Cockpit System: Collaboration with Applications in AGL Ecosystem

NOBUHIKO TANIBATA

Project Manager
ICT Development department
Contents

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

Focus point 1: HMI Management

- Interaction / Communication
- Recognition of driver’s condition
- Intelligent HMI
- Vehicle control security access
- Vehicle information
- Notification
- Cyber security
- Software Update/Maintenance

Focus point 2: AGL Applications

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

Cockpit

IVI system

Qt apps
Home screen
Car Navigation

AGL Distribution CC

Cluster demo
AGL Distribution CC

Graph sharing

2017 DENSO CES demo

Cockpit

IVI system

Car Navigation
Home screen
Smartphone Connection

AGL Distribution CC

Graphic sharing

OEM C
HUD
Realtime OS Y

Cluster demo

1. Easily replaced by each companies' ECU
2. Easy to integrate Commercial applications

© DENSO CORPORATION All RightsReserved.
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.
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
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 supports almost same as Wayland protocol inter ECUs.
## Waltham protocol mapping to Wayland

<table>
<thead>
<tr>
<th>Interface</th>
<th>Waltham original</th>
<th>Detail</th>
</tr>
</thead>
<tbody>
<tr>
<td>wth_display</td>
<td></td>
<td>In wayland protocol it is wl_display</td>
</tr>
<tr>
<td>wthp_registry</td>
<td></td>
<td>The Group of global objects. In wayland protocol it is wl_registry</td>
</tr>
<tr>
<td>wthp_callback</td>
<td></td>
<td>The callback interface. In wayland protocol it is wl_callback</td>
</tr>
<tr>
<td>wthp_compositor</td>
<td></td>
<td>The compositor. In wayland protocol it is wl_compositor</td>
</tr>
<tr>
<td>wthp_blob_factory</td>
<td>〇</td>
<td>It creates wthp_buffer. Wthp_buffer is used for row pixel transfer</td>
</tr>
<tr>
<td>wthp_buffer</td>
<td></td>
<td>The buffer. In wayland protocol it is wl_buffer</td>
</tr>
<tr>
<td>wthp_surface</td>
<td></td>
<td>The surface. In wayland protocol it is wl_surface</td>
</tr>
<tr>
<td>wthp_seat</td>
<td></td>
<td>The group of input devices. In wayland protocol it is wl_seat</td>
</tr>
<tr>
<td>wthp_pointer</td>
<td></td>
<td>The pointer device. In wayland protocol it is wl_pointer</td>
</tr>
<tr>
<td>wthp_keyboard</td>
<td></td>
<td>The keyboard device. In wayland protocol it is wl_keyboard</td>
</tr>
<tr>
<td>wthp_touch</td>
<td></td>
<td>The touch screen device. In wayland protocol it is wl_touch</td>
</tr>
<tr>
<td>wthp_output</td>
<td></td>
<td>The Compositor output region. In wayland protocol it is wl_output</td>
</tr>
<tr>
<td>wthp_region</td>
<td></td>
<td>The region interface. In wayland protocol it is wl_region</td>
</tr>
</tbody>
</table>

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

- **ivi-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

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

\[\text{Map Data: HERE}\]

- Navigation API EG: Contributing Navigation API to AGL
  - Target to be enable in This year 2017.
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/)
AGL compatible Media player:

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
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

UBIQUITIOUS QUICKBOOT™

QuickBoot

Hibernation

Prioritized Image Restoration
Entire Image is Restored

Significant reduction in boot time

Boot time
10+ seconds

in seconds
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

Standard protocol
Waltham and AudioManager

AGL Distribution
DD

Install AGL application

IVI system

Car Navigation
Home screen
Media play
Smartphone Connection

DENSO Meter cluster

DENSO HUD
### Schedule

<table>
<thead>
<tr>
<th>Jun</th>
<th>Jul</th>
<th>Aug</th>
<th>Sep</th>
<th>Oct</th>
<th>Nov</th>
<th>Dec</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Integrating Commercial applications with AGL Home screen</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Validating Graphic/Audio sharing with Cluster/HUD</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>AGL AMM</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>CES</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- **Demonstrate AGL Homescreen with installed commercial applications.**
- **More Commercial Applications with AGL demo**
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!