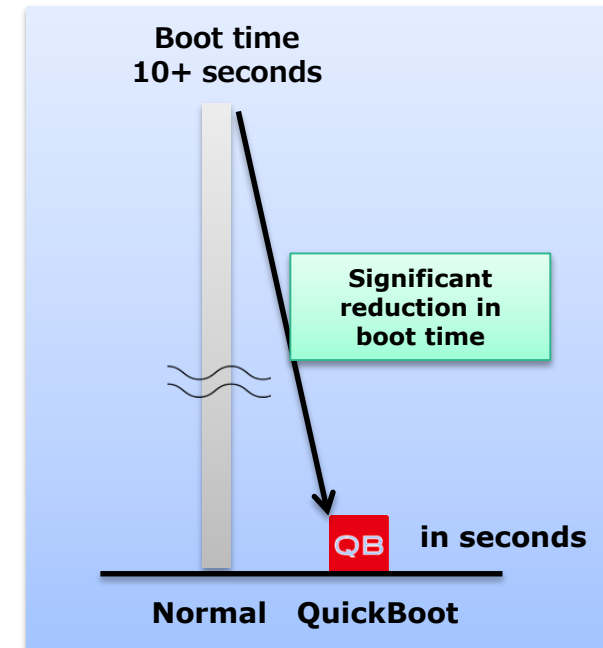


Prioritized Image Restoration

Hibernation



Entire Image is Restored



# 5.

## Next AGL All Member Meeting Demo



# 2017 All member meeting Fall demo plan

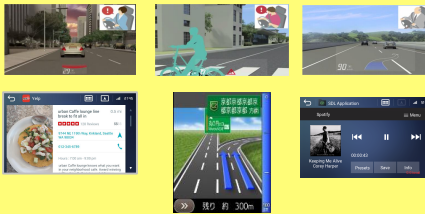
AGL Homescreen, installing AGL applications listed in previous slides.  
More comprehensive UI in Cluster and HUD, collaborating AGL applications.

**Demonstrate 'Standard protocol' and 'AGL applications'**



HMI Management of Cockpit system

Graphic and Audio



IVI system

Car Navigation

Home screen

Media play

Smartphone Connection

AGL Distribution  
DD

Install AGL application

Standard protocol  
Waltham and AudioManager

DENSO Meter cluster



DENSO HUD



# Schedule

	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	Integrating Commercial applications with AGL Home screen							
	Validating Graphic/Audio sharing with Cluster/HUD							
					★ AGL AMM			★ CES



Demonstrate AGL Homescreen with installed commercial applications.

More Commercial Applications with AGL demo

# 6.

## Summary

# Summary

Cockpit system is a challenge for AGL to step up next stage

To archive this, the following focus points are mandatory

- Standard protocol of Graphic and Audio sharing
- Enlargement commercial applications to kick off AGL Certified application

More collaboration and Synergy is required with OEM, Tier1, and Application vendors.

**Shall we develop AGL as platform for Cockpit system together!**

***DENSO***

Crafting the Core