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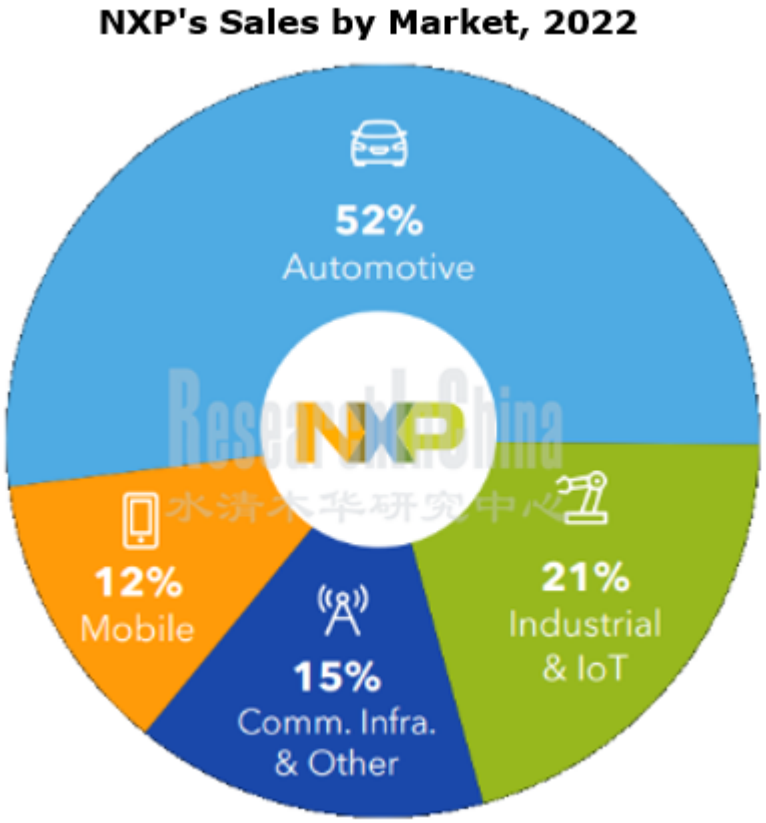
NXP's Intelligence Business Analysis Report, 2022-2023

June 2023

NXP’s performance

In 2015, NXP acquired Freescale for USD11.8 billion, hereby becoming the largest automotive semiconductor vendor. Yet NXP's development progress has not always gone smoothly. In 2021, Infineon replaced NXP as the biggest automotive semiconductor vendor.

In 2022, NXP’s revenue jumped by 19.4% on the previous year to USD13.205 billion, 52% of which was from the Automotive; its net income hit USD2.833 billion, soaring by 48.6%. Despite a good growth, NXP was still positioned second in the industry.



Source: NXP

NXP S32 Automotive Platform

NXP S32 Automotive Platform is designed for autonomous driving, involving the perception, decision and actuation. Among NXP's main ADAS chips, S32R is used for radars, S32A for L3~L5 CPUs, S32V for visual processing, S32G for automotive gateways, S32Z/S32E for real-time processing and power domain controller systems, and S32K for small domain controllers and small sub-nodes.

NXP once worked hard on S32V vision processor and BlueBox ADAS domain controller, but the result was not as expected. By contrast, it succeeded in S32R and S32G

NXP S32 Automotive Platform

Source: NXP

NXP has gambled on 4D imaging radar and network processor since 2022.

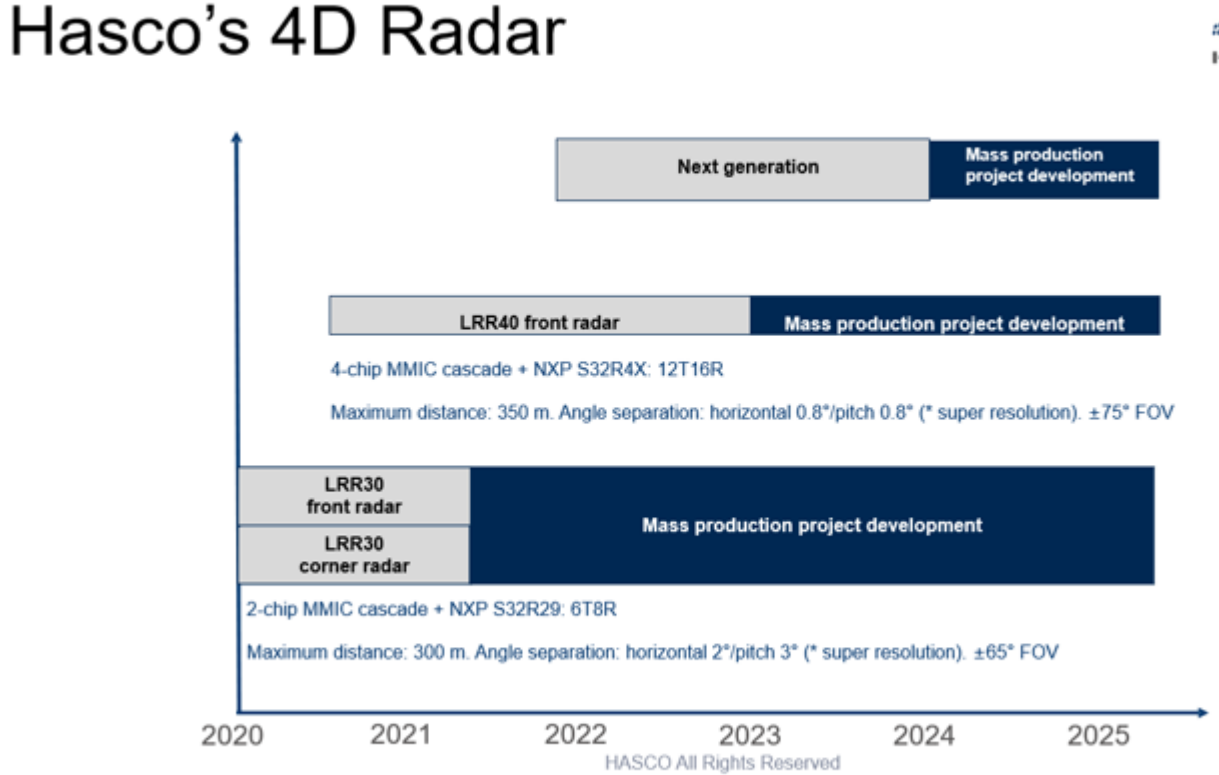
NXP has established a solid foothold in automotive radars for more than 20 years. By 2022, it had launched six generations of radar chips, and has transitioned to RFCMOS as early as the fourth generation. NXP has a leading position in the automotive radar market, offering radar technology to the top 20 automotive OEMs in the world.

In early 2022, NXP released the industry's first dedicated 16nm imaging radar processor, the NXP S32R45, which is also the flagship of NXP's 6th generation automotive radar chipset family. Additionally, the new NXP S32R41 was introduced to extend 4D imaging radar's benefits to a much larger number of vehicles including high-end cars, vehicles used for mobility services, and mainstream passenger cars. Together these processors serve the L2+ through L5 autonomy sectors, enabling 4D imaging radar for 360-degree surround sensing.

Radar developers such as Hawkeye and Hasco have developed 4D imaging radars based on NXP S32R45.

Based on NXP S32R45, Hasco has developed 4-chip cascaded imaging radar, with a detection range of 350 meters, 1° horizontal resolution, 2° pitch resolution and ±75° FOV, covering more blind spots. Hasco has a high expectation of the prospect that 4D radar will completely replace conventional ordinary radars in the future. LRR30, Hasco's 4D radar, can output 1,024 4D point clouds and track up to 64 objects. It is one of the first imaging radar sensors to be production-ready in the market. The LRR40 being developed by Hasco can output up to 3,072 4D point clouds and track 128 objects.

Hasco's Planning for 4D Radars Based on NXP S32R



Source: Hasco

NXP focuses on deploying radar chips and network processors.

The layout in vehicle intelligence in recent year reveals that NXP focuses on deploying radar chips and network processors.

Recent Dynamics of NXP's Radar Chips and Network Processors

Time	Product	Event	Description
Oct. 2022	Radar toolchain	Rohde & Schwarz empowered launch of a 4D imaging radar platform by automotive radar manufacturer Cubtek in partnership with NXP.	NXP imaging radar chipset solution uses the flagship S32R45 radar MPU and the second-generation high performance RFCMOS radar transceiver TEF82XX. When developing the 4D imaging radar, Cubtek chose the R&S ZVA40 network analyzer and the R&S ZVA-Z90 millimeterwave converter from Rohde & Schwarz to make RF measurements of E-band.
Jan. 2023	Network domain controller	NXP announced the OrangeBox automotive-grade development platform, which unifies wireless and wired connectivity solutions into a single connectivity domain controller.	OrangeBox integrates a wide variety of NXP wireless technologies, from broadcast radio, Wi-Fi 6 and Bluetooth, to secure car access with Ultra-Wideband (UWB) and Bluetooth Low Energy (BLE), and 802.11p-based V2X. The OrangeBox is a single, security enhanced, modular development platform that provides a unified interface between the vehicle's gateway and its wired and wireless technologies.
Jan. 2023	Imaging radar chip	NXP announced SAF85xx, a new industry-first 28nm RFCMOS radar one-chip IC family for next generation ADAS and autonomous driving systems.	The new SAF85xx one-chip family combines NXP's high performance radar sensing and processing technologies into a single device. NXP's new family of automotive radar SoCs is comprised of high-performance radar transceivers integrated with multi-core radar processors which are built on NXP's S32R radar compute platform. The SAF85xx offers twice the RF performance and accelerates radar signal processing by up to 40%, compared to NXP's previous generation. The one-chip family enables 4D sensing for corner and front radar.
Mar. 2023	Imaging radar chip	NXP released S32R41, the latest member of its scalable S32R radar processor family, into production.	The comprehensive feature set enables the S32R41 family to meet the requirements of advanced high-resolution corner and front radar applications. CubTEK will leverage NXP's S32R41 processors and TEF82xx RFCMOS transceivers for its new high-end radar sensor system. Next-generation commercial vehicles will be able to use this technology in a sophisticated blind spot information system (BSIS) to assist drivers in enhancing road safety for vulnerable road users such as pedestrians and cyclists.
Apr. 2023	Network processor	AWS and NXP collaborated to integrate cloud capabilities with edge processing.	AWS IoT Core, AWS IoT Greengrass and AWS IoT FleetWise are integrated with NXP S32G processors for vehicle and cloud data acquisition, processing and storage. Additionally, Amazon SageMaker and Amazon SageMaker Edge can be used to build, train and deploy optimized machine learning models on NXP S32G processors. NXP also offers the Automotive SPICE-qualified eIQ™ Auto toolkit that supports deep learning inferencing in vehicles.
May 2023	Imaging radar chip	NIO cooperated with NXP on 4D imaging radars.	NXP's imaging radar technology enables NIO to achieve high-level autonomous driving through vastly improved sensor resolution and extended detection range. Extended radar capabilities allow cars to more accurately detect, separate, and classify objects.
May 2023	Network processor	The S32G family of vehicle network processors doubles in size with the production launch of the S32G3 series offering up to 2.5x the performance, memory and networking bandwidth as the S32G2 series.	At present, the central computing unit of GAC's X-Soul Architecture adopts NXP S32G3 featuring strong security and communication capabilities, super reliability and ultra-low latency. Automakers use the S32G3 processors for central computing of software-defined vehicles (SDVs) to host automotive services, integrate cross-domain functions (virtual ECUs), provide security gateway functions, and manage vehicle OTA updates.

Source: ResearchInChina

NXP's Thinking on Intelligent Transformation of the Automotive Industry

NXP believes that the automotive industry is building a new triangle value chain. OEMs are mainly responsible for architecture definition and system integration. To this end, they need basic technologies and chip platforms from semiconductor companies, as well as hardware and software integration and software actuation provided by Tier 1 suppliers. NXP aims to gradually step in the triangle value chain as a technical partner. That is to say, a technology company like NXP should have a team that serves Tier 1 suppliers, and another team targeting OEMs. Therefore, in recent years, NXP has been increasing the number of system engineers and software engineers to enhance its complete system-level solutions. In terms of products, NXP is transforming into a chip supplier, that is, it is integrating more software on the basis of chips. NXP's software engineers have outnumbered hardware engineers. NXP continues system-level investments, in a bid to deeply understand how the automotive architecture develops and evolves.

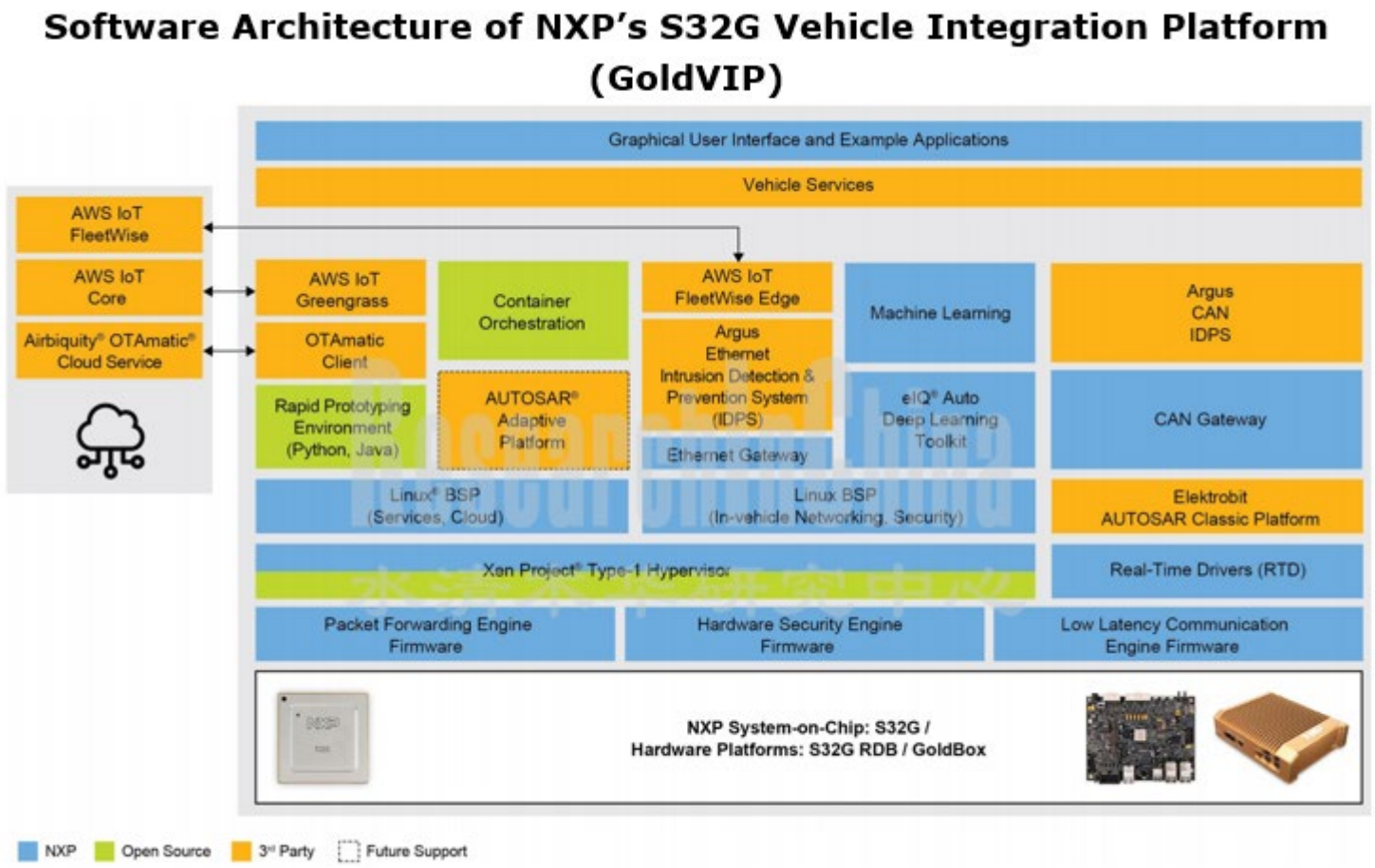
Obviously, other automotive chip vendors such as Horizon Robotics are following suit, making the chip toolchain and grouped algorithms as perfect as possible to reduce the chip introduction workload for OEMs and Tier1 suppliers.

The automotive industry is heading towards software-defined vehicles, and it requires brand-new automotive software development methods to handle ECU integration, data-driven automotive services, secure cloud connection and service-oriented architectures. Automakers and Tier1 suppliers are confronted with new challenges in multi-tenancy (one MPU supports multiple virtual MCUs), network management, cloud services, functional safety and advanced safety technology. This makes it extremely difficult for automakers and Tier1 suppliers to introduce automotive intelligent chips.

NXP's S32G Vehicle Integration Platform (GoldVIP) provides a reference vehicle integration platform that accelerates S32G hardware evaluation, software development and rapid prototyping efforts. NXP helps address these challenges with GoldVIP's pre-integrated software, including from partners Airbiquity, Amazon Web Services, Argus Cyber Security and Elektrobit.

GoldVIP has integrated the following software: Airbiquity OTAmatic client (for OTA updates), AWS IoT Greengrass V2 edge runtime (for secure cloud services), Elektrobit tresos AUTOSAR Classic Platform and Argus Cyber Security Intrusion Detection and Prevention System

Software Architecture of NXP's S32G Vehicle Integration Platform (GoldVIP)



Source: NXP

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Contact

Beijing Headquarters

TEL: 010-82601561, 82863481
FAX: 010-82601570

Chengdu Branch

TEL: 028-68738514
FAX: 028-86930659

Website: ResearchInChina

WeChat: Zuosiqiche

zuosiqiche