"Requirements for the Physical Model of Urban Perception Systems"

Compilation Instructions

1. Work Summary

(1) Source of the task

To implement the "Outline Development Plan for the Guangdong-Hong Kong-Macao Greater Bay Area," the "National Standardization Development Outline," and the relevant requirements of the "Action Plan for Implementing the National Standardization Development Outline," the Provincial Market Supervision Administration has vigorously promoted the construction of the "Bay Area Standards" system, incorporating this work into the "14th Five-Year Plan for Modernization of Market Regulation in Guangdong Province." The construction of smart cities is a strategic initiative to advance new urbanization, enhance urban governance, and develop the digital economy. President Xi Jinping has placed great emphasis on the development of smart cities, providing important instructions on multiple occasions. On October 9, 2016, during a collective study session of the Political Bureau, President Xi emphasized, "By promoting e-government and building new smart cities, and through data centralization and sharing, we will establish a nationally integrated national big data center, promote the integration of technology, business, and data, and achieve collaborative management and services across levels, regions, systems, departments, and businesses." On October 31, 2018, President Xi Jinping stated, "We should promote the construction of smart cities, encourage the deep application of artificial intelligence in the field of public safety, strengthen the use of AI in ecological areas, and utilize AI to improve the level of public services and social governance." On October 24, 2019, President Xi Jinping emphasized, "We should integrate blockchain technology services with the construction of new smart cities, explore the application and promotion in areas such as information infrastructure, smart transportation, and energy power, and enhance the intelligence and precision of urban management." On March 31, 2020, President Xi Jinping visited the Hangzhou City Brain Operation Command Center to observe the progress of the "Digital Hangzhou" project and remarked, "The transition from informatization to intelligence and then to wisdom is the inevitable path for building smart cities, with a broad and promising future." In 2022, the report of the 20th National Congress of the Communist Party of China stated, "Strengthen urban infrastructure construction to create livable, resilient, and smart cities." In December 2023, during his inspection in Shanghai, President Xi Jinping emphasized, "Adhere to a consistent blueprint in urban planning and implementation, and accelerate the digital transformation of cities."

On May 20, 2024, the National Development and Reform Commission, the National Data Administration, the Ministry of Finance, and the Ministry of Natural Resources jointly issued the "Guiding Opinions on Deepening Smart City Development and Promoting Comprehensive Digital Transformation of Cities" (NDRC Data [2024] No. 660). The document explicitly requires "improving urban operation management service platforms, deepening the construction of 'one network for unified management,' promoting data integration across all stages of urban planning, construction, management, and operation and maintenance, strengthening urban vital signs monitoring, and empowering urban health checks and urban renewal with data and business linkage. Relying on urban operation and governance intelligent hubs, integrating functions such as status sensing, modeling analysis, urban operation, and emergency command, aggregating areas such as public safety, planning and construction, urban management, emergency communication, traffic management, market supervision, ecological environment, and public sentiment perception, to achieve comprehensive situation awareness, intelligent trend analysis, collaborative and efficient handling, agile dispatch response, and rapid switching between normal and emergency situations." "

The urban sensing system serves as the "senses" for perceiving the state of a city and is the source of data generation. The integration of data within the urban sensing system is a prerequisite for the development of smart cities and the foundation for advancing the digital economy. By aggregating the strengths and best practices of Shenzhen, Hong Kong, and Macao in the integration of urban sensing system data, and by standardizing the technical requirements for a unified object model in urban sensing systems, this initiative holds significant practical importance for the in-depth development of smart city construction in the Guangdong-Hong Kong-Macao Greater Bay Area, especially under the strategic and collaborative development framework of the region. In line with the "Bay Area Standards" development plan, this project was proposed by Huawei Technologies Co., Ltd. and the Shenzhen Institute of Standards and Technology, and was jointly initiated in June 2024 by the Smart City Industry Ecosystem and the Shenzhen Internet of Things Industry Association.

(2) Drafting Unit and Division of Responsibilities

This standard was drafted by a working group composed of 14 institutions, including Huawei Technologies Co., Ltd., Shenzhen Standard Technology Research Institute, Chengdu Smart City Information Technology Co., Ltd., China Electronics Standardization Institute, Shenzhen National High-Tech Industry Innovation Center, Hangzhou Xujian Technology Co., Ltd., Guangzhou Xinwei Smart Security Technology Co., Ltd., Shenzhen Xingwang Xintong Technology Co., Ltd., Autel Technology Co., Ltd. (Hong Kong), Longjie Technology Co., Ltd. (Hong Kong), Digital City Industrial Ecosystem Alliance (Hong Kong), China IoT Holdings Limited (Hong Kong), Macao University of Science and Technology (Macao), and Yanhuang Group Limited (Macao). The specific division of labor for the drafting is as shown in the table below.

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| --- | --- |
| Task Division | Preparing Unit |
| Standard project initiation, standard implementation coordination, standard development implementation plan, standard outline, standard objectives and drafting principles | Huawei Technologies Co., Ltd., Shenzhen Standard Technology Research Institute |
| Technical Requirements for Content Development of Thing Models | Chengdu Smart City Information Technology Co., Ltd., China Electronics Standardization Institute, Shenzhen National High-Tech Industry Innovation Center, Hangzhou Xujian Technology Co., Ltd., Guangzhou Xinwei Smart Security Technology Co., Ltd., Shenzhen Xingwang Xintong Technology Co., Ltd., Autel Technology Co., Ltd. (Hong Kong), Longjie Technology Co., Ltd. (Hong Kong), Digital City Industrial Ecosystem Alliance (Hong Kong), China IoT Holdings Limited (Hong Kong), Macao University of Science and Technology (Macao), Yanhuang Group Limited (Macao) |

2. The necessity of standard establishment and the issues to be addressed

(1) The Necessity of Project Approval

## China's smart city construction has entered a new phase of comprehensive digital and intelligent transformation, ushering in a new chapter of system restructuring and quality improvement. In August 2014, the National Development and Reform Commission and seven other ministries jointly issued the "Guiding Opinions on Promoting the Healthy Development of Smart Cities" (NDRC High-Tech [2014] No. 1770), aiming to address issues such as the lack of top-level design and overall planning, lagging institutional innovation, and prominent network security risks in China's smart city construction at that time. This document played a crucial role in standardizing and promoting the healthy development of smart cities in China. In May 2024, the "Guiding Opinions on Deepening Smart City Development and Promoting Comprehensive Digital Transformation of Cities" (NDRC Data [2024] No. 660) was issued, marking the entry of China's smart city construction into a new stage of deepened development.

Firstly, the technological architecture is rapidly reshaping, comprehensively enhancing the support for urban digital transformation. In the new era of smart city construction, it is essential to emphasize the reconstruction of the urban digital foundation with a systematic approach, breaking through the traditional model of stacking single-point technologies. This involves a systematic layout and integrated advancement to accelerate the construction of a future-oriented urban digital foundation. This includes building a self-controlled computing power infrastructure, establishing a cross-departmental data integration system, and upgrading the creation of an AI-based integrated urban-wide perception and collaborative decision-making support capability.

Secondly, institutional innovation continues to deepen, optimizing the urban digital transformation ecosystem throughout the entire process. In the new era of smart city construction, it is essential to focus on the mutual promotion of institutional innovation and technological innovation, advancing both construction and operation in parallel. Through appropriate institutional innovations, a regulatory system compatible with digital development is established, continuously innovating the operational and maintenance models of smart cities. This optimizes the urban digital transformation ecosystem throughout the entire process, promoting process reengineering, model transformation, and method reshaping.

Thirdly, data-driven continuous enhancement empowers urban digital transformation scenarios across all domains. In the new era of smart city construction, it is essential to emphasize the integration and utilization of data throughout the entire process of urban digital transformation. This approach drives comprehensive economic and social development through data, creating an upgraded version of smart cities that balances modern urban governance with modern industrial systems. It provides rich application scenarios for industrial agglomeration and digital economic development, and establishes practical and promotional platforms for the integrated innovation and application of new digital technologies and products.

(2) Proposed Problems to Solve

With the deepening advancement of new urbanization and the construction of Digital China, urban governance is gradually transitioning towards digitalization and intelligence. The urban sensing system, as the core foundation for the digital and intelligent development of cities, is increasingly becoming a crucial bridge connecting the physical and digital worlds. The rapid development of Internet of Things (IoT) technology has led to a sharp increase in the variety and number of urban sensing devices. However, due to the lack of a unified physical model standard during the processes of data collection, transmission, and processing, these devices face issues such as inconsistent data formats, incompatible interface protocols, and significant challenges in system integration. These problems severely hinder the efficient collaboration and large-scale application of urban sensing systems. Therefore, the development of standard specifications for urban sensing systems can provide construction guidance and implementation references for the planning, design, development, and application of these systems. This approach can avoid issues such as poor interconnectivity, numerous technical routes, inconsistent performance experiences, and difficulties in continuous upgrade and maintenance during the construction process, thereby ensuring that the development of urban sensing systems is conducted in an orderly and regulated manner. It holds significant importance for guiding and promoting the standardized construction of urban sensing systems, as well as for driving the orderly, healthy, and sustainable development of industries.

3. Determination of Standard Development Principles and Main Content

(1) Principles for Standard Development

This standard is strictly prepared in accordance with the relevant provisions of GB/T 1.1-2020 "Guidelines for Standardization Part 1: Structure and Drafting Rules of Standardization Documents."

This standard serves as the specific technical basis for guiding the construction of urban sensing system object models, and it also forms the foundation for establishing quality evaluation standards, engineering standards, and application standards for related platforms. It plays a crucial foundational supporting role in the planning and construction of urban sensing systems. This standard should be consistent with relevant national standards.

Adopt a work approach that integrates theory with practice, actively carry out pilot verification of standards, solidify the construction experience of typical and effective urban sensing system object models into standards, and strengthen the application and implementation of these standards to enhance their applicability and practicality.

(2) The main content of the standard

This document establishes the overall architecture of the urban sensing system's thing model and specifies the elements and feature lists of the thing model.

This document applies to the design, development, and application of the physical model for urban sensing systems.

4. Analysis of Key Tests or Verification Situations

During the development of this standard, extensive reference was made to the practical experiences of related urban sensing system constructions, and stakeholders involved in the construction of relevant platforms were also incorporated into the development process.

During the standard development process, research, verification, and analysis of the standard content were conducted simultaneously in regions such as Nanjing and Wuhan, with timely improvements made to the standard content.

5. The standard has undergone research, discussions, solicitation of opinions, and review by experts from the three regions of Guangdong, Hong Kong, and Macao.

The drafting organization of the standard was led by the Shenzhen Institute of Standardization and Technology. After establishing the task of formulating this standard, the drafting team developed a detailed project implementation plan, clearly defining the tasks, objectives, output products, and timeline requirements for each phase. The drafting team conducted meticulous data collection, research, and standard writing. The draft standard underwent multiple rounds of discussions and revisions for improvement. Throughout the stages of research, drafting, discussion, solicitation of opinions, and technical review, experts from the three regions were organized to discuss and confirm the content of the standard, standard modifications, and the handling of opinions, reaching a consensus.

(1) Preliminary Research and Call for Participation in Drafting Standards

The standardization team initiated the research and refinement of the draft standard from June to July 2024, clarifying the standard framework for "Requirements for Urban Perception System Object Models" as well as the objectives and key points for each section. Additionally, the team solicited participating units for the standard within the smart city industry ecosystem and the digital city industry ecosystem alliance.

(2) Standard Development Kick-off Meeting and First Workshop

The standard development team held an inaugural meeting and the first discussion session via an online conference on October 21, 2024. The meeting was chaired by the Secretariat, during which the team engaged in in-depth discussions on the framework, content, subsequent work plans, and task assignments for the "Requirements for Urban Perception System Object Models."

(3) The second standard seminar was held.

According to the project schedule, the standard development team held the second discussion meeting via an online conference on November 13, 2024. The team conducted an in-depth discussion on the technical details of the "Requirements for the Physical Model of Urban Perception Systems." Subsequently, the lead unit revised the content to form a draft for comments.

(4) Drafting the Standard for Public Comment

From February 24, 2025, to April 14, 2025, the Smart City Industry Ecosystem, Digital City Industry Ecosystem Alliance, and Shenzhen Internet of Things Industry Association respectively solicited public opinions through their WeChat official accounts, association websites, and the National Group Standard Information Platform. A total of 0 opinions were received.

7. The process and basis for handling significant divergent opinions

During the process of soliciting opinions, no significant divergences were encountered. The drafting team conducted thorough research and analysis on the differing opinions and suggestions raised by individual units and experts, and engaged in extensive communication and exchange with the contributors to reach a consensus. For certain technical details, reasonable solutions were determined through further experimental research and data analysis, ensuring that the standard content is scientific, reasonable, and feasible.

8. Standard Comparison and Analysis of Adoption Status

(1) International Standard

None

(2) National Standard

None

(3) Industry Standard

To be used in conjunction with the industry standards "General Technical Specification for Urban Perception System of Smart Cities" (Project No.: 2023-0568T-SJ) and "Operating System Specification for Terminal Devices of Urban Perception System in Smart Cities" (Project No.: 2023-0567T-SJ).

(4) Other provinces' equivalent standards

After research, it has been found that other provinces currently do not have specific standards for the construction of the physical model of the smart city perception system. The formulation of this standard fills a gap in this field. It combines the characteristics of the Guangdong-Hong Kong-Macao Greater Bay Area in its technical content, providing a comprehensive, systematic, and locally distinctive technical specification for the construction project of the physical model of the smart city perception system. This standard also offers certain reference value for lightning protection work in similar projects in other regions.

(5) Adoption of Standards

In the process of formulating this standard, advanced technologies and concepts from relevant domestic and international standards were fully referenced. However, the standard does not directly adopt or cite international or foreign standards. Instead, based on the actual conditions of the physical model construction of the smart city perception system in the Guangdong-Hong Kong-Macao Greater Bay Area, independent innovation and optimization were carried out to ensure that the content of the standard meets local practical needs, thereby enhancing its relevance and applicability.

9. The situation involving patents in the standards

The standard does not address patents.

10. Expected Economic Benefits

In terms of promotion and application, several typical cities and regions will be selected for demonstration and market promotion. Firstly, a number of cities will be chosen to establish demonstration projects based on urban sensing business scenarios by constructing urban sensing system platforms, thereby validating the implementation of this standard. Secondly, the standard will be promoted in different types of cities to facilitate its application across various urban scenarios, achieving multi-departmental business collaboration and integrated scheduling and coordination in urban sensing.

11. Other matters that should be explained

None.

"Construction Requirements for Multi-Level Linked Command Platforms in Smart Cities"

Standard Writing Group

June 2025