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Global and China Automotive Operating System (OS) Industry Report, 2021

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Automotive OS Is Highly Competitive

Automotive OS has always been complicated and dazzling.
A year ago, ResearchInChina classified "Automotive OS" into four types:

1) Basic Auto OS: it refers to base auto OS such as AliOS, QNX, Linux, including all base components like system kernel, underlying driver and virtual machine.

2) Custom-made Auto OS: it is deeply developed and tailored on the basis of basic OS (together with OEMs and Tier 1 suppliers) to eventually bring cockpit system platform or automated driving system platform into a reality. Examples are Baidu in-car OS and VW.OS.

3) ROM Auto OS: Customized development is based on Android (or Linux), instead of changing system kernel. MIUI is the typical system applied in mobile phone. Benz, BMW, NIO, XPeng and CHJ Automotive often prefer to develop ROM auto OS.

4) Super Auto APP (also called phone mapping system) refers to a versatile APP integrating map, music, voice, sociality, etc. to meet car owners' needs. Examples are Carlife and CarPlay.

However, profound changes have taken place in the Automotive OS field so far. In this report, we classified Automotive OS from another perspective.

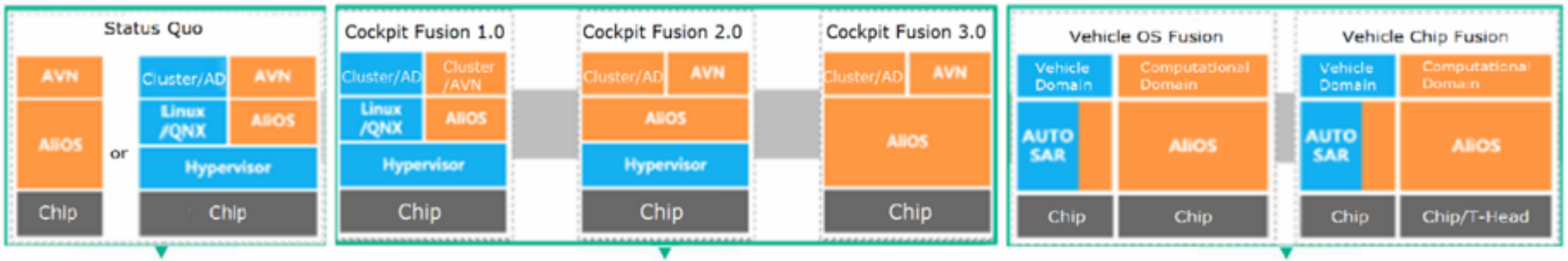
OS types	Subtypes	Automaker/integrator-oriented	User-oriented
IVI OS		AliOS IVI version, Android, etc.	Huawei HiCar, Carlife, etc.
Cockpit OS	Underlying OS	AliOS cockpit version, QNX, Android Automotive, HOS , etc.	
	Customized OS	Baidu DuerOS, Qing OS, TINNOVE 3.0	Mercedes-Benz MBUX, Dongfeng Aeolus Windlink, etc.
Autonomous Driving OS	Underlying OS	Baidu Apollo, Apex.OS, DRIVE OS, Huawei AOS, etc.	
	Customized OS	AICC ICVOS, Neusoft NeuSAR, etc.	
Vehicle OS		Phoenix Auto Intelligence's TINNOVE 5.0 , etc.	vw.OS, Toyota Arene, etc.

Three-Step Strategy of AliOS

Many Automotive OS vendors have started from IVI OS, with the technological evolution: IVI OS-->Cockpit OS -->Vehicle OS. They are expected to head toward Vehicle OS after 2024.

In 2020, Banma SmartDrive proposed the evolution route of AliOS, namely Smart IVI OS-->Smart Cockpit OS -->Smart Vehicle OS.

Three-step Strategy of AliOS: IVI OS to Cockpit OS to Vehicle OS



1 System optimization and decoupling cost-effective platform

- System-level multi-layer protection system;
- Comprehensive functions, hierarchical decoupling and deep performance optimization enable system customization;
- Hardware ecological cooperation empowers the baseline capabilities of mainstream chips.

2 Multi-screen and service distribution integration platform

- The security perception and defense system of cloud collaboration at the level of software and hardware collaboration;
- Distributed heterogeneous service-oriented integration framework;
- Distributed multi-screen interactive fusion framework;
- Real-time virtualization technology is gradually commercialized

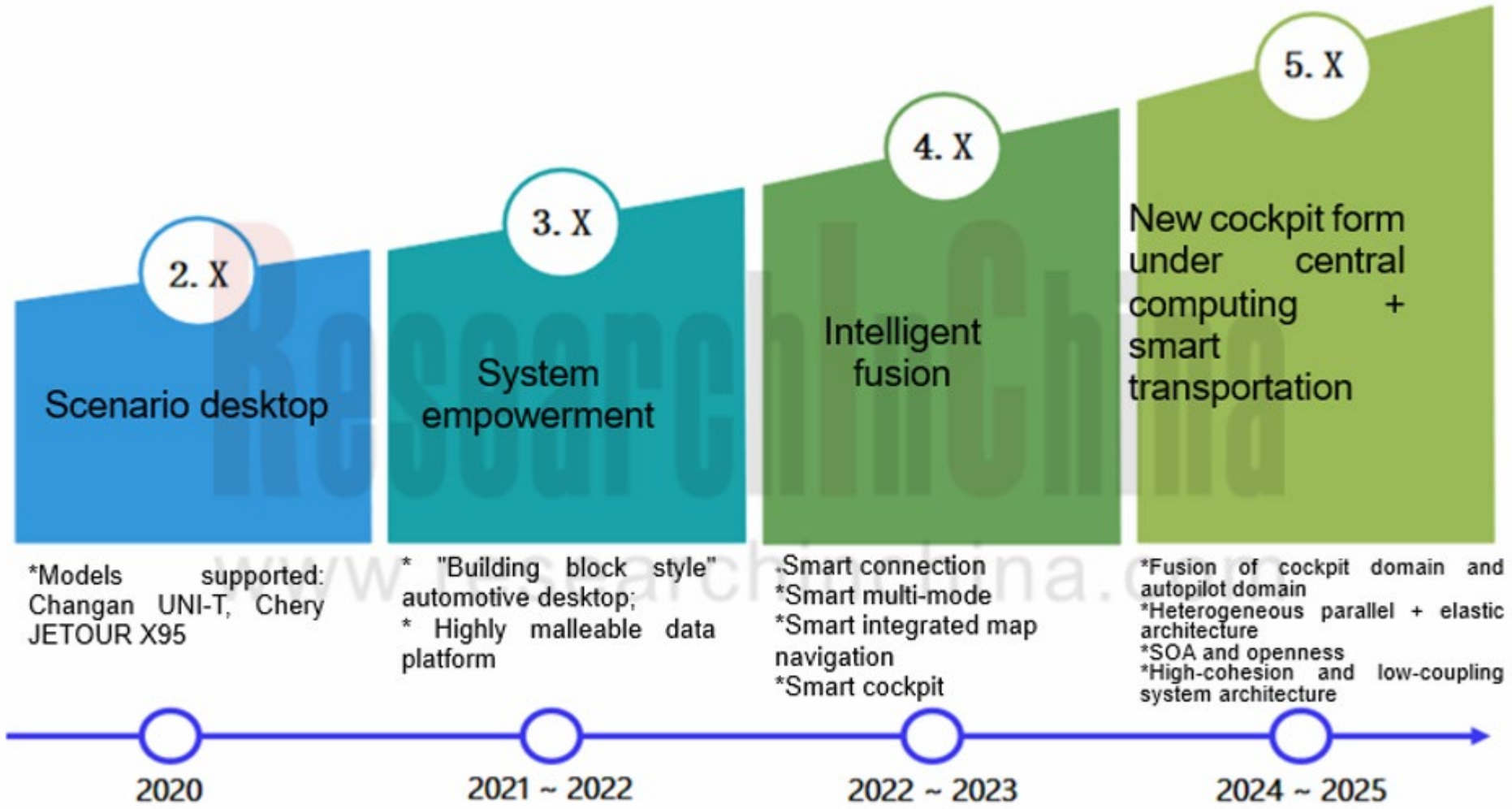
3 Real-time virtualized chip-based computing platform

- Cloud integrated security system covering the entire vehicle;
- Heterogeneous integration of service capabilities in the vehicle domain;
- Heterogeneous distributed real-time perception link computing capabilities are gradually commercialized in the vehicle domain;
- Automotive AI chips are gradually commercialized.

TINNOVE OS Technology Roadmap

Based on Tencent's ecology, TINNOVE OS follows the technology roadmap from Cockpit OS to Vehicle OS that integrates the cockpit domain and the autonomous driving domain.

Through the "open" and "ecological" approach, TINNOVE OS transfers Tencent's ecosystem to the system and OEMs. At present, it has cooperated with Changan Automobile, Audi, Chery JETOUR, Ford and other brands. TINNOVE OS has been installed in more than a dozen models like Changan CS75Plus, UNI-T, CS35Plus and CS85 COUPE. Phoenix Auto Intelligence has recently reached in-depth cooperation with Qualcomm, and SemiDrive, etc.



Autonomous Driving OS and Domain Controllers Are Integrated to Be Autonomous Driving Computing Platform

With the popularity of software-defined vehicles and domain controllers, automakers, Tier1 suppliers and core chip vendors have been all making layout from the perspective of platforms and ecology.

Autonomous driving computing platform providers not only lay out Autonomous Driving OS, but also launch domain controllers, and build ecosystems based on computing platforms consisting of Autonomous Driving OS and domain controllers. With these autonomous driving platforms, OEMs and autonomous driving integrators no longer have to deal directly with the underlying operating system and chips, which can greatly simplify the development process and shorten the product cycle.

Neusoft Reach and AICC are typical autonomous driving computing platform providers.

Neusoft Reach's next-generation autonomous driving computing platform includes the software platform NeuSAR3.0, the all-in-one X-Cube3.0 for ADAS, and the autonomous driving domain controller X-Box 3.0. In October 2021, Neusoft Reach was invested by SDIC and Virtue Capital with a total of RMB650 million.

In February 2021, AICC released the intelligent driving computing platform "Intelligent Vehicle Basic Brain" (iVBB) 1.0, including intelligent connected vehicle operation system (ICVOS), intelligent vehicle domain hardware (ICVHW), and intelligent connected vehicle-edge-cloud basic software (ICVEC). It features rapid application development, platformization, connectivity, scalability and compliance with automotive regulations.

Automotive OS investment soars, and market competition becomes fierce

In March 2021, Evergrande New Energy Vehicle and Phoenix Auto Intelligence signed an agreement to invest 60% and 40% respectively in establishing an operating system joint venture.

In July 2021, the veteran shareholders Alibaba Group, SAIC Group, SDIC, and Yunfeng Capital jointly injected RMB3 billion into Banma SmartDrive for further R&D and promotion of intelligent vehicle OS.

In June 2021, AICC the completed the angel financing of nearly RMB100 million. In October 2021, AICC raised hundreds of millions of yuan in the pre-A round of financing.

The background of the above three companies: Phoenix Auto Intelligence is backed up by Tencent, Alibaba is behind Banma SmartDrive, and AICC is supported by CICV (invested by more than a dozen traditional OEMs and Tier1 suppliers). Plus Baidu and Huawei, which are aggressive in the Automotive OS market, all players are powerful.

The competition in automotive computing platforms, including operating systems, is essentially ecological competition. Who can win the support of more software developers, component companies, service operators, etc. will dominate the future autonomous driving.

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