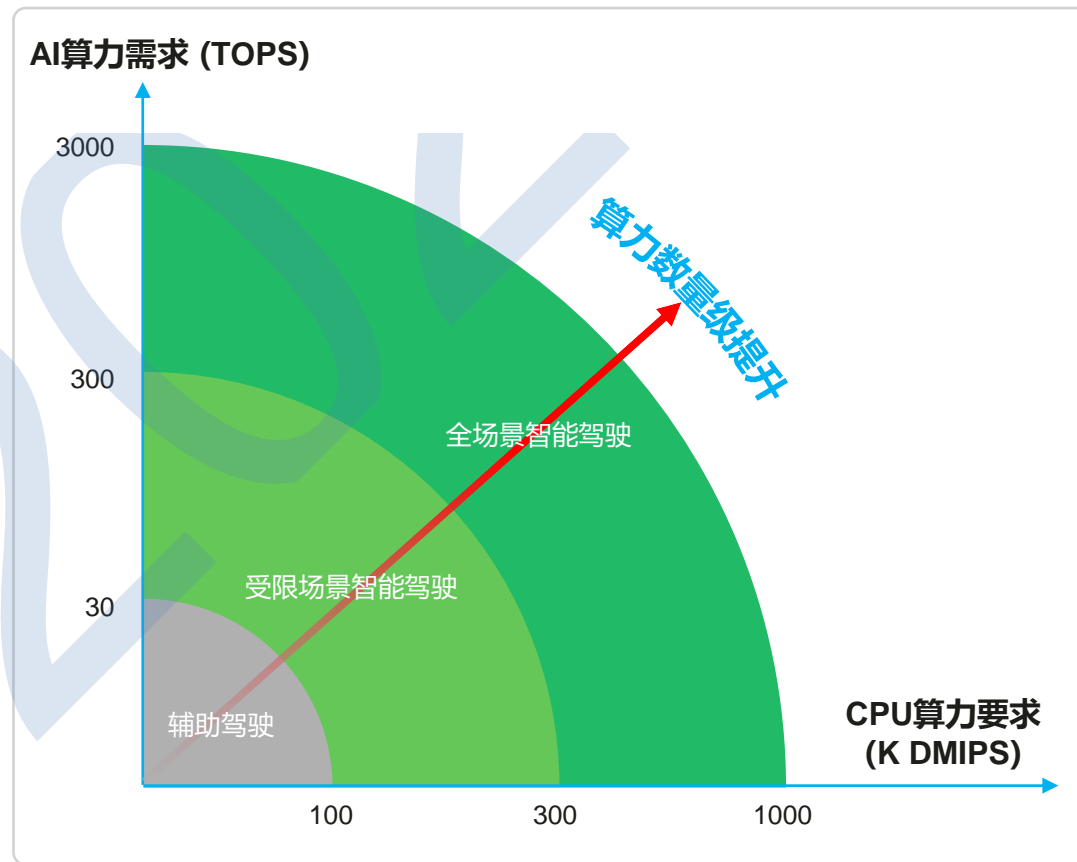
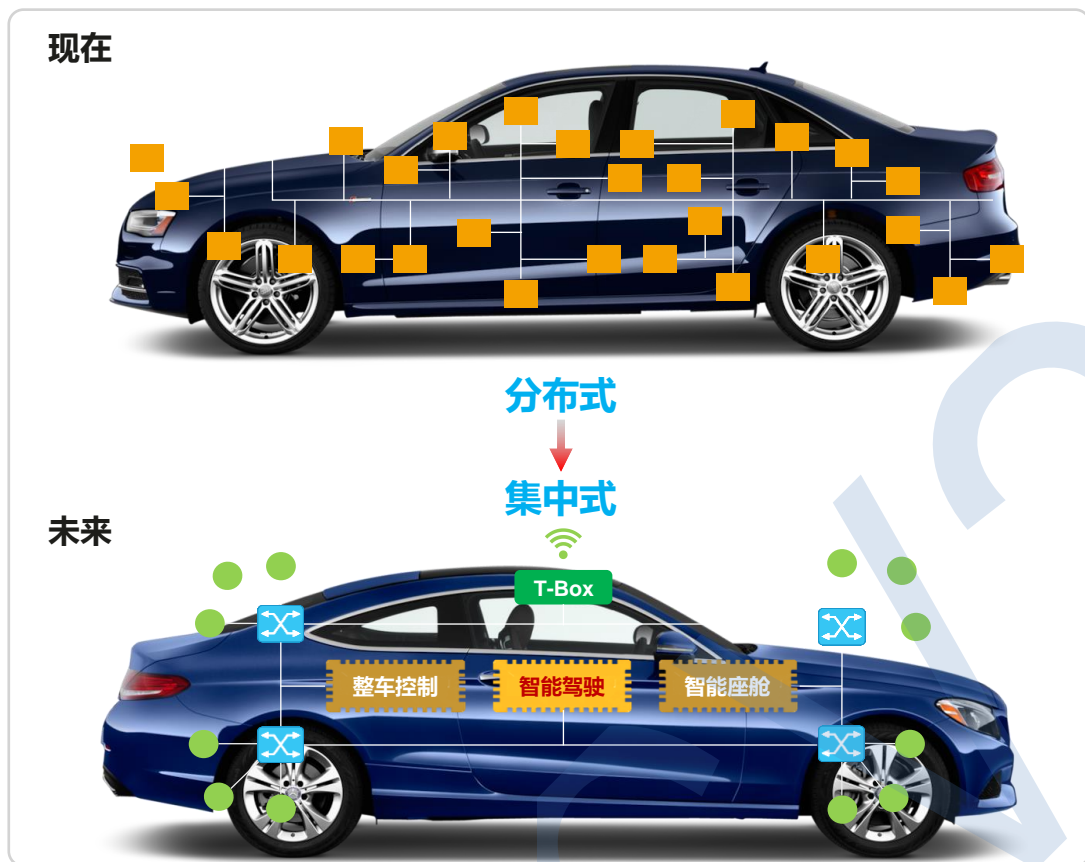




车载计算平台标准化需求 研究报告

2021.7, 沧州

现行EE架构不能满足智能驾驶需求，必然走向集中式架构



E/E架构持续演进，ECU数量越来越
少，计算**越来越集中**

智能驾驶从辅助驾驶向全场景智能驾
驶演进，算力需求**越来越大**



智能驾驶技术复杂度飙升，需要平台化的计算技术

感知系统

毫米波雷达 摄像头 超声波雷达 激光雷达 V2X通讯 定位/地图

眼睛 耳朵



决策系统

大脑



车载计算平台 (汽车大脑)



执行系统

四肢



刹车和油门 驱动系统 传动系统 转向系统 制动系统



ICT技术

芯片、硬件工程 (集成度、散热、能耗等)、操作系统、中间件、通信、云等

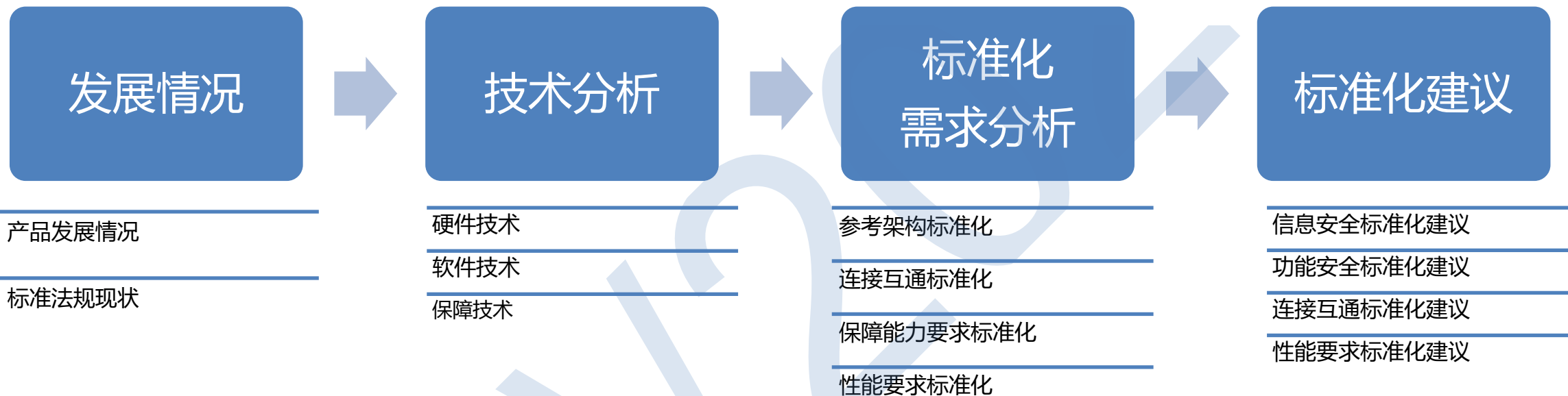
算法技术

聚类算法、机器视觉、深度学习、强化学习、机器学习等

汽车控制技术

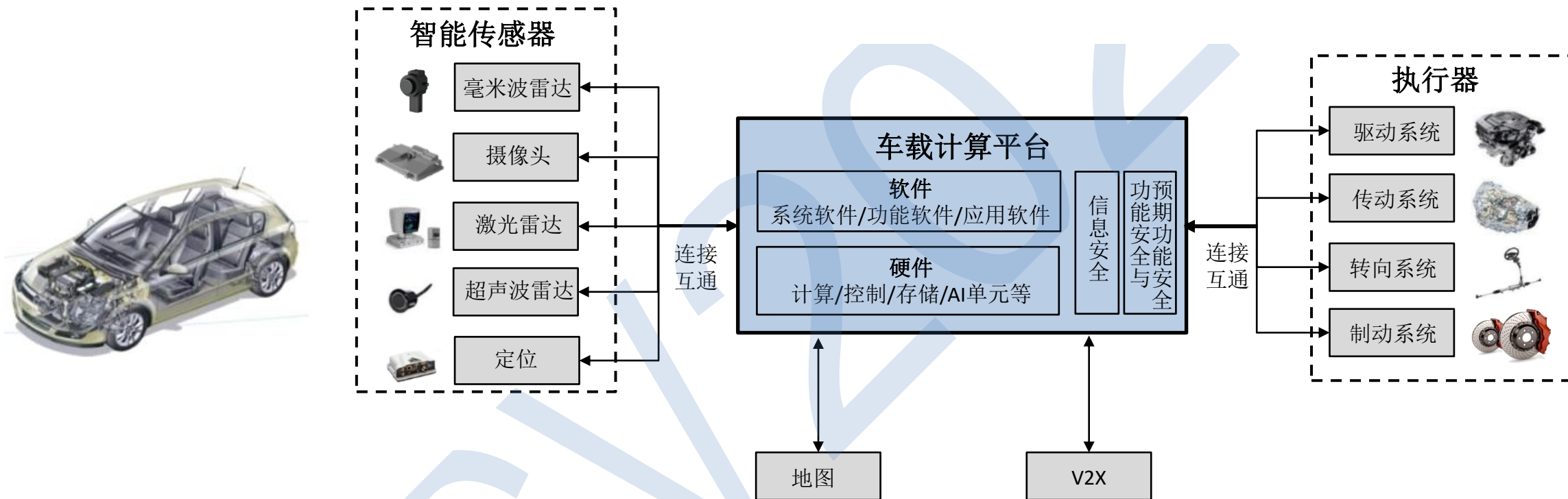
动力控制、转向控制、制动控制等

研究报告概览



牵头单位	华为技术有限公司、中国软件评测中心（工业和信息化部软件与集成电路促进中心）
参与单位	中国汽车技术研究中心有限公司、博世汽车部件（苏州）有限公司、惠州市德赛西威智能交通技术研究院有限公司、北京地平线机器人技术研发有限公司、国汽（北京）智能网联汽车研究院有限公司、上汽通用五菱汽车股份有限公司、联合汽车电子有限公司、大陆汽车投资（上海）有限公司、长城汽车股份有限公司、标致雪铁龙（中国）汽车贸易有限公司、北京百度网讯科技有限公司、浙江吉利汽车研究院有限公司、上海汽车集团股份有限公司技术中心

基本定义



车载计算平台是支撑智能网联汽车驾驶自动化功能实现的软硬件一体化平台，包括芯片、模组、接口等硬件以及系统软件、功能软件等软件，以适应传统电子控制单元向异构高性能处理器转变的趋势。也被称为**车载智能计算基础平台**。

典型产品：华为MDC



私人出行



长途运输



Robotaxi



园区通勤



街道清洁



快递物流



港口货运

MDC系列化产品



MDC 300F: 64TOPS, 商用车/作业车, 港-矿-园等场景

MDC210: 48TOPS, 乘用车, $\geq L2+$ 场景

MDC610: 200+TOPS, 乘用车, $\geq L4$ 场景

MDC810: 400+TOPS, 乘用车, L4~L5场景

MDC：智能驾驶计算平台

硬件平台(自研CPU/AI芯片)+软件平台
(自研OS)+工具链



摄像头



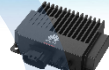
毫米波/超声波雷达



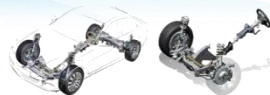
激光雷达



T-Box



组合定位



线控底盘

技术优势

- 高算力：CPU+AI 异构计算能力业界领先
- 高安全：芯片+硬件+OS+工具链，可靠工程能力与车规级安全认证

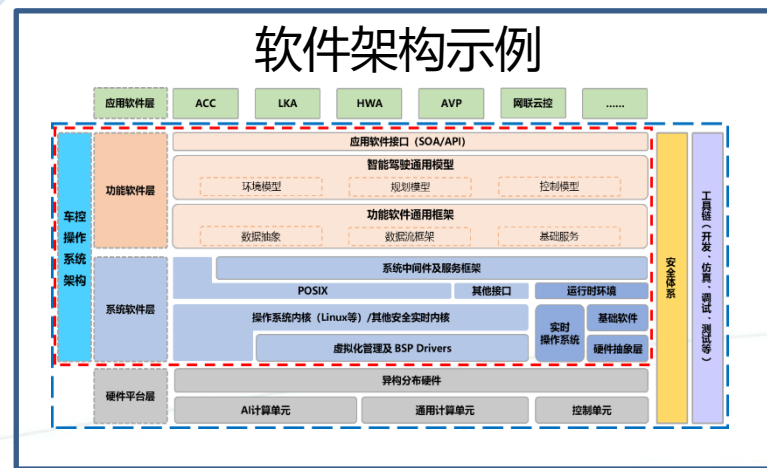
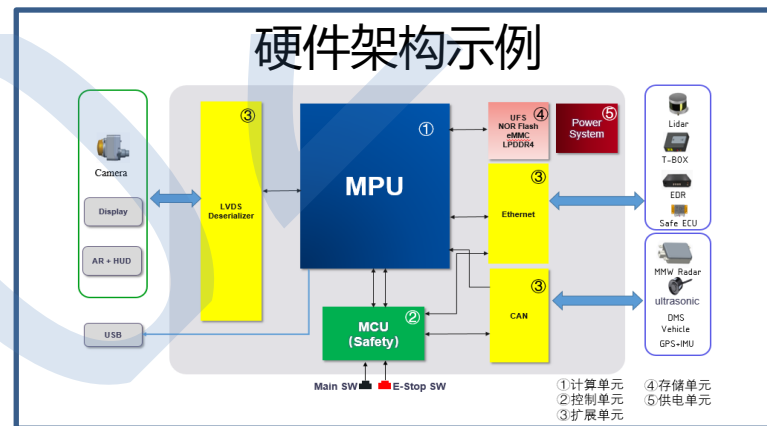
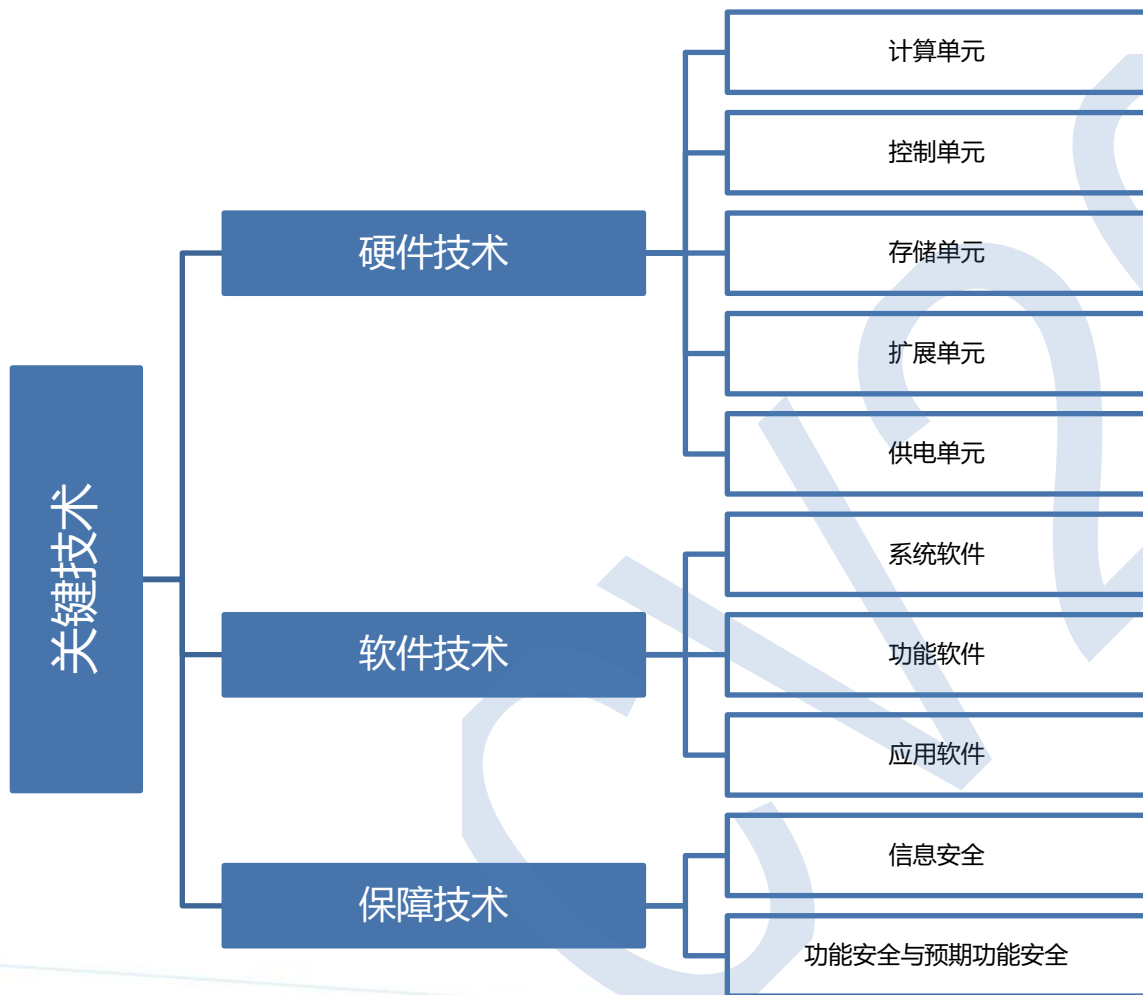
开放生态

- Adaptive AUTOSAR标准组件和接口
- 支持对接ROS，兼容ROS应用
- 功能完整易用的开发工具链

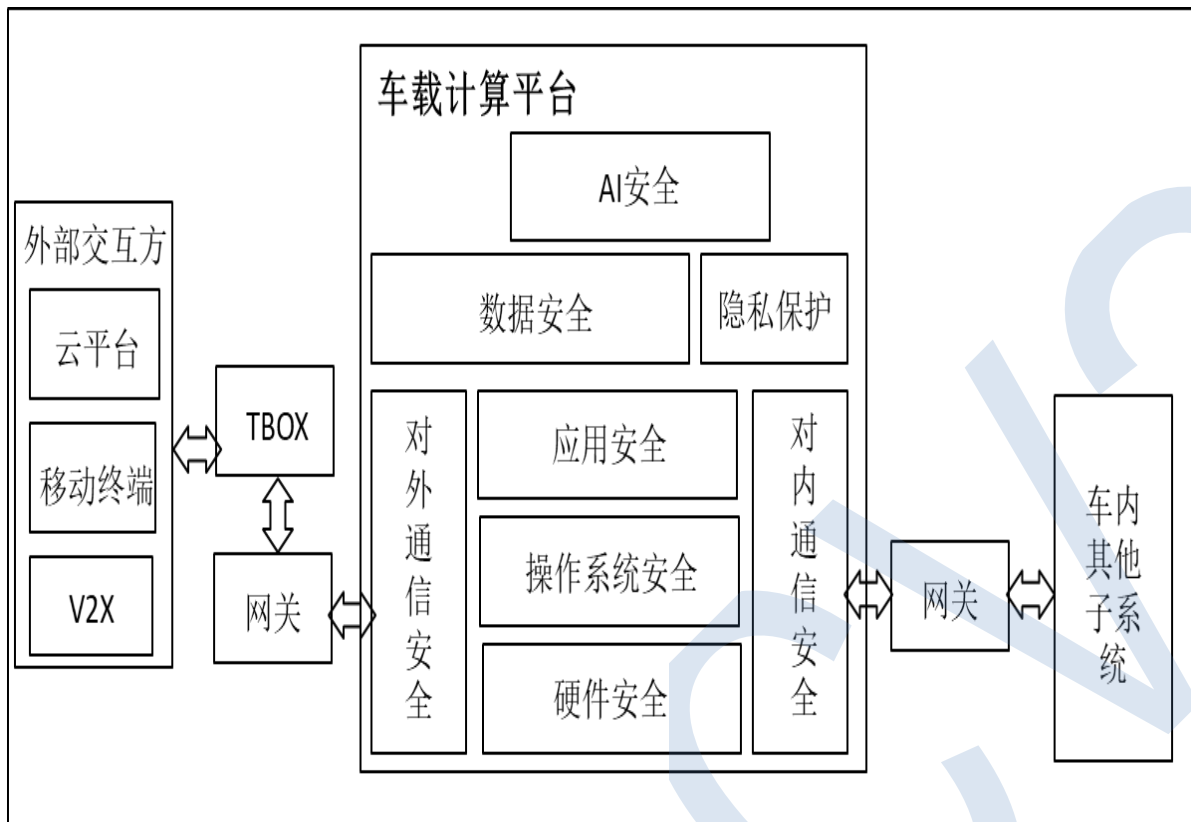
统一架构

- 硬件能力集中式，应用算法可平滑演进
- 软硬件分层解耦，OTA持续升级

关键技术

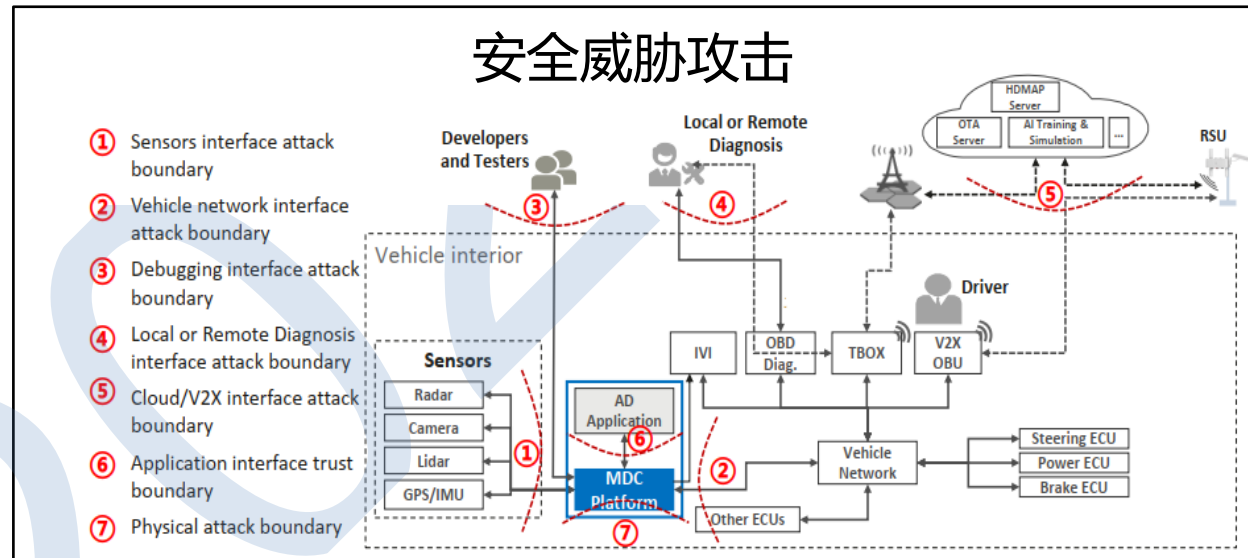


车载计算平台信息安全技术

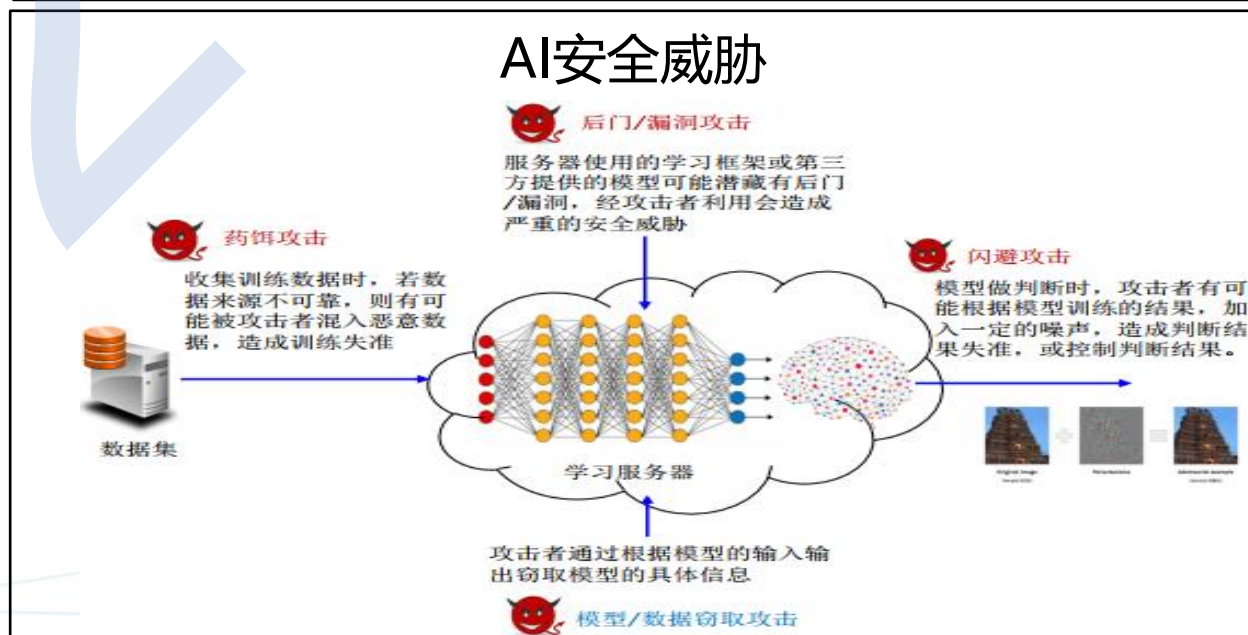


信息安全架构

安全威胁攻击



AI安全威胁



标准化需求 (1)

标准化维度	标准化内容	相关标准
连接互通	连接器接口标准化	《QC/T 1067 汽车电线束和电器设备用连接器》、《QC/T 29106 汽车电线束技术条件》等
	通信网络标准化	有线: LIN/CAN/CANFD/FlexRay/Ethernet 无线: BT/SparkLink
	逻辑接口标准化	传感器逻辑接口: ISO 23150 执行器逻辑接口: 《线控转向及制动系统通讯协议要求及测试规范》
性能要求	算力评测指标与方法	CPU: DMIPS AI: TOPS; MAPS
	功耗评测指标与方案	TOPS/W

标准化需求 (2)

标准化维度	标准化内容	相关标准
信息安全	硬件安全标准化	《GB 汽车整车信息安全技术要求及试验方法》； 《GB/T 汽车信息安全通用技术要求》； 《GB/T 车载信息交互系统信息安全技术要求及试验方法》； 《GB/T 汽车网关信息安全技术要求及试验方法》； 《GB/T 汽车诊断接口信息安全技术要求》等
	通信协议与接口安全标准化	
	AI安全标准化	
	操作系统安全标准化	
	应用软件安全标准化	
	数据安全标准化	
功能安全	功能安全标准化	ISO 26262; GB/T 34590
	预期功能安全标准化	ISO 21448
其它	术语定义	《GB/T 智能网联汽车 术语和定义》

标准化建议

建议优先启动的标准

- **名称：**《车载计算平台信息安全技术要求》
- **必要性：**车载计算平台承担自动驾驶关键功能，是交互的核心纽带，直接影响人身安全，未来前景广阔，有必要制定专门的信息安全标准
- **内容：**硬件安全技术要求及测试方法、通信协议与接口安全技术要求及测试方法、AI安全技术要求及测试方法、应用软件及数据安全技术要求及测试方法

其它建议启动的标准

- 《车载计算平台功能安全技术要求》，包括关键模块的功能安全等级要求，规范软件单元测试验证、软件集成验证、嵌入式软件测试等
- 《车载计算平台性能测试方法》，包括计算平台性能测试关键指标项（如算力芯片实际性能、时延、信号传输性能、数字信号准确率等），及相应测试工具、设备等

谢谢!

有任何疑问和建议，可联系

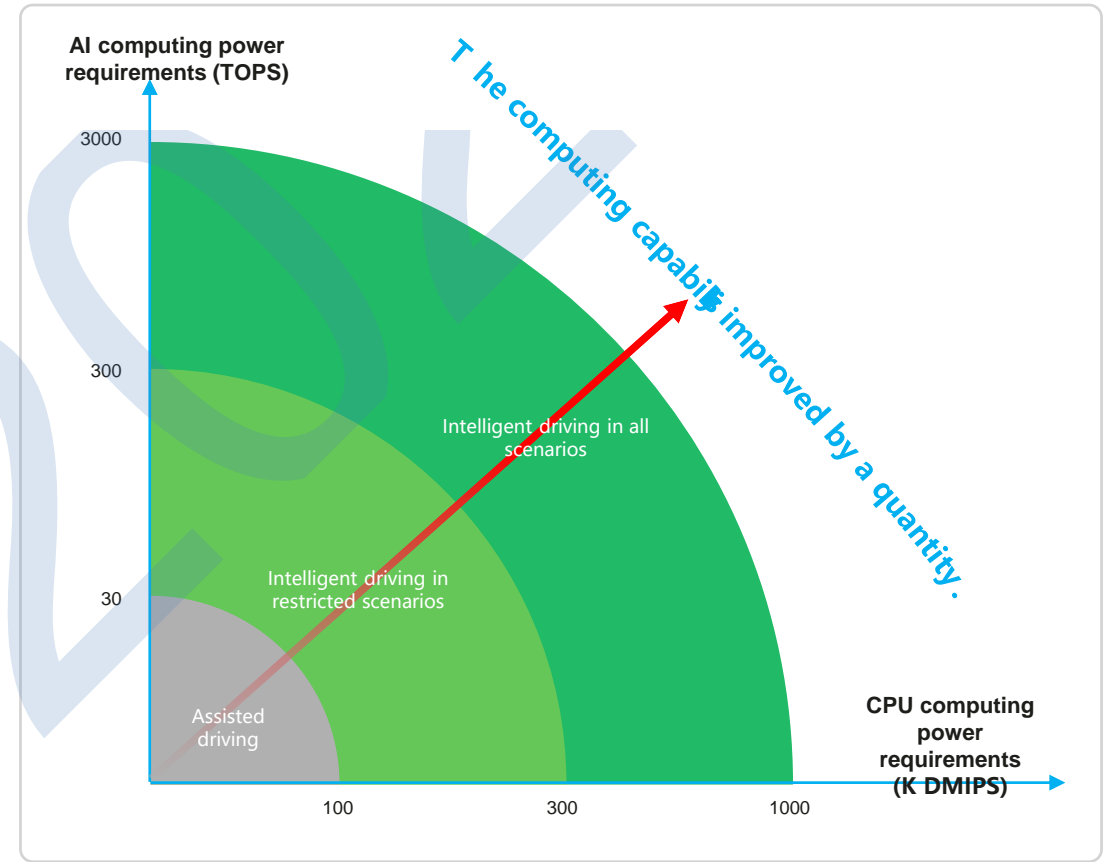
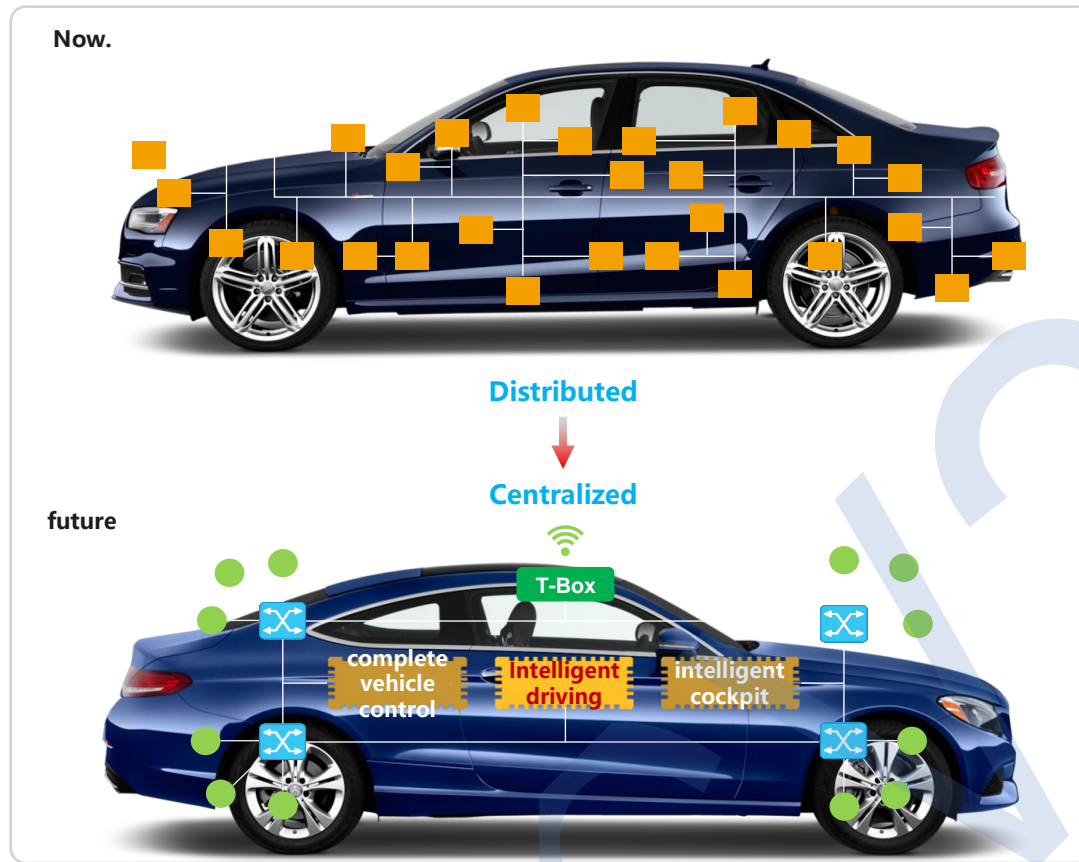
- 华为：马涛，matao.matao@huawei.com
- 中国软件评测中心：王伟，wangwei@cstc.org.cn



Research on vehicle computing platform standardization

2021.7, Cang Zhou

Centralized EE architecture



The E/E architecture is continuously evolving, the number of ECUs is decreasing, and computing is increasingly centralized.

Intelligent driving evolves from ADAS to full-scenario intelligent driving, increasing computing power requirements.



Technology complexity requires platform-based computing technology

sensing system

millimeter wave radar camera ultrasonic radar lidar v2x Positioning

Eyes Ears

ICT technology

Chip, hardware engineering (integration, heat dissipation, and energy consumption), operating system, middleware, communications, and cloud

decision-making system

Brain

Vehicle computing platform (car brain)

Algorithmic technology

Clustering algorithm, machine vision, deep learning, reinforcement learning, and machine learning

execution system

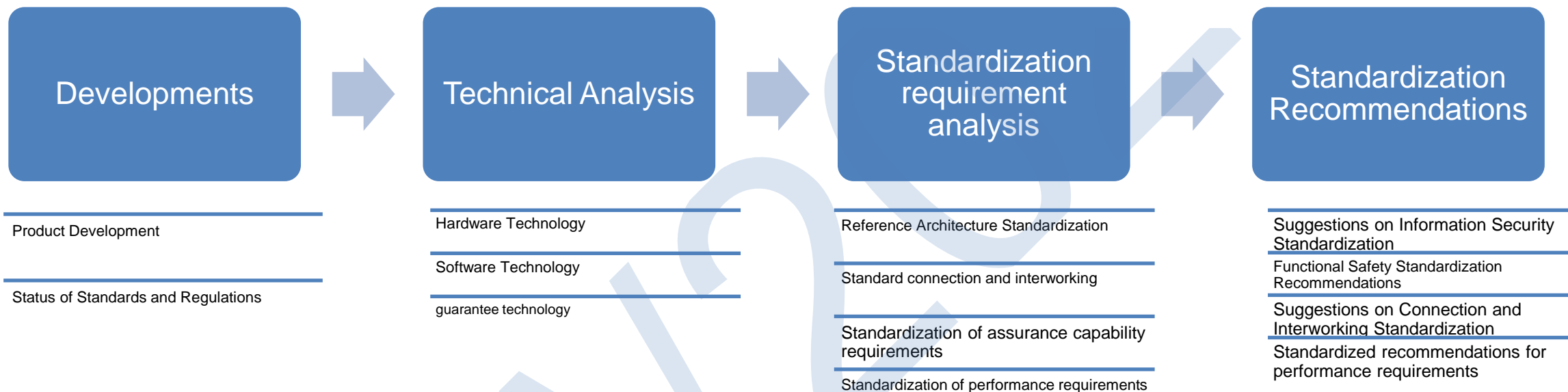
limbs

Brakes and throttles drive system drive system Steering system Braking system

Automotive Control Technology

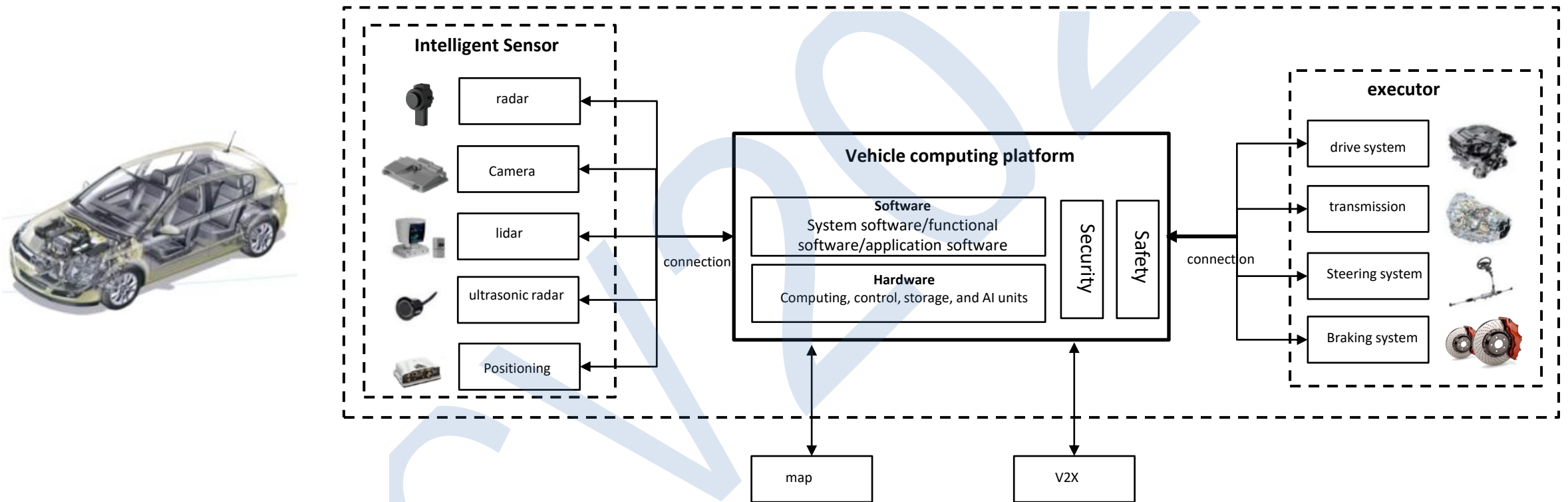
Power control, steering control, brake control, etc.

Overview of Research Report



牵头单位	华为技术有限公司、中国软件评测中心（工业和信息化部软件与集成电路促进中心）
参与单位	中国汽车技术研究中心有限公司、博世汽车部件（苏州）有限公司、惠州市德赛西威智能交通技术研究院有限公司、北京地平线机器人技术研发有限公司、国汽（北京）智能网联汽车研究院有限公司、上汽通用五菱汽车股份有限公司、联合汽车电子有限公司、大陆汽车投资（上海）有限公司、长城汽车股份有限公司、标致雪铁龙（中国）汽车贸易有限公司、北京百度网讯科技有限公司、浙江吉利汽车研究院有限公司、上海汽车集团股份有限公司技术中心

Basic Definitions



The vehicle computing platform is an integrated software and hardware platform that supports the realization of ICV driving automation function, including hardware such as chip, module, interface, system software, function software, etc., to adapt to the trend of the transformation of traditional electronic control unit to heterogeneous high-performance processor. It is also called intelligent vehicle base computing platform.

Typical product: Huawei MDC



Private travel



Long distance transportation



Robotaxi



Campus Commuting



Street Cleaning



express logistics



port freight



MDC: Intelligent Driving Computing Platform

Hardware platform (self-developed CPU/AI chip) + Software platform (self-developed OS) + Tool chain



Camera



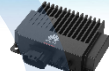
Millimeter wave/ultrasonic radar



lidar



T-Box



combined positioning



Wire control chassis

Technical Advantages

- High Computing Power: Industry-leading CPU+AI Heterogeneous Computing Capability
- High security: Chip + hardware + OS + tool chain, reliable engineering capability, and vehicle-level security certification

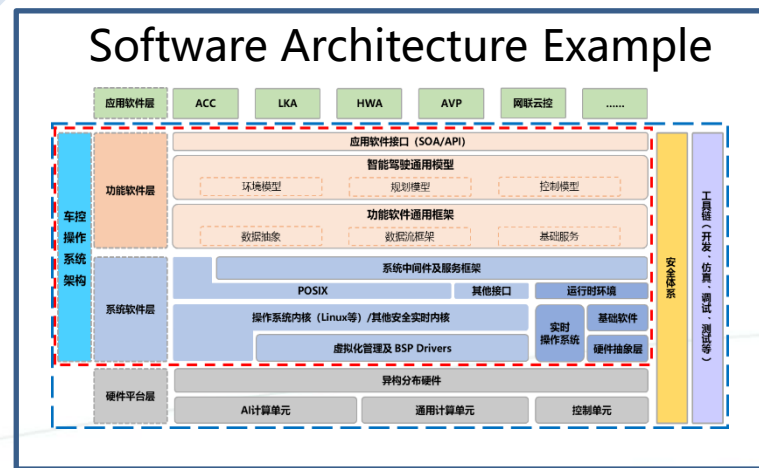
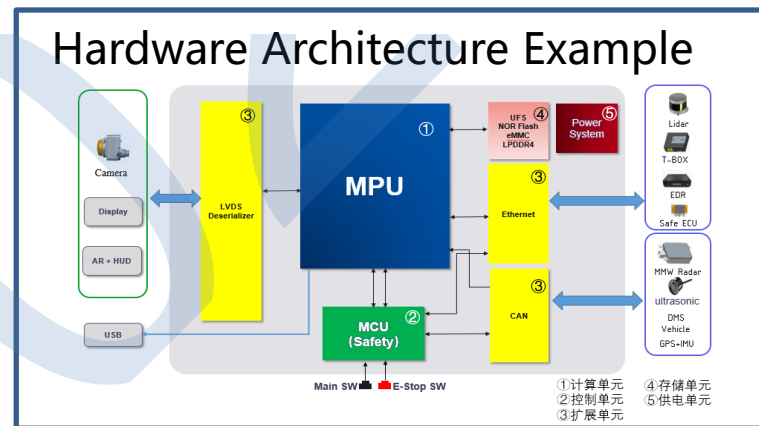
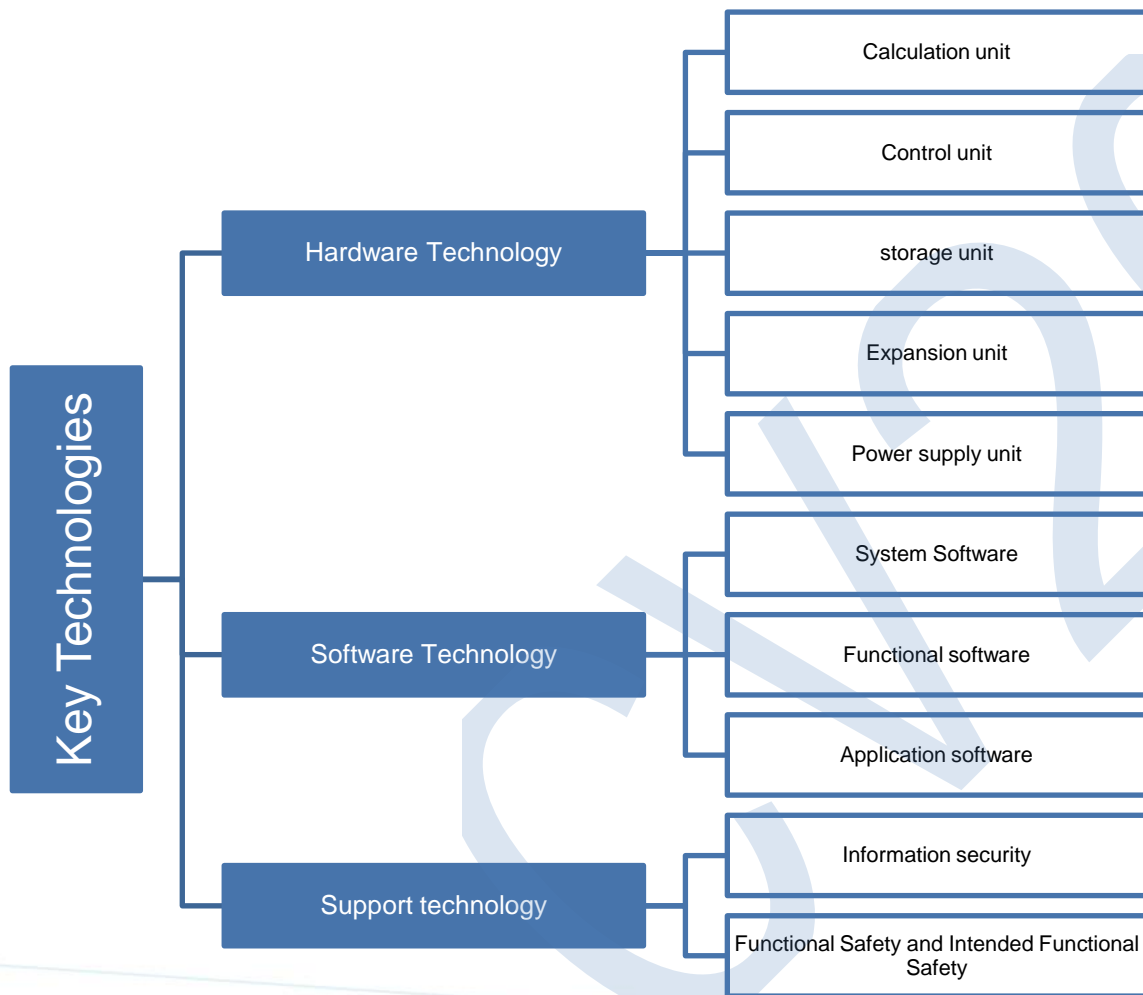
Open Ecosystem

- Adaptive AUTOSAR Standard Components and Interfaces
- Supports interconnection with ROS and compatibility with ROS applications.
- Complete and easy-to-use development tool chain

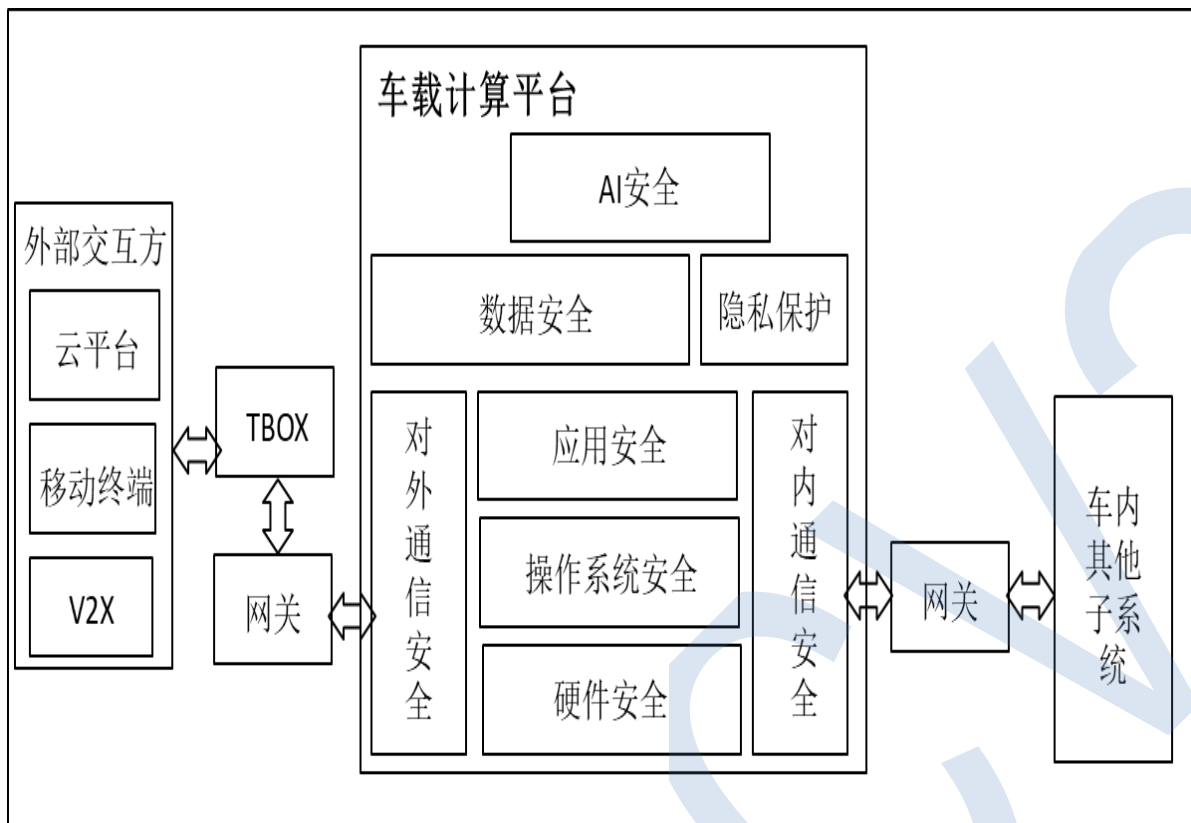
Unified architecture

- Centralized hardware capabilities and smooth evolution of application algorithms
- Software and hardware are decoupled by layer, and OTAs are continuously upgraded.

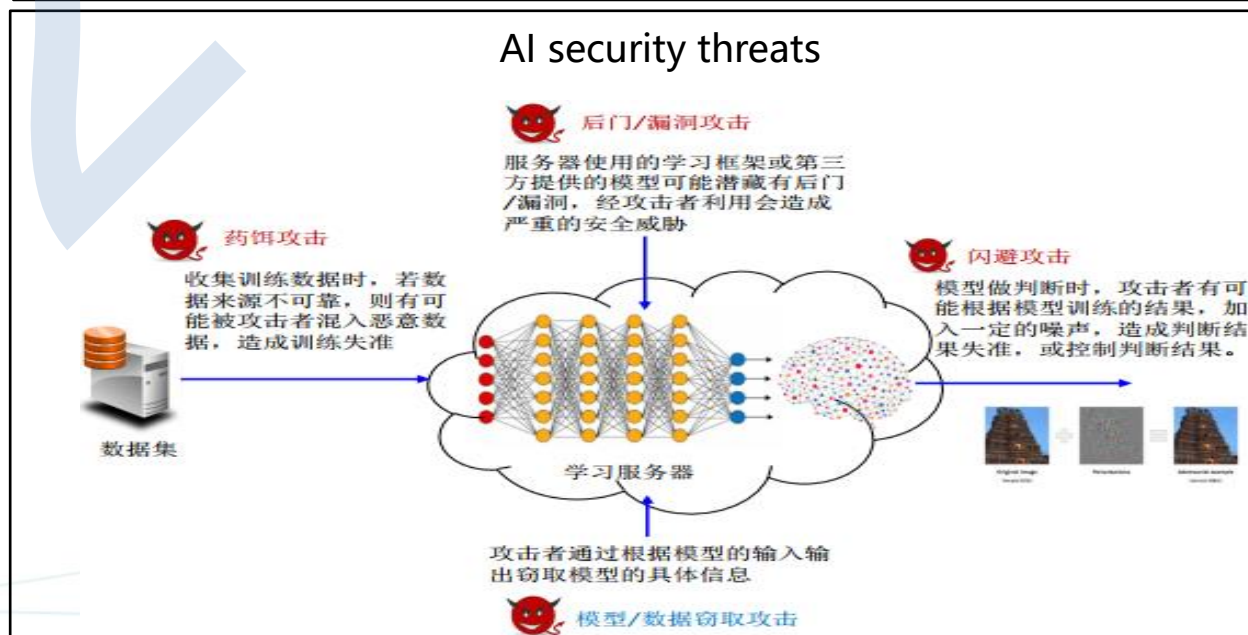
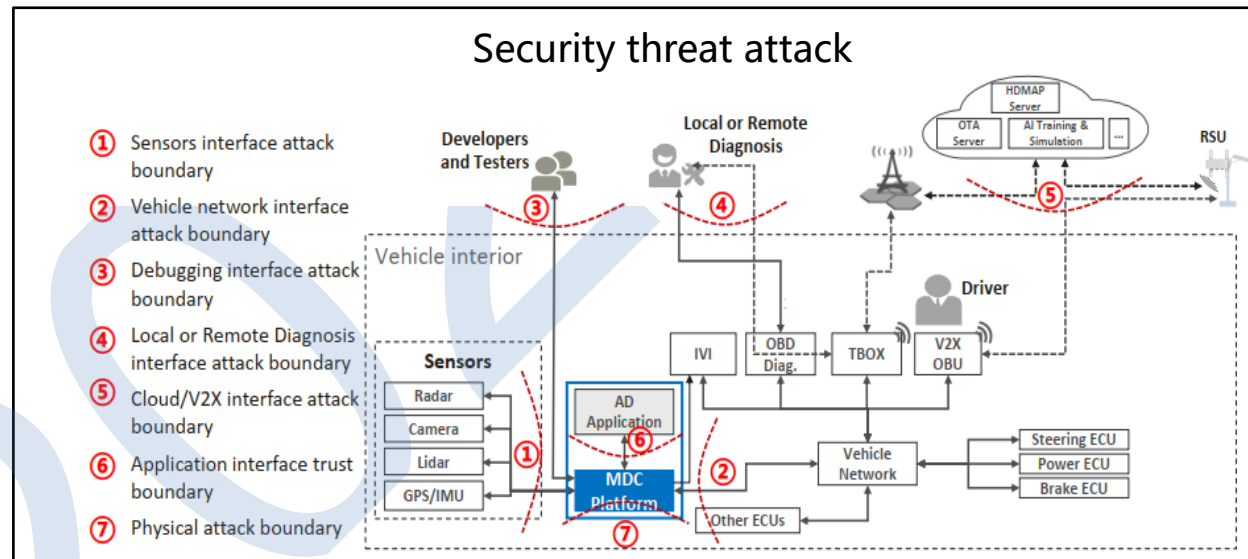
Key Technologies



Security Technology



Information Security Architecture



Standardization requirements (1)

Standardized dimension	Standardized Content	Related Standards
Connection and interworking	Connector Interface Standardization	QC/T 1067, QC/T 29106, etc.
	Communication Network Standardization	Wired: LIN/CAN/CANFD/FlexRay/Ethernet Wireless: BT/SparkLink
	Logical Interface Standardization	Sensor logical interface: ISO 23150 Actuator Logic Interface: Communication Protocol Requirements and Test Specification for Steering-by-wire and Braking-by-wire
Performance Requirements	Evaluation Index and Method of Calculated Force	CPU: DMIPS AI: TOPS; MAPS
	Power Consumption Evaluation Indicators and Solution	TOPS/W

Standardization requirements (2)

Standardized dimension	Standardized Content	Related Standards
Security	Hardware security standardization	-
	Communication protocol and interface security standardization	
	AI security standardization	
	OS Security Standardization	
	Application software security standardization	
	Data security standardization	
Functional Safety	Functional Safety Standardization	ISO 26262; GB/T 34590
	Expected Functional Safety Standardization	ISO 21448
Other	Definition of Terms	GB/T Intelligent Networked Automotive Terms and Definitions

Standardization Recommendations

Top Priority Recommended Standards

- Name: Security Technical Requirements for Vehicle Computing Platforms
- Necessity: The vehicle computing platform assumes the key functions of automatic driving and is the core link of interaction. It directly affects personal safety. Therefore, it is necessary to develop a dedicated security standard.
- Content: hardware security technical requirements and test methods, communication protocol and interface security technical requirements and test methods, AI security technical requirements and test methods, application software and data security technical requirements and test methods

Other Recommended Standards

- Technical Requirements for Functional Safety of Vehicle Computing Platforms, including requirements for functional safety levels of key modules, standardizing software unit test verification, software integration verification, and embedded software test
- Test Methods for Vehicle Computing Platform Performance, including key indicators for the computing platform performance test (such as the actual performance of the computing chip, delay, signal transmission performance, and digital signal accuracy), and corresponding test tools and equipment

Thank you!