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Global and China Automotive Intelligent Cockpit Platform Research Report, 2021

May 2021

Abstract

Next-Generation Intelligent Cockpit Platform: Deep Domain Integration, Pluggable Hardware, Reusable Software

As new-generation E/E architectures evolve, deep integration of cockpit domain may become a trend.

The development of automotive E/E architectures comes with the integration of ADAS functions and V2X systems into the cockpit domain that already combines conventional cockpit electronics.

Through the lens of function integration, the cockpit domain tends to be integrated. As well as basic capabilities including dashboard and center console, rear seat entertainment, HUD and voice, quite a few suppliers currently integrate also surround view camera, DMS, IMS and some ADAS functions into their intelligent cockpit platforms.

Function Integration of Some Intelligent Cockpit Platforms

Vendor	Cockpit Domain/Platform	SOP	Integrated/Supported ADAS and Safety Functions
Visteon	SmartCore	2018	Mid-to-high-end vehicle models support voice assistant, and in-vehicle perception including driver monitoring, AI integrated driver health, face recognition, 360° surround view camera, etc. In future, HMI will be used to integrate SmartCore and DriveCore to combine cockpit and automated driving domains closely into intelligent cockpit solutions.
Faurecia	Cockpit domain controller (CDC)	2020	To integrate HUD management, comfort and health management, high-quality sound and IMS
Bosch	Autosee 2.0	2022	HUD, driver and occupant monitoring system (DOMS), around view monitor (AVM) and face recognition Face ID, multi-microphone input, active noise reduction, etc. In future, more attempts will be made to integrate intelligent cockpit and more driving assistance functions into cockpit domain.
Denso	E-Cockpit	2019	Smartphone integration, HUD, DSM, surround view camera
	Intelligent-Cockpit	2020	AR-HUD, air conditioner control, AI-driven scene understanding, DSM, surround view camera
	i-Cabin	2025	WSD, DSM/OSM, surround view camera, V2V, V2X, etc.
Harman	Top-class cockpit platform	2020	Integrate blind corner alert, face recognition, built-in device integration, DMS/OMS, 3D surround view, virtual personal assistant, and 3D AR navigation functions, and add night vision system, etc.
	Cockpit domain	2024	Integrate L1 ADAS functions, e.g., AEB, LKA, ISA/ACC
	Cockpit domain	2026	Integrate L2 ADAS functions, e.g., PA, PP, TJA
	Cockpit domain	Future	Above L2+, cockpit/ADAS domain integrated with the fallback node, the autonomous driving domain
Neusoft	Intelligent cockpit system	2020	Integrate ADAS, AVM, V2X T-Box, etc.
Nobo Automotive Systems	iN9.0	~2021	Integrate body control function, 360-degree surround view, DMS, face recognition, etc.
ThunderSoft	TurboX Auto 4.5	~2021	Integrate front-view ADAS, DMS, automated parking function, etc.
ArcherMind Technology	Intelligent cockpit software platform	~2021	Integrate multiple telematics solutions, customized HMI, V2I, left/right blind spot display (cluster), face recognition, driver monitoring system, object recognition, AR HUD, FFC, APA, LDWS, FCWS, etc.
Huizhou Foryou General Electronics	Intelligent cockpit domain controller	~2021	Integrate or support HUD and some ADAS applications

Source: ResearchInChina

Automotive market business models are undergoing disruption. Under the new cooperation model, components suppliers and OEMs partner more closely, and their joint development of cockpit software platforms will become a trend. Tier1s have even been a part of automakers' engineering design, even partaking in their product design. Platform-based open cooperation on both hardware and software holds a trend. **Tier1s are becoming so-called Tier0.5s, while Tier2s work towards Tier1s.**

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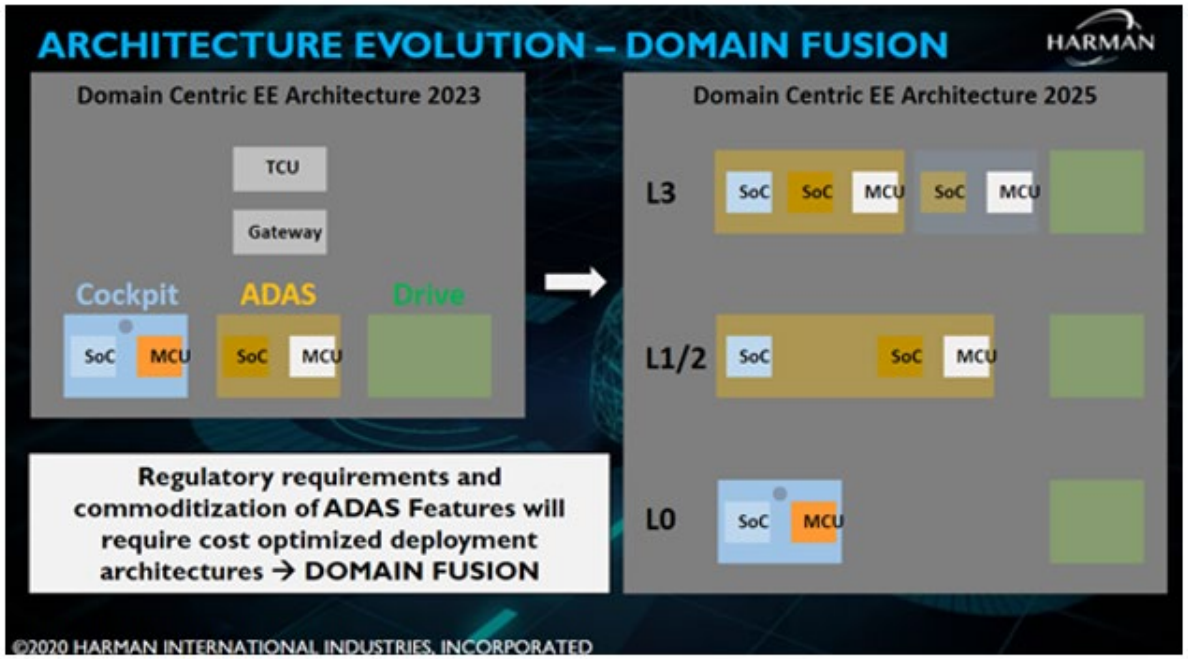
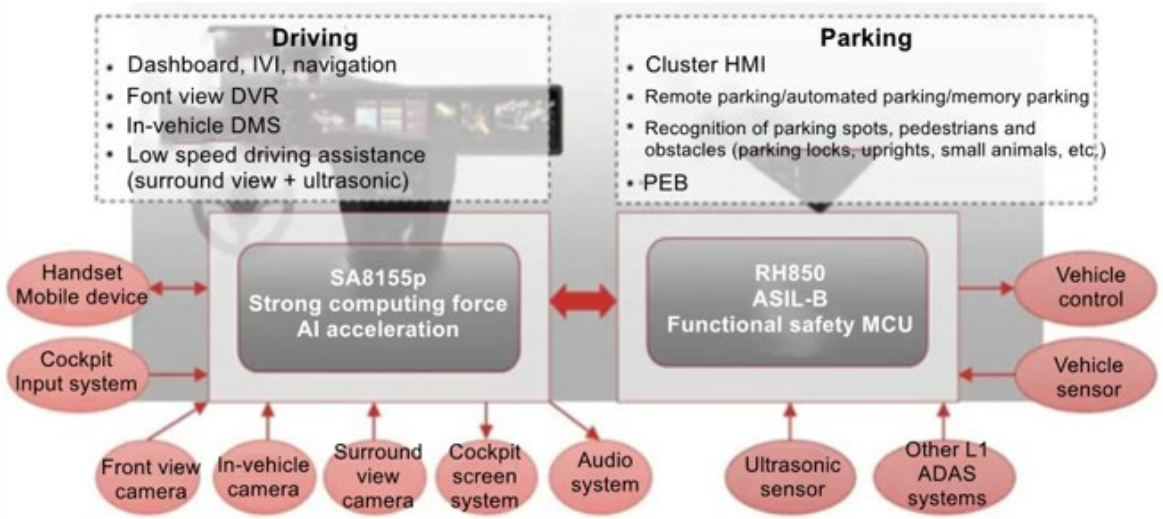
In Harman's case, its cockpit platform already integrates L0 ADAS functions from AR navigation and 360° surround view to DMS/OMS and E-mirror. In future, Harman will combine intelligent cockpit domain controller and ADAS domain controller to support L1~L2+/L3 capabilities, giving OEMs scope for lowering their costs and simplifying systems.

In 2021, ThunderSoft also introduced TurboX Auto 4.5, its new-generation intelligent cockpit platform that allows the cockpit to integrate DMS and automated parking solution and interact with ADAS scenarios. Its intelligent cockpit that can start the built-in computing platform in the parking process optimizes low speed driving with stronger computing force or assists the driver in parking, providing better driving experience.



Source: Harman



Source: ThunderSoft

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Cockpit SoC trends: stronger CPU and AI computing force, more displays and sensor interfaces, modular and renewable

With a tendency towards intelligent cockpit multi-sensor fusion, multi-mode interaction and multi-scene mode, cockpit SoC as the processing center needs breakthrough upgrades. The next-generation cockpit SoC will head in the following directions:

1. Increasingly strong CPU computing force: for example, Qualcomm Snapdragon SA8155P chip and SA8195P CPU boast computing force of 85KDMIPS and 150KDMIPS, respectively; SemiDrive's latest X9U cockpit chip features CPU computing force of up to 100KDMIPS.

2. Needs for ever stronger AI computing force that allows the driver to interact with voice, graphics and even vehicle functions. In current stage, some mass-produced cockpit SoCs are embedded into AI accelerated computing platforms, affording computing force of 1~5TOPS. Examples include Nvidia Parker for Mercedes-Benz's first-generation MBUX, with AI computing force of 1TOPS, and Samsung's mass-produced Exynos Auto V910 with AI computing force of approximately 1.9TOPS and its Exynos Auto V920 cockpit chip to be spawned around 2025 with NPU computing force of 30TOPs.

3. Access to more vehicle displays and sensors. For example, Qualcomm 8155/8195 supports up to 8 sensor outputs and 5-way displays; Samsung V910 supports 6-way displays; X9U, SemiDrive's latest intelligent cockpit chip unveiled at Auto Shanghai 2021 supports 10 HD displays.

Displays and Sensors Main Cockpit Processors Allow to Access

Vendor	Model	Supported Camera/Sensor Inputs & Supported Display Outputs
Qualcomm	820a Prem	Support for up to 8 simultaneous camera sensor inputs
	SA6155P	Supporting up to 8 GMSL cameras and 2 mini display ports for multimedia.
	SA8155P	8 camera inputs, 5 display outputs (up to 4K resolution supporting multiple touchscreen displays
	SA8195P	8 camera inputs, 5 display outputs
Samsung	ExynosAuto V910	Up to 12 cameras, Up to 6 displays, (5120x2880, 8192x1800) 2x DP 4 lanes, 2x MIPI DSI 4 lanes
NXP	i.mx8QM	Camera MIPI-CSI 4-lanes each Supports single Ultra HD 4Kp60 display or up to 4 independent Full HD 1080p60 displays
TI	Jacinto6	DRA718: 1 HDMI OUT, 2 LCD OUT
MediaTek	MT2712	Supporting 1 display (2560*1600 p60/2880*1080p60); 2 displays (1920*1080p60); 3 displays (800*480 p60)
SemiDrive	X9P	Supporting up to 12-way HD cameras and 8 HD displays
	X9H	Supporting up to 12-way HD cameras and 4 HD displays
	X9U	Supporting up to 10 HD displays
Allwinner	T7	Supporting 1080p60 and providing multiple display interfaces (MIPI & LVDS & RGB); supporting up to 8-way HD camera inputs
SiEngine	A7862	Supporting simultaneous outputs of multiple 4K/2K high resolution displays, and simultaneous inputs of up to 11-way 2M@60fps cameras

Source: ResearchInChina

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4. More advanced chip process. At present, 7nm and 8nm cockpit chips such as Qualcomm 8155/8195 and Samsung V910 have been mass-produced. Qualcomm's new fourth-generation Snapdragon automotive cockpit chip adopts 5nm process and is projected to be produced in quantities in 2022.

5. Faster chip iteration, shorter release cycle. New cockpit chips are released every 1 or 2 years compared with previous 3 or 5 years, showing faster iteration.

6. Cockpit SoC also tends to be modular, replaceable and scalable. In April 2021, Huawei released 9610, an IVI module with built-in Kirin 990A automotive chip. The chip module featuring pluggable design can be upgraded by way of replacing central processing unit every three years, and each generation with the same interfaces allows direct replacement, covering the full life cycle of vehicles.

Cockpit SOC Development and Plan of Major Vendors

Release Time	~2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023~
Qualcomm		Gen 1: 602A		Gen 2: 820A (14nm)			Gen 3 SA6155/SA8155/SA8195 (7nm)		Gen 4 (5nm)		
Samsung			Exynos 8890 (14nm)				Exynos Auto V910 (8nm)		High-end V920 (~5nm), mid-end V720	Low-end V520 or V320	
Intel			A3900		A3920	A3950/A3960 (14nm/0					Next generation (~10nm)
Intel	Parker					Xavier	NVIDIA Orin (autonomous driving) (7nm)		Atlan (AI autonomous driving)		
Renesas	R-Car H2	R-Car M2/R-Car E2	R-Car H3 R-CAR M3								R-CAR next generation
NXP				i.MX 6	i.MX 8M (28nm)				i.mx8.5/ i.mx10x (5nm)		
TI	Jacinto 6			J6 entryJ6/J6 echo/J6 Plus				J7 chip (non-cockpit product)			
Telechips						TCC803x (name: Dolphin+)		Dolphin 3		Dolphin 5 (NPU)	
Huawei									Kirin 990A (28nm)		
Horizon Robotics							Journey 2 (28nm)	Journey 3 (16nm)	Journey 5	Journey 5P	Journey 6
MediaTek (ECARX)							MT271 (E01, E02)		(E03)		
SemiDrive								X9H/X9P (16nm)	X9U/G9V		
AutoChips							AC8015			AC8025	AC8035
UNISOC								A7862 (12nm)			
SiEngine									SE1000 (7nm)		

Source: ResearchInChina

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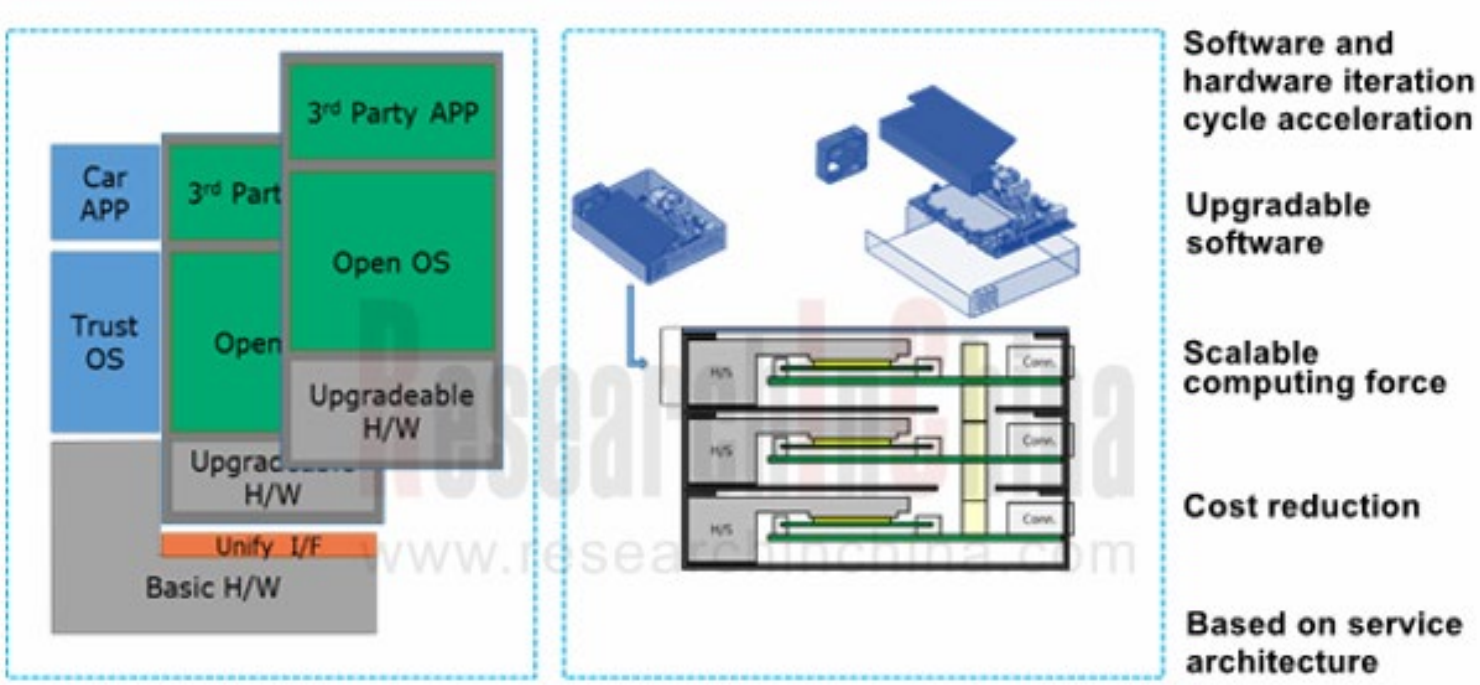
Neusoft Vehicle Computing Platform (VCP) also allows flexible, free configurations with hardware plug and unplug. The separation of the computing unit from the functional unit successfully decouples the software and hardware development process, making it a reality features and advantages like upgradable hardware, sharable computing force and scalable software, to build more flexible business models for automakers.



Modular, Pluggable Hardware Architecture

Source: Neusoft

Abstract

Cockpit software platform: a standard, scalable, open integrated basic software platform

Quite a few technology firms including Continental EB, ThunderSoft, Neusoft Reach, Huawei, ArcherMind Technology and Banma Information Technology have made deployments in intelligent cockpit software platform.

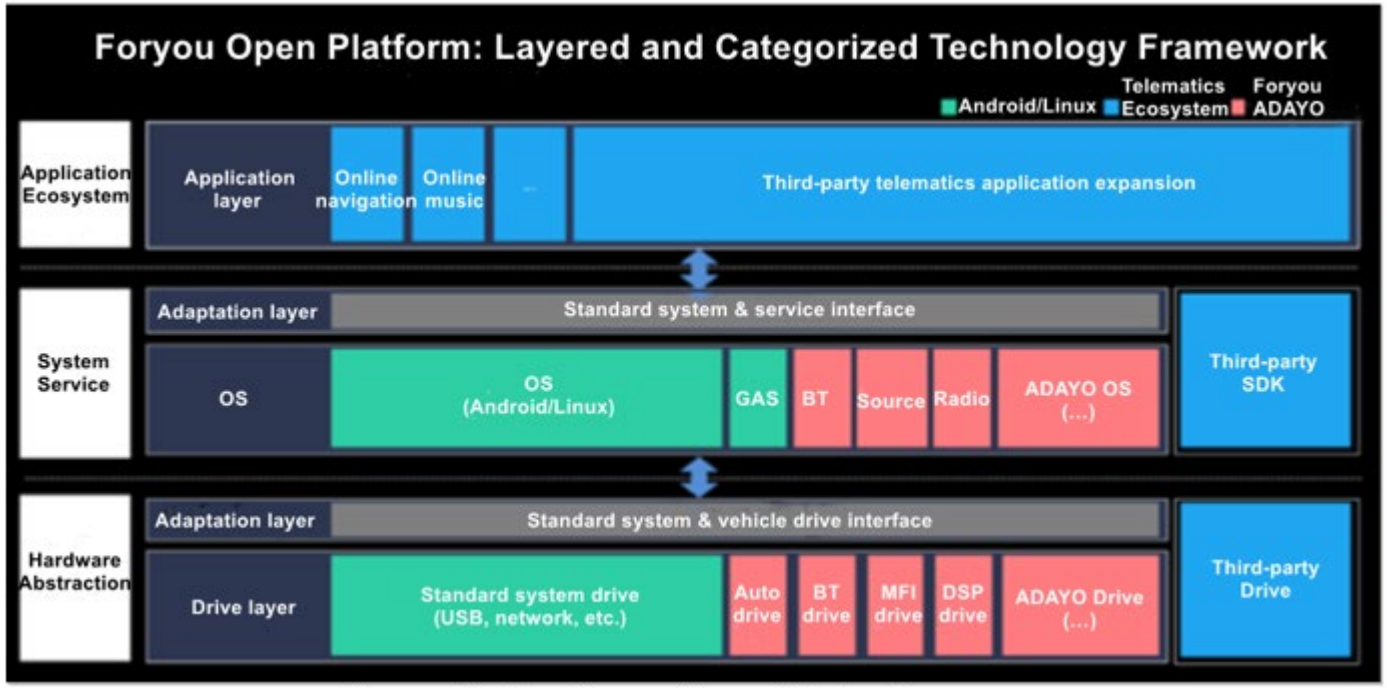
At present, decoupling and separating the intelligent vehicle cockpit software and hardware has been a common belief. Based on service oriented architecture (SOA), the decoupling and reuse of vehicle software and hardware at the underling layer enable rapid iteration of software functions, and the interaction with users over the air (OTA) helps to deliver personalized and differentiated cockpit product experience.

TurboX Auto 4.5, ThunderSoft's SOA-based intelligent cockpit platform, enables decoupling of scenarios and services, and rapid development and iteration of scenario services.

Besides needed rapid iteration of cockpit software, reusability, scalability and enough flexibility should also be taken into account in SOA design so that the needs for a mass of inputs can be satisfied with minimal software change.

Neusoft already builds its general standard software architecture and software platform that can fast adapt to different mainstream SoC hardware platforms, and help to realize mass production of high-, mid- and low-end multi-platform intelligent cockpits shortly to meet the needs of different OEMs.

In Jul. 2020, Foryou introduced ADAYO Automotive Open Platform (AAOP) which decouples the telematics software ecosystem at the upper layer and the hardware ecosystem at the underlying layer. AAOP focuses on the intelligent cockpit platform. Based on the standard, modular, layered and categorized software framework of AAOP, Huizhou Foryou General Electronics' software development model can be transformed from project-based embedded software delivery to layered, categorized software development, which accelerates research and development, reduce R&D preparations and improve R&D efficiency.



Source: Huizhou Foryou General Electronics

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