5GAA
Automotive Association

C-V2X policies and regulations in China

5GAA Automotive Association
Technical Report

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Contents

Foreword

This Technical Report has been produced by 5GAA.

The contents of the present document are subject to continuing work within the Working Groups (WG) and may change following formal WG approval. Should the WG modify the contents of the present document, it will be re-released by the WG with an identifying change of the consistent numbering that all WG meeting documents and files should follow (according to 5GAA Rules of Procedure):

x-nnzzzz

(1) This numbering system has six logical elements:

(a) x: a single letter corresponding to the working group:

where x =

T (Use cases and Technical Requirements)

A (System Architecture and Solution Development)

P (Evaluation, Testbed and Pilots)

S (Standards and Spectrum)

B (Business Models and Go-To-Market Strategies)

(b) nn: two digits to indicate the year. i.e. ,17,18 19, etc

(c) zzzz: unique number of the document

(2) No provision is made for the use of revision numbers. Documents which are a revision of a previous version should indicate the document number of that previous version

(3) The file name of documents shall be the document number. For example, document S-160357 will be contained in file S-160357.doc

1. Scope

With the rapid development of the national economy, building a strong, safe, convenient, efficient, green, modern and comprehensive transportation system has become one of China's key goals by 2035. To achieve this, the vehicle-to-everything (V2X) network will be a vital factor. Based on advanced ICT technologies, V2X will provide secure, intelligent, comfortable services by connecting vehicles, pedestrians and roads. Meanwhile, the laws and protocols governing intelligent vehicles, autonomous driving and V2X networks will also be developed in order to define each road user's role and duty.

2. References

- 'Outline of Building a Powerful Transportation Country', issued by the State Council

- 'New Energy Vehicle Industry Development Plan (2021-2035)', issued by the State Council

- 'Outline of National Comprehensive Three-dimensional Transportation Network Planning', issued by the State Council

- 'V2X Industry Development Special Committee of the Leading Group for the Construction of National Manufacturing Power', issued by the State Council

- 'National V2X Industry Standard System Construction Guide', issued by the MIIT

- 'V2X Industry Development Action Plan', issued by the MIIT

- 'Regulations on Frequency Band for Direct Communication', issued by the MIIT

- 'Medium- and Long-Term Development Plan of Automobile Industry', issued by the MIIT

- 'Notice of MIIT on Accelerating the Development of 5G', issued by the MIIT

- '5G Application "Raising the Sail" Action Plan (2021-2023)', issued by the MIIT

- '14th Five-Year Plan: Information and Communication Industry Development Plan', issued by the MIIT

- 'Innovative Development Strategy of Intelligent Vehicles', issued by the NDRC

- 'Notice on Organising the Implementation of New Infrastructure Construction Projects (Broadband Network and 5G) in 2020', issued by the NDRC

- 'Platform for Action to Promote the Development of Integrated Transport Big Data (2020-2025)', issued by the MOT

- 'Digital Transportation Development Planning Outline', issued by the MOT

- 'Guidance of the Ministry of Transport on Promoting the Development and Application of Road Traffic Autonomous Driving Technology', issued by the MOT

- 'Guiding Opinions of the MOT on Promoting the Construction of New Infrastructure in the Field of Transportation', issued by the MOT

- 'Management Specification for Road Test and Demonstration Application of Intelligent Connected Vehicles (Trial)', issued by the MPS

- 'Notice on Strengthening the Management of Autonomous Driving Map Production, Testing and Application', issued by the MNR

3. Abbreviations

For the purposes of the present document, the following symbols apply:

BDS   BeiDou Navigation Satellite System
MIIT   Ministry of Industry and Information Technology

MNR Ministry of Natural Resources
MOT Ministry of Transport
MPS Ministry of Public Security
NDRC National Development and Reform Commission
V2X Vehicle-to-everything

4. Overview of the State Council, ministries and commissions

This section introduces the executive branches in the Chinese government on formulating and implementing plans, policies, standards, and executive relegations related to the V2X industry.

4.1 State Council

The State Council of the People's Republic of China (www.gov.cn) is an executive branch of the Chinese Government operating at the highest administrative level. It is composed of the premier, vice premiers, state councillors, ministers of various ministries, directors of various commissions/committees, the auditor-general and the secretary-general. The State Council is under leadership of the premier.

4.2 Ministry of Industry and Information Technology (MIIT)

The MIIT (www.miit.gov.cn) of the People's Republic of China is the ministry responsible for industrial and information governance under the State Council. The Ministry is mainly responsible for formulating and implementing industrial plans, policies and standards, monitoring the daily operations of industries, promoting the development of major technology and equipment innovation, managing the communications industry, guiding the informatisation construction.

4.3 National Development and Reform Commission (NDRC)

The NDRC (www.ndrc.gov.cn) of the People's Republic of China conducts comprehensive research on and formulation of economic and social development policies. It works as a macro-department that guides reforms in the overall economic system as well as a planning department for comprehensive economic management. The Commission plays an important role in the economic cabinet, and is also known as 'Small State Council'.

4.4 Ministry of Transport (MOT)

The MOT (www.mot.gov.cn) of the People's Republic of China is the department in charge of the administrative affairs of railways, highways, shipping, ports, urban passenger transport and civil aviation. As such, it is mainly responsible for formulating and organising the implementation of industrial plans, policies and standards for transport by land, water and air (civil aviation only). It is also responsible for undertaking planning and coordination work related to the integrated transport system, and promoting the interconnection of various modes.

4.5 Ministry of Public Security (MPS)

The MPS (www.mps.gov.cn) of the People's Republic of China is the department in charge of national public security. The main responsibilities include investigating and stopping illegal and criminal activities; preventing and combating terrorist activities; maintaining law and social order; managing household registration, resident ID cards, nationality, entry and exit affairs, and foreigners' residence and travel permits; supervising and securing public information networks, etc.

4.6 Ministry of Natural Resources (MNR)

The MNR (www.mnr.gov.cn) of the People's Republic of China is the ministry responsible for natural resources in the country. It was formed on 19 March 2018, taking on the responsibilities of the now-defunct Ministry of Land and Resources, State Bureau of Surveying and Mapping and State Oceanic Administration, with additional responsibilities coming from other departments and ministries.

5 Key information of policies and regulations

5.1 Led by the State Council

5.1.1 Outline of Building a Powerful Transportation Country

Building an interconnected and powerful transportation system in China is a forerunner for building a modern economic system and includes:

1. **Guiding ideology** – This is used to promote transformative changes within the transport sector, from the pursuit of speed and scale to the emphasis on quality and efficiency, from the relatively independent development of various modes of transportation to the emphasis on integrated and united development, and from relying on traditional factors to focusing on innovation. This can ensure that building a modern comprehensive transportation system is safe, convenient, efficient, green and comprehensive. With first-class facilities, technology, management and services, a truly powerful people-centred transportation network can be achieved.

2. **Development objectives** – China's '13th Five-Year' development plan, which ended in 2020, laid a solid foundation for building what it refers to as a "powerful transportation country". By 2035, it will strive to become a 'transportation powerhouse' which means a modern but also comprehensive system of traffic governance and practices that meet the users' needs. By 2050, the objective is to become a global leader that provides high-quality, safe and secure transport infrastructure, equipment, and scientific and technological innovation, including intelligence (smart) developments and environmental protection. It serves and guarantees the construction of excellent transportation services.

5.1.2 New Energy Vehicle Industry Development Plan (2021-2035)

Developing new energy vehicles is a vital part of China's mission to become a so-called powerful transportation country, and it is a strategic measure to cope with climate change and promote green technology. The development of new energy vehicles in China faces several challenges, such as the need for greater innovation in core technology areas, stronger quality assurance systems, more and better infrastructure, underdeveloped industrial ecology, and increasing market competition. This plan addresses these issues under several headings:

1. **Market-leading** – The market should play a decisive role while governments concentrate more on strategic planning, formulating standards and regulations, supervising quality and safety, maintaining market stability, and guiding green consumption, thus creating a conducive environment for industrial development.

2. **Driven by innovation** – A market-driven technological innovation system should be established and implemented, with enterprises as the main body, as called for in the Innovation-Driven Development Strategy. Strong collaboration between industry and the academia and research community is needed to nurture and strengthen innovation, as well as to promote parallel development of diverse technological routes. This means encouraging various entities to work together on core technologies, increasing business model innovation, and forming a robust industry innovation ecosystem.

3. **Coordinated promotion** – Improve horizontal coordination and vertical alignment in order to:
   a) Promote greater integration of energy, transport, information and communication elements feeding in new energy vehicle developments.
   b) Promote technology-based R&D, standards formulation and promotion, as well as application and infrastructure construction.
   c) Transform super-scale market advantages into industrial advantages.

4. **Open development** – The concept of cooperation should be practised based on openness, integration, mutual benefit and win-win outcomes. With openness, further expansion of high-level reforms leading to more innovation and fresh developments can be expected. Moreover, it is essential to strengthen international cooperation and competition, cultivate new advantages in the new energy vehicle industry, and better integrate global industrial chains.

5.1.3 Outline of National Comprehensive Three-dimensional Transportation Network Planning

This Outline seeks to accelerate the construction of a powerful transportation country, to build a comprehensive and multi-dimensional national transportation network, and to support the construction of a modern economic system and society. The plan covers the period 2021 to 2035, with a vision set for 2050:

1. **Guiding ideology** – In order to coordinate development, safety and security aspects, both the central and local authorities should be involved and focusing on improved quality, efficiency, integration and innovation. With first-class facilities, technologies, management and services, the goal is to build a high-quality transportation network that is reliable, safe, convenient, smooth and cost-effective, green, and intelligent – precursors to becoming a "powerful transportation country" on schedule.

2. **Working principles** – It is important to promote a coordinated transportation system, including land, space and industrial developments, and new urban paradigms. It is also important to strengthen international connectivity, deepen cooperation, and improve the safety, openness and reliability of global transportation networks and logistics supply chains. Green and low-carbon developments should also be accelerated to cut CO_2 emissions from the transportation sector as soon as possible.

3. **Development objectives** – By 2035, the goal is to create a multi-dimensional, modern and comprehensive national transportation network which meets diverse user needs and enables international and domestic connectivity – the so-called "three-dimensional" access to major cities across the country.

5.1.4 V2X Industry Development Special Committee of the Leading Group for the Construction of National Manufacturing Power

China attaches great importance to the development of the V2X industry. To accelerate innovation and development in the V2X industry, MIIT convened in September 2017 some 20 ministries and commissions – including the NDRC, MOST, MPS, MOF and MOT – to set up the V2X Industry Development Committee as a cross-department coordination mechanism. The Special Committee has held four plenary meetings in Beijing, Xiong'an New District, Wuxi, Jiangsu Province and Beijing respectively. Each member unit has carried out a great deal of work in promoting the industry through better policy and guidance, laws and optimisation strategies.

MIIT, NDRC, MOT and MNR have issued a number of **policy guidance** documents and strategies: *Mid-and Long-Term Development Plan for the Automobile Industry*; the *Innovative Development Strategy for intelligent Vehicles*; *Action Plan for the Development of the Vehicle-to-Everything (V2X)*; *Outline of the Digital Transportation Development Plan*; *Notice on Accelerating the Development of 5G*; *Guiding Opinions on Promoting New Infrastructure Construction in Transportation*; *New Energy Vehicle Industry Development Strategy (2021-2035);* and other papers and reports.

This has prompted several breakthrough **laws and regulations** to be issued. MIIT, MOT and MPS jointly issued the *Intelligent Networked Vehicle Road Test Management Regulations (Provisional)*, which guided Beijing, Shanghai, Chongqing and Jiangsu to issue implementation rules together with more than 100 test licences. The revision of relevant regulations, such as the R*oad Traffic Safety Law,* was also actively promoted.

The industrial environment in the sector has undergone continuous **optimisation**. MIIT has released the *Regulations on the Use of 5905-5925 MHz Frequency Band for V2X Direct Communication*, instructing Hainan and Tianjin to issue licences for V2X test frequencies and 5G commercial licences were also issued. Research on management mechanisms, such as operation entities and identity authentication, was also conducted and helped to lay the foundation for large-scale applications. MNR carried out research on the application technology for autonomous driving maps, and worked with MIIT and Beijing to promote a pilot application of V2X and autonomous driving maps.

5.2 Led by the MIIT

5.2.1 National V2X Industry Standard System Construction Guide

To implement the *Outline of Building a Powerful Transportation Country* and promote the application of autonomous driving, C-V2X technologies and the healthy development of the industry, MIIT and the National Standardisation Management Committee jointly established the *National V2X Industry Standard System Construction Guide*. This includes several components: *Intelligent Connected Vehicle Standard System*; *Information and Communication Standard System*; *Electronic Product and Service Standard System*; *Intelligent Transportation Related Standards System;* and *Intelligent Vehicle Management Standard System*. Its goal is to enhance top-level design, promote technology R&D and standards formulation in the V2X industry, and promote the healthy and sustainable development of the entire industry.

1. **Guiding ideology** – At its core, the Guide seeks to accelerate the construction of "manufacturing and network powerhouses" while leveraging the role of standards and further promoting the development of integrated V2X technologies, digital solutions and industries that meet requirements for R&D, testing, demonstration and operation. It means developing and transforming V2X innovations/technologies and upgrading related industries (i.e. automobile, electronics, information, and communications). Establishing a system of cross-industry, cross-domain national standards for V2X that meets the needs of China's technological and industrial development is also critical.

2. **Basic principles** – Based on the status and characteristics of China's V2X technology and industry, the various government departments should play a leading role, formulate a standardised construction scheme that combines government guidance and market drive, and establish a national V2X industry system of standards suitable to Chinese conditions. Scientific foundations, focusing on intelligent control and information communication, are key to building a robust system that also factors in the role of enterprises in technological innovation, industrialisation and market promotion. All this seeks to accelerate V2X industry standards to meet China's requirements and support innovative development.

3. **Action objectives** – To meet the V2X industry's needs in China, the overall is to accelerate progress on standards related to advanced driver assistance systems, key technologies for in-vehicle electronic products, wireless communications, and 5G eV2X key technology for industry applications.

5.2.2 V2X Industry Development Action Plan

The V2X industry is a relatively new organism in which sectors – automobiles, electronics, information communication, and road transportation – have seen the importance of becoming deeply integrated in order to 1) improve the level of connected vehicles on the road (i.e. conducive to autonomous driving), 2) to develop intelligent transportation, and 3) to promote better information flow. China's V2X industry has entered the fast lane, where technological innovation is increasingly active, and new applications are constantly expanding. However, there are still some challenges, such as the need for breakthroughs in core technologies and improvements to the overall industry ecosystem including better policies and regulations. This Action Plan has been formulated to further promote the sustainable and healthy development of the V2X industry:

1. **Guiding ideology** – The main thrust of the Plan is to take the technological advantages of China's network communication industry, the market advantages of its electronic information industry, and scale advantages of its automobile industry and optimise the policy environment in order to strengthen cross-industry cooperation and make breakthroughs in key technologies. As part of this, the plan is to consolidate and promote the formation of a new V2X industry ecosystem featuring deep convergence, active innovation, security, trustworthiness, and strong competitiveness.

2. **Basic principles** – To Plan seeks to promote key technology R&D, standards and specifications, testing, demonstration and promotion, and to build infrastructure and suitable foundations for healthy industry development. Moreover, this calls for strengthened international exchanges and cooperation for upgrading the automotive industry and transforming application modes.

3. **Action objectives** – By 2020, the goal is to make breakthroughs in V2X towards cross-industry convergence where intelligent connected vehicles with high-level autonomous driving functions can be applied in specific scenarios on a large scale. Policies, regulations, standards, and safety assurance systems adapted to industrial development can been initially established, and an innovative, open, integrated and, thus, well-developed industrial ecosystem can take shape to meet diverse, personalised and continuously evolving and growing user needs.

5.2.3 Regulations on Frequency Band for Direct Communication

In order to promote the application and development of V2X intelligent connected vehicles in China using different radio frequencies (i.e. *Regulations of the People's Republic of China on Radio Management* and the *Regulations of the People's Republic of China on Radio Frequency Division*) and in light of current frequency usage, the following has been stipulated:

1. The 5905-5925 MHz is specified as the working frequency band for the LTE-V2X-based V2X direct communication. The basic technical requirements of the radio equipment used are shown in the following:

Table 1: Technical Requirements for Direct Communication Radio Equipment

Frequency range of operation	Channel Bandwidth	EIRP
5905-5925 MHz	20 MHz	Vehicle-mounted or portable radio equipment: 26 dBm Roadside radio equipment: 29 dBm

2. In principle, when installing and using roadside radio equipment in the 5905-5925 MHz frequency band in order to construct and operate a V2X system, a licence from the national radio administration agency is needed.

3. The installation and use of vehicle-mounted and portable radio equipment in the 5905-5925 MHz frequency band refers to the management of the ground public mobile communication terminal, and no frequency use licence or radio

station licence is needed.

4. The production of V2X direct communication radio transmission equipment for sale and use in China is under the national radio administration agency's remit and thus a certificate is required in accordance with relevant regulations.

5.2.4 Medium- and Long-term Development Plan of the Automobile Industry

China's automotive industry has entered a strategic period of transformation, upgrading, and opportunity. This Development Plan seeks to implement the State Council's strategy for building a "powerful manufacturing country" and to promote the construction of a "powerful automobile country" within that.

A driving mechanism for this is to strengthen key technologies associated with V2X. This means continuously improving the cross-industry, collaborative innovation, and focusing on key solutions such as environmental awareness, intelligent decision-making and collaborative control, as well as promoting R&D behind industrial applications for sensors, in-vehicle terminals, and operating systems. Alongside this is efforts to promote the interconnection between intelligent vehicles and their surroundings and facilities, to integrate resources and means, and encourage data openness and sharing while ensuring security. The Plan further promotes the construction of broadband network infrastructure and multi-industry co-construction of big data interaction platforms for intelligent connected vehicles.

The Plan foresees demonstration and promotion activities for intelligent connected vehicles. Here, it calls for test and evaluation systems to be introduced, and step-by-step demonstrations of intelligent connected vehicles. The test and verification environment and corresponding data collection and analysis, management and monitoring platforms should be built as pilots, allowing performance evaluations to be carried out in a centralised manner. Strong information exchange and collaboration mechanisms between intelligent connected vehicles and the internet (including Internet of Things, intelligent networks, smart grids and smart cities) is vital. Innovative development models suitable for intelligent connected vehicles under Chinese conditions are needed. Conducive and supportive policies and regulations for intelligent connected vehicles are also important to specify legal requirements, such as the definition of security responsibility entities and cyber-security assurance.

5.2.5 Notice of MIIT on Accelerating the Development of 5G

This Notice aims to fully promote 5G network construction, application promotion, technology development, and safety and security, and to support high-quality economic development. The C-V2X-related content includes promoting the collaborative development of '5G+ V2X' and the integration of V2X into new national information infrastructure projects. It also covers the promote of large-scale LTE-V2X deployments and the building of what can be called a national 'V2X pilot zone' for testing and exploring rich application scenarios, and for optimising business models. Based on the commercial deployment of 5G, the Notice also seeks to guide key regions in their advanced 5G and LTE-V2X planning. It also seeks to further develop and verify 5G-V2X standards and strengthen cross-ministry collaboration in establishing key communication standards and protocols for smart city and intelligent transportation construction.

5.2.6 5G Application 'Raising the Sail' Action Plan (2021-2023)

This Plan aims to promote comprehensive and coordinated development of 5G and 5G-enablement products for thousands of industries. It implies the upgrading of production, lifestyle, and governance methods, and fosters new drivers of economic and social development.

For V2X, the aim is to strengthen collaboration among the automotive, communications and transportation industries, strengthen contacts among governments, industry organisations and enterprises, and jointly establish a complete 5G and V2X test and evaluation system in order to ensure end-to-end connectivity of applications.

The creation of national 'V2X pilot zones' and collaborative planning and construction of V2X infrastructure and 5G networks should be supported. It also calls for faster, more efficient 5G+ V2X deployment, promoting innovative applications of C-V2X technologies in areas such as campuses, airports, ports, and mines. Lastly, it envisages establishing a cross-industry and cross-regional V2X security communication system that supports mutual trust and recognition.

5.2.7 '14th Five-Year Plan' Information and Communication Industry Development Plan

This document covers the *14th Five-Year Plan for National Economic and Social Development of the People's Republic of China*, providing an outline of the 'Vision Targets 2035', and a guide to the development of the information and communications industry in the next five years.

For V2X, the aim is to accelerate the deployment of V2X applications, strengthen the top-level design of C-V2X-based infrastructure deployment, promote highway V2X upgrades and reconstruction, and build a national V2X pilot zone.

It also seeks to accelerate large-scale deployment of C-V2X on major urban roads and explore pilot application for C-V2X on some highways in order to stimulate R&D, testing and verification of key V2X technologies, and to explore V2X operation entities and business model innovation.

5.3 Led by the NDRC

5.3.1 Innovative Development Strategy of Intelligent Vehicles

This Strategy seeks to better implement important undertakings proposed by the CPC Central Committee and State Council, comply with the latest scientific, technological and industrial trends and transformations, seize the strategic opportunity of Industry 4.0 (digital) developments and innovations, and accelerate development of intelligent vehicles, It outlines the following:

1. **Development trends** – a) Intelligent vehicles have become a key strategic direction of global automotive industry developments, b) Intelligent vehicles are of great strategic significance to China, c) China has established strategic advantages in the development of intelligent vehicles.

2. **Overall requirements** – a) Fundamental principles: this should be driven by innovation and supported by platforms, market-oriented and cross-border integration, and open cooperation which is secure and controllable, b) Strategic vision: by 2025, a system of technological innovation, industry ecosystem, infrastructure, regulations and standards, product supervision, and cyber-security for intelligent vehicles in China should be in place. Intelligent vehicles with autonomous driving can be produced on a large scale, and those with "highly autonomous driving" capabilities can be marketed/used in specific environments. The construction of intelligent transportation systems and smart city-related facilities will need to progress accordingly. Vehicle wireless communications networks (such as LTE-V2X) are expected to have achieved regional coverage and next-generation networks (5G-V2X) gradually deployed in some cities and highways. Also by 2025, a high-precision, time-space benchmark service network is expected to be rolled out. Looking forward to 2035-2050, China's standard intelligent vehicle system is expected to be fully built and integrated.

3. **Main tasks** – a) Building a collaborative, open intelligent vehicle technology innovation system, including breakthroughs in key technologies, improving the test/evaluation technology, and carrying out application demonstration pilots, b) Building a cross-border integrated intelligent vehicles industry ecosystem, including enhancing the core competitiveness of the industry, cultivating new market players, innovative industrial development forms, and promoting the transformation and application of new technologies, c) Constructing a system for advanced intelligent vehicle infrastructure, including the planning and construction of intelligent roads and a wide-ranging vehicle wireless communication network, d) Constructing a systematic and complete system of regulations and standards for intelligent vehicles, including technical standards, certification and recognition systems.

5.3.2 Notice on Organising the Implementation of New Infrastructure Construction Projects (Broadband Network and 5G) in 2020

To accelerate the implementation of the Broadband China Strategy and promote new infrastructure construction, NDRC and MIIT jointly organised the 2020 New Infrastructure Construction Project (in the broadband network and 5G domain).

One of the basic network improvement projects within this is a verification and application proving ground for 5G-based C-V2X. Therefore, the aim is to build a large-scale C-V2X demonstration network, verify the functions and interaction capabilities of the C-V2X platform in typical application scenarios, and verify the functions and performance of related C-V2X/5G modules and devices. The project also standardises and analyses large-scale test data, and carries out industrial R&D on related modules, terminal products, and platforms that meet the requirements of C-V2X large-scale test results.

5.4 Led by the MOT

5.4.1 Platform for Action to Promote the Development of Integrated Transport Big Data (2020-2025)

Focusing on basic support, innovative applications, security assurance, and management reform, the 'Five Actions' for comprehensive Transportation Big Data development is implemented according to the principles of well-coordinated, application-driven, security-controlled, multi-party participation. The aim is to promote better integration of big data into the transportation sector, build a comprehensive transportation big data centre, and support China's ambitions to become a "transportation powerhouse".

1. **Main objectives** – By 2025, the aim is to have built a comprehensive and standardised system for managing big transportation data. This means large-scale and systematic big data sets, such as infrastructure and transportation

vehicles, will be basically completed and comprehensive transportation information resources will be shared and open. It also means big data is likely to be more widely used in various service fields in the wider 'integrated transportation' sector. A comprehensive transportation big data centre is expected to be built within the same timeframe, facilitating the development of the digital economy together with intelligent transportation.

2. **Main tasks** – The key tasks include consolidating the foundation for big data development, promoting big data sharing and openness, promoting innovative applications of big data, enhancing big data security assurance, and improving the big data management system.

5.4.2   Digital Transportation Development Planning Outline

1. **Guiding ideology** – The target is to promote a comprehensive and strategic approach, seize opportunities introduced thanks to scientific, technological and industrial advances, continue to support high-quality, people-centred developments in the field, and to promote the deep integration of advanced information technology and transportation.

2. **Basic principles** – With data as the key factor, the principle is to enable transportation and related industries, promote joint innovation in models, business practices, products, and services, improve the quality of travel and logistics services, and enable digital dividends to benefit people/users. The role of the market, scientific contributions and a strong 'digital' transportation industry ecosystem – featuring cross-border integration, co-creation and sharing – are important as well. The principle is also to promote and adhere to a global vision with international standards and Chinese characteristics, to adopt an open and inclusive attitude, adapt to technology developments, use pilot projects, and pool resources such as technology, intelligence, and industry.

3. **Development goals** – By 2025, new steps will be taken in the digital upgrade of transportation infrastructure and equipment. The basis for a digital collection system and networked transmission system will be formed. Transportation is expected to become the main civil industry for BeiDou Navigation Satellite System (BDS). Public networks such as 5G mobile communications and next-generation satellite communications systems will be initially applied in the industry. Also within the same timeframe, transportation is likely to be deeply integrated with the automotive, electronics, software, communications, and internet services industries, and the application level of new business forms and new technologies remains world-leading. By 2035, all-element and full-cycle digitalisation of transportation infrastructure will be completed, a traffic control network that integrates the world will be in place. On-demand, real-time travel services will be widely used.

4. **Main tasks** – The key work includes cultivating and nurturing an industrial ecosystem, building robust systems for digital collection, networked transmission and intelligent applications. These will all improve the network and data security systems, the application of standards, and provide support and assurances for the whole system.

5.4.3   Guidance of the Ministry of Transport on Promoting the Development and Application of Road Traffic Autonomous Driving Technology

With key technology R&D as the support, application demonstration in typical scenarios as the guide, policies and standards as the guarantee, the aim of this Guidance is to encourage innovation and diversified development. It calls for a piloting first approach to ensuring safety and accelerating the development and application of autonomous driving technologies on China's roads, and it demands comprehensive modernisation of transportation in the country. The Guidance seeks to better meet the diverse and high-quality travel needs of people, and provide support for accelerating the construction of the so-called "powerful transportation country".

1. **Development goals** – By 2025, the goal is to make positive progress in researching basic theories for autonomous driving, and to make major R&D breakthroughs and tests verifying key technologies such as intelligent road infrastructure and C-V2X. The Guidance also requires the introduction of a number of basic but important standards for autonomous driving. This calls for a number of national autonomous driving test bases and pilot application demonstration projects, implementing large-scale applications in some scenarios, and promoting the industrialisation of autonomous driving technologies.

2. **Main tasks** – The main tasks in the Guidance document include strengthening R&D for autonomous driving technology, improving the intelligence of road infrastructure, promoting pilot and demonstration applications for autonomous driving technologies, and lastly, improving the support system that adapts to autonomous driving.

5.4.4   Guiding Opinions of the MOT on Promoting the Construction of New Infrastructure in the Field of Transportation

1. **Guiding ideology** – With digitalisation, networking and intelligence as the main line, the aim of these Guiding Opinions is to promote digital transformation and the upgrade of transportation infrastructure so that it is intelligent,

convenient and smooth, cost-effective, green, and reliable.

2. **Basic principles** – The principle is to strengthen the role of government in overall planning, coordination, support and guidance, and create a sound environment for development, while enterprises stimulate the market, promote close collaboration between upstream and downstream actors in the industrial chain, and deliver more and better services. The principle is to strengthen industry collaboration, systematic links between ministries and provinces, as well as regional coordination, to boost integrity and synergy and form a "joint force for development". This also leverages the scale advantages of transportation infrastructure, and facilitates the development of advanced technology and equipment.

3. **Development goals** – By 2035, the construction of new infrastructure in the field of transportation are expected to achieve significant results. Advanced information technologies would enable transportation infrastructure and improve vehicle capabilities (i.e. precise perception and analysis, detailed management and better service). These technologies are a powerful support for accelerating the construction of a "transportation powerhouse". The goal calls for greater efficiency, reduced energy consumption, smarter infrastructure construction and operation. Ubiquitous sensing facilities, advanced transmission networks, and BDS navigation/information services will become integral to the transportation industry. Smart trains, autonomous vehicles, and smart ships will be gradually introduced. Scientific and technological innovation will be significantly improved, and the application of forward-looking technologies are expected to rank among the world's pioneers.

4. **Main tasks** – The document's main tasks include building and integrating an efficient, intelligent transportation infrastructure comprising smart highways, railways, seaways, harbours, airways and postal systems. It calls for the application of new energy and new materials across industry, and facilitates information infrastructure construction from collaborative applications of 5G, BDS and remote-sensing satellite industry applications.

5.5 Led by the MPS

On 27 July 2021, MIIT, MPS and MOT jointly issued the *Management Specification for Road Test and Demonstration Application of Intelligent Connected Vehicles (Trial)*, which aims to accelerate the development of manufacturing and technology, build a strong network and transportation system, promote the application of intelligent and networked technologies and industrial development, and standardise road testing and demonstration applications for intelligent and connected vehicles in China.

The Specification mainly includes seven chapters: General Provisions, Road Test and Demonstration Application Subjects, Drivers and Vehicles, Road Test Application, Demonstration Application, Road Test and Demonstration Application Management, Traffic Violation and Accident Handling and Supplementary Provisions. Key points and changes identified in the document include:

1. **Further improvement of road test specifications** – After three years of development and improvement, compared with the *2018 Intelligent Connected Vehicle Road Test Management Specification (Trial)*, the *Management Specification for Road Test and Demonstration Application of Intelligent Connected Vehicles (Trial)* has more detailed classification and description.

2. **Demonstration application specifications are proposed for the first time** – Compared with 2018, this *Management Specification (2021)* adds regulations on the management specifications for demonstrations of intelligent networked vehicles.

3. **The technical route is clear and instructive, and the operability is stronger** – The Specification incorporates demonstration applications into the management scope according to the latest industry developments so the testing scope and content of intelligent networked vehicles are more complete; the scope of testing vehicles adds special operation vehicles. In order to meet the needs of unmanned sweepers, etc., the test and demonstration subjects have increased the "guarantee capability requirements" of network security, data security, etc., which are more practical.

5.6 Led by the MNR

With the development of the autonomous driving and intelligent connected vehicles, China has issued many industrial policies related to intelligent connected vehicles and smart travel, focusing on supporting the industrial upgrade of autonomous driving maps and establishing and improving road traffic geographic information covering the national road network.

The *Outline of National Comprehensive Three-Dimensional Transportation Network Planning* issued by the State Council shows that the development of high-precision maps is highly valued and supported at the national level. High-precision geographic data for roads is an important part of intelligent connected vehicles, which is a new product coming

out of the surveying and geographic mapping sector. With the increasing scale of enterprises participating in the research of intelligent connected vehicles, demand for high-precision and semantically rich road data is urgent, and a unified standard is needed to guide and standardise data collection, production and application.

In 2016, the *Notice on Strengthening the Management of Autonomous Driving Map Production, Testing and Application* was issued by MNR in order to safeguard national security and interests, promote the wide application and healthy development of new geographical information products including autonomous driving maps. The main significance of this Notice is as follows:

1. Autonomous driving maps are a new but important part of navigation systems whose data collection, editing, processing and production must be undertaken by specialist units.

2. Zones for road tests and application sections or areas for testing advanced intelligent connected vehicles should be defined by the local government within its jurisdiction. Map data used by units and enterprises for autonomous driving technology tests and road tests (including the addition of content, elements or accuracy improvements to traditional electronic navigation maps) must be managed according to the results of confidential surveying and mapping. Necessary measures must be taken to ensure data security. Providing or sharing map data to any foreign organisations/individuals, wholly foreign-owned and Sino-foreign joint ventures and cooperative enterprises registered in China is forbidden without the permission of the administrative department of surveying and mapping geographic information at or above the provincial level. Unauthorised personnel (outside the scope of relevant technical or road tests) are not allowed to access map data.

3. The National Bureau of Surveying and Mapping Geographic Information is speeding up the study and formulation of policies on technology for confidential treatment and public use of autonomous driving maps. In carrying out surveying and mapping activities related to autonomous driving, all units should strengthen contact and communication with the administrative departments of surveying and mapping geographic information, and report relevant problems in a timely fashion, thus promoting the standard application and healthy development of autonomous driving maps.

6. Summary and proposal

China's industrial policy is actively promoting 5G and C-V2X, which is a sign of the country's will to make C-V2X a technology choice for V2X. The State Council has released its *Outline of Building a Powerful Transportation Country* and *Outline of National Comprehensive Three-Dimensional Transportation Network Planning* in order to build a so-called "powerful transportation country". MIIT, MOT, NDRC, MPS, and MNR jointly formulate relevant standards, systems and policies including the *National V2X Industry Standard System Construction Guide (Intelligent Transportation Related)*, *V2X Industry Development Action Plan*, *Innovative Development Strategy of Intelligent Vehicles* and *Platform for Action to Promote the Development of Integrated Transport Big Data (2020-2025)*, etc. The V2X special committee promotes C-V2X technology selection and network deployment. C-V2X is actually a vision of achieving a safe, efficient, green, and civilised intelligent vehicle power by 2035.