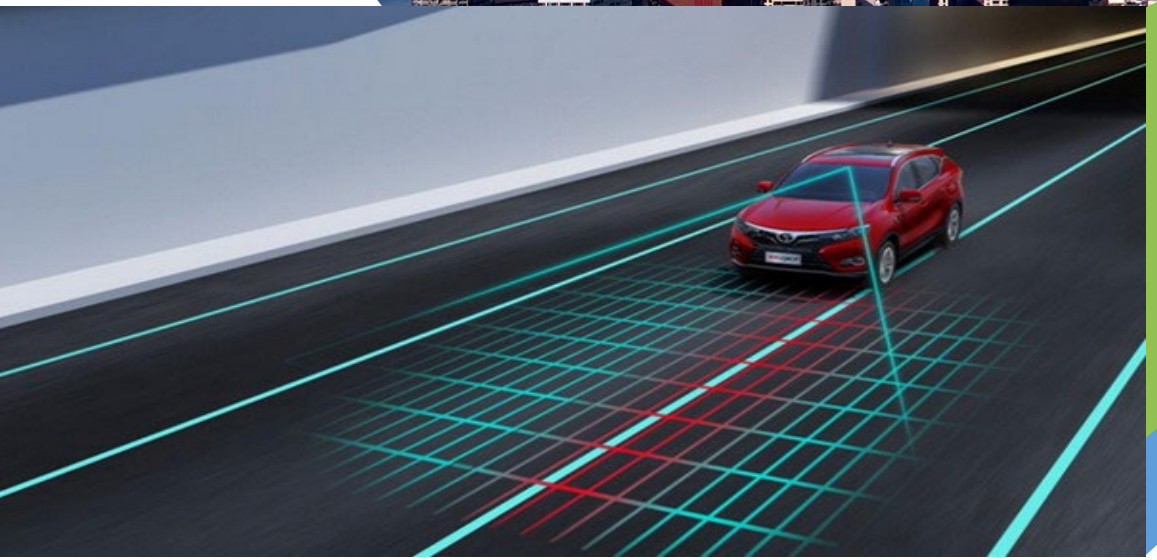

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Passenger Car Chassis Domain Controller Industry Report, 2022

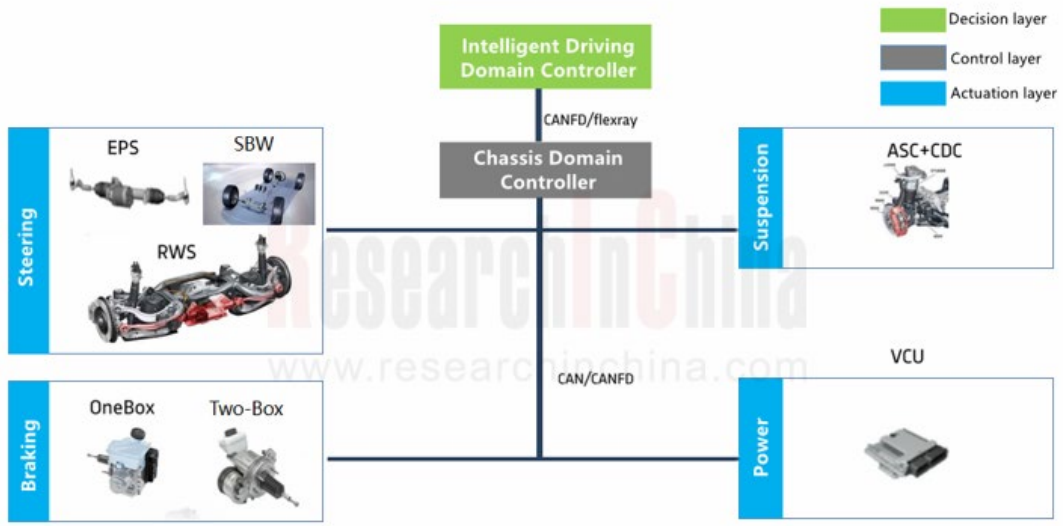
Aug.2022

Chassis domain controller research: full-stack independent development, or open ecosystem route?

Chassis domain consists of transmission, driving, steering and braking systems. Conventional vehicle chassis fail to fit in with the development of vehicle intelligence and autonomous driving, and need chassis-by-wire transformation. Vehicle chassis tend to be electronic, modular and intelligent. Mechanical decoupling is a prerequisite for chassis technology upgrade. Yet in conventional chassis, braking and steering are mechanically coupled, that is, their power source is the mechanical force from drivers who control terminals with the force amplified by hydraulic pressure. In the process of intelligent evolution, the key to chassis electronics however is to enable the decoupling of the mechanical force and replace it with motor drive, so as to improve the control accuracy and also realize better combination of human and systems.

In addition to mechanical decoupling, chassis also need software and hardware decoupling. Conventional electronic chassis systems are divided by components such as electronic stability control system (ESC), electric power steering system (EPS) and electronically controlled suspension system. Each subsystem is from different suppliers or different development departments of OEMs, and has an independent vehicle power control system and vehicle dynamic control model. In the development of chassis controllers, all of which triggers such problems as strong coupling relationship between software and hardware, repeated research and development and high development cost, and countervailing negative effect between subsystems, making optimal vehicle control unreachable.

To answer the current needs for new vehicle technologies and new functions, intelligent chassis domain controllers come into being. In the field of highly automated driving, chassis domain controller products are more needed to enable the centralized control of steering, braking, suspension and even power systems, and separation of software and hardware, as well as the transverse, longitudinal and vertical coordinated control of vehicles, better serving intelligent driving.



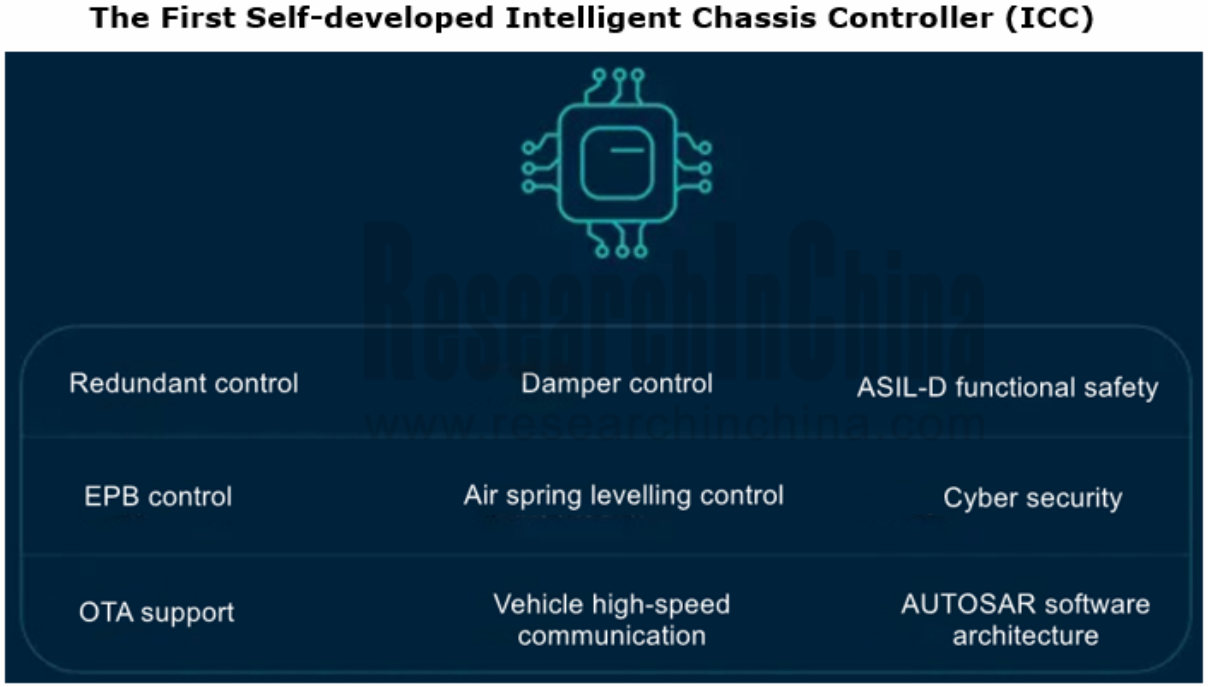
Source: Voyah

Chassis domain controller technology development routes

There are two chassis domain controller technology development routes: the full-stack self-development route of some OEMs, and open ecosystem route of represented by Tier 1 suppliers.

Volkswagen MEB platform uses three controllers to control the whole vehicle and enable functions. The ICAS1 vehicle control domain controller combines many functions including body control management, drive system management, driving system management, power system management, and comfort system management, and integrates body, power and chassis domains into one domain controller.

In 2022, NIO introduced its Intelligent Chassis Controller (ICC) when launching ET7. The ICC enables design and adjustment of chassis in all aspects of comfort, maneuverability and drivability and integrates control functions such as "redundant parking, air suspension and shock absorber". This controller also supports cross-domain integrated high-level automated driving scenarios. FOTA updates allow its flexible, quick iterations. The controller of NIO can uniformly adjust and control air spring leveling, shock absorber damping, electronic parking brake and other capabilities.

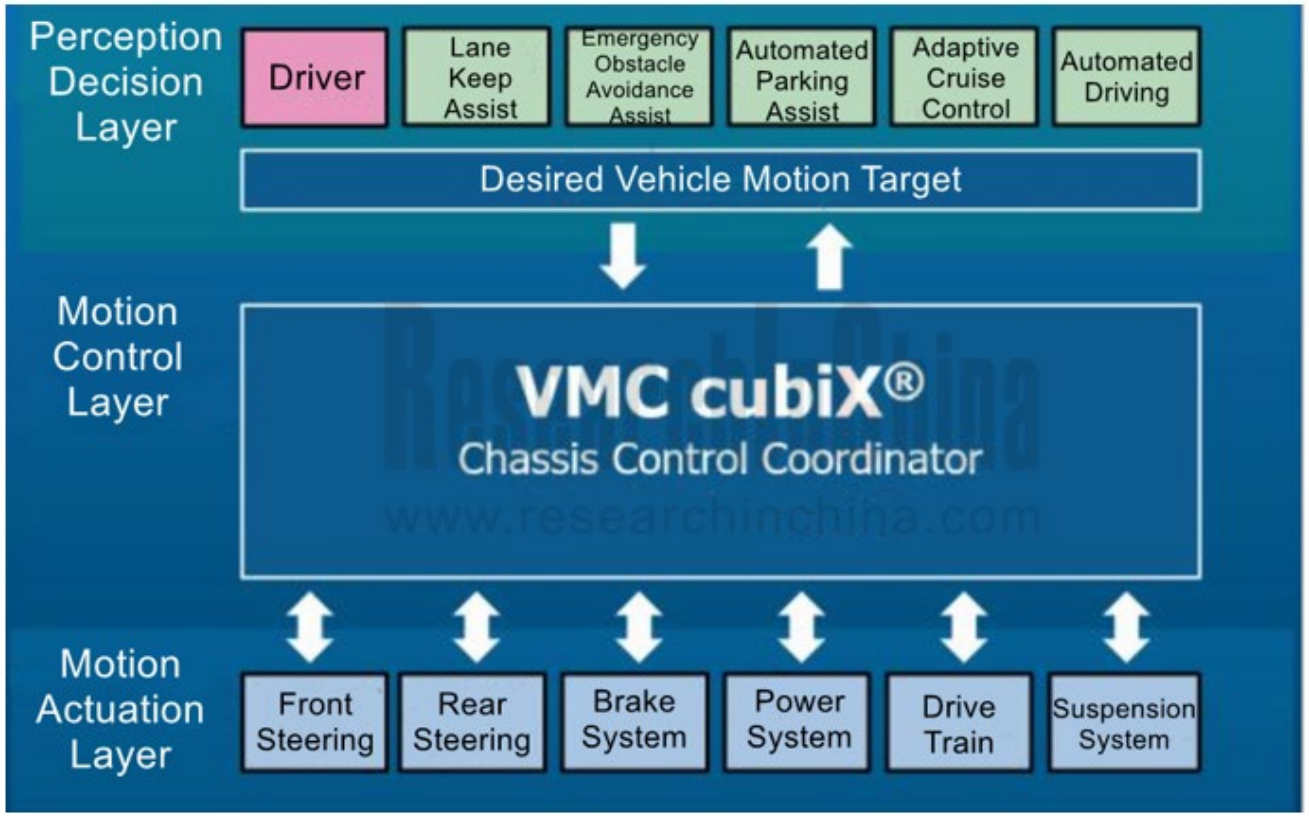


Source: Internet

Chassis domain controller technology development routes

As concerns the open ecosystem route, chassis domain controllers pose high technical barriers, and there are few mass-produced solutions. At present, Tier 1 suppliers work on single/multi-subsystem development (domain) controllers for chassis subsystems. For example, Keboda Technology has shipped in batches its DCC (dynamic chassis control) that supports Xpeng Motors. This controller is designed to enable the dynamic control of suspensions. The two mainstream products of Suzhou Gates Electronics, i.e., continuous damping dynamic suspension electrically controlled system and air suspension electrically controlled system, are also used for suspension control.

In terms of integrated control of chassis systems, Chinese suppliers still need to learn from world-renowned Tier 1 suppliers.



Source: Internet

ZF's Integrated Brake Control

ZF's Integrated Brake Control (IBC), a brake-by-wire system, combines the brake-by-wire active rear axle steering Active Kinematics Control (AKC) and the active damping system (sMotion), bringing longitudinal, transverse and vertical safety and comfort experience. Recently, ZF's front-axle steering, the most important component for vehicle steering systems, has also enabled drive-by-wire decoupling of software and hardware. All actuation systems are uniformly controlled by cubiX platform. cubiX is an integrated software suite for vehicle motion control, coordinating all the aforementioned actuators and sensors related to vehicle motion.

ZF's VMC cubiX gathers sensor information from the entire vehicle and environment, and prepares it for an optimized control of active systems in the chassis, steering, brakes and propulsion. Meanwhile, following a vendor-agnostic approach, cubiX can support both ZF and third-party components.

In the disruption of intelligent vehicle industry, the only constant is change. Either full-stack independent development or open ecosystem route has its own market space. There is still a wide gap between Chinese chassis (domain controller) Tier 1 suppliers and their foreign counterparts. Fortunately, chassis intelligence is bound up with vehicle electrification. Chinese OEMs have a leading edge in electrification, providing a golden opportunity for these Chinese players and drawing talents who serve Tier 1 suppliers at abroad back into domestic companies.

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