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Ecological Domain and Automotive Hardware Expansion Research Report, 2024

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Automotive Ecological Domain Research: How Will OEM Ecology and Peripheral Hardware Develop?

Ecological Domain and Automotive Hardware Expansion Research Report, 2024 released by ResearchInChina recently delves in the dynamics of automotive ecological domain in peripheral hardware expansion, supplier ecological solutions and OEM ecological implementation, and comprehensively combs and forecasts the development and future trends of automotive ecological domain.

First, the ecological domain will realize large-scale interconnection between IVI and external software and hardware, and obtain efficient collaborative perception and calculation of multiple devices.

The automotive ecological domain refers to the software and hardware ecosystem centering on IVI and including various peripheral devices. The IVI can call terminal sensors (such as mobile phones, cameras, UAVs, tablet PCs, etc.) and computing power, and attain efficient collaborative perception and computing of multiple devices through the cloud platform. The ecological expansion of automotive applications has always been a hot spot for OEMs and suppliers, and the development can be divided into three stages. In the first stage, ecological expansion is mainly realized through IVI application mall. In the second stage, the mobile phone ecosystem will be transferred to IVI through phone-vehicle interconnection. In the third ecological stage, watches, cameras, tablet PCs, and even UAVs, smart homes, seats, etc. are added.

Three development stages

	First stage	Second stage	Third stage
Core	App stores + WeChat applets	IVI-phone interconnection	Ecological domain
Details	IVI app stores and WeChat applets provide users with free download space for IVI application ecology.	Through IVI-phone interconnection, the mobile phone ecology is transferred to the IVI which can directly call the applications on the mobile phone.	As more terminal devices are added, the IVI can call terminals (such as mobile phones, cameras, UAVs, tablet PCs, etc.) and computing power, and attain efficient collaboration and computing of multiple devices
Application	<ul style="list-style-type: none"> ➢ NIO, Li Auto, Xpeng, etc. enable users to download dozens of applications through IVI app stores ➢ Neta, Leapmotor, Voyah, etc., through app stores and WeChat applets, realize the lightweight expansion of application ecology. 	<ul style="list-style-type: none"> ➢ Baidu CarLife, Huawei HiCar, NIO Link, Meizu Flyme Link, Xiaomi CarWith, VIVO Jovi InCar, OPPO Carlink and other IVI-phone interconnection solutions can make mobile phones control vehicles, and allow IVI to directly call the applications and data of mobile phones. 	<ul style="list-style-type: none"> ➢ Based on Xiaomi Hyper OS, Huawei Harmony OS, etc., the cross-terminal interconnection of devices is realized, and the software and hardware ecology under the same underlying operating system is opened up. ➢ Based on the expansion interfaces reserved in cars, more hardware is inserted to expand ecology.
Ecological expansion scale	➢ Dozens of kinds	➢ Hundreds of kinds	➢ Thousands of kinds
Ecological expansion type	➢ Software	➢ Software + Hardware	➢ Software + Hardware
Typical case	<ul style="list-style-type: none"> ➢ Neta provides application ecological expansion through the "Neta App Store"+WeChat applet. 	<ul style="list-style-type: none"> ➢ Changan and others are equipped with Huawei HiCar 4.0 to realize the deep interconnection between mobile phones and IVI hardware and software, and add functions such as non-inductive interconnection, mobile phone ecology on vehicles, "shake your phone to get link advertisement", navigation transfer and so on. 	<ul style="list-style-type: none"> ➢ The Hyper OS carried by Xiaomi Automobile has opened up dozens of people-car-home eco-products supported more than 1,000 kinds of Xiaomi equipment to get on vehicles without feeling, and gradually adapted and shared more than 5,000 applications. It allows users to control a variety of smart devices through Xiaomi Automobile. 

Source: ResearchInChina

Xiaomi Automobile is a typical ecological domain constructor.

Xiaomi Automobile is a typical ecological domain constructor. Relying on its HyperOS and Mi Home ecosystem, Xiaomi Automobile can support 1,000+ Mi Home devices to get on vehicles seamlessly, and can be connected without passwords under the same account to realize automatic scenario linkage.

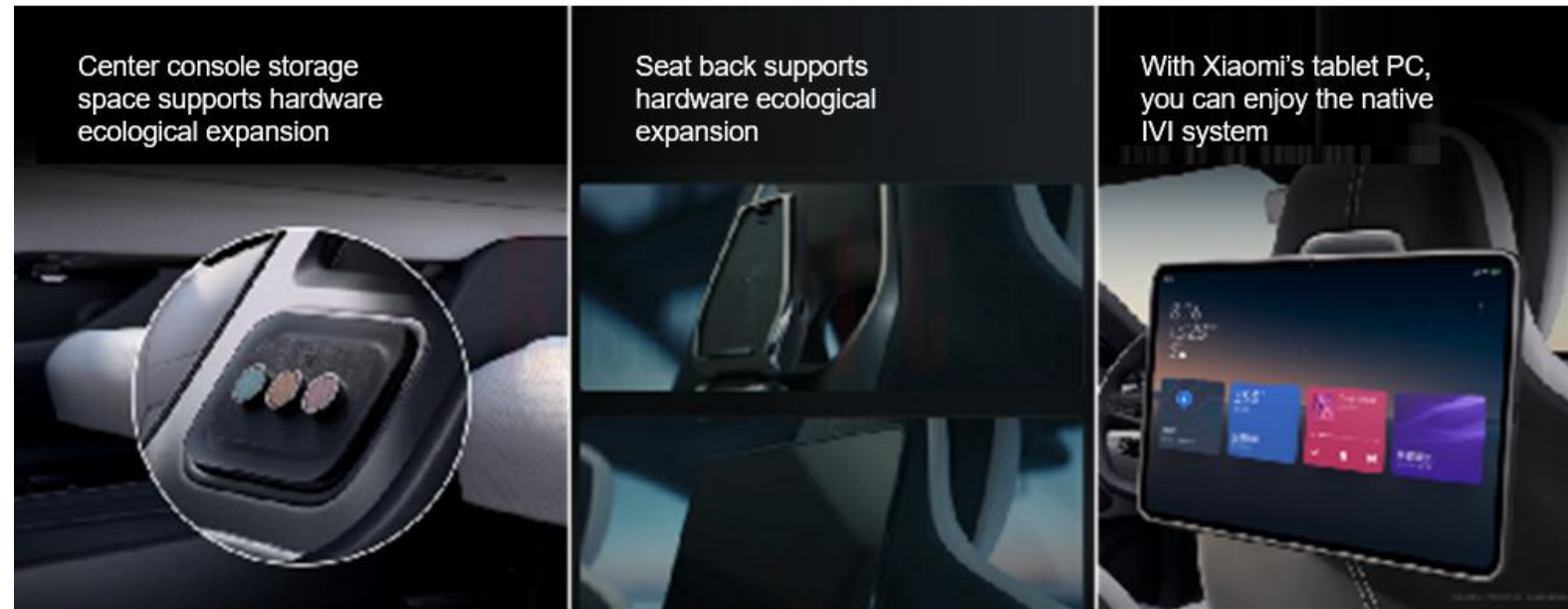


Xiaomi has reserved a large number of interfaces in central instrument displays (CIDs), center consoles and seat back

In order to support ecological expansion, Xiaomi has reserved a large number of interfaces in central instrument displays (CIDs), center consoles and seat back. For instance:

- PIN points are reserved around CIDs to expand interfaces, hardware devices of the third parties can realize plug-and-play, and there is a magnet at the bottom of the screen to attract a group of physical buttons for the purpose of control in vehicles.
- The storage space of center consoles reserves hardware interfaces, power interfaces and magnetic attraction, which can expand more innovative hardware of the third parties, such as Mi Home automotive fragrance diffusers.

* The back of seats features 22.5W magnetic charging. After Xiaomi's tablet PC is adsorbed, it will directly become the original IVI, which can control 30+ automotive systems such as navigation, air conditioning, seating, audio and video. In addition, the IVI has CarPlay and AirPlay wireless connections, and the expansion of the seat back also supports iPad, which can control air conditioning, music and seats.



Source: Xiaomi Automobile

Second, OEMs often start from scenarios to design the ecological domain expansion.

According to Ecological Domain and Automotive Hardware Expansion Research Report, 2024 by ResearchInChina, the automotive ecology has included hundreds of kinds of hardware and thousands of accessible hardware devices. From OEMs' point of view, Xiaomi Automobile can support the first batch of 1,000+ Mi Home devices to get on vehicles, GAC's Green Smart Car Home can support interconnection with 4,000+ devices, and Huawei's house-wide intelligence is connected with 7,000+ smart items carrying HarmonyOS.

Facing massive hardware resources, OEMs often conduct hardware layout from scenarios when designing the ecological domain, especially typical scenarios like smart home, gaming, viewing, karaoke, virtual reality, shooting, office, camping, charging, smart mobility, sports and health. At present, most of automotive hardware products are optional, and some of them can be purchased conveniently through official App stores of OEMs.

Automotive hardware expansion products

Application scenarios	Automotive hardware expansion products
Intelligent scenarios home	<ul style="list-style-type: none"> Smart speakers, smart desk lamps, smart ceiling lamps, smart air conditioners, electric water heaters Smart bathrooms, smart door locks, home doorbells, surveillance cameras, sweeping robots Smart vacuum cleaners, smart screens/smart TVs, smart refrigerators, smart washing machines Smart dishwashers, fruit and vegetable washing machines, smart tableware disinfection machines, smart steamers & ovens Smart toilets, smart stoves, smart fast charging plugs, smart humidifiers, curtains Air purifiers, smart mattresses, smart scales, smart rice cookers, smart microwave ovens Smart water purifiers, flood alarms, AI super-sensing sensors, etc...
Gaming scenarios	<ul style="list-style-type: none"> Game consoles such as SWITCH/PS/XBOX, game consoles and game collection bases.
Movie watching and karaoke scenarios	<ul style="list-style-type: none"> Projectors, curtains, microphones, etc.
Virtual reality scenarios	<ul style="list-style-type: none"> AR glasses, VR glasses, smart rings, etc.
Shooting scenarios	<ul style="list-style-type: none"> Automotive UAVs, motion cameras, etc.
Office scenarios	<ul style="list-style-type: none"> Tablet PCs, computers, printers, automotive rear folding tables, reading lights, USB flash drives, etc...
Camping scenarios	<ul style="list-style-type: none"> Discharge equipment, automotive microphones, outdoor Bluetooth speakers, smart water cups, car roof electric tents Automotive gourmet warming stoves, automotive inverters, and flashlights Inflatable mattresses/headrests/pillows and quilts, parasols/sunshades, etc...
Charging scenarios	<ul style="list-style-type: none"> Charge and discharge guns, automotive chargers, outdoor mobile power supplies, etc...
Smart mobility scenarios	<ul style="list-style-type: none"> Detachable welfare seats, children's seats, intelligent walkie-talkies, etc.
Sports & health scenarios	<ul style="list-style-type: none"> Smart watches, smart rings, etc...
Other scenarios	<ul style="list-style-type: none"> Automotive refrigerators, smart fragrance diffusers, storage boxes, tissue boxes, beauty mirrors Mobile phone holders, magnetic multifunctional hooks, automotive vacuum cleaners, handheld car washers Automotive ashtrays, number plates, trash cans, safety hammers, etc...
.....	

Source: ResearchInChina

OEMs introduce a series of entertainment equipment

1. In entertainment scenarios, OEMs introduce a series of entertainment equipment such as game consoles (SWITCH, PS, etc.), movie-watching equipment, microphones, automotive UAVs, sports cameras, etc. to link multi-terminal information with IVI, thus improving playability of cockpits.

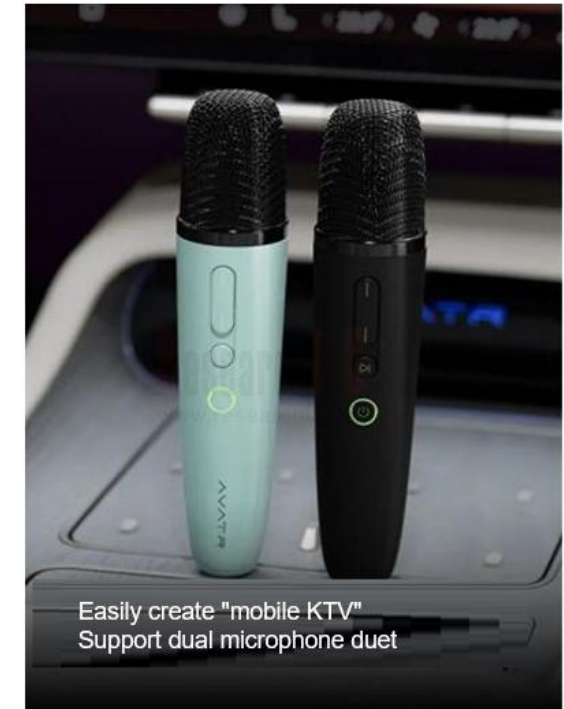
Hardware interconnection cases in entertainment scenarios:

① Dongfeng Warrior is equipped with a UAV system: Warrior 917, which was launched in August 2023, is equipped with a UAV system. The system is composed of a S400 UAV from GDU and a control system, focusing on safe and intelligent outdoor scenarios of IVI integration. Its roof can be expanded to be an apron. In addition to regular flying functions, the UAV can monitor roads, survey road terrain, slope, angle and other environmental information, and support synchronous intelligent path planning.

② Avatr has a custom karaoke microphone: Avatr boasts a wireless karaoke microphone (dual microphone) customized for the smart cockpit, with a built-in DSP processing chip, which can beautify human voice, optimize reverberation curve, and support linkage with the screen, sound and atmosphere lights in the cockpit.



Source: Dongfeng Motor



Source: Avatr

OEMs have promoted "the whole ecology covering people, cars and home".

2. In smart home scenarios, OEMs have promoted "the whole ecology covering people, cars and home". Users can remotely control and manage smart home devices (including air conditioners, water heaters, lighting, security systems, etc.) through mobile phones, cars and other devices.

Hardware interconnection cases in smart home scenarios:

① AITO and various smart home terminals realize car-home linkage: AITO integrates the capabilities of all kinds of terminals including smart screens, smart air conditioners, sweeping robots and home surveillance cameras in smart home scenarios based on HarmonyOS. In addition, AITO also supports preset scenarios like "go home happily", "leave home confidently". For example, car owners can turn on air conditioners, lights, TV sets and music at home with one click on their way off work.

"Go home happily", "leave home confidently".

Use the CID in the car to set the home mode.

Turn on the lights, music and air conditioning in advance, and enjoy the comfort of getting home.



Source: Autohome

GAC's "Green Smart Car Home" solution enables car-home interaction

② GAC's "Green Smart Car Home" solution enables car-home interaction: GAC's "Green Smart Car Home" supports the interconnection of more than 1,000 home appliance brands and 4,000+ devices. It allows car owners to remotely control smart home appliances in their cars through voice, touch screens, etc. It will also wake up and control vehicle functions at home.

The infographic is divided into two horizontal sections. The top section, titled "Vehicle controls home", features a car icon and describes "Account sharing" (linking car and smart home IoT accounts) and "Geofence" (triggering interconnection within 2-3 km). The bottom section, titled "Home controls vehicle", features a house icon and describes "One-click vehicle preparation" (navigation planning) and "At home, you can wake up and control the vehicle at home at any time." The background includes a stylized city map and a white car in a parking space.

Vehicle controls home

- Account sharing
Link the car account with smart home IoT platform account.
- Geofence
Trigger interconnection within 2-3 kilometers.

Home controls vehicle

- One-click vehicle preparation.
Navigation planning
- At home, you can wake up and control the vehicle at home at any time.

Source: GAC

Third, the way to expand automotive ecological domain

In the process of ecological domain expansion, OEMs give priority to mobile phones as the entry point for ecological domain expansion. Through the deep interconnection between mobile phones and IVI, functions like computing power sharing, data seamless connection and hardware sharing can be attained, bringing users a more convenient and intelligent mobility experience. At the same time, massive user habit data and ecosystem on mobile phones are migrated to cars. On this basis, OEMs gradually expand interconnection with terminal products such as cameras, UAVs and tablet PCs, and build a perfect intelligent ecosystem. This expansion process not only provides users with richer functions and services, but also strengthens the competitiveness of OEMs in the field of intelligent ecology.

The cooperation between OEMs and mobile phone/technology vendors can be summarized and classified into the following modes: OEMs acquire mobile phone vendors, OEMs conduct independent R&D, OEMs cooperate with technology companies in research and development, mobile phone vendors manufacture cars (through cooperation), OEMs cooperate with mobile phone/ technology vendors. From the perspective of cooperation modes, some OEMs tend to get through the underlying operating systems of mobile phones and IVI, and promote Internet of Everything based on a unified platform. Other OEMs focus on improving IVI systems and seek cooperation with other vendors to achieve partial IVI interconnection.

In addition, it is worth noting that AM automotive hardware products are also an indispensable part of building a complete automotive ecosystem. When comparing the automotive hardware products of OEM app stores, we find that Huawei and Xiaomi, as top smart phone players, have a huge user base and mature e-commerce platforms (such as Huawei Mall and Xiaomi Mall). These platforms not only sell core products such as mobile phones, but also offer products in many fields such as smart home, smart wear and accessories. Therefore, for the car owners of Xiaomi and Huawei HarmonyOS, they can completely purchase automotive hardware products which they desire through these existing e-commerce platforms instead of OEM app stores.

Automotive Hardware Products Offered by OEM App Stores

Automotive Hardware Products Offered by OEM App Stores

Automaker	ZEEKR	AITO	Xiaomi
Automotive hardware product			
Automotive microphone	√	√	√
Canopy sunshade	√	√	√
Skylight ice armor		√	
Automotive front windshield sunshade			√
Automotive mobile phone holder	√		√
Storage box	√	√	
Automotive glasses case		√	
Automotive tissue box	√		
Automotive self-inflating mattress	√	√	
Automotive refrigerator	√		
Handheld lithium battery car washer	√	√	
Multifunctional portable vacuum cleaner	√	√	
Parking number plate	√	√	
Automotive trash can	√		
Automotive ashtray	√	√	
On-board charger	√		
Home charging pile	√	√	√
Portable AC charging gun/charging and discharging gun	√	√	√
Automotive AC discharging socket	√		
Automotive emergency starting power	√		
Multifunctional automotive inflator	√		
Bluetooth adapter	√		
Automotive safety hammer	√		
Multifunctional strong light flashlight			√
Automotive aromatherapy/fragrance	√	√	
Automotive smart fragrance diffuser			√
Automotive Bluetooth speaker/smart speaker	√	√	√
Speaker hat		√	
Bluetooth smart key	√		√

Automotive Hardware Products Offered by OEM App Stores

Automotive Hardware Products Offered by OEM App Stores

Automaker	ZEEKR	AITO	Xiaomi
Automotive hardware product			
Smart dual dial			√
Sound pickup ambient lighting			√
Seat back magnetic interface		√	√
Smart sticker	√		
CID physical button			√
Child safety seat	√	√	
Xiaomi walkie-talkie			√
Walkie-talkie charging stand			√
Bluetooth earphone	√	√	
Cell phone		√	
Smart watch	√	√	
AR glasses	√	√	
Tablet PC	√	√	√
Laptop	√	√	
Camera/motion camera	√		
UAV	√		
Switch game console	√		
Gamepad	√	√	
Game collection base	√		
Trunk net pocket		√	
Smart tea cup		√	
Cup holder		√	
Fully automatic electric pedal		√	
Second-row small table		√	
Roof luggage rack		√	
Trunk luggage box		√	
Roof bicycle frame		√	
Rear canopy	√		
Screen protector	√	√	
Car clothing/window film	√	√	
Floor mat/trunk mat	√	√	
Cushion/lumbar support/neck pillow/headrest/cushion	√	√	√

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