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**Global and China
Automotive Gateway
Industry Report, 2023**

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Automotive gateway research: integrated gateways have become an important trend in zonal architecture

Automotive gateway is a core component in the automotive electronic/electrical architecture. As the hub of in-vehicle networks, it enables such functions as data transmission, security prevention and control, and remote diagnostics.

As E/E architecture evolves from the distributed to the centralized domain architecture, gateway also changes accordingly. Its evolution route is as follows:

- * **Phase I:** Conventional CAN gateway in distributed architecture
- * **Phase II:** Central gateway in domain-centralized architecture
- * **Phase III:** Distributed gateway in zonal architecture

1. Conventional CAN gateway in distributed architecture

Phase I: the distributed ECU architecture means that many single functional ECUs provide hardware/software solutions. These functional ECU clusters (e.g. power, chassis, body, safety and IVI systems) are combined together and connected via conventional bus systems such as CAN, LIN or FlexRay?. While sensors and actuators are directly connected to the ECUs, the interaction between domains is realized through CAN gateways.

2. Central gateway in domain-centralized architecture

Phase II: the "domain" of a domain controller generally refers to functional domains which fall into: Powertrain, Chassis Control, Body Control, Entertainment System (Cockpit), and ADAS. Systems in these domains are interconnected still using CAN and FlexRay communication buses. For inter-domain communication, the Ethernet with higher performance serves as the backbone network for information exchange. In such architecture, a central gateway is needed for inter-domain communication. This gateway allows for data exchange with OEM vehicle clouds, and is thus regarded as a "service gateway".

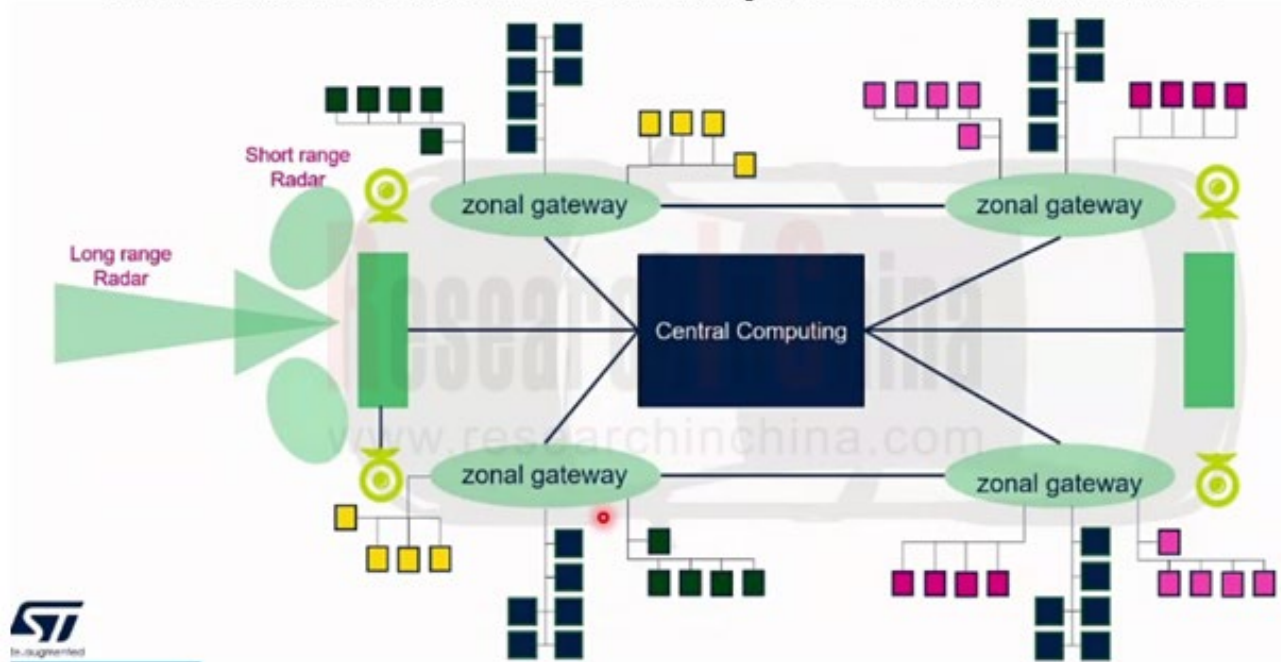
3. Distributed gateway in zonal architecture

Phase III: in the zonal architecture, the central gateway will evolve into a HPC or a central computer, while the domain gateways will evolve into zonal gateways. The gateway is not only responsible for routing of in-vehicle network communication buses, but also takes charge of more complex functions, for example, data association and processing between safety and functional domains (e.g., powertrain, chassis and safety, body control, IVI and ADAS) via the MCU+SoC computing platform. The biggest benefit offered by this architecture is to greatly reduce wiring harnesses and thus cut down the weight and cost by about 30%.

Gateways are in a transitional phase from centralized gateways in domain centralized architecture to distributed gateways in zonal architecture

Currently, gateways are in a transitional phase from centralized gateways in domain centralized architecture to **distributed gateways in zonal architecture**.

Phase III: Distributed Gateway in Zonal Architecture

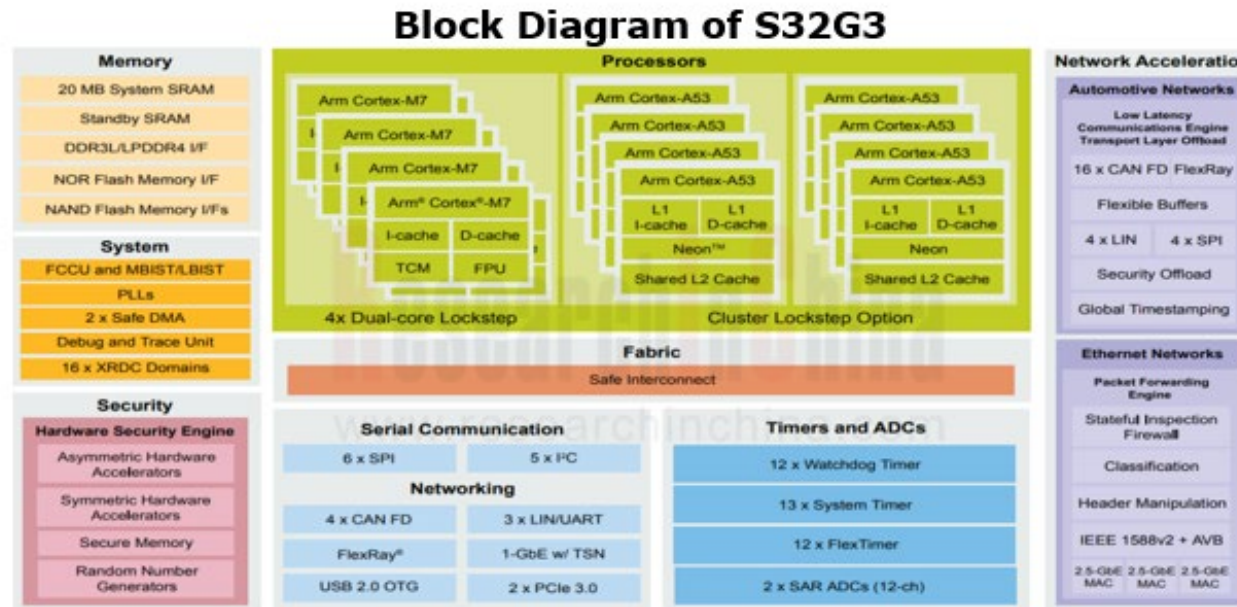


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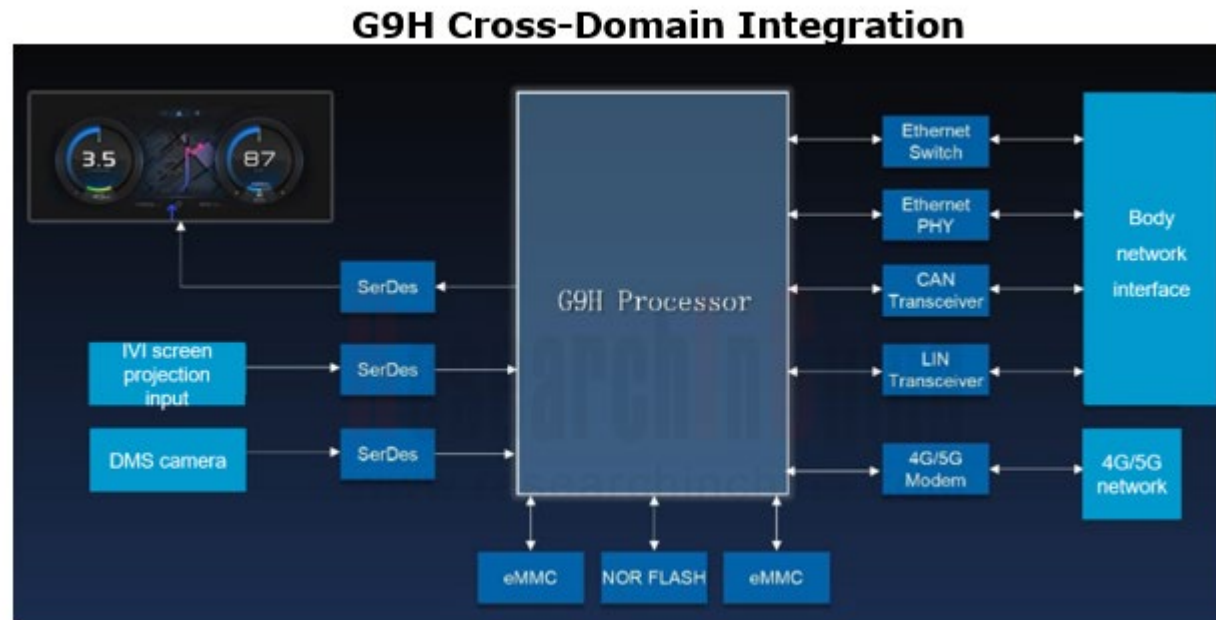
In response to the major trend for cross-domain integration, many gateway chip vendors propose their solutions. For example, NXP S32G3 network processors released at the end of 2021 feature real-time processing capability, service-oriented high-performance computing power, cross-domain integration, and high-performance safety processing, and also provide complete software development tools, which can meet the development requirements of various new automotive E/E architectures: service-oriented gateways, vehicle computers, domain controllers, zonal processors, and safety processors.

NXP S32G3 network processors were mass-produced in February 2023, and were first installed in GAC Hyper GT in April 2023.



Source: NXP

The G9H chip SemiDrive unveiled in July 2022 is mainly used in such scenarios as next-generation high-performance central gateways, vehicle computing units, and cross-domain controllers. In addition to body network interfaces, G9H also supports video input/output interfaces, including 1-channel MIPI DSI and 2-channel MIPI CSIs. Coupled with PowerVR's high-performance 3D GPU, G9H can integrate 3D cluster, DMS and other features into the central gateway, further lowering the BOM cost of the system.



Source: SemiDrive

Gateway suppliers make a gradual shift to integrated gateways from independent gateways

Gateway suppliers make a gradual shift to integrated gateways from independent gateways. The main integration modes include integration between gateways and body domains, between gateways and zone controllers, and between gateways and central computer. In 2023, quite a few suppliers have announced integrated gateway solutions.

Examples include the cross-domain central computing platform product for next-generation E/E architectures, released by UAES in April 2023. This solution integrates central gateway, body control, power and other functional domains, and Neusoft Reach provides underlying software and middleware development support.

UAES Cross-Domain Central Computing Platform Product



Source: UAES

Another example is the physical zone control unit (ZCU) and the central computing platform (CCP), released by Jingwei HiRain in May 2023:

* ZCU: Integrates vehicle power distribution function, zonal gateway routing function (100M Ethernet, CANFD, LIN, etc.), body comfort domain, new energy power domain, and partial chassis domain, as well as input/output signal acquisition and control for air conditioner and thermal management.

* CCP: Integrates centralized gateway, body and comfort control, new energy vehicle power control, air conditioner and thermal management, vehicle management, full-volume data acquisition, OTA update, SOA service and other functions.

At present the above two products have been developed, tested and produced in small volume. They will be spawned and delivered by the end of 2023. Wherein, the CCP has been mass-produced to support four cooperative mainstream automakers in China.

Jingwei HiRain's CCP & ZCU



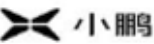

Central Computing Platform (CCP) Zone Control Unit (ZCU)



Source: Jingwei HiRain

OEMs race to implement their "quasi-centralized" architecture solutions on production models

As gateway chip and integrated gateway technologies mature, OEMs race to implement their "quasi-centralized" architecture solutions on production models, most of which will be rolled out during 2022-2024.

Company	EE Architecture	Architecture Hardware Components	Gateway Overview	Applied Model/ Platform	SOP
 埃安	Protoss Architecture	Central computing platform + intelligent driving module + intelligent cockpit module + 4 zone controllers	The central computing platform integrates body control, vehicle gateway functions, and chassis control applications (e.g., damping control, adaptive air suspension and chassis tuning), and cross-domain vehicle control functions; The central computing platform is provided by Continental and utilizes NXP S32G399 gateway processor.	Hyper GT	Apr. 2023
 长城汽车	GEEP 4.0	Central computing platform + intelligent driving module + intelligent cockpit module + 3 zone controllers	The central computing platform integrates body, gateway, air conditioner, power/chassis control and ADAS functions across domains.	First available to Great Wall Motor's new electric hybrid platform, and gradually extend to the full range of the automaker's models	Late 2022
 小鹏	X-EEA 3.0	Central computing platform + 4 zone controllers	Zone controllers enable the integration of Ethernet ETH module and body controller; Jointly launched by Xpeng Motor and Steel Mate.	Xpeng G9	2022
 NIO	Next-generation E/E Architecture	Central computing platform + 4 zone controllers	Zone controllers are classified by physical location in vehicles, and act as gateways to distribute data and power.	/	Expected early 2024

Source: Public Data

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