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Automotive Cockpit Platform Report, 2023

Intelligent Research

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Intelligent cockpit platform research: the boundaries between vehicles and PCs are blurring, and there are several feasible paths for cockpit platforms.

Automotive Intelligent Cockpit Platform Research Report, 2023 released by ResearchInChina highlights the products and plans of 8 overseas and 11 Chinese cockpit platform suppliers, and the installation of cockpit platforms by more than 20 OEMs, and also explores some of key issues, such as:

- * Cockpit platform supply chains, development paths and strategies of dozens of mainstream Chinese independent automakers, joint venture automakers, and start-up automakers
- * In the trend for cockpit-driving integration, how cockpit platforms will develop?
What are the application scenarios of hypervisor and hardware isolation solution in cockpit platforms?
- * How China's local cockpit platforms replace foreign ones?
- * In the evolution of cockpit platforms, what is the status quo of integrated ADAS functions?
- * In the underlying SoC+MCU hardware architecture of cockpit platforms, will MCU be removed?

To meet market demand, players tend to make a multi-form layout of intelligent cockpit platform products.

In recent years, under the wave of vehicle intelligence, intelligent cockpits have enjoyed a boom. Intelligent cockpits, which are no longer a simple riding tool, play a more important role in scenarios that require comfort, entertainment and emotion. The integration of more functions in cockpit software will further facilitate iteration and upgrade of the underlying hardware platform of intelligent cockpits.

The underlying hardware platform of intelligent cockpits passes through four development phases

As new cockpit SoC products are rolled out, the underlying hardware platform of intelligent cockpits passes through four development phases in general, as follows:

The first phase is cockpit hardware platform products based on SoCs, e.g., NVIDIA Parker, NXP i.MX6 and TI J6, enabling the integration of basic functions of the dashboard and center console dual display;

The second phase is cockpit domain control hardware platforms based on SoCs, e.g., Qualcomm 820A, Intel Apollo Lake, NXP i.MX8 and Renesas R-CAR H3, enabling the single-chip dual-system integration using hypervisor virtualization technology, the introduction of Android-based IVI systems, and the integration of more screens;

The third phase is cockpit hardware platforms based on SoCs, e.g., Qualcomm 8155 and Samsung, and also a generation of domain control products currently produced in quantities, enabling the single-chip multi-system multi-screen control, and the integration of some ADAS functions including HUD, rear seat entertainment, air conditioning control, voice, and even surround view and DMS/OMS on the basis of original dashboard and IVI.

The fourth phase is new-generation cockpit hardware platform products based on higher performance SoCs, e.g., Qualcomm 8295 and AMD, enabling the integration and exploration of more functions such as 3D HMI, car games and cockpit-driving integration on the basis of the previous generation.

Composition and Main Functions of Latest-generation Intelligent Cockpit Platform Products of Some Suppliers

In the process, both foreign suppliers (e.g., Visteon, Aptiv, Bosch and Continental), and Chinese local suppliers (e.g., PATEO CONNECT+, Desay SV and Neusoft Group), play an active part in the cockpit disruption, pulling intelligent cockpit platforms to an ever higher level. In PATEO CONNECT+'s case, with years of technical expertise and product delivery experience, the company has launched a range of intelligent cockpit platform products based on multiple SoCs like NXP i.MX8QM, SemiDrive X9HP, MediaTek MT8666 and Qualcomm 8155, covering the cockpit systems of various mid-to-high-end models, and has had products mass-produced and installed in several models. PATEO is designing and developing new-generation Qualcomm 8295-based intelligent cockpit platforms which are expected to be mounted on related models in 2024.

The introduction of higher-compute cockpit SoC products enhances the performance of the underlying hardware of intelligent cockpit platforms, allowing software to integrate more functions, and enabling the integration of more human-computer interaction modes and more personalized experiences into vehicles, as well as some low-level ADAS functions (e.g., DMS, OMS, surround view and low-speed parking).

Composition and Main Functions of Latest-generation Intelligent Cockpit Platform Products of Some Suppliers

Company	Latest Product	Composition and Main Functions	SOP Plan
PATEO CONNECT+	New-generation Qinggan Vehicle Intelligent Cockpit Platform	<ul style="list-style-type: none"> ✓ Based on Qualcomm 8295 ✓ Support 3D HMI+4K display and cross-screen display + streaming media rearview mirror + self-developed ADSP sound algorithm + 7.1-channel audio output + offline and millisecond-level voice interaction + self-developed DMS and lip interaction vision algorithms + vehicle Ethernet capability + integrated autonomous driving, APA, etc. 	2024
Desay SV	4th Generation Intelligent Cockpit Platform (G9PH)	<ul style="list-style-type: none"> ✓ Qualcomm 8295 + Android 12.0 + QNX 7.1 + Hypervisor ✓ Intelligent applications that meet individual needs + enhanced safety and security capabilities + AI application and multimodal fusion + driving assistance integration, etc. 	~2024
ThunderSoft	Cockpit V7.0	<ul style="list-style-type: none"> ✓ Qualcomm 8295 + Android S + QNX 7.0 + QNX Hypervisor 2.1 ✓ Single chip supporting three screens (6K+2*2K) + HMI2.0 + multimodal interaction + intelligent vision + Carplay2.0 + immersive cockpit game platform, etc. 	2024
ECARX	Makalu Cockpit Platform for Global Markets	<ul style="list-style-type: none"> ✓ AMD Ryzen Embedded V2000 + Radeon RX 6000 Series GPU + Cloudpeak Software System ✓ Support the latest graphics processing interface of desktop computing platforms and Unreal Engine + large 3A games and Epic Games Store game ecosystem 	2024
Visteon	SmartCore Gen4	<ul style="list-style-type: none"> ✓ Samsung Exynos Auto V9 + Android P (IVI) + scalable software architecture + hard isolation solution ✓ All-digital dashboard + IVI + rear seat infotainment + AI voice recognition + Alexa voice assistance + functional safety + cyber security + ADAS functions (LKA, APA, SVM, etc.) supporting hardware safety islands + multi-screen display, etc. 	~2025
Aptiv	New-generation Cockpit System	<ul style="list-style-type: none"> ✓ Based on Qualcomm 8295 ✓ Support 6-screen display + 8K large screen + surround speaker layout + V2X + gigabit vehicle Ethernet + the latest WiFi6 standard + holographic projection and augmented reality algorithm + integrated DMS & OMS + high-definition driving record function + cockpit-parking integrated solution + global SDR platform + platform with built-in DSP + touch, gesture, voice, eyesight four-dimensional space interaction, etc. 	~Late 2023
Bosch	2nd Generation Cockpit Domain Controller	<ul style="list-style-type: none"> ✓ Based on Qualcomm 8295 ✓ Support at least 5 screens + 16-channel cameras + DMS, OMS & around view + AR-HUD + driving recorder + surround view + active noise reduction + voice assistant + analog sound wave + high-speed Ethernet and 5G communication + OTA + software-defined radio (SDR) + parking assist (upgraded version) + AR navigation + UHD entertainment domain camera + multi-person multi-modal interaction + dynamic gesture interaction 	-

Source: ResearchInChina

Intelligent cockpit platforms develop in several typical forms

To meet the application requirements of intelligent cockpits, intelligent cockpit platforms develop in several typical forms.

One is to comply with EEA evolution. Supported by high-compute chips, intelligent cockpit platforms are heading in the direction of cross-domain integration on the basis of the improving core application functions of cockpit platforms. The typical products are Qualcomm 8295-based intelligent cockpit platforms. In terms of cross-domain application, Qualcomm's next-generation intelligent cockpit solutions use the AI compute and multi-camera support capabilities of SA8295 for the integration of low-speed driving assistance and cockpit domain, so as to better support 360° surround view and smart parking functions.

For example, PATEO's new-generation Qinggan Vehicle Intelligent Cockpit Platform is equipped with Qualcomm 8295, a 5nm intelligent cockpit chip with AI compute up to 30TOPS, supporting more powerful voice, map, and visual AI computing features. Compared with the previous generation, the performance of the main computing units like CPU and GPU is improved by more than 50%; the main line capability is increased by over 100%; the 3D rendering capability is increased by up to 3 times, supporting a higher-definition, smoother 3D HMI. The new-generation platform also allows for connection of more 4K high-definition large screens and real-time analysis of multi-channel video contents, and provides support for multi-domain integrated products and capabilities, bringing smoother driving experience.

Using the 8295 vehicle cockpit platform and the next-generation wireless communication technology (SparkLink), PATEO has started a vehicle intelligence layout that centers on intelligent vehicle lights, streaming media rearview mirrors, smart surface interiors and exteriors, OLED screens/special-shaped screens and integrates such modules as multi-level autonomous driving such as L2+ and automated parking.

Another form is to develop cockpit platforms focusing on cockpit entertainment functions and experiences. The typical products are intelligent cockpit platforms based on AMD chips. For example, in March 2023, ECARX introduced Makalu, its latest cockpit platform for global markets. Based on AMD Ryzen Embedded V2000 and Radeon RX 6000 Series GPU, the product with performance comparable to netbook computers supports the newest graphics processing interface of desktop computing platforms, and Unreal Engine, as well as 3D environment rendering and panoramic spatial audio, and also allows users to directly play 3A masterpieces and other games in cars.

Intelligent cockpit platforms develop in several typical forms

In addition, to ensure the best cockpit performance experiences, there are also several car models carrying dual cockpit SoCs, including Li Auto L9, Li Auto L8 Max, Buick GL8 Century, Lotus Eletre and Lynk & Co 08. Wherein, Lotus Hyper OS, a cockpit system released by Lotus, uses two Qualcomm 8155 SoCs, and connects them via the high-speed interconnect interface. It adopts a unique computing power distribution technology to exploit the total computing power (210K DMIPS) and 32G storage of the dual chips, simultaneously supporting 5 cockpit screens, cool 3D desktop engines and applications.



Source: ECARX

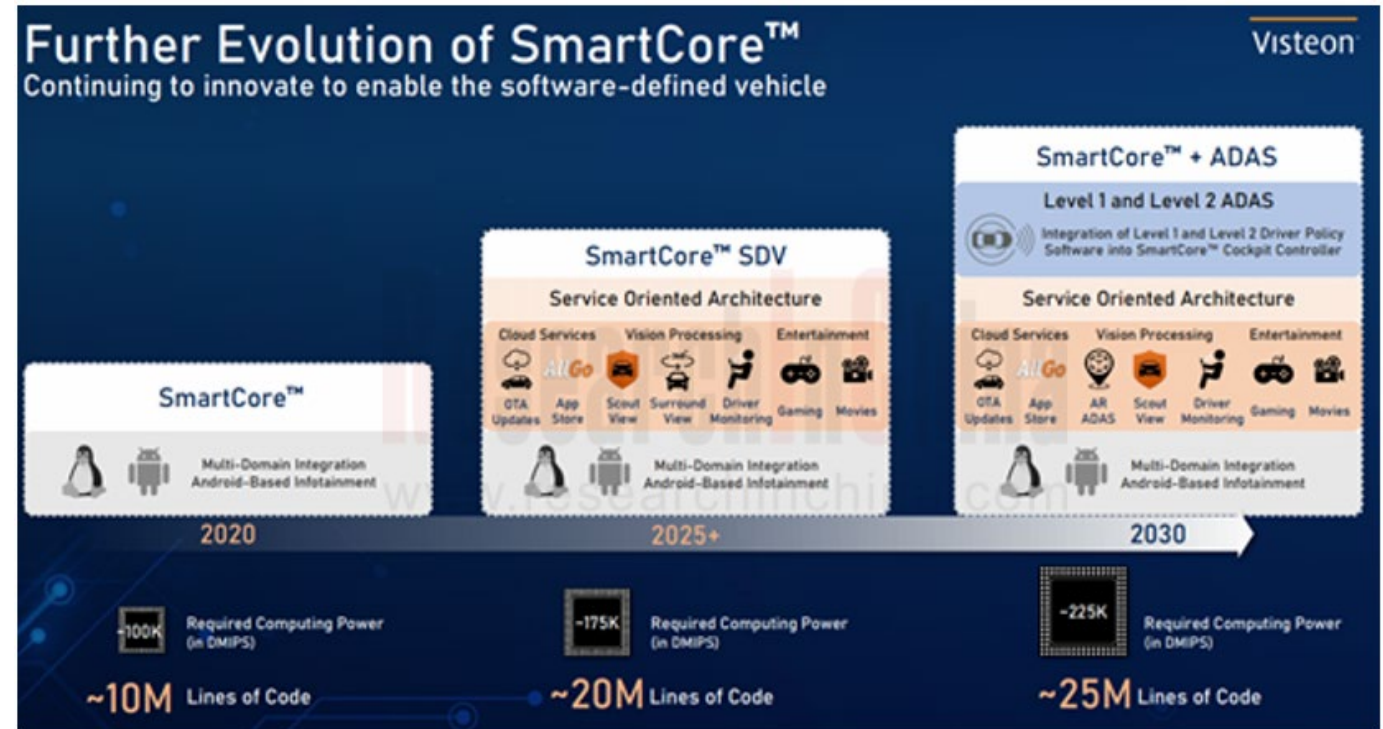
In the EEA trend, players are working to explore the layout of cockpit-driving fused and even integrated products.

The combination of EEA evolution, high-compute chips, higher software development capabilities, and ever wider adoption of intelligent driving technology helps intelligent cockpits integrate more new functions. Cockpits begin to evolve from single domain to cross-domain integration, that is, first integrate the functions of some domains into a high-performance computing unit, then gradually aggregate more functional domains, and finally form a cockpit-driving integrated central computing mode.

Currently, a number of companies including PATEO CONNECT+, Desay SV, ThunderSoft, Joynext, Neusoft Group, Hangsheng Electronics, ECARX, EnjoyMove Technology, Technomous, UnlimitedAI, ZF, Bosch, Harman and Visteon have set about deploying cockpit-driving integrated central computing platforms by way of first promoting the integration between some vehicle domains and gradually evolving to fully centralized solutions.

According to its latest plan, in 2025, Visteon will create SmartCore products based on service-oriented architecture (SOA) for software-defined vehicles, enabling multi-domain integration and supporting cloud services, visual processing (surround view, DMS), and game & entertainment; in 2030, Visteon SmartCore will be integrated with L1 and L2 ADAS functions, and at that time, Visteon will seamlessly integrate SmartCore with DriveCore through a set of HMI, and combine the cockpit electronics and autonomous driving domains closely as an intelligent cockpit solution.

Future Evolution of Visteon SmartCore



Source: Visteon

ECARX Super Brains

In March 2023, ECARX announced ECARX Super Brain, its first car brain product that integrates Longying No.1 and Black Sesame A1000 chips. This product combines vehicle control MCU and ultrahigh-speed inter-process communication to enable cockpit-driving integrated functions, and supports mainstream intelligent driving solutions (e.g., 3R1V, 5R6V and 5R10V, realizing NOA, etc.), meeting the needs of different vehicle models. Moreover, the product also decreases 5% wiring harnesses for lower vehicle complexity, and cuts down R&D cost by 15% and BOM cost by 20%.



Source: ECARX

In addition, at the software level, high-performance SoC products are the hardware foundation for cockpit-driving integration, and service-oriented architecture (SOA) is the software foundation, amid the development of central computing platforms like cross-domain integrated platforms. Quite a few companies have launched corresponding cross-domain integrated basic software products to seize the market opportunity.

Localized intelligent cockpit platform products are highly competitive

Intelligent cockpit platforms play a crucial and decisive role in performance and structure of intelligent cockpit systems. The core components from cockpit chips to underlying operating systems are still dominated by foreign manufacturers, and China's local products are still on the way to replacing them.

At present, in the context of faster localization of core components such as cockpit SoC and basic software in China, intelligent cockpit platform products have been deployed vigorously by key local intelligent cockpit suppliers including PATEO CONNECT+, Foryou Group, Kotei Information and Neusoft Group, all of which have announced their intelligent cockpit system solutions based on SemiDrive's chips, with some spawned in 2022. SiEngine, which released the 7nm intelligent cockpit chip "Longying No.1" in late 2021, and ECARX have also inked strategic cooperation agreements with cockpit suppliers like PATEO CONNECT+, Desay SV, Neusoft and BDStar Intelligent & Connected Vehicle Technology (BICV), under which the mass production is expected to be achieved by the end of 2023.

Intelligent Cockpit Platform Product Layout of Some Local Suppliers in China

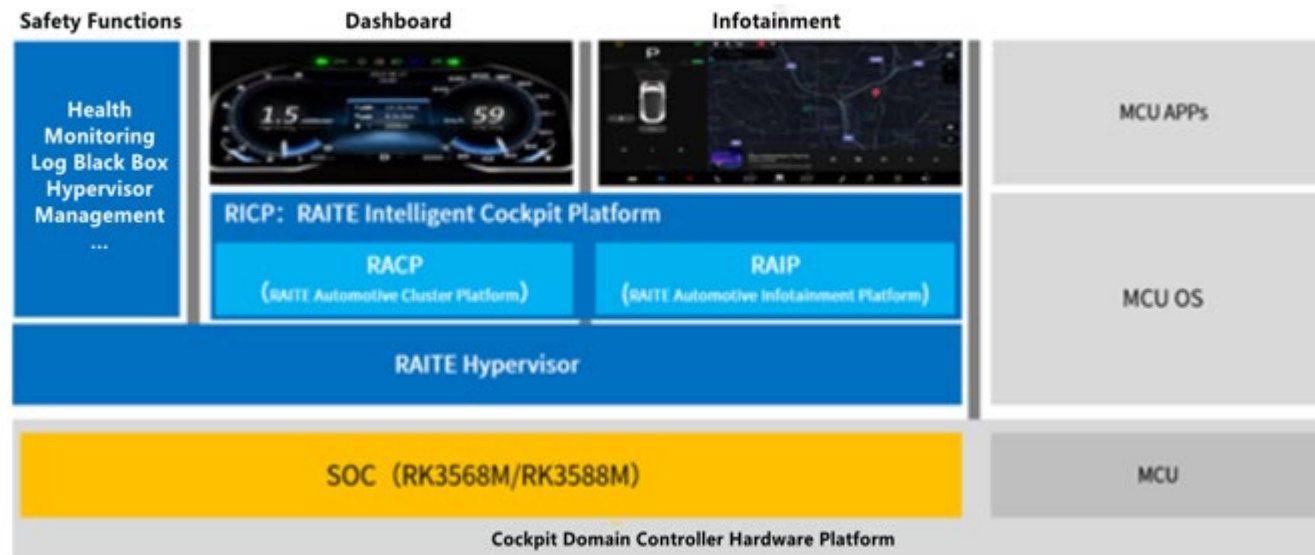
Release Time	Company	Intelligent Cockpit Platform	Description	SOP Plan
2023	PATEO CONNECT+	High-end Intelligent Cockpit	<ul style="list-style-type: none"> ◆ SemiDrive X9HP/X9H ◆ Based on SiEngine Longying No.1 	-
2023.3	ECARX	Antora 1000	<ul style="list-style-type: none"> ◆ Based on "Longying No.1" + Cloudpeak Software System 	~2023
		Antora 1000 Pro	<ul style="list-style-type: none"> ◆ Two Longying No.1 chips + Cloudpeak Software System ◆ A cockpit-parking integrated product 	2023
2022	Desay SV	Domestic Cockpit Customized Products	<ul style="list-style-type: none"> ◆ Based on SemiDrive X9SP + Android 12.0 + QNX7.1 + hard isolation solution Built on SiEngine Longying No.1 	-
2022.12	Rockchip & Zlignsmart	Domestic Virtual Intelligent Cockpit Solution (1)	<ul style="list-style-type: none"> ◆ Hardware: Rockchip RK3588M ◆ System software: Zlignsmart RAITE Hypervisor Operating System (RHOS) + RAITE Intelligent Cockpit Platform (RICP) ◆ Realize "one chip supporting multiple screens" and also support 360° surround view function 	-
		Domestic Virtual Intelligent Cockpit Solution (2)	<ul style="list-style-type: none"> ◆ Hardware: Rockchip RK3568M ◆ System software: Zlignsmart RAITE Hypervisor Operating System (RHOS) and RAITE Intelligent Cockpit Platform (RICP) ◆ Support such functions as LCD cluster, center console entertainment, 360° surround view and DMS, and meet the needs of commercial vehicles and light IVI-enabled passenger cars for intelligent cockpits. 	-
2022.12	Kotei Information	Intelligent Cockpit Solution	<ul style="list-style-type: none"> ◆ Hardware: SemiDrive X9 Series ◆ Software: KCAR OS self-developed by Kotei 	-
2022	CooKoo.AI	AutoCabin-P3	<ul style="list-style-type: none"> ◆ ACU3xx Series intelligent cockpit domain controllers (SemiDrive X9HP/SP + ASIL-B MCU) + CarNetOS automotive human-computer-cloud interaction system software (based on open source Linux and Android) ◆ Drive 5-channel digital LCD screens and 9-channel digital cameras, and realize such functions as dashboard, center console, multimedia, comfort control, surround view, and parking assist 	-
2021.12	Foryou General Electronics (ADAYO)	-	<ul style="list-style-type: none"> ◆ SemiDrive X9 Series chips + ADAYO Automotive Open Platform (AAOP) 	Mass-produced
2021	UnlimitedAI	Wukong No.2	<ul style="list-style-type: none"> ◆ Two Horizon J3 and one SemiDrive X9H chips ◆ Realize the integration of intelligent driving and intelligent cockpit domains, and the visual AI perception of 1-channel 8-megapixel front-view camera and 11-channel 2-megapixel cameras (side view/rear view/DMS/OMS/surround view), and support Gigabit Ethernet, OTA updates, and advanced intelligent driving functions, e.g., NOP and AVP 	-

Source: ResearchInChina

Rockchip and Zlingsmart jointly announced a fully localized solution

In December 2022, Rockchip and Zlingsmart jointly announced a fully localized solution. With the hardware based on the automotive cockpit chip RK3588M/RK3568M self-developed by Rockchip, and the system software running on RAITE Hypervisor Operating System (RHOS) and RAITE Intelligent Cockpit Platform (RICP) independently developed by Zlingsmart, the solution allows a single RK3588M chip to drive multiple screens including in-vehicle infotainment system, LCD instrument panel, electronic rearview mirror and rear row headrest screens, and also supports 360° surround view function, providing users with safe, reliable and all-scenario interaction experiences.

Localized Intelligent Cockpit Platform Architecture of Rockchip and Zlingsmart



Source: Zlingsmart

Table of Content (1)

1 Status Quo of Intelligent Cockpit Platform

1.1 Status Quo of Intelligent Cockpit Platform

1.1.1 Definition of Automotive Intelligent Cockpit Platform

1.1.2 Evolution of Cockpit Platform Solutions of Major Foreign Suppliers (1)

1.1.3 Evolution of Cockpit Platform Solutions of Major Foreign Suppliers (2)

1.1.4 Evolution of Cockpit Platform Solutions of Major Chinese Suppliers (1)

1.1.5 Evolution of Cockpit Platform Solutions of Major Chinese Suppliers (2)

1.1.6 Composition and Main Functions of Latest-generation Cockpit Platforms of Major Suppliers (1)

1.1.7 Composition and Main Functions of Latest-generation Cockpit Platforms of Major Suppliers (2)

1.1.8 Development Characteristics of Intelligent Cockpit Platforms of Suppliers

1.1.9 Trend for Cockpit Hardware and Software Separation

1.2 Intelligent Cockpit Platform Hardware Architecture and Development Trends of Cockpit Core Component SoC

1.2.1 Introduction to Cockpit Hardware Platform

1.2.2 Main Cockpit Platform Hardware Architectures

1.2.3 Block Diagram of Cockpit System Based on Qualcomm 8155

1.2.4 Block Diagram of Four-screen Intelligent Cockpit System Based on Renesas R-CAR H3

1.2.5 Block Diagram of Intelligent Cockpit System Based on NXP iMX8QM

1.2.6 Configuration of Dual Cockpit SoCs

1.2.7 Visteon's Intelligent Cockpit Platform Architecture Based on 2 Cockpit SoCs and Dual Systems

1.2.8 Competitive Pattern of Cockpit SoC Market

1.2.9 Competitive Pattern of Foreign Cockpit SoC Vendors

1.2.10 Competitive Pattern of Chinese Cockpit SoC Vendors

1.2.11 Comparison between Main Cockpit SoCs (1)

1.2.12 Comparison between Main Cockpit SoCs (2)

1.2.13 Comparison between Main Cockpit SoCs (3)

1.2.14 Cockpit SoC Development Plans of Major Companies: Overseas

1.2.15 Cockpit SoC Development Plans of Major Companies: Chinese

1.2.16 Performance of Next Generation Cockpit Processor Products

1.3 Composition and Trends of Intelligent Cockpit Software Platform

1.3.1 Introduction to Intelligent Cockpit Software Platform

1.3.2 Future Cockpits Require New Software Platform Architecture

1.3.3 Main Cockpit Software Platform Products (1)

1.3.4 Main Cockpit Software Platform Products (2)

1.3.5 Main Cockpit Software Platform Products (3)

1.3.6 Key Features of Software Platforms of Suppliers

1.3.7 Major Suppliers Accelerate Software Layout

1.3.8 Harman's Next Generation Cockpit Software Platform Architecture

1.3.9 Neusoft's SOA-based Software Development Capabilities

1.3.10 Megatronix SmartMega? Core Automotive Software Standard Function Modules

1.3.11 Megatronix's Intelligent Cockpit Solutions

1.3.12 ECARX Cloudpea Cross-domain System

1.3.13 Zlingsmart's RAITE Intelligent Cockpit System Platform

1.4 Intelligent Cockpit Platform Development and Supply Model Evolution 1.4.1

Development and Evolution Trends of Intelligent Cockpit System

1.4.2 Four Supply Modes of Intelligent Cockpit Platform

1.4.3 Change in Cockpit Business Models (1)

1.4.4 Change in Cockpit Business Models (2)

2 Data Supply to Intelligent Cockpit Platforms

2.1 Intelligent Cockpit Market Size and Related Supply Relationships

2.1.1 Global Intelligent Cockpit Market Size

2.1.2 China Intelligent Cockpit Market Size

Table of Content (2)

- 2.1.3 Market Shares of Intelligent Vehicle Intelligent Cockpit Integrators in China
- 2.1.4 Intelligent Cockpit Platform Supply Relationships of Chinese Independent Automakers and Their Sales in 2022 (1)
- 2.1.5 Intelligent Cockpit Platform Supply Relationships of Chinese Independent Automakers and Their Sales in 2022 (2)
- 2.1.6 Intelligent Cockpit Platform Supply Relationships of Chinese Independent Automakers and Their Sales in 2022 (3)
- 2.1.7 Intelligent Cockpit Platform Supply Relationships of Chinese Independent Automakers and Their Sales in 2022 (4)
- 2.1.8 Intelligent Cockpit Platform Supply Relationships of Chinese Independent Automakers and Their Sales in 2022 (5)
- 2.1.9 Intelligent Cockpit Platform Supply Relationships of Chinese Independent Automakers and Their Sales in 2022 (6)
- 2.1.10 Intelligent Cockpit Platform Supply Relationships of Joint Venture Automakers and Their Sales in 2022 (1)
- 2.1.11 Intelligent Cockpit Platform Supply Relationships of Joint Venture Automakers and Their Sales in 2022 (2)
- 2.1.12 Intelligent Cockpit Platform Supply Relationships of Emerging Carmakers and Their Sales in 2022 (1)
- 2.1.13 Intelligent Cockpit Platform Supply Relationships of Emerging Carmakers and Their Sales in 2022 (2)
- 2.2 Summary of Cockpit Platform Layout Trends of OEMs
 - 2.2.1 Future Cockpit Layout of Foreign OEMs (1)
 - 2.2.2 Future Cockpit Layout of Foreign OEMs (2)
 - 2.2.3 Future Cockpit Layout of Chinese Independent Automakers (1)
 - 2.2.4 Future Cockpit Layout of Chinese Independent Automakers (2)
 - 2.2.5 Future Cockpit Layout of Emerging Carmakers (1)
 - 2.2.6 Future Cockpit Layout of Emerging Carmakers (2)
 - 2.2.7 Features of Cockpit Layout of OEMs

- 2.2.8 Chip Layout of OEMs
- 2.2.9 Software Layout of OEMs

3 Key Issues about Intelligent Cockpit Platform

- 3.1 Will the Underlying Hardware MCU of Cockpit Platforms Be Removed
 - 3.1.1 Current Cockpit Platform Hardware Is Based on the SoC + External MCU Architecture
 - 3.1.2 Is Cockpit Platform MCU Indispensable
 - 3.1.3 Can Hardware Main Control SoC of Cockpit Platforms Integrate MCU Functions
 - 3.1.4 Main Challenges in Main Control SoC Integrating MCU Functions
- 3.2 Localization of Intelligent Cockpit Platform Solutions in China
 - 3.2.1 Status Quo of Intelligent Cockpit Platform Localization
 - 3.2.2 Bottlenecks in Intelligent Cockpit Platform Localization
 - 3.2.3 Demand for Intelligent Cockpit Platform Localization
 - 3.2.4 Types of Localized Intelligent Cockpit Platform Solutions
 - 3.2.5 Current Localized Intelligent Cockpit Platform Solutions
 - 3.2.6 Layout of Localized Cockpit Platforms by Some Cockpit Suppliers
 - 3.2.7 Case: A Localized Intelligent Cockpit Platform Solution Created by Rockchip and Zlingsmart
 - 3.2.8 Case: A Localized Full-stack Cockpit-driving-parking Integrated Solution Created by Banma Zhixing and SemiDrive
 - 3.2.9 Case: UnlimitedAI's Domain Control Product That Integrates Intelligent Driving Domain and Intelligent Cockpit Domain
 - 3.2.10 Case: A Cockpit Platform Created by SiEngine and ECARX
 - 3.2.11 Case: SemiDrive + ZTE + Neusoft Solution
- 3.3 Application Scenarios of Hypervisor or Hard Isolation Solution in Intelligent Cockpit Platforms
 - 3.3.1 Current Fused Domains Isolation Solutions for Intelligent Cockpits
 - 3.3.2 In the Single-chip Multi-system Trend, Hypervisor Becomes the First Choice

Table of Content (3)

3.3.3 Main Types of Hypervisor	3.5.7 Software and Hardware Composition and Realized Functions in Main Cockpit-driving Integration Layout Schemes
3.3.4 Hypervisor Mainly Used in Vehicles	3.5.8 Challenges in Single SoC Based Cockpit-driving Integrated Solution
3.3.5 Deficiencies and Challenges in Cockpit Hypervisor Technology	3.5.9 Cockpit-driving Integrated Software Architecture Layout: Higher Requirements for Vehicle OS
3.3.6 Hypervisor Alternative Solution for Intelligent Cockpits: Hard Isolation Solution	3.5.10 Case: EnjoyMove Technology's Multi-domain Fused Software Platform: EMOS
3.3.7 Advantages and Disadvantages of Intelligent Cockpit Hardware Isolation Solution	3.5.11 Case: Joynext's Central Computing Software Architecture
3.3.8 Case: Hardware Isolated Cockpit Solution Based on NXP iMX8	3.5.12 Case: Blackberry QNX's Three-domain Fused Central Controller Software Architecture
3.3.9 Case: Example of Hardware Isolated Cockpit Design Architecture of AutoChips AC8025	3.5.13 Case: Baidu's Exploration of Intelligent Cockpit ARC Cockpit-driving Integration
3.4 Mass Production of Cockpit Platforms Integrating Some ADAS Functions	3.5.14 Case: Baidu's Automotive Cockpit-driving Integrated Solution
3.4.1 Some Functions Such as ADAS and V2X Are Gradually Integrated into Intelligent Cockpits	3.5.15 Case: UnlimitedAI's HPC Vehicle Central Computer Solution
3.4.2 Cockpit-parking Integration Layout	3.5.16 Case: ECARX's Super Brain Central Computing Platform
3.4.3 Constraints on Development of Cockpit-parking Integration	
3.4.4 Status Quo of Cockpit-parking Integration Production	
3.4.5 Future Trends of Cockpit-parking Integration	
3.4.6 Case: ECARX's Cockpit-parking Integrated Computing Platform	
3.4.7 Case: SemiDrive's Cockpit-parking Integration Configuration	
3.4.8 Case: Jidu Auto's Cockpit-driving Integrated Backup Solution	
3.5 Development Trends of Cockpit-driving Integration	
3.5.1 Development Trend of Intelligent Cockpit: Cockpit Domain, Domain Integration, Zone, Central Computing Platform, Cloud Computing	
3.5.2 Cross-domain Trend of Intelligent Cockpit: Autolink's Cross-domain Integration Route	
3.5.3 Development Trend of Intelligent Cockpit Platform: Neusoft Group's Cross-domain Integration Trend	
3.5.4 Intelligent Cockpit Cross-domain Integration Has Become An Inevitable Trend	
3.5.5 Main Layout Modes of the Final Form Cockpit-driving Integrated Computing Platform	
3.5.6 Status Quo of Cockpit-driving Integration Layout	

4 Intelligent Cockpit Platform Layout of OEMs

4.1 Tesla
4.1.1 Intelligent Cockpit
4.1.2 Evolution of MCU (1)
4.1.3 Evolution of MCU (2)
4.1.4 HW4.0 Cockpit Domain
4.2 Mercedes-Benz
4.2.1 Cockpit Architecture
4.2.2 Evolution of MBUX System
4.2.3 The Latest MBUX System
4.2.4 Software Department Layout
4.2.5 MB.OS
4.2.6 Hardware Layer of MB.OS
4.2.7 Software Layer of MB.OS

Table of Content (4)

4.2.8 Cockpit Partners	4.7.2 SYNC 4.0
4.3 BMW	4.7.3 SYNC+ of Ford China
4.3.1 Intelligent Cockpit Domain Layout	4.7.4 Intelligent Cockpit Planning and Development of Ford China
4.3.2 Latest-generation Intelligent Cockpit Domain	4.8 Stellantis
4.3.3 Cockpit Software Layout	4.8.1 Profile
4.3.4 Evolution of iDrive Cockpit System	4.8.2 Development Plan
4.3.5 ID 8.5 & ID 9.0	4.8.3 Layout of Three Technology Platforms (1)
4.3.6 BMW's First Android-based Cockpit System - ID9.0	4.8.4 Layout of Three Technology Platforms (2)
4.4 Volkswagen	4.8.5 Intelligent Cockpit Platform Layout
4.4.1 Intelligent Cockpit Layout	4.9 BYD
4.4.2 ICAS Domain Controller System	4.9.1 Development of Intelligent Cockpit
4.4.3 ICAS3.0 Cockpit Domain Controller System	4.9.2 Cockpit Configurations of Major Brands
4.4.4 Software Platform Planning and Layout	4.9.3 Overseas Models of Han and Tang Will Pack AutoLink's Qualcomm 8155-based Cockpit Solutions
4.4.5 Software Platform System Planning of China Team	4.9.4 Cockpit Software Architecture
4.4.6 Self-developed Operating System - VW.OS	4.9.5 Vehicle Operating System - BYD OS
4.5 Audi	4.9.6 BYD Di Ecosystem
4.5.1 Intelligent Cockpit Layout	4.9.7 BYD e-platform 3.0
4.5.2 Hardware and Software Layout (1)	4.10 Great Wall Motor
4.5.3 Hardware and Software Layout (2)	4.10.1 Intelligent Cockpit Layout
4.5.4 Hardware and Software Layout (3)	4.10.2 Forest Ecosystem Layout
4.5.5 IVI System	4.10.3 Iteration Route of Intelligent Cockpit Platform
4.6 Volvo	4.10.4 Cockpit Domain Software Architecture
4.6.1 Cockpit Layout	4.10.5 Coffee Intelligent Cockpit 2.0
4.6.2 Cockpit of EX90 SUV BEV	4.10.6 Self-developed Cockpit Operating System - GC-OS
4.6.3 Cockpit of XC90 BEV	4.10.7 Intelligent Cockpit Domain Layout Planning of Nobo Automotive Technology
4.6.4 Cooperation with Qualcomm to Deploy Intelligent Cockpits	4.10.8 Intelligent Cockpit Domain Products of Nobo Automotive Technology
4.6.5 VolvoCars.OS	4.10.9 Hardware Architecture of In9.0 Cockpit Platform
4.7 Ford	4.10.10 Software Architecture of In9.0 Cockpit Platform
4.7.1 Cockpit System Layout	

Table of Content (5)

4.10.11 Cockpit-driving Integration Planning	4.14.2 Evolution of Intelligent Cockpit Platform
4.10.12 Central Computing SOA	4.14.3 Create Intelligent Cockpit Platforms Based on SiEngine Longying No.1
4.11 SAIC	4.14.4 Cockpit-driving Integration Layout
4.11.1 Intelligent Cockpit Layout of SAIC	4.14.5 Intelligent Connectivity: i.RFlag Contains A Technology Architecture, Three Major Platforms and Five Highlights
4.11.2 Latest-generation Galaxy Intelligent Cockpit Solution of SAIC Z-ONE	4.15 BAIC
4.11.3 SAIC Z-ONE's Intelligent Cockpit Computing Platform - ZCM	4.15.1 Intelligent Cockpit Layout
4.11.4 Z-ONE Galaxy? Cockpit-driving Integrated Computing Platform -ZXD	4.15.2 BAIC @me Intelligent Cockpit
4.11.5 SAIC Z-ONE Galaxy 3.0 Platform	4.15.3 Intelligent Cockpit Cooperation with Huawei
4.11.6 Future Intelligent Cockpit Integrated Software Architecture	4.16 Changan Automobile
4.11.7 SOA Software Platform of SAIC Z-ONE	4.16.1 Intelligent Cockpit Layout
4.12 GAC	4.16.2 Intelligent Cockpit System of Major Models
4.12.1 Intelligent Cockpit Layout	4.16.3 Super Digital Integrated Platform SDA for All-Scenario Services
4.12.2 Development History of ADiGO Intelligent Driving Interconnect Ecosystem	4.16.4 All-scenario Digital Twin Development Open Platform
4.12.3 Psi OS	4.16.5 Changan Zhuge Intelligence Strategy
4.12.4 ADiGO Intelligent Driving Interconnect Ecosystem	4.16.6 Cockpit-driving Integration Layout
4.12.5 ADiGO SPACE Intelligent Cockpit System	4.16.7 The Full Range of Models Will Come with Intelligent Cockpits during the "14th Five-Year Plan" Period
4.12.6 High-performance Immersive Cockpit	4.17 Neta Auto
4.12.7 GAC Trumpchi M8 Grandmaster	4.17.1 Intelligent Cockpit System Configuration
4.13 Geely	4.17.2 NETA SPACE Intelligent Cockpit System
4.13.1 Intelligent Cockpit	4.17.3 Intelligent Cockpit Planning
4.13.2 Cockpit Chip Layout	4.17.4 Haozhi Intelligent Vehicle Central Supercomputing Platform: 2.0 to Realize Cockpit-driving Integration
4.13.3 The Latest Four Intelligent Cockpit Computing Platform Products Released by ECARX	4.18 Li Auto
4.13.4 ECARX's Latest Intelligent Cockpit Computing Platform: Makalu	4.18.1 Cockpit Configuration
4.13.5 Immersive Intelligent Cockpit Co-built by Smart, ECARX and AMD	4.18.2 Li AI Intelligent Cockpit Space System
4.13.6 Smart Geely 2025 Strategy - Intelligent Cockpit	4.18.3 Cockpit-driving Integration Planning
4.13.7 Software and Hardware Planning in 2025	4.18.4 Li OS
4.14 FAW Hongqi	
4.14.1 Intelligent Cockpit Core Business Layout	

Table of Content (6)

- 4.18.5 Self-developed Central Domain Controller
- 4.19 Xpeng Motors
 - 4.19.1 Intelligent Cockpit System of Major Models
 - 4.19.2 Evolution of Cockpit Intelligent System
 - 4.19.3 Xmart OS 4.0: Integration of Intelligent Driving and Interaction
 - 4.19.4 Cockpit-driving Integration Planning
 - 4.19.5 Software Architecture Evolution
 - 4.19.6 Cockpit Supply Chain
- 4.20 Weltmeister
 - 4.20.1 Intelligent Cockpit
 - 4.20.2 Living Mate Intelligent Cockpit System
- 4.21 Human Horizons
 - 4.21.1 HiPhi Intelligent Cockpit
 - 4.21.2 H-SOA Hyperbody Intelligent Architecture
 - 4.21.3 Developer Platform Ecosystem
 - 4.21.4 Layout of New-generation Intelligent Vehicle Operating System
- 4.22 NIO
 - 4.22.1 Cockpit System Evolution
 - 4.22.2 Cockpit System of Major Models
 - 4.22.3 Cockpit-driving Integration Planning
- 4.23 Leapmotor
 - 4.23.1 Intelligent Cockpit
 - 4.23.2 Layout and Planning in Intelligent Cockpit 3.0 Era
 - 4.23.3 Self-developed Central Supercomputing Platform Planning

5 Global Intelligent Cockpit System Integrators

- 5.1 Harman
 - 5.1.1 Profile
 - 5.1.2 Intelligent Cockpit Hardware Platform

- 5.1.3 Scalable Intelligent Cockpit Solutions
- 5.1.4 Multimodal Digital Cockpit
- 5.1.5 Intelligent Cockpit Product - Ready Upgrade
- 5.1.6 Build A Highly Integrated Intelligent Cockpit Scene
- 5.1.7 Propose Cockpit Modularization and Combinable Cooperation Mode
- 5.1.8 Cockpit Domain Control Concept
- 5.1.9 Intelligent Cockpit Platform
- 5.1.10 Intelligent Cockpit Pre-integrated with ADAS Functions
- 5.1.11 Development Trend of Intelligent Cockpit Infrastructure: HARMAN Intelligent Cockpit Architecture
- 5.1.12 Development Planning for Intelligent Cockpit and ADAS Function Integration
- 5.1.13 Dynamics
- 5.2 Visteon
 - 5.2.1 Profile
 - 5.2.2 Cockpit of the Future
 - 5.2.3 4th Generation SmartCore Cockpit Platform
 - 5.2.4 SmartCore Versions
 - 5.2.5 SmartCore Cockpit Platform Architecture
 - 5.2.6 Software Architecture of In-vehicle Infotainment (IVI) System
 - 5.2.7 Performance of SmartCore Cockpit Domain
 - 5.2.8 Multi-domain Fusion Idea: Promote the Integration of SmartCore and ADAS into a Unified Solution
 - 5.2.9 Evolution of Intelligent Cockpit Products
 - 5.2.10 Partners: Develop Intelligent Cockpit Solutions Together with ECARX and Qualcomm
- 5.3 FORVIA
 - 5.3.1 Profile
 - 5.3.2 The Cockpit Technology and Software Business Belongs to the Electronics Division

Table of Content (7)

5.3.3 Software Strength of Automotive Electronics Division	5.5.5 Cockpit-driving Integration Evolution Route
5.3.4 Sales Scale of Automotive Electronics Division in 2025	5.5.6 Cockpit-driving Integrated Solution Design: Hardware Architecture
5.3.5 Faurecia Cockpit Intelligence Platform (CIP)	5.5.7 Cockpit-driving Integrated Solution Design: Software Architecture
5.3.6 Faurecia Cockpit Domain Controller (CDC): Evolving and Integrating More Functions	5.5.8 Cooperation with AutoLink
5.3.7 Faurecia Cockpit Domain Controller (CDC)	5.5.9 Future Software Architecture Scheme
5.3.8 Faurecia's Cockpit Domain Controller Planning Goals	5.6 Continental
5.3.9 Development Trends of Faurecia Cockpit of the Future	5.6.1 Profile
5.4 Aptiv	5.6.2 HPC
5.4.1 Profile	5.6.3 Cockpit HPC
5.4.2 Acquisition of Wind River	5.6.4 Cockpit HPC: Architecture with Hardware and Software Separation
5.4.3 Software Strategy and Software Development Solutions	5.7 Denso
5.4.4 New Generation Intelligent Cockpit Platform	5.7.1 Profile
5.4.5 Cockpit Domain Development Planning	5.7.2 Cockpit Development Planning
5.4.6 Intelligent Cockpit Computing Platform and Software Architecture	5.7.3 Cockpit Integrated Control System
5.4.7 Integrated Cockpit Domain Controller	5.7.4 Cockpit Integrated Control System Based on Virtualization Technology
5.4.8 Integrated Cockpit Domain Solution	5.7.5 Cockpit Domain Control Harmony Core
5.4.9 Integrated Cockpit Domain System Architecture	5.7.6 Cross-domain Layout
5.4.10 Domain System Hardware Architecture	5.7.7 Software Layout in CASE Strategy
5.4.11 Integrated Cockpit Controller Solution	5.7.8 Semiconductor Layout in CASE Strategy
5.4.12 Future-oriented VEMS for Autonomous Driving	5.7.9 In Denso's 2035 "Peace of Mind" Strategy, the Future Cockpit and Intelligent Driving Will Be Deeply Integrated
5.4.13 Cockpit Domains in Aptiv SVA? Hardware Platform	5.7.10 "Peace of Mind" Intelligent Cockpit System
5.4.14 Zone Controller Layout	5.7.11 Development Blueprint for "Peace of Mind" Intelligent Cockpit System
5.4.15 Dynamics	5.7.12 Localization Layout in China
5.5 Bosch	5.8 Panasonic
5.5.1 Profile	5.8.1 Automotive Business
5.5.2 Establishment of the Cross-Domain Computing Solutions Division (XC Division)	5.8.2 Cockpit Electronics Layout
5.5.3 Intelligent Cockpit	5.8.3 SPYDR
5.5.4 Cockpit Domain Control Platform Products	5.8.4 Cockpit Electronics Computing Architecture

Table of Content (8)

- 5.8.5 Cockpit Software Architecture
- 5.8.6 New Generation Connected Electronic Cockpit Solutions
- 5.8.7 Development Trends of Skip Gen In-vehicle Infotainment Operating System

6 Chinese Intelligent Cockpit System Integrators

6.1 PATEO CONNECT+

- 6.1.1 Profile
- 6.1.2 Intelligent Cockpit Platform Route
- 6.1.3 Qinggan Intelligent Cockpit Platform (1)
- 6.1.4 Qinggan Intelligent Cockpit Platform (2)
- 6.1.5 Qinggan Vehicle Intelligent Cockpit Platform
- 6.1.6 Cockpit-driving Integration Layout
- 6.1.7 Cooperation with BlackBerry
- 6.1.8 Major Customers
- 6.1.9 Dynamics in Cockpit Cooperation
- 6.2 Desay SV
- 6.2.1 Profile
- 6.2.2 Intelligent Cockpit Product Layout
- 6.2.3 Evolution Trend of Intelligent Cockpit Platform
- 6.2.4 4th Generation Intelligent Cockpit System
- 6.2.5 Multi-domain Central Computing Platform Integrating Cockpit, Intelligent Driving and Connectivity (1)
- 6.2.6 Multi-domain Central Computing Platform Integrating Cockpit, Intelligent Driving and Connectivity (2)
- 6.2.7 Dynamics in Intelligent Cockpit Layout
- 6.3 Hangsheng Electronics
- 6.3.1 Profile
- 6.3.2 Intelligent Cockpit Layout
- 6.3.3 Intelligent Cockpit System

- 6.3.4 Cockpit Layered Design Architecture with Software and Hardware Separation
- 6.3.5 Intelligent Cockpit Domain Route
- 6.3.6 Core Competences in Next-Generation Cockpit Building
- 6.3.7 Research on Multi-system Integrated Intelligent Cockpit
- 6.3.8 Intelligent Driving and Cockpit Integration Layout
- 6.3.9 Change of Service Models
- 6.4 Joyson Electronic
- 6.4.1 Intelligent Cockpit Solution
- 6.4.2 Development of Cockpit Domain Controller
- 6.4.3 Intelligent Cockpit System Supports Multiple Chips and Multiple Systems
- 6.4.4 Dual-system Cockpit Solution
- 6.4.5 Joynext and Huawei Deepen Cooperation to Build a New Intelligent Cockpit Ecosystem
- 6.4.6 Create An Intelligent Empathic Cockpit as Cockpit-driving Integration Evolves
- 6.4.7 Joynext's Overall Technical Solution of Central Computing Unit
- 6.4.8 Joynext's Central Computing Unit Technology Route
- 6.4.9 Joynext's SOA-based Human-Machine Co-Driving System Design
- 6.5 Huawei
- 6.5.1 Intelligent Cockpit Solutions
- 6.5.2 Intelligent Cockpit Operating System - HOS
- 6.5.3 Intelligent Cockpit Computing Platform
- 6.5.4 HiCar Development Platform
- 6.5.5 HarmonyOS Intelligent Cockpit Ecosystem
- 6.5.6 Inside Business Model
- 6.6 ThunderSoft
- 6.6.1 Profile
- 6.6.2 Intelligent Connected Vehicle Layout
- 6.6.3 Evolution Route of Thunder Auto OS
- 6.6.4 Evolution Route of E-Cockpit Intelligent Cockpit System

Table of Content (9)

6.6.5 New Intelligent Cockpit Solution - E-Cockpit 7.0	6.10 BICV
6.6.6 Exploration of Cockpit Cross-domain Integration	6.10.1 Profile
6.6.7 SOA Middleware Platform	6.10.2 Business Layout
6.6.8 Business Model	6.10.3 Latest Cockpit Platform Products
6.6.9 Partners	6.10.4 Intelligent Cockpit Domain Controller
6.7 NavInfo	6.10.5 Dynamics and Main Customers
6.7.1 Intelligent Cockpit Layout	6.11 ADAYO
6.7.2 Profile	6.11.1 Automotive Electronics Business
6.7.3 Intelligent Cockpit Solution Based on Virtualization	6.11.2 Intelligent Cockpit Layout
6.7.4 Non-virtualized Intelligent Cockpit Solution	6.11.3 Cockpit Domain Controller and New Generation Intelligent Cockpit Solution
6.7.5 Athena OS	6.11.4 Open Platform Development Planning
6.7.6 Exploration of Cockpit-driving Integration	6.11.5 ADAYO Automotive Open Platform (AAOP): Five Features
6.8 ArcherMind Technology	6.11.6 Cooperated with SemiDrive to Create A Localized Cluster Platform
6.8.1 Profile	6.11.7 Cooperated with BlackBerry to Build A Cockpit Domain Controller
6.8.2 Intelligent Cockpit Software Platform Route	
6.8.3 Intelligent Cockpit Software Platform - EX6.0	
6.8.4 Cross-domain Integrated Vehicle Software Computing Platform	
6.8.5 Central Control Domain Software Platform Fusion3.0: Cross-domain Software OS Solution	
6.8.6 Established A Software Development Joint Venture with BMW, and Cooperated with EB on Agency and Distribution	
6.9 Kotei Information	
6.9.1 Intelligent Cockpit Business	
6.9.2 Global Full-stack Solution for Automotive Software System	
6.9.3 SOA-Based Automotive Middleware - LightSpeedDev	
6.9.4 Building A Super Software Factory	
6.9.5 Localized Intelligent Cockpit Solution Layout	
6.9.6 Dynamics in Cooperation	



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