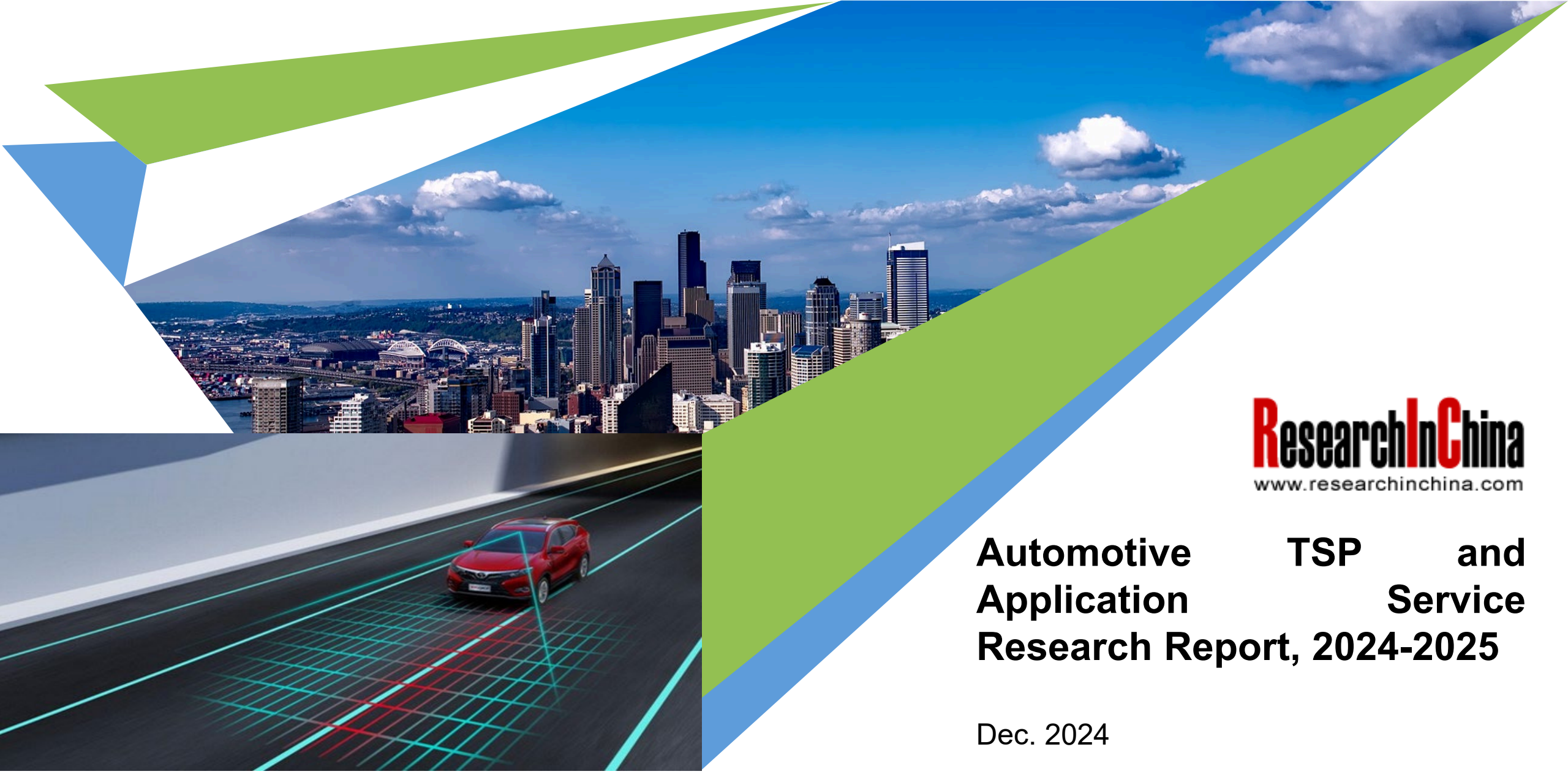

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Automotive TSP and Application Service Research Report, 2024-2025

Dec. 2024

TSP Research: In-vehicle connectivity services expand in the direction of cross-domain integration, all-scenario integration and cockpit-driving integration

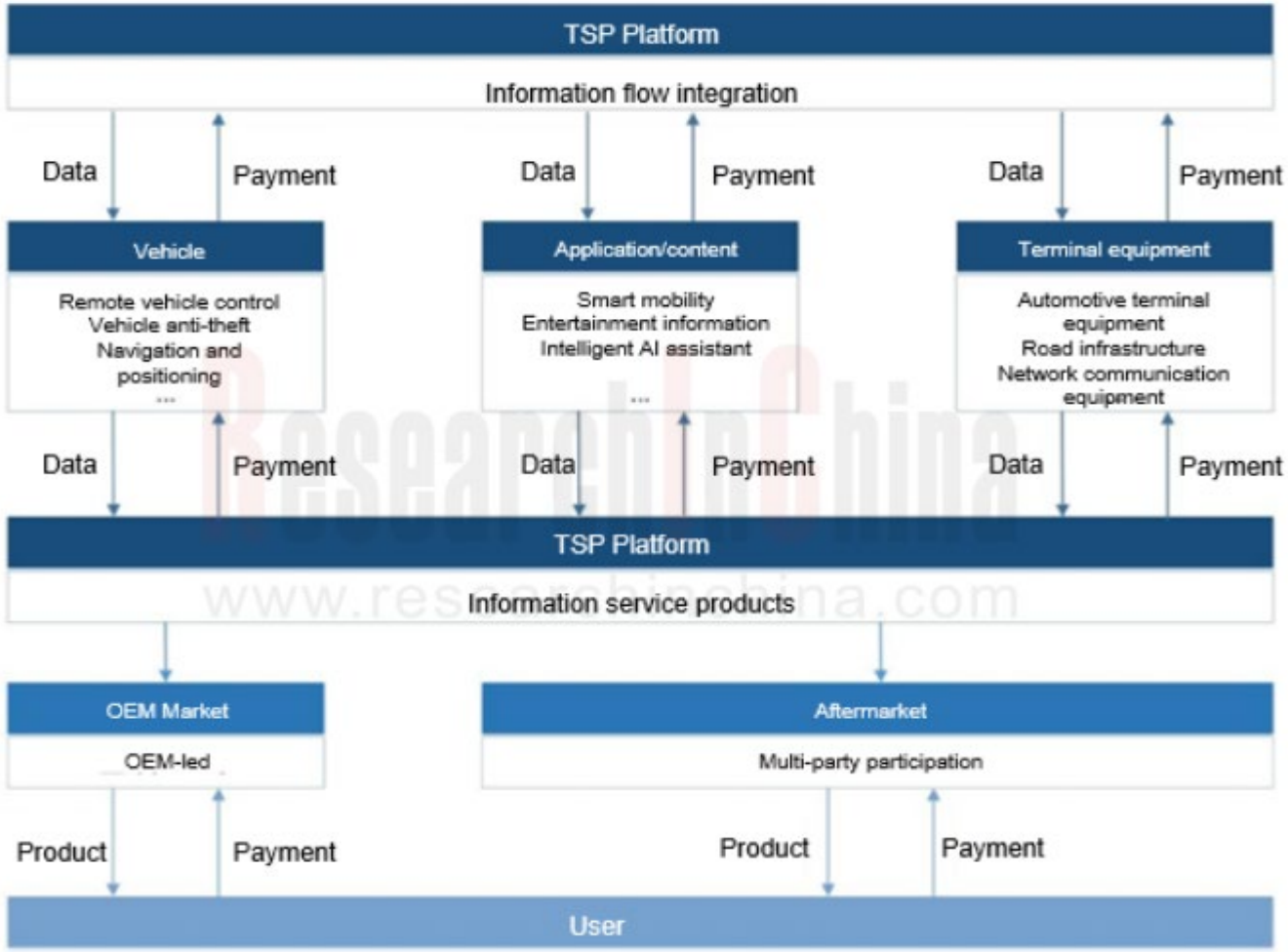
TSP (Telematics Service Provider) is mainly responsible for data collection and supply between cars and various service providers, thereby providing more diversified services to car owners. TSP services cover navigation, social contact, entertainment, remote maintenance, security, etc.

In the trend towards cross-domain integration and cockpit-driving integration, TSPs also quietly make progress, expanding from only in-car connectivity service applications to cross-domain integration, all-scenario integration and cockpit-driving integration.

In cross-domain integration, on the one hand, the modular software platform can realize the functional integration of different domains such as cockpit and intelligent driving domains. On the other hand, phone-IVI integration applications enable the computing power call and ecosystem integration of mobile phones and IVI.

All-scenario integration mainly refers to the realization of connectivity services in various scenarios such as interaction, entertainment, social contact, navigation, parking, and charging, centering on all mobility scenarios.

Cockpit-driving integration is mainly to connect the capabilities of intelligent cockpit and intelligent driving. For example, the latest maps launched by Baidu, Tencent and NavInfo link mobility maps with ADAS maps.

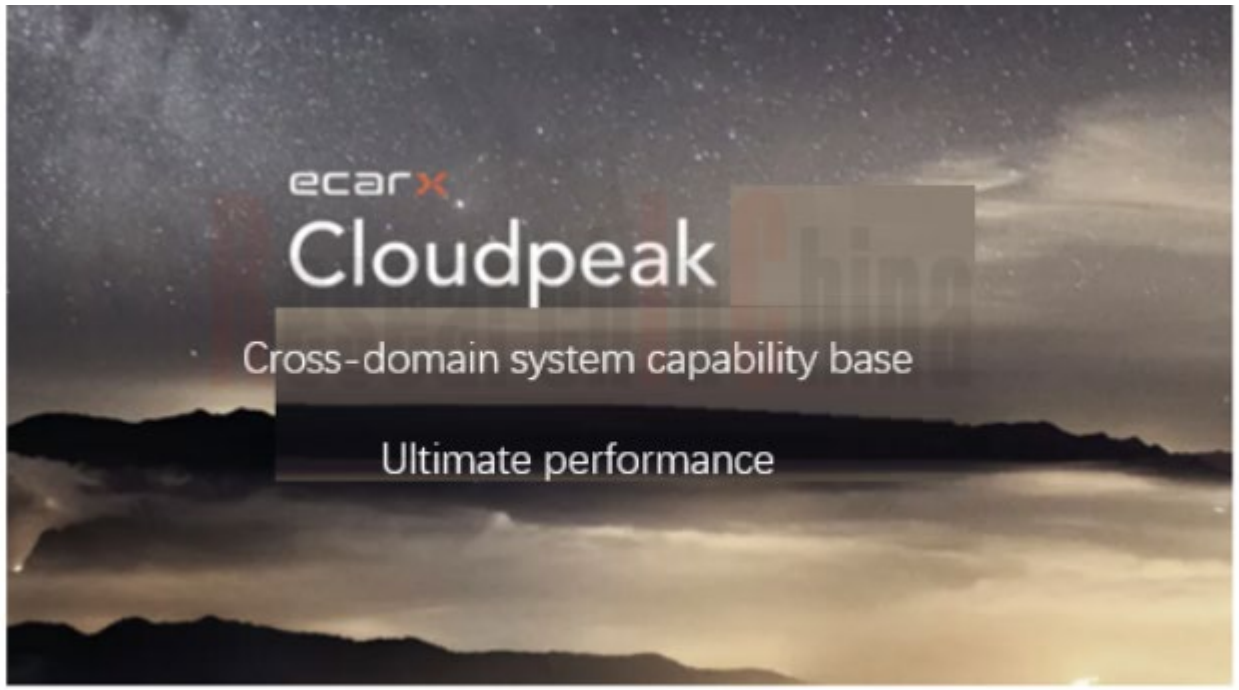


Source: Public information

1. Cross-domain integration of system base

As an established TSP, ECARX provides infotainment systems, online membership services, telematics operation and maintenance services, traffic value-added services, etc. to dozens of brands. As of September 30, 2024, ECARX's technical services and products had been available in more than 7.3 million vehicles worldwide.

In the TSP business, Cloudpeak, the cross-domain system capability base released by ECARX in 2024, can form a complete product with different computing platforms, and can support the development of the state-of-the-art infotainment systems and ADAS functions.



ECARX Cloudpeak

In 2024, ECARX Cloudpeak was installed on EX30, Volvo's SUV BEV with global mass production and delivery. ECARX Cloudpeak injects rich intelligent functions into the intelligent cockpit of EX30:

Google Automotive Services (GAS): GAS makes it easy for users to experience Google Maps, Google Assistant, and massive applications in the Google Play App Store.

Phone-IVI integration: as a supplement to the application ecosystem, ECARX Cloudpeak provides EX30 with phone-IVI integration experiences such as Android Auto and Apple CarPlay.

ADAS prompt: ECARX Cloudpeak can interconnect and communicate with all ADAS functions of EX30. It can process the information perceived by radar, cameras and other sensors related to intelligent driving assistance and present it on the cluster screen in front of the driver, thereby maximizing the driver's front view, relieving the anxiety and reducing safety hazards caused by the deviation of the field of vision.

It supports **5G connectivity and OTA updates** to ensure that applications and operating systems are always up to date.

Going overseas: ECARX Cloudpeak supports EX30 to be launched in more countries and regions around the world. Volvo Cars plans to increase the capacity of this model at its Ghent Plant in Belgium from 2025.

ECARX + Xingji Meizu mainly realize the integration of three major capabilities

In addition, ECARX has teamed up with Xingji Meizu to integrate the "mobile phone domain" and the "vehicle domain" through IVI-phone integration. The intelligent cockpit system based on the ECARX cockpit series computing platform + Meizu FlymeAuto solution can achieve seamless connection, cross-domain cooperation, ecosystem sharing, and data interoperability between mobile phones and vehicles.

- **Data integration (data integration, account integration, ecosystem integration):** Integrate the data sandbox between the mobile phone and IVI from the software level. The most basic storage data, account integration, and integration of millions of mobile phone applications create a new IVI application ecosystem for users.

- **Team integration (Meizu, ECARX, Lynk & Co):** Integrate Meizu's mobile phone industry, ECARX's computing platform and the personalized needs of OEMs to connect cross-industry production processes - in the initial stage of vehicle R&D, locations have been reserved for mobile phones, chips and corresponding functions.

- **Computing power integration (distributed application ecosystem, IVI-phone integration framework, protocol fusion, heterogeneous networking):** reconstruct the underlying communication protocols of IVI and mobile phone, and integrate distributed application ecosystems, phone-IVI integration framework, protocol fusion and heterogeneous networking capabilities to allow the hardware capabilities of mobile phones and vehicles to share with and call each other, so as to meet more usage scenarios. The rapidly iterative mobile phone computing power can also be perfectly integrated with the IVI computing power, making the user experience more "unbounded".

All-scenario integration of service capabilities

At the "TIME DAY" in April 2024, Tencent upgraded its TSP and intelligent cockpit solution to TAI 5.0, and introduced a cockpit foundation model to improve intelligent interaction and active service experiences in an all-round way. It comprehensively upgraded the entertainment ecosystem, mobility services, and phone-IVI integration, ultimately achieving all-scenario integration of service capabilities.

Functional Upgrades of Tencent TAI 5.0	
1. Intelligent interaction	• Based on Tencent's self-developed Hunyuan Model, plus professional vehicle data fine-tuning, a cockpit foundation model was launched. On the one hand, through fine-tuning and task training with massive automotive expertise, the AI vehicle assistant can respond to high-level tasks more accurately and meticulously; on the other hand, it improves the efficiency of accessing content and services. • Based on Tencent's APP Agent capabilities, it only takes one week to become proficient in using hundreds of applications or applets in mature processes, without the need for APIs to achieve in-depth voice interaction with vehicle applets and APPs. • Add such functions as AI-driven order taking, intelligent vehicle control, intelligent itinerary planning, and text-to-image as smart wallpaper to enhance the service experience.
2. Entertainment ecosystem	• Tencent's Pioneer Cloud Game Platform supports introduction of multiple genuine licensed games in vehicles. It is adapted to the automotive environment and rendered through the cloud, with no need to download or occupy vehicle memory. • Users can enter the game via the vehicle screen in the non-driving mode, and can link the steering wheel, Bluetooth gamepad, vehicle audio system, ambient lighting, seat vibration and other hardware to enjoy an immersive gaming space. • Tencent AiQuTing has introduced video applications such as Kuaishou and Mango TV. Plus QQ Music, QQ News, WeRead, Koudai Story, etc., it has formed a rich content matrix.
3. In-vehicle WeChat	• Combined with in-vehicle sensors and IVI system account changes, user IDs are intelligently identified to enable fully automatic or semi-automatic login. • Users can set the "call only" mode, which does not display text messages but retains important voice calls to avoid excessive message interruption and protect privacy. • When the user is inconvenient or does not want a voice reply, quick text reply which can be customized is supported.
4.1 Phone-IVI integration	• Based on the user connection of WeChat, the connection between mobile phone and vehicle scenario is attained. • The location, Dianping, articles released by public WeChat accounts, music and other messages in the conversation via WeChat can be sent to the vehicle with one click; • TAI 5.0 exclusively cooperates with Dianping to recommend high-scoring merchants along the way in the navigation route, display restaurant ratings, per capita price, user reviews, recommended dishes and other information, directly set waypoints or destinations to initiate navigation, and make reservations and other operations. • The front passenger can scan the code with his/her mobile phone and view it on the mobile phone.
5. Mobility services	• Ecosystem services about parking, valet parking, designated driving, charging and refueling, maintenance and online ride-hailing are available in vehicles. • Tencent Intelligent Driving Map has launched a parking lot guidance solution that can provide detailed indoor map data of parking lots, including parking spaces, charging areas and elevators. • It can automatically plan a reasonable parking space navigation route according to the destination restaurant that the user navigates, and guide the user to the elevator closest to the restaurant and the most suitable parking space.
6. Overseas solutions	• Tencent also launched an overseas intelligent cockpit solution. Based on the browser form, it helps Chinese OEMs quickly and economically build a localized cockpit service ecosystem. • Equipped with Tencent's latest X5 web kernel, it not only quickly connects to ecosystems of entertainment, navigation, content, etc., but also covers local vehicle services. OEMs do not need to connect with local ecosystem partners one by one and perform additional IVI adaptation. They can configure them by region to achieve differentiated operations.

Cockpit-driving integration of maps

In 2024, Baidu, Tencent, and NavInfo all released their latest IVI maps. In addition to 3D maps and lane-level navigation, ADAS maps are also a highlight. Map services and driving assistance are thus integrated.

Baidu Maps V20

In April 2024, Baidu Maps V20 was released. It can support multiple systems such as iOS, Android, Linux, QNX and HarmonyOS. Baidu Maps V20 not only supports 3D lane-level navigation on IVI, but also enables phone-IVI synchronization, personalized voice packages, real lane-level navigation, real-time traffic lights, and real-time maps among others, regardless of system interconnection.

- **Phone-IVI integration:** the mobile phone and the IVI share the same version, and the mobile phone map and the IVI map are updated synchronously on a perpetual basis;
- **Real lane-level navigation:** it is available nationwide. Lane-level map data of 3.6 million kilometers of roads and 360 cities across China have been produced and launched, covering 95% of user navigation mileage;
- **Map agents:** foundation models land on vehicles, and IVI maps can offer free questions and answers in natural language, and access a billion-POI content service ecosystem at any time;
- **Phone-IVI interconnection:** Baidu Maps V20 breaks the system boundaries and enables connection without needing to buy a mobile phone with the car or change the mobile phone when buying a car. It allows for "use of a Huawei mobile phone to get into a Xiaomi car", and also "use of an Apple mobile phone to get into an AITO car".

Tencent Maps 8.0

In September 2024, Tencent Maps was upgraded to Version 8.0, offering upgrades around scenarios such as parking, energy replenishment, and location-based services.

Updates

- Parking lot and parking area recommendation
- Parking lot indoor map display and floor switching
- Navigation in the parking lot
- Lane-level navigation extends to all urban, highway and expressway scenarios
- Accompanying route and GLOSA ? Human-IVI co-driving guidance
- Account system
- Phone-IVI integration
- WeChat location shared to IVI
- More realistic 3D renderings
- New energy charging radar layer
- Fully automatic calculation of the continuous path

NavInfo’s latest map

NavInfo’s latest map

With the development of vehicle intelligence, NavInfo’s map services have extended from traditional navigation maps to multiple segments, including:

- SD maps: used for basic navigation
- ADAS maps: serving ADAS
- HD maps: providing HD map services
- AVP maps: supporting automated valet parking (AVP)

NavInfo made progress in the map business in 2024:

- **Map business:** It continued to promote lightweight HD map solutions, and has entered up to 100 cities. It launched or completed POC with multiple autonomous driving solution providers and OEMs.
- **Navigation products:** It continued to optimize and improve the navigation experience, enhance capabilities in all scenarios, and provide accurate and reliable navigation services.
- **Human-machine co-driving:** It formed a differentiated configuration of cockpit chips, flexibly met the needs of high-, mid- and low-end markets, and supported all-scenario capabilities with heavy maps, light maps, or no maps.
- **Intelligent map engine:** With continuous efforts on technological innovation, it achieved continuous innovation and improvement of capabilities which can be compatible with different map strategies, including heavy maps, light maps and SD maps, and support intelligent driving on highways, urban expressways and urban roads and in parking lots.
- **Lane-level navigation products:** Expanding from highways and urban expressways to urban areas, it attained a wider coverage.

In addition, NavInfo's service capabilities based on maps are advancing from cockpits to intelligent driving. In 2024, two of its four key projects are centered on autonomous driving.

NavInfo's Key Construction Projects, 2024H1

Project	Purpose	Expected Impact on the Company's Future Development
Autonomous driving map update and application development project	Build an autonomous driving map update system and application capabilities, including an autonomous driving information database, service platform, and service system, and ultimately realize the acquisition, upload, classification, cleaning, vectorization, differentiation, update, and release of autonomous driving map data, and accomplish real-time online processing and service functions of map data.	After the implementation of the project, the production of autonomous driving map products for highways and ordinary roads in core cities across China can be completed, supporting the implementation of light maps in key cities. The product content caters to the mass production of autonomous vehicles, the product quality reaches the industry-leading level, and the data reaches the advanced level, serving the mass production and application of autonomous vehicles.
Autonomous driving dedicated cloud platform project	In order to adapt to the development of the autonomous driving industry, the company plans to productize and cloudify the technology, data and industry experience it has accumulated in the field of autonomous driving, and provide OEMs with a dedicated cloud for autonomous driving. This exclusive cloud can provide OEMs with professional autonomous driving simulation test services, autonomous driving test data sets, autonomous driving service research and development platforms, autonomous driving data compliance, and autonomous driving dedicated cloud platform construction services to support large-scale R&D and testing by OEMs before mass production of autonomous vehicles.	Improved R&D capabilities for autonomous driving functions and services, huge data reserves and powerful computing capabilities satisfy large-scale R&D and testing of OEMs. The quality of the company's products and the R&D process will also be unified and guaranteed on the cloud platform, and the window for external service releases will also be unified, which can provide high-level, high-quality product services as well as operation and maintenance guarantees for OEMs.
Location big data platform	Create a product platform for digital earth/digital twin scenarios	Enhance the competitive edges of intelligent transportation, public safety and digital cities to gain more market share.
Traffic information processing and publishing subsystem	Provide highly dynamic traffic information services covering the entire country, continue to improve service quality, and explore innovative service growth engines	Dynamic traffic information services have become a stable source of revenue and profit in the company's automotive business. Product upgrades and innovative products will further enhance the competitive edges of the company's overall business and help it with business expansion and transformation.

Source: NavInfo

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