

**Global and China Intelligent Cockpit
Platform for Automobiles Industry
Report, 2020**

Feb.2020

STUDY GOAL AND OBJECTIVES

This report provides the industry executives with strategically significant competitor information, analysis, insight and projection on the competitive pattern and key companies in the industry, crucial to the development and implementation of effective business, marketing and R&D programs.

REPORT OBJECTIVES

- ◆ To establish a comprehensive, factual, annually updated and cost-effective information base on market size, competition patterns, market segments, goals and strategies of the leading players in the market, reviews and forecasts.
- ◆ To assist potential market entrants in evaluating prospective acquisition and joint venture candidates.
- ◆ To complement the organizations' internal competitor information gathering efforts with strategic analysis, data interpretation and insight.
- ◆ To suggest for concerned investors in line with the current development of this industry as well as the development tendency.
- ◆ To help company to succeed in a competitive market, and

METHODOLOGY

Both primary and secondary research methodologies were used in preparing this study. Initially, a comprehensive and exhaustive search of the literature on this industry was conducted. These sources included related books and journals, trade literature, marketing literature, other product/promotional literature, annual reports, security analyst reports, and other publications. Subsequently, telephone interviews or email correspondence was conducted with marketing executives etc. Other sources included related magazines, academics, and consulting companies.

INFORMATION SOURCES

The primary information sources include Company Reports, and National Bureau of Statistics of China etc.

Abstract

Cockpit electronic system refers to a complete set of system composed of center console, full LCD dashboard, HUD, rear seat entertainment system, smart audio, telematics module, streaming media rearview mirror and telematics system. Based on cockpit domain controller, intelligent cockpit system as a foundation of human-car interaction and V2X, provides intelligent interaction, intelligent scenarios and personalized services beyond capabilities of a cockpit electronic system, through a unified software and hardware platform.

Intelligent cockpit platform is a software and hardware architecture enabling sub-systems and features of a smart cockpit. It consists of hardware and software parts: hardware part is a hardware platform comprised of domain controllers and chips; software part refers to a software platform built by operating system, Hypervisor, middleware and support tools.

With advances in technologies about chip, software, among others, one-core multi-screen multi-system integrated cockpit platform as a way to integrate systems, cut costs and meet needs for multi-screen interconnection, intelligent interaction and intelligent driving capabilities that an usual cockpit cannot provide, becomes a mainstay in next-generation cockpit.

Quite a few automakers have set about deploying smart cockpit system. Some already equip the system on their production vehicles. Examples include MBUX system mounted on 2018 Mercedes-Benz A Class, and C4-Alfus 2.0 and C4-Pro, two domain controller-based cockpit platforms co-developed by Neusoft and Intel and installed in 2019 models like Hongqi HS7 and EXCEED LX.

Main Automakers' Deployments in Intelligent Cockpit Platform

OEM	Cockpit Applied	Platform	Mass-production Plan	Others
Audi	Aptiv ICC		Not yet	Audi A8 packs Aptiv autonomous driving platform
Daimler	MBUX-SmartCore		Spawned	-
Dongfeng	Visteon SmartCore		Spawned	-
Ferrari	Dual Cockpit-Aptiv ICC		Spawned	-
Geely	Visteon SmartCore		~2020	-
GAC Group	Visteon SmartCore		2020	Aion LX to be launched in 2020 is the first model carrying the platform
Great Wall Motor	Neusoft vehicle computing platform (VCP)		2022	Haval and WEY
SAIC	AICS		2020	Based on NXP chips, AliOS, and Banma intelligent system
Toyota	Denso Harmony Core		Spawned	2020 Subaru Legacy/Outback will carry
VW	ICAS3		2020	The first vehicle carrying the platform may be VW I.D.3, a model based on MEB platform and composed of three domains (cockpit domain is ICAS3)
Volvo	Aptiv ICC		2020	
Hongqi	C4-Alfus		Spawned	HS7, E-HS3 and HS5 pack Neusoft cockpit platform based on Intel
Chery	C4 Pro		Spawned	EXCEED; Intel's Apollo Lake processor and ACRN virtualization solution, Android 9.0
Hozon	XX domain controller		Spawned	Based on ATOM architecture, using Intel Apollo Lake master chip
Dearcc Enovate	Desay SV domain controller		Spawned	Dearcc ME7, using Dearcc intelligent modular architecture (iMA); Qualcomm S820A chip

Source: ResearchInChina

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At CES 2020, Land Rover unveiled New Defender 90 and 110, the first ever vehicles to feature dual-modem, dual eSIM design for enhanced connectivity and functionality. Powered by the Qualcomm Snapdragon S820Am Automotive Platform with the integrated Snapdragon X12 LTE Modem, the New Defender can download Software-Over-The-Air (SOTA) updates without interruption and while streaming music and apps through the vehicle's new Pivi Pro infotainment system. The New Defender is also the first Land Rover vehicle to include a domain controller that consolidates a number of Advanced Driver Assistance Systems (ADAS) and driver convenience functions built on top of the QNX Hypervisor.



Land Rover New Defender Cockpit

Intelligent cockpit hardware platform tends to be a fusion of more and more sub-systems and capabilities. How to well manage these sub-systems and functions rests with the upgrading of cockpit processor and smart cockpit software platform.

Smart cockpit hardware platform becomes ever more powerful in the process of integration

As the base of an intelligent cockpit hardware platform, cockpit domain controller integrated with multiple electronic control units (ECU) outperforms others in safety, size, power consumption, weight and cost, enabling seamless human-machine interaction in combination with interaction ecosystem.

All automotive system integrators are stepping up their efforts to deploy smart cockpit platform. Among them, Tier1 suppliers like Visteon, Aptiv, Neusoft and Desay SV have spawned intelligent cockpit platforms; Continental, Panasonic, Bosch, Samsung, Huawei and so forth have also rolled out their new-generation intelligent cockpit platforms. In the forthcoming years, competition in cockpit platform field will prick up.

Visteon currently leads the intelligent cockpit domain controller industry. Visteon SmartCore has found massive application in Mercedes-Benz MBUX system early in 2018. At CES 2020, Visteon showcased its newest SmartCore?, an intelligent cockpit platform which is integrated with the Tencent Auto Intelligence (TAI) system and first available to GAC Aion LX, a new BEV model to be launched in 2020. Moreover, Dongfeng and Geely are also partners of Visteon.

SmartCore™ GAC

Digital Integrated Cockpit Solution



Features:

- Integrated cockpit controller designed for the China market
- Scalable SoC
- Tencent cloud integration
- Supports multiple domains, including infotainment, connectivity, instrument cluster, HVAC and body controller
- Multi-display environment
- Enables multiple OS
- Hypervisor

Benefits:

- Rich Tencent user experience
- Next-generation cockpit architecture
- Scalable across vehicle lines
- ASIL-B functionality
- Centralized security and FOTA
- Enhanced HMI using multi-screen environment
- Extended lifecycle through feature adds/upgrades via app store
- Simplified packaging

Visteon SmartCore displayed at CES 2020

At the IAA 2019 in Frankfurt, Continental showcased the latest version of its Integrated Interior Platform (IIP), a new scalable cockpit platform favoring operating systems like QNX, Integrity, and Android. Continental plans to mass-produce the solution in 2021.

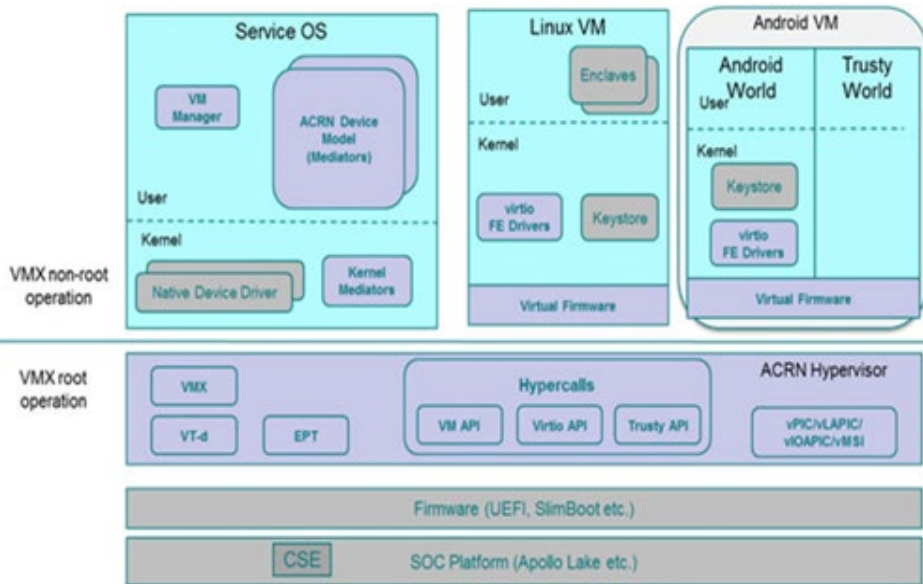


Continental Integrated Interior Platform (IIP)

At CES 2020, Samsung Electronics unveiled Digital Cockpit 2020, which utilizes 5G to link features inside and outside the vehicle and provide connected experiences for drivers and passengers alike. Digital Cockpit 2020 is the third co-development between Samsung Electronics and Harman International, and combines Samsung's telecommunications technologies, semiconductors and displays with HARMAN's automotive expertise. Digital Cockpit 2020 incorporates eight displays inside the vehicle, as well as eight cameras. The solution utilizes Samsung Exynos Auto V9 SoC (System on Chip), a semiconductor for vehicle electronics, and Android 10, which allow for several features to be run at the same time. Besides, Samsung's integrated IoT platform SmartThings can work in tandem with the revamped "Bixby in the car" to enhance connectivity by allowing the vehicle to actively communicate with the driver. Once the driver logs in using either facial recognition or a smartphone fingerprint reader, the Center Information Display can be used to show the driver's schedule and a range of other information. Unlike the 2019 Digital Cockpit, the 2020 solution allows for connections to be made wirelessly.



Samsung's 5G-Based Digital Cockpit 2020 at CES 2020



Panasonic Automotive revealed its latest fully connected eCockpit concept at CES 2020. The technology platform integrates Panasonic's proprietary SkipGen 3.0 in-vehicle infotainment (IVI) system with Google's Android Automotive OS running on Android 10. In the concept vehicle, SkipGen 3.0 is paired with the next generation cockpit domain controller, SPYDR 3.0. At the core, the single brain SPYDR 3.0 acts as a hypervisor and is capable of driving up to eleven displays.

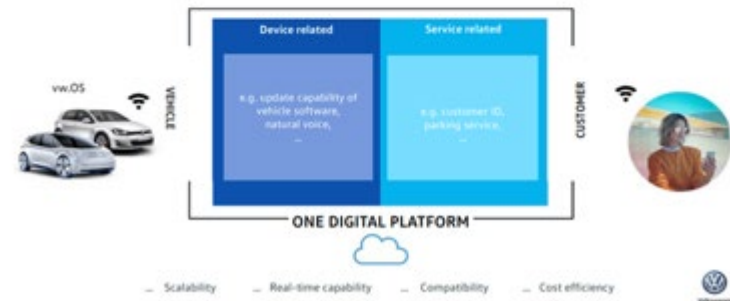
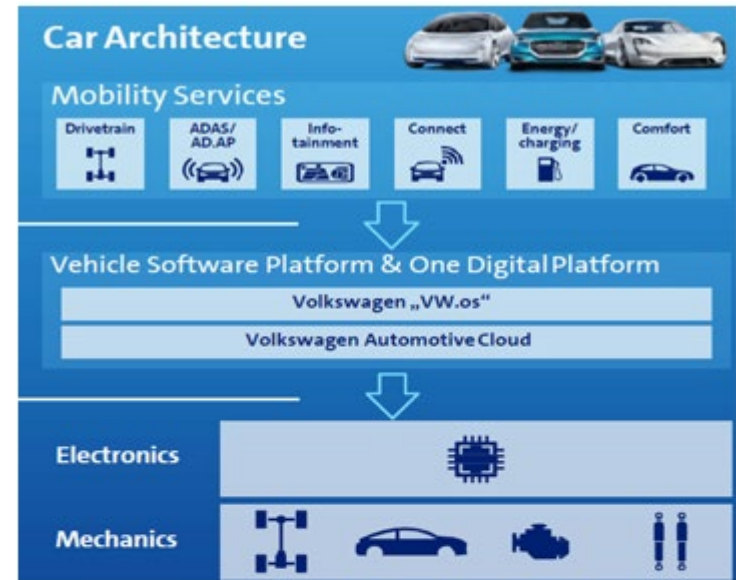
As the kernel of cockpit domain controllers, cockpit processors are mainly supplied by Qualcomm, NXP, Intel, Renesas, Texas Instruments, NVIDIA, Allwinner, Samsung, MediaTek, Horizon Robotics, etc. Among them, Qualcomm, Intel and Renesas are the most competitive market players by virtue of their bombshells -- Qualcomm 820a / 835A, Intel A3900 and Renesas R-Car H3 / M3. The major processor chips differ in fabrication processes, cores, and especially GPU computing power which determines the infrastructure level of the cockpit hardware platform.

Software platform becomes the focus of differentiation; Cockpit will be defined by software in future

In intelligent cockpit software platform, hypervisor and vehicle operating system are the most important components. Hypervisor allows multiple operating systems and applications to share hardware as a middle software layer that runs between the underlying physical server and the operating system.

The prevailing automotive operating systems embrace QNX, Linux, Android, AliOS, etc., each of which has merits and demerits. Among them, QNX dominates the automotive cluster system market with high security; the open-source Linux has become the underlying system of custom-made operating systems; Android and AliOS are increasingly used by IVI systems due to rich application ecosystem.

Under the software-defined car trend, operating system is crucial to the intelligent connectivity layout of automakers, and the focus of the emerging system integrators' deployments. Tesla's self-developed operating system made a success. In 2019, Volkswagen announced to lavish huge on R&D of VW.OS. Several Chinese emerging automakers follow Tesla to develop operating systems by themselves. Yet, all Japanese automakers support AGL in which China-based SITECH also joined.



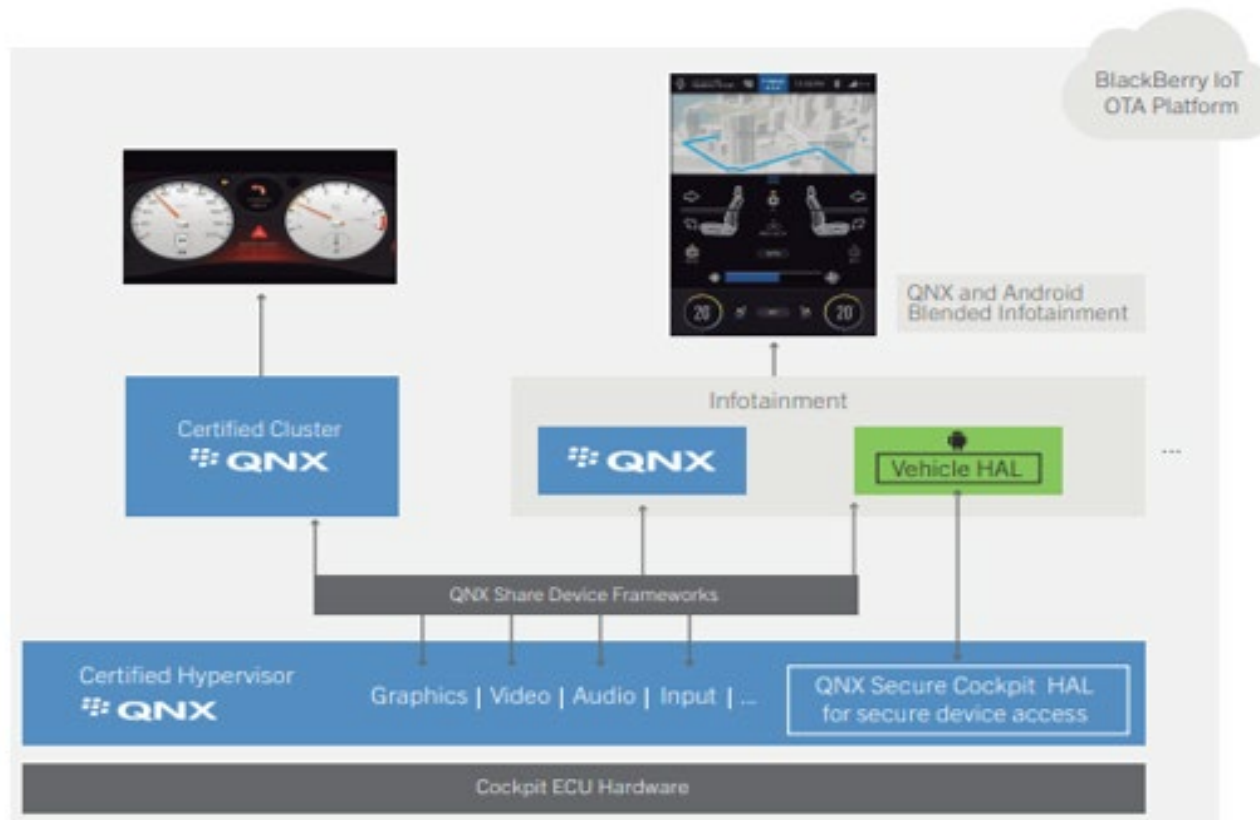
Volkswagen VW.OS and automotive digital platform

Also, the new suppliers such as Huawei, ZTE, Alibaba and Baidu have rolled out self-developed operating systems successively. In the future, there will be cut-throat competition in the automotive operating system market. At length, only two or three mainstream operating systems may survive. In fact, there are three mainstream cockpit operating systems for automakers: QNX, Android, and Linux (AGL).

Due to high requirements on safety, most clusters apply QNX. IVI, co-pilot entertainment and rear seat entertainment systems mostly make use of Android. Chinese brands like Geely, Changan, BYD, Dongfeng, Great Wall Motor and GAC are all based on Android, while SAIC prefers AliOS. Audi launched Android-based MIB3 system in 2019. BMW is extending the reach of seamless connectivity in its vehicles with the introduction of Android Auto? starting in mid-2020.

Because intelligent cockpit supports multiple operating systems such as QNX, Android and Linux simultaneously, hypervisors running directly on physical hardware have been widely used. As an intermediate software layer, hypervisors allow operating systems and applications to share hardware. Hypervisors not only coordinate access to hardware, but also impose protection between virtual machines. Common hypervisors include QNX Hypervisor, ACRN, COQOS Hypervisor, PikeOS, and Harman Device Virtualization.

QNX Hypervisor 2.0 uses BlackBerry's 64-bit embedded operating system QNX SDP 7.0, allowing developers to unify multiple operating systems to a single computing platform or SoC chip. Operating systems such as QNX Neutrino, Linux, and Android are supported on BlackBerry QNX Hypervisor 2.0. The cockpit platforms of Visteon, Denso, Marelli, WM Motor, etc., unexceptionally render QNX Hypervisor.



The cockpit platform based on QNX Hypervisor

Global and China Intelligent Cockpit Platform for Automobile Industry Report, 2020 highlights the followings:

- Definition, status quo, industry chain and trends of automotive intelligent cockpit platforms;
- Comparison between automotive intelligent cockpit platform solutions, OEM cockpit platform solution layout;
- Status quo and trends of intelligent cockpit platforms, domain controller market size forecast, typical cockpit hardware platform domain controller solutions and their customers;
- Major intelligent cockpit hardware platform vendors (Visteon, Panasonic, Continental, Aptiv, etc.) and product layout;
- Applied cases of intelligent cockpit hardware platform (Tesla, Mercedes-Benz, Land Rover, etc.);
- Comparison between intelligent cockpit processors. Major cockpit processor vendors (Qualcomm, Intel, NXP, Samsung, Allwinner, Horizon Robotics) and product development;
- Composition and trends of major intelligent cockpit software platforms;
- Status quo of automotive operating systems, underlying OS market share, major automotive operating system vendors and product development;
- Intelligent cockpit software platform virtualization technology (Hypervisor) layout;
- 18 global and Chinese automotive intelligent cockpit platform solution integrators (cockpit platform solutions and planning).

1 Overview of Intelligent Cockpit Platform

- 1.1 Definition of Intelligent Cockpit Platform
- 1.2 New Features like Multi-screen Linkage Facilitate the Evolution of Intelligent Cockpit Platform
- 1.3 Volkswagen's Unified Automotive Electrical Architecture
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- 3.3.1 QNX Hypervisor
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