

The Automotive Grade Linux project plans to build a reference hardware device targeted to In-Vehicle Infotainment systems. The plans for the device will be open sourced and available to anyone who would like to modify and build the reference device. The Reference Hardware Expert Group has created a specification for this device and wants to design and build a number of sample devices. Please provide a quotation based on the following conditions, and propose modules and devices designed to satisfy the following functional specification.

## 1. Business content

Design hardware interface to realize the Replaceable and Interchangeable architecture based on the AGL\_ReferenceHardwareSpec\_v0.2.4 and develop hardware samples on which all requirements are implemented.

## 2. Deliverables

Deliverables	Remarks
Hardware samples	Minimum of 10 units. Please provide quotations for building 20 or more units as well.
Hardware Interface specification documents	Connector specification, Terminal specification, Signal specification
BSP (Board Support Package)	Device Driver source code and build scripts using a Yocto layer that can easily be added to the AGL Unified Code base. Procedure manual to build software

### 2.1. Acceptance inspection criteria

#### 2.1.1. Design Review

The contractor shall conduct a design review of their chosen design with the AGL Reference Hardware and System Architecture Expert Group and System Architecture Team. The design review will provide a detailed Bill of Materials for the chosen design and will also allow the review team to determine which trade offs are appropriate for

the chosen design when there is a question of cost versus functionality versus schedule that must be decided. The design review will be scheduled by the contractor and AGL Development Manager and may be held in-person or via conference call.

### **2.1.2. Hardware samples**

- All hardware samples shall be delivered to Linux Foundation Japan office. First sample shall be delivered by the date specified in section 3. Final sample shall be delivered within 4 weeks of first sample.
- Contractor must provide a hardware acceptance test report. The test report shall detail the tests performed on each component prior to delivery. A test report must be delivered with each sample to verify that the components are working.
- The hardware samples must implement all requirements defined in section 4 and agreed upon at the hardware design review.
- The hardware samples must be distributable to anyone in AGL community without requiring an NDA.

### **2.1.3. Hardware Interface specification documents**

- The Hardware Interface Specification must define all interface specifications included in chapter 5.
- An initial version of the Hardware Interface Specification must be included in the Design Review and it must be distributable to anyone in AGL community without requiring an NDA.
- The Hardware Interface Specification must have enough technical information for any hardware developer to design the board having same interface based on the connector specification, the terminal specification and the signal specification.

### **2.1.4. BSP (Board Support Package)**

- The BSP must satisfy all requirements defined in chapter.6.
- The device driver and the procedure manual to build software must be distributable to anyone in AGL community.
- The BSP be include in the AGL Continuous Integration test system and must pass >98% of all automated tests and >95% of all manual application level tests. All testing shall be run using a GeChic display.

### 3. Milestones

RFQ Issued: 8/1/2019

RFQ Response Due: 8/19/2019

Design Review: 8/22/2019

Delivery due date: 10/31/2019

Final BSP and Documentation Acceptance inspection date: 12/15/2019

## 4. Hardware detailed specification

### 4.1. Form factor

- It must comply with 2DIN standard defined in ISO 7736.
- The boards must be stored in the enclosure made by metal or plastic.  
The enclosure must be removable.
- The placement of external connector must follow the table below.

Placement	External connector
Front	<ul style="list-style-type: none"><li>• HDMI</li><li>• USB</li></ul>
Rear	<ul style="list-style-type: none"><li>• Others</li></ul>

## 4.2. Functional Specification

- The boards must be 3-layer structure of Control Board, Audio Board and Vehicle Board as shown in Figure 1.
- The interface between Control Board, Audio Board and Vehicle Board must be standardized (Common I/F).
- It must be operable on any combinations of Control Board + Vehicle Board, or Control Board + Audio Board + Vehicle Board.  
(The functionality may be limited on non-standard combination.)

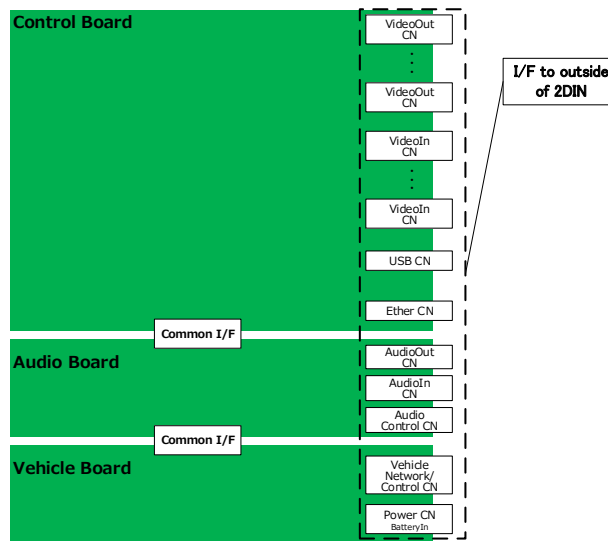


Figure 1 The board structure

- The Control Board, Audio Board and Vehicle Board must follow the function arrangement shown in Table 1. The child boards checked on the table must be the removable boards which follow the interface design.

**Table 1 The function arrangement**

Board	Function	Child board
Control Board	SoC(CPU, RAM, ROM)	-
	Video Out	X
	USB	X
	Connectivity(Bluetooth, WiFi)	X
	GNSS	X
	Network(Ethernet)	X
Audio Board	Audio Input	-
	Audio Output	-
	Audio processing (Filtering, Acoustic, Mixing, etc.)	-
	Digital-Analog / Analog-Digital conversion processing	-
Vehicle Board	Power input (DC12V )	-
	CAN	-

- Each function of hardware sample must satisfy the specifications defined in Table 2

**Table 2 Hardware specifications**

Function	Specifications
Input Power	DC 12V (10.5~16V)
Current Consumption	Under 10A
Operating Temperature	-10~+60°C
SoC	Renesas H3 or equivalent
ROM	32GByte
RAM	4GByte
Video Out	HDMI
Video In	HDMI
Audio Out	Analog
Audio In	Analog
WiFi	IEEE802.11b/11g/11n
Bluetooth	Ver4.1 LE
GNSS	BeiDou, Galileo, GLONASS, GPS / QZSS
CAN	CAN-FD
Ethernet	1000Base-T
UART	I2C, LIN
USB	USB 3.0 Host USB 3.0 OTG USB 3.0 Device USB 3.1 C PD (may be quoted as a separate option)
SD Card	SDHC / SDXC

- The type of the external connector must be shown as Table 3.

**Table 3 The type of the external connector**

Function	Connector type	Number
Video In	Full HDMI	2
Video Out	Full HDMI	2
Audio Out	Φ3.5 Stereo jack	1
Audio In	Φ3.5 Stereo jack	1
CAN	★ Should propose valid type of connector	2
Ethernet	RJ-45 (for development and debug)	1
UART	★ Should propose valid type of connector	2
USB	Type A (Host/OTG)	2
	Micro B (Device)	1
	USB C (optional)	1
SD Card	Micro SD	1
BT / WiFi antenna	★ Should propose valid type of connector	1-2
GNSS antenna	★ Should propose valid type of connector	1
Power	2.1mm standard DC jack	1



## 5. Hardware interface

- The interface between the boards shown in Table 4 must be designed.

**Table 4 Interface**

Interface	Connected boards
Common I/F	Control Board, Audio Board, Vehicle Board
Video In I/F	Control Board, Video In Board
Video Out I/F	Control Board, Video Out Board
USB I/F	Control Board, USB Board
Network I/F	Control Board, Network Board
Connectivity I/F	Control Board, Connectivity Board
GNSS I/F	Control Board, GNSS Board
Extension I/F	Control Board, Extension Board
Tuner I/F	Audio Board, Tuner

- The each interface must be defined connector specification, terminal specification and signal specification.
- The connector type must be chosen which has enough availability, scalability and durability.
- The connector must cover assumed pattern of terminal specification so that it can connect the device which has different terminal specification.
- The connector must cover assumed pattern of signal specification so that it can connect the device which has different signal specification.

## 6. BSP

- The device driver must be provided to control all devices implemented on the hardware sample.
- The device driver must guarantee normal operation on AGL Happy Halibut 8.0.1 or later.
- The device driver must be readily portable to Itchy Icefish 9.0.0 based on its use of Yocto 2,6 (thud).
- It can be built according to the “Procedure manual to build software” and can make a software image of AGL Happy Halibut 8.0.1 that works on the hardware sample.