ITS Standardization Activities in Japan

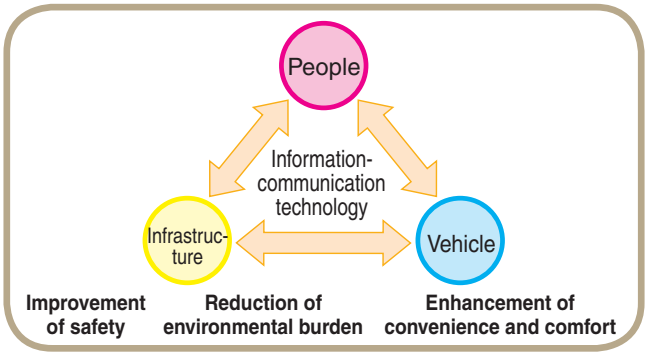
2018

Standardization of ITS

What is ITS?

ITS (Intelligent Transport Systems) is designed to rapidly improve road traffic safety, transport efficiency and comfort and to significantly contribute to energy and environmental conservation through traffic flow facilitation, such as elimination of traffic jam, by using communication technologies to link between people, infrastructure and vehicles.

Due to its wide variety of related technologies and its ability to drastically change social and economic structures, ITS has the potential to create new industries and markets.



Importance of participating in international standardization programs

The WTO (World Trade Organization)'s TBT Agreement (Agreement on Technical Barriers to Trade) aims to eliminate unnecessary trade barriers by aligning various standards with international standards.

The GPA (Agreement on Government Procurement), an appendix of the TBT Agreement, requires countries party to the agreement to define a technical specification based on the applicable international standard (if one exists) when they carry out government procurement that exceeds a certain size. Even for international procurement, in addition to traditional evaluation indexes, including technological advantages, cost (cost performance), and international prevalence, it is increasingly required that the technology applied complies with an international standard in areas where global standards exist. Thus, to improve Japan's global competitive strength in the industrial field, it is essential for Japan to actively participate in international standardization programs and to position Japan's superior technologies as open and global standards in accordance with global trends.

Especially from the standpoint of ensuring user convenience, it is important to reduce costs while promoting international standardization of its various basic technologies without sacrificing the interoperability and expandability of the systems and, at the same time, smoothly enabling the social changes that will be fostered by ITS. In addition, more companies are expanding overseas as domestic markets shrink due to the aging population and low birthrate or are collaborating with foreign companies for development and application of advanced technologies. Under such circumstances, businesses are more likely internationalized or diversified across industries, so Japanese companies need to develop technologies accepted worldwide while completing or collaborating with foreign companies to maintain their presence.

Landscape of standardization of ITS (related standardization bodies)

ITS supports the movement of people and goods on a variety of levels.

The core technologies of ITS are information and telecommunication technologies.

As shown in the next page, ITS international standardization is carried out by ISO, IEC, JTC and ITU. The TC 204 committee specializes in ITS standardization activities.

Under study at TC 204 are standardization proposals for (1) systems architecture, (2) interfaces (message sets, etc.), (3) frameworks (data dictionaries and message templates), (4) system performance requirements, and (5) test methods. This booklet describes the present state of ITS standardization, with a focus on TC 204 programs.

Reference

What is standardization?

Standardization consists of programs to minimize, simplify, and rationalize things, whenever possible, which, if left alone, would become divergent, complex, or chaotic.

The original aim of standardization in the industrial field is to secure the compatibility of products and provide an environment where customers willing to buy products are not confined to purchasing things from a specific supplier.

What are standards?

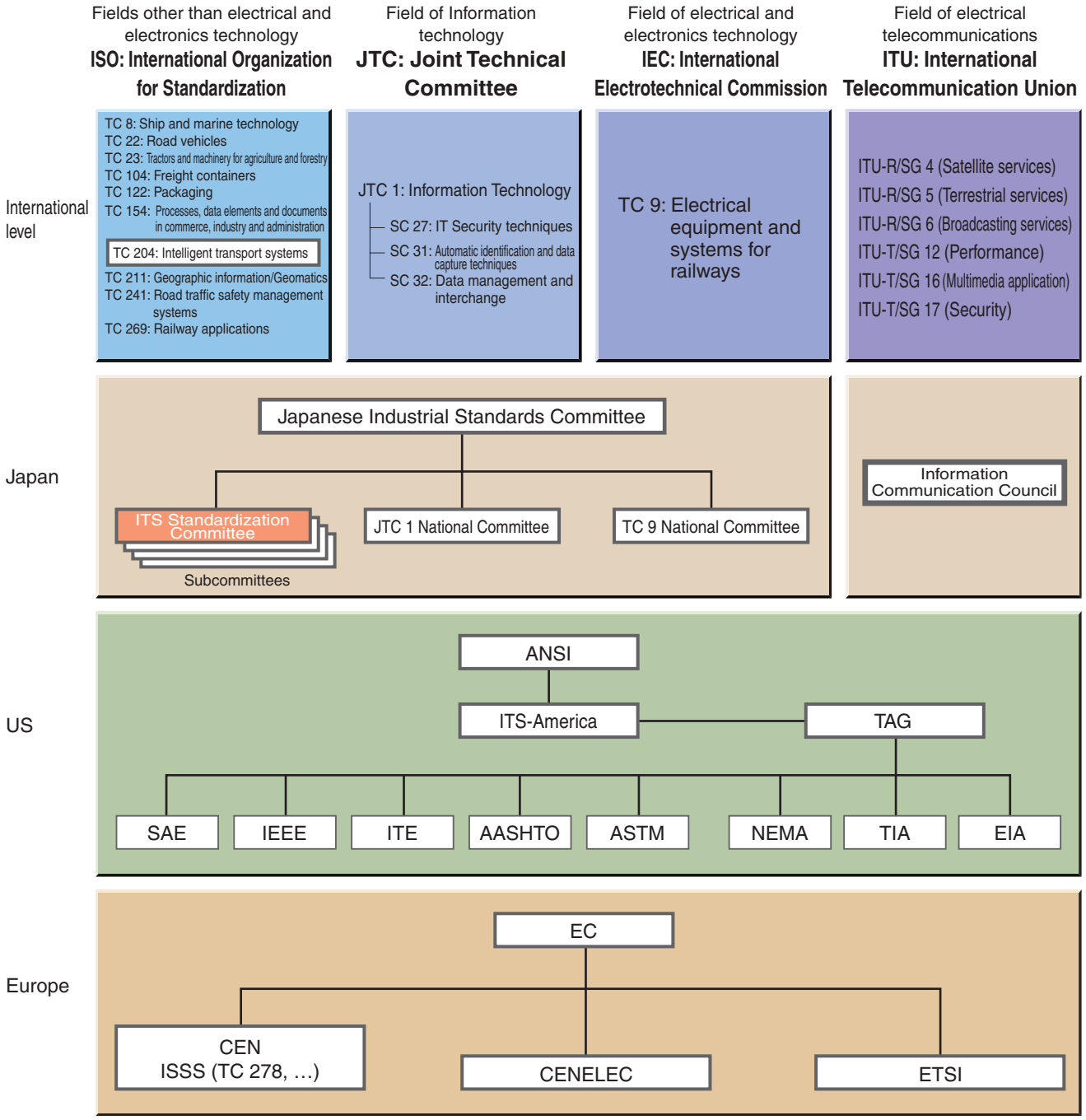
Written rules defined by standardization are generally referred to as "standards."

Typically, a standard has no binding power as would a legal requirement, which means that standards are optional. In ordinary transactions the standard on which parties concerned rely should be defined based on an agreement among them. In fact, government agencies often mandate compliance with specific standards (mandatory standards) for the purpose of public benefit, such as for maintaining compatibility, preventing mutual intervention, or protecting consumers.

Key roles of standardization:

- Securing the compatibility of products. Assurance of interface
- Improvement of production efficiency
- Assurance of quality
- Accurate communication, promotion of mutual understanding
- Prevalence of technologies from research and development
- Assurance of safety and security
- Reduction of environmental burden
- Enhancement of industrial competitive strength, preparation of competitive environment
- Promotion of trade, and more

Relationship between ITS standardization organizations



AASHTO : American Association of State Highway and Transportation Officials
ANSI : American National Standards Institute
ASTM : American Society for Testing and Materials
CEN : European Committee for Standardization
CENELEC : European Committee for Electrotechnical Standardization
EC : European Commission
EIA : Electronic Industries Alliance
ETSI : European Telecommunications Standards Institute
IEC : International Electrotechnical Commission
IEEE : Institute of Electrical and Electronics Engineers
ISO : International Organization for Standardization
ISSS : Information Society Standardization System
ITE : Institute of Transportation Engineers
ITU-R : International Telecommunication Union-Radio Communication Sector
JISC : Japanese Industrial Standards Committee
JTC : Joint Technical Committee
NEMA : National Electrical Manufacturers' Association
SAE : Society of Automotive Engineers
SC : Sub Committee
SG : Sub Group
TAG : Technical Advisory Group
TC : Technical Committee
TIA : Telecommunications Industry Association

Framework for Standardization

TC 204 Activities (International)

TC 204, the technical committee for ITS standardization within the ISO was established in 1992, and held its first meeting the following year. Subcommittees (SCs) are oftenly placed under technical committees (TCs), but within TC 204, Working groups (WGs) are placed under the direct jurisdiction of the TC. Some working groups have been suspended or merged for over 20 years since the inception of TC 204, and there are currently 12 active working groups. Nine countries serve as lead countries for the working groups, with Japan leading two groups, and the US leading three.

As shown in the list below, TC 204 has published numerous international standards. (As of June 2018)

Deliverable	Published	Under development
International Standards	135	66
Technical Specifications	67	16
Publically Available Specifications	0	1
Technical Reports	46	19
Other (Amendments, etc.)	15	28*
Total	271	122

*Including PWI

Scope:

Standardization of information, communication and control systems in the field of urban and rural surface transportation, including intermodal and multimodal aspects thereof, traveller information, traffic management, public transport, commercial transport, emergency services and commercial services in the intelligent transport systems (ITS) field.

Excluded:

• in-vehicle transport information and control systems (ISO / TC 22).

Note:

ISO / TC 204 is responsible for the overall system aspects and infrastructure aspects of intelligent transport systems (ITS), as well as the coordination of the overall ISO work programme in this field including the schedule for standards development, taking into account the work of existing international standardization bodies.

Relationship between ITS standardization organizations

TC 204 Chairperson

Secretariat : SAE International

Internal Liaison Committees

- TC 8 (Ships and marine technology)
- TC 22 (Road Vehicles)
- TC 23 (Tractors and machinery for agriculture and forestry)
- TC 104 (Freight containers)
- TC 122 (Packaging)
- TC 154 (Processes, data elements and documents in commerce, industry and administration)
- TC 211 (Geographic information/Geomatics)
- TC 241 (Road traffic safety management systems)
- TC 269 (Railway applications)
- TC 286 (Collaborative business relationship management - Framework)
- JTC 1 (Information Technology)

Liaison Organizations

- APEC (Asia Pacific Economic Cooperation)
- ETSI (European Telecommunication Standards Institute)
- ICAO (International Civil Aviation Organization)
- IEEE (Institute of Electrical and Electronic Engineers)
- ISOC (Internet Association)
- ITU (International Telecommunication Union)
- OGC (International Geographical Union)
- TISA (Travelers Information Services Association)
- UNECE (United Nations Economic Commission for Europe)

Working Group	Convenor
WG 1 : Architecture	USA
WG 3 : ITS database technology	Japan
WG 4 : Automatic vehicle and equipment identification	Norway
WG 5 : Fee and toll collection	Sweden
WG 7 : General fleet management and commercial/freight	Canada
WG 8 : Public transport/emergency	USA
WG 9 : Integrated transport information, management and control	Australia
WG 10: Traveller information systems	UK
WG 14: Vehicle/roadway warning and control systems	Japan
WG 16: Communications	USA
WG 17: Nomadic Devices in ITS Systems	Korea
WG 18: Cooperative systems	Germany

Participating members (28 countries): Contribute to the meetings, participate actively in the work, and have the obligation to vote.

Australia, Austria, Belarus, Belgium, Canada, China, Cyprus, Czech Republic, France, Ethiopia, Germany, Hungary, India, Islamic Republic of Iran, Israel, Italy, Japan, Republic of Korea, Malaysia, Netherlands, New Zealand, Norway, South Africa, Spain, Sweden, Switzerland, Macedonia, United Kingdom, United States of America

Observing members (29 countries): Follow the work as observers with the right to submit comments and attend the meetings.

Algeria, Bulgaria, Chile, Colombia, Congo, Croatia, Cuba, Denmark, Egypt, Finland, Greece, Hong Kong China, Indonesia, Ireland, Israel, Mexico, Mongolia, Montenegro, Pakistan, Philippines, Poland, Romania, Russian Federation, Serbia, Singapore, Slovakia, Sri Lanka, Thailand, Turkey

Reference: Progress of mobility-related standardization

In Europe, the standardization of Urban ITS has been significantly progressed since around 2015 as an ITS tool to solve transport issues in urban areas, particularly issues about multi-modal transport, transport management and urban freight transport. In February 2016, the EC released the commission implementing decision M/546 on a standardization request to the European standardization organizations as regards ITS in urban areas. As a result, the first meeting of WG 17, a new WG responsible for Urban ITS standardization, was held at CEN/TC 278 in November the same year.

Following this trend, TC 204 established an ad hoc group for cross-cutting discussion about intelligent mobility topics at the October 2015 Potsdam meeting, and it has also discussed establishment of a new WG, mirrored CEN/TC 278/WG 17.

At the April 2018 Seoul meeting, activities conducted by the ad hoc group were summarized, and establishment of a new advisory group was proposed to replace the ad hoc group for further discussion of the standardization activities. The new advisory group will be launched at the spring 2019 TC 204 meeting after discussion over the scope (standardization target) and its name.

ITS Standardization Committee of Japan

The ISO (and IEC) allows participation of only one member organization per country. Based on the approval of the Cabinet Office, Japan is represented by the Japanese Industrial Standards Committee (JISC). Within Japan, the ITS Standardization Committee (National Committee), set up under the auspices of the Society of Automotive Engineers of Japan (JSAE), carries out TC 204 international standardization activities on behalf of the Japanese Industrial Standards Committee (JISC). The main tasks of the Committee are to (1) act swiftly in response to changes in the standardization environment, (2) carry out standardization projects in accordance with the established strategy, (3) provide assistance with national standardization (JIS), and (4) provide related parties with up-to-date information. The Committee identified the standardization trends within and outside Japan and drew up the Five-year Plan for Strategic International Standardization 2018, which organizes strategies and action plans for each working group.

To share information on ITS communications, the Committee also liaises with the ITS Info-Communications Forum, administered by the Association of Radio Industries and Businesses (ARIB) and the TTC Standardization Committee, administered by the Telecommunication Technology Committee (TTC).

ITS Standardization Committee Organization

ITS Standardization Committee

- Planning strategies for ITS standardization
- Discussion on drafts
- Comprising 30 members, including manufacturers, consumers and neutral parties

Secretariat: Society of Automotive Engineers of Japan

Technical committee

- Confirmation of progress in work by subcommittees
- Information exchange
- Comprising some 30 members, including WG representatives, liaison persons and experts

Liaison

ITS Info-Communications Forum
Secretariat: Association of Radio Industries and Businesses

TTC Standardization Committee
Secretariat: The Telecommunication Technology Committee

Subcommittees	Secretariat
• Discussion on standardization drafts · Responses to international working groups	
Architecture (WG 1)	JARI (Japan Automobile Research Institute)
ITS Database Technology (WG 3)	DRM (Japan Digital Road Map Association)
Automatic Vehicle and Equipment Identification (WG 4)	UTMS (Universal Traffic Management Society of Japan)
Fee and Toll Collection (WG 5)	HIDO (Highway Industry Development Organization)
General Fleet Management and Commercial/ Freight (WG 7)	HIDO (Highway Industry Development Organization)
Public Transport/Emergency (WG 8)	JICE (Japan Institute of Constructions Engineering)
Integrated Transport Information, Management and Control (WG 9)	UTMS (Universal Traffic Management Society of Japan)
Traveler Information Systems (WG 10)	UTMS (Universal Traffic Management Society of Japan)
Vehicle/ Roadway Warning and Control Systems (WG 14)	JSAE (Society of Automotive Engineers of Japan)
Communications (WG 16)	JEITA (Japan Electronics and Information Technology Industries Association)
Nomadic Devices in ITS Systems (WG 17)	JEITA (Japan Electronics and Information Technology Industries Association)
Cooperative ITS (WG 18)	HIDO (Highway Industry Development Organization)

Standardization in Relation to V2X Communication Security

Use of ITS Communications in Safety Driving Assistance and Automated Driving

General safety driving assistance systems, as well as the automated driving technology for which research and development is currently ongoing, are driving systems that use sensors such as radars and cameras mounted on automobiles to detect the conditions around a car. For that reason, the detectable range is restricted to target objects that fall within the scope of visibility. In view of that, cooperative systems aim to improve safety by using ITS communications to enable the exchange of information between vehicles that are in motion, and between vehicles and roadside unit. Obtaining information that falls outside the scope of visibility not only provides safety driving assistance by preventing collisions at intersections and protecting vulnerable road users (such as pedestrians, cyclists, and users of mobility scooters) but also makes it possible to share a wide range of information including traffic congestion, road conditions, and traffic signal conditions.

On the other hand, as cooperative systems make use of various information through the medium of ITS communications, the reliability of that information as well as security and privacy protection are of great importance. In particular, as automated driving vehicles use ITS communications to handle information related to the driving controls of the vehicle, these elements take on even greater importance. A specific example is the emergence of cases of attacks targeting the vulnerabilities of automated driving vehicles since 2010, which has even led to recalls of such vehicles in 2015 due to the discovery of vulnerabilities that enable external parties to control the vehicles.

In cases where information is communicated via ITS communications, it is necessary to standardize not only the communication frequency and means of communication (such as DSRC and mobile telephone networks) but also the communication protocol and messages.

Furthermore, there is also a pressing need to standardize security in relation to ITS communications.

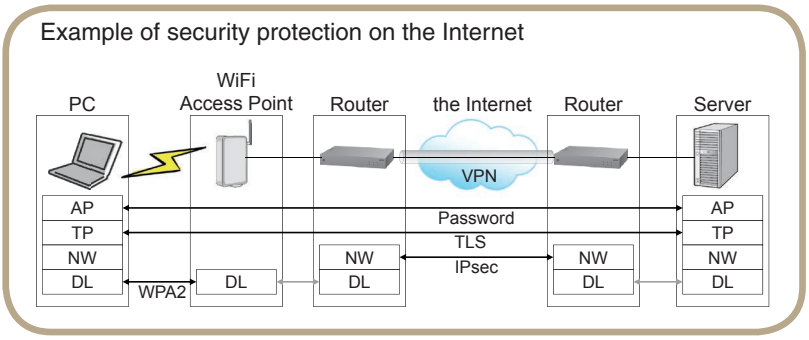
Security in Relation to ITS Communications

(1) What is Security?

In this context, security includes confidentiality (the disclosure of information only to entities that have been authorized), authentication (verification of whether or not these entities have been registered), authorization (verification of whether or not the authenticated entities have the rights to obtain the information in question), and integrity (information is accurate and has not been tampered with). There is also a need to consider privacy protection to ensure that there are no linkages with information that enables the identification of individuals.

(2) Security on the Internet

On the Internet, security is protected at each layer of the network. For example, in the example of security protection on the Internet presented below, the data link (DL) layer between a computer and a wireless LAN access point is encrypted with WPA2, while in the case of connections to LAN between bases, IPsec is used at the network (NW) layer in each router to prevent external parties from tapping in on the communications. Furthermore, TLS is enabled at the higher order level of the transport (TP) layer between a computer and a server to ensure the confidentiality of communications between computers, and a password is used to authenticate users between applications (AP).



(3) Security in ITS Communication Applications

There are different security requirements for the respective applications that make use of ITS communications. For example, in the case of cooperative awareness, as exemplified by collision prevention at intersections and the approach of emergency vehicles, it is not generally necessary to ensure the confidentiality of the information that is broadcasted. Rather, it is necessary to carry out authentication in order to clarify the source of the information, and to verify integrity in order to ensure that the information has not been tampered with. In addition, in order to protect the privacy of the information source, it is crucial to have in place a mechanism that prevents linkages with information that enables the identification of individuals, and further, to ensure that the system has low latency. On the other hand, for applications that incur charges, it is necessary to authenticate and authorize users in addition to ensuring confidentiality and integrity. In the case of ITS communications, the computers that are used for in-vehicle devices often have poorer calculation capabilities as compared to personal computers or other computing devices, and network bandwidth is also limited. Hence, latency conditions often tend to be more severe, thereby creating an environment that makes it difficult to ensure robust and tight security in comparison with general networks. Careful consideration is, therefore, necessary.

Efforts Related to the Standardization of ITS Communication Security

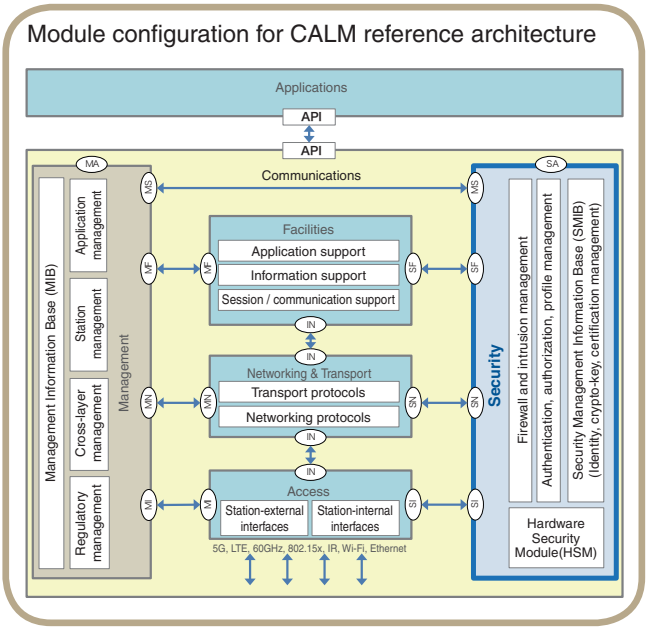
(1) ISO/TC 204 (WG 16)

- ISO 21217

In ISO 21217, which is a standard established under ISO/TC 204/WG 16, security functions are defined within the protocol stack as shown in the figure on the next page, as CALM reference architecture in ITS communications. It prescribes access via service access points for the access layer, network and transport layer, and facility layer respectively. It defines firewalls, intrusion detection, authentication and authorization management, security management information base (SMIB) for networks, management of encryption keys, and hardware security modules (HSM) as security functions. This standard ultimately presents only the positioning of modules as reference architecture, and does not provide any details about security functions or other details.

- ISO 16461

This standard was published in 2018 under TC 204/WG 16. It sets out the evaluation criteria for the privacy of probe data.



(2) ISO/TC 204 (WG 18)

TC 204/WG 18 presents the following three security-related proposals from Europe, but the draft is currently still being developed. Details are provided under "Secure Connections Between In-vehicle ITS Communication Station and Vehicle Information Systems" on page 42.

- TS 21177

  A standard that covers systems that swiftly authenticate and establish secure communications between ITS stations.

- TS 21184

  Preparation of a data dictionary for messages of in-vehicle information systems, including sensor information and control networks.

- TS 21185

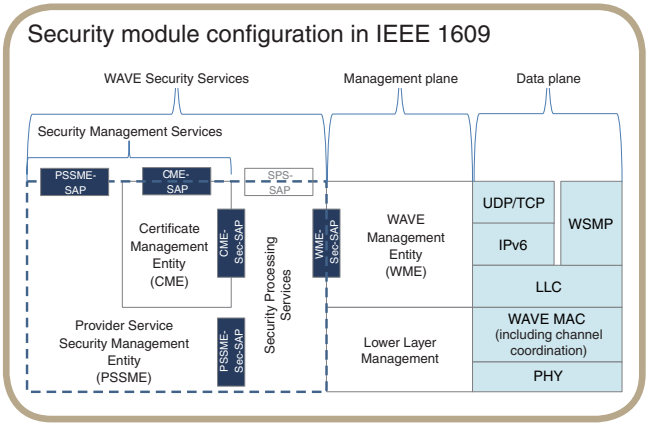
  A standard for profiles related to communications at lower layers, aimed at ensuring secure communications between ITS stations and vehicles.

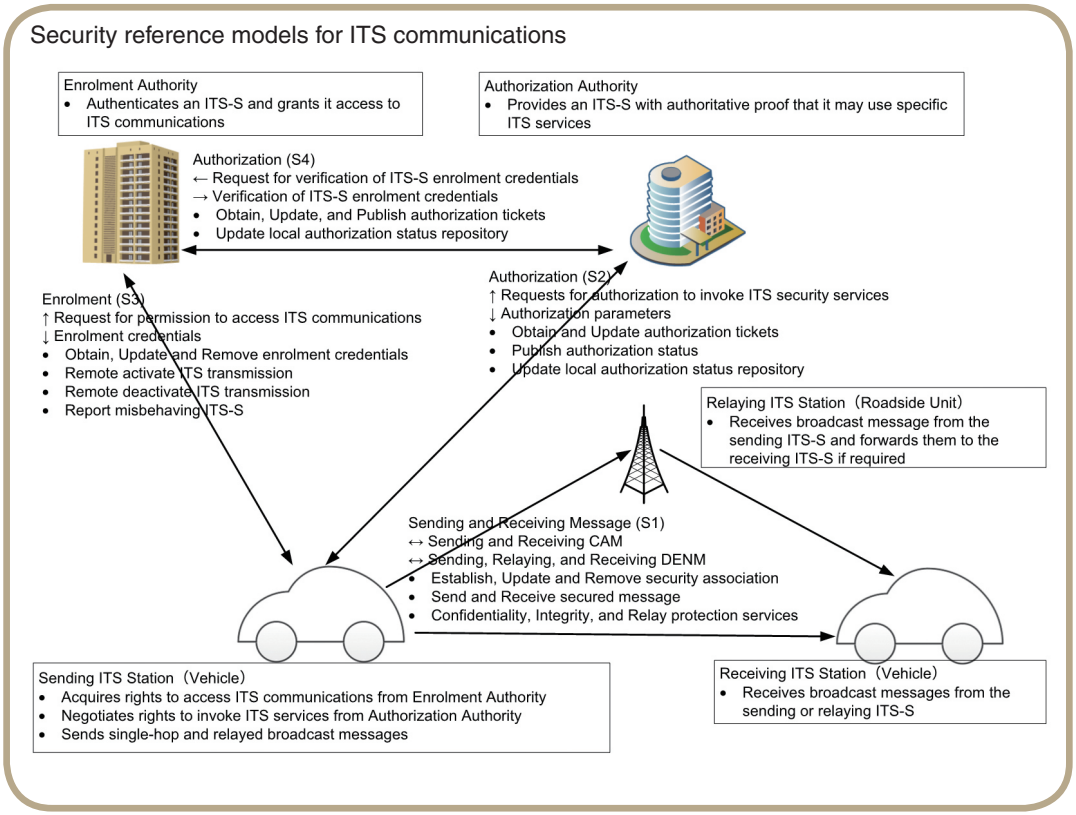
(3) ETSI (TS 102 940 - 943)

The European Telecommunications Standards Institute (ETSI) has established multiple specifications for ITS security. Specifically, TS 102 940 sets out the positioning of security in network modules, TS 102 941 covers node registration and authentication procedures, TS 102 942 covers access control, and TS 102 943 covers confidentiality services. As shown in the "Security reference models for ITS communications" on the right, these standards set out the respective roles of security reference models in the security of ITS communications, as well as the security reference models related to reference points for vehicles, roadside units, enrolment authorities, and authorization authorities. In addition, they also cover aspects such as the management of encryption keys, security life-cycles (during production, during registration, during authentication, and during maintenance), security associations that ensure safe communication paths, and the roles of each layer in the protocol stack.

(4) IEEE (1609.2)

The Institute of Electrical and Electronics Engineers (IEEE) in the United States has established IEEE 1609.2, which prescribes standards for security services for applications and administrative messages. This standard is the second part of IEEE 1609, a series of standardization specifications related to network functions as well as the architecture of V2V (vehicle-to-vehicle) and R2V (road-to-vehicle) communications that primarily make use of DSRC (WAVE: Wireless Access in Vehicular Environments). It sets out the process flow for realizing security services, the procedures for data exchange, specific data structures, and the values for the respective data elements. It is characterized by the use of PKI for communicating with an unspecified and large number of vehicles, and the use of a certificate format that is based on the premise of narrowband communications.



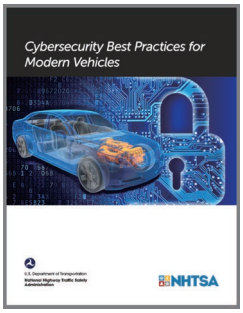


(5) SAE (J3061)

The Society of Automotive Engineers (SAE) in the United States regulates the security development processes for automobiles based on the provisions for functional safety set out in ISO 26262. The SAE regulations are process regulations that incorporate security measures during the development of individual vehicles. Specifically, they call for vulnerability analysis and vulnerability tests during the development of hardware and software, and set out provisions for such procedures. However, they do not cover the details for the relevant methods.

(6) NHTSA (DOT HS 812 333)

The National Highway Traffic Safety Administration (NHTSA) of the United States publishes the Cybersecurity Best Practices for Modern Vehicles. This set of guidelines requires not only automotive manufacturers and suppliers but also software development companies to engage in vehicle development that takes cybersecurity into consideration, share information on threats, conduct risk assessments, and restrict access to vehicular information and networks.



Cybersecurity Best Practices for Modern Vehicles

Source: https://www.nhtsa.gov/staticfiles/nvs/pdf/812333_CybersecurityForModernVehicles.pdf

(7) EU-US Task Force (HTG1-1)

The EU-US Task Force (HTG1-1) for cooperative systems has established a task group (HTG) for the harmonization of the respective standardization specifications, and is engaged in the analysis of security interoperability. Based on the premise of using IEEE 802.11p as a means of communication, and based on the assumption that notifications of potential risk situations through Europe's Cooperative Awareness Messages (CAM) and the United States' Basic Safety Message (BSM) serve as an application, it reviews the need for confidentiality, integrity, authentication, authorization, and privacy protection in the situations of broadcasting from vehicles, broadcasting from roadside unit, and unicasting between roads and vehicles. Here, applications are not included within the scope, and the interoperability of protocol stack implementation is not taken into consideration.

(8) ITU-T (SG 17)

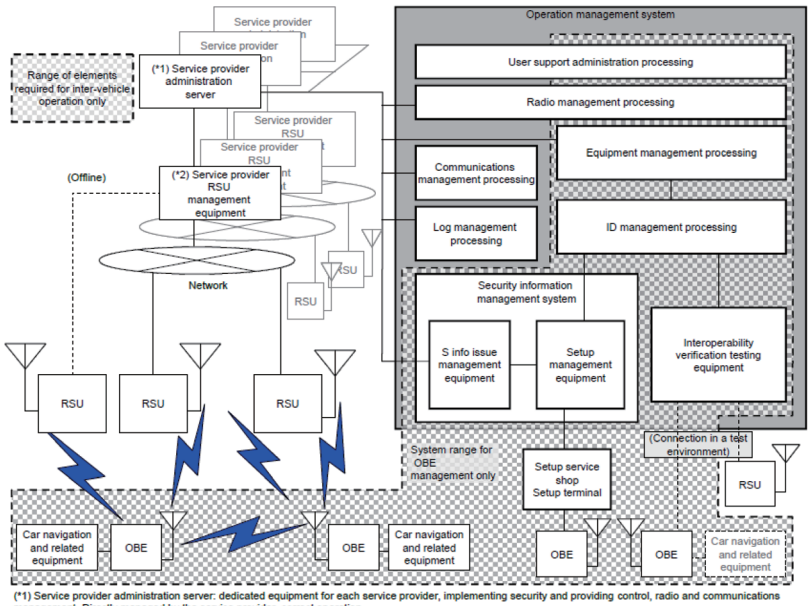
Study Group 17 (Security) of the ITU-T is working on establishing standards with a focus on secure ITS. With regard to secure software updates for ITS communication devices at the application layer, Recommendation ITU-TX.1373 sets out the general specifications for the basic model for software updates, threat/risk analysis, definitions for security requirements, software update controls, and data format for update modules. The Study Group is currently preparing security guidelines for V2X communications. There are also plans to publish security guidelines and recommendations that reflect the outcomes of efforts to establish standards under WP 29/TFCS, which have been carried out in tandem with standardization activities. ITU-T/SG 17 submitted a liaison request to WG 18 at the ISO/TC 204 meeting held in 2017, with the aim of developing standards jointly.

(9) ITS Forum (RC-009)

In Japan, the ITS Info-communications Forum (ITS Forum) has drawn up security guidelines (RC-009) for driving assistance systems that employ V2V and R2V communications using 700MHz-band DSRC. Hypothetical services that are covered under these guidelines include collision prevention during left-turns (involving two-wheeled vehicles), collision prevention during right-turns (with vehicles moving straight in the opposite lane), head-on collision prevention (such as at intersections with poor visibility), rear impact collision prevention (with the vehicle in front at a sharp bend), provision of information on emergency vehicles, prevention of overlooking pedestrians crossing the road, prevention of overlooking traffic signals, and prevention of overlooking regulations for vehicles to come to a temporary stop.

The figure at the bottom of the page shows the system configuration for the realization of specific services through DSRC based on the premises of these guidelines. It is based on the assumption that operation is carried out through the respective units of the operations management organiza-

System configuration based on the premises of RC-009



(*1) Service provider administration server: dedicated equipment for each service provider, implementing security and providing control, radio and communications management. Directly managed by the service provider. correct operation
(*2) Service provider RSU management equipment: Equipment owned by service provider and used for control of RSUs.

Source: http://www.soumu.go.jp/main_content/000288895.pdf

tion that are linked to the roadside units owned respectively by multiple service providers and the management equipment and servers that manage these roadside unit, and that such infrastructural equipment is connected to the in-vehicle devices owned by users.

(10) Security of SIP Automated Driving Systems

Under the Cross-ministerial Strategic Innovation Promotion Program's Automated Driving for Universal Services (SIP-adus), the analysis and evaluation methods for attacks on vehicles, as well as the simplification of signature verification in V2X communications, were considered as themes for the security-related research and development project for FY2016. The former is primarily a review of the countermeasures and evaluation measures in the event of an attack on vehicles via networks outside of the vehicle, while the latter is primarily a review of methods for simplifying message verification with the aim of reducing the burden of processing a large volume of messages received through V2V communications. Specifically, the method involves prioritizing messages based on factors such as the position and direction of travel of the vehicle, and its distance with other vehicles, and filtering the messages based on their priority. These outcomes are scheduled to be proposed in ISO standards.

Current Situation and Future Challenges

(1) Security System Configuration

In cases where a common key cryptosystem is used in ITS communications, it is necessary for both the sender and recipient of the common key to manage the private key. If the common key is divulged, it would then become impossible to ensure security. On the other hand, in cases where a public key cryptosystem is used, there is no need to share the private key, which is needed during decryption, with other parties. While this provides a greater level of confidentiality in comparison with the common key cryptosystem, its drawback is that processing is complicated.

The public key cryptosystem is generally used in cases that call for the authentication of the sender, such as in the detection of identity theft. The public key is registered with the authentication authority, the public key certificate signed digitally by the authentication authority is received, and this certificate is then sent out. On the other hand, the recipient of the certificate verifies that the certificate is correct, then obtains the public key. In cases where only DSRC is used, communication will be carried out directly between vehicles, or between vehicles and roadside unit; however, it will be necessary to connect to an external network such as the Internet in order to communicate with the authentication authority to obtain the digital certificate. If protection from side-channel attacks (such as the analysis of compromising emanations) is taken into consideration, it would be desirable to update the key regularly.

(2) Reliability of Information

From the perspective of the reliability of information, it is important to prevent malicious tampering of the information that is sent out via ITS communications, and the sending and receiving of fraudulent information through identity theft. To that end, it is necessary to fully review and put in place countermeasures in the aforementioned security systems.

On the other hand, apart from the security perspective, there is also a need to consider the reliability of the original information that is generated. For example, there is the possibility for an authenticated user to cause traffic confusion intentionally by engaging in misbehavior, such as tampering with information with malicious intent. Even when there is no malicious intent, situations where the information becomes inaccurate or incorrect due to sensor defects or deterioration in the environment where measurements are taken resulting in significant errors are also plausible.

While the reliability of information that is delivered from the infrastructure in V2I communications can be clearly regulated to a certain degree, it is difficult to assess the reliability of information that is delivered from multiple vehicles in V2V communications. Europe is currently considering the adoption of a Collective Perception Service, which will be used to gather sensor information that is sent out by multiple vehicles and roadside unit in order to provide safety driving assistance. As of now, it is moving in the direction of assigning a level of reliability to the respective information, and having the recipients of the information assess the reliability of the information based on their own discretion.

(3) Challenges in Reviewing ITS Communication Security

Amidst the growing focus placed on the importance of ITS communications in technology related to connected cars and cooperative automated driving systems, concrete discussions on the security of such communications are lagging behind. Security technology is necessary for ensuring confidentiality in communications, preventing the tampering of information that is sent and received, and the protection of privacy. Depending on the kind of such security technology needed, the performance that is demanded of the communications that incorporate such security technology is also expected to undergo significant changes. Hence, there is an urgent need to engage in discussions on security, with an aim of practical application.

Textbooks on cryptography (such as Angou Gijutsu Nyuumon (Introduction to Cryptography) by Hiroshi Yuki, SB Creative) often raise the following points as common knowledge in relation to cryptography and security:

- Do not use secret cryptographic algorithms
- Any cryptographic algorithms will be broken at some point
- Cryptography is only one aspect of security

These points highlight the need to base discussions on the premise of suitable cases of actual application, and to bear in mind methods for updating systems toward the future when reviewing specific algorithms to that end, as well as for ITS communication systems with extremely long life-cycles.

(4) Challenges in the Standardization of ITS Communication Security

As explained above, there are differences in the security systems that are being considered by each country, as well as in the security formats. Differences in the treatment of privacy with regard to the information that is exchanged via ITS communications can sometimes influence the differences in the policies of each country.

Generally, usability declines when security functions are enhanced, and the overall cost of the systems rises due to the need for broadband communications, faster processing capabilities, and large memory capacity. While many forms of security technology have already been developed and applied to the Internet, there are many situations where such security technology is not directly compatible with the requirements of ITS communications, due to factors such as formats of use and restrictions in the processing capability of mobility terminals including vehicles.

To ensure the security of ITS communications, it is important to review the requirements that are unique to ITS communications, as well as security systems that match the circumstances of each country. In view of that, it is important to organize, from an early stage, the common points between each country and the areas that should be standardized, and to move forward on concrete reviews. On the other hand, while reviews to date have been carried out based primarily on the perspective that the wireless communication used in ITS is dedicated ITS communication, 5G (fifth generation mobile communication system) has also emerged on the scene of ITS-related standardization. Hence, there is also a need to consider the approach to security when using such cellular networks.

Reference
[1] Angou Gijutsu Nyuumon (Introduction to Cryptography), Hiroshi Yuki, SB Creative

WG 1 Architecture

ITS is a large-scale collection of systems covering many areas of application, with a large number of people involved in its development over a long period. This makes it crucial to establish an architecture that ensures the expandability of the systems that comprise ITS as well as their interoperability and compatibility. WG 1 is developing standards for common information and methods in the ITS sector, including shared terminology, the standardization of data representation formats, architectures for sharing service and system concepts, as well as risk assessment methods and the benefits of services.

List of WG 1 Work Items

		Standardization themes	ISO Number	Content
	1	Privacy aspects in ITS standards and systems	TR 12859	Guidelines for protecting privacy in the development of ITS standards and systems
	2	Management of electronic privacy regulations	ISO/PWI 23507	(Under development)
	3	Reference model architecture(s) for the ITS sector	ISO 14813-1 ISO/DIS 14813-5 ISO 14813-6	Specification of fundamental services, core architecture and descriptive requirements for architectures, for reference in the developing new architectures and comparing different ones
★	4	Architecture – Use cases and high-level reference architecture for connected, automated vehicles	ISO/NP TR 23254	Use cases and a reference architecture for cooperative automated vehicles
	5	ITS central data dictionaries/Part1: Requirements for ITS data definitions	ISO 14817-1	Defines the requirements for data dictionaries that list the data definitions to be shared by the parties involved in ITS
	6	ITS central data dictionaries/Part2: Governance of the Central ITS Data Concept Registry	ISO 14817-2	Management procedures for data registration
	7	ITS data dictionaries/Part3: Object identifie assignments for ITS data concepts	ISO 14817-3	OID structure
	8	Using UML for defining and documenting ITS/TICS Interfaces	TR 17452	Guidelines for UML use in defining and documenting ITS interfaces
★	9	Using web services (machine-machine delivery) for ITS service delivery -Part 1: Realization of interoperable web services	ISO 24097-1	Stipulation of guidelines on the use of web services designed to support collaboration between Internet-based systems
★	10	Using web services (machine-machine delivery) for ITS service delivery -Part 2: Elaboration of interoperable web services' interfaces	TR 24097-2	Technical guidelines to achieve web service interoperability in the context of ITS
★	11	Using web services (machine-machine delivery) for ITS service deliverly Part 3: Quality of services	FDIS 24097-3	Quality of services in the context of ITS
★	12	Procedures for developing ITS deployment plans utilizing ITS system architecture	ISO/NP TR 24098	Description of procedures to develop ITS deployment plans utilizing ITS system architecture
	13	Use of unified modelling language (UML) in ITS International Standards and deliverables	TR 24529	Stipulation of rules and guidelines on the use of UML for ITS standards, data registries and data dictionaries
	14	Using XML in ITS standards, data registries and data dictionaries	ISO 24531	Stipulation of rules on the use of XML for ITS standards, data registries and data dictionaries
	15	Using CORBA (Common Object Request Broker Architecture) in ITS standards, data registries and data dictionaries	TR 24532	Stipulation of rules on the use of CORBA for ITS standards, data registries and data dictionaries
	16	Harmonization of ITS data concepts	TR 25100	Provision of guidelines for data concepts related to registration in data registries
	17	'Use Case' pro forma template	TR 25102	Provision of a template to facilitate use case description
	18	Training requirements for ITS architecture	TR 25104	Definition of requirements concerning training courses about ITS architecture
	19	Use of 'process-orientated methodology' in ITS International Standards and other deliverables	TR 26999	Stipulation of rules for process (function) oriented methodologies for ITS standards, data registries and data dictionaries
	20	Cooperative ITS- Part 1: Terms and definitions	TR 17465-1	Definition of Cooperative ITS
	21	- Part 2: Guidelines for standard documents	TR 17465-2	Guidelines on the formulation of Cooperative ITS standards documents
	22	- Part 3:Release procedures for standards documents	TR 17465-3	Release procedure for the development of standards documents on cooperative ITS
	23	Terminology	NP TR 14812	Terminology related to ITS
	24	Identifiers - Part 2: Management and operation of registries	PWI 17419-2	Registration method to the data registry of the ITS application, etc.
	25	Identifiers – Part3: Architecture requirements for ITS-AID requests	ISO/PWI 17419-3	(Under development)
	26	Architecture - Applicability of data distribution technologies within ITS	AWI TR 23255	Report on possibility of application for the data delivery technology

★ Item(s) that Japan is / has been actively working on

ITS Reference Model Architecture (ISO 14813 Series)

System architecture plays an important role in ensuring that everyone concerned shares a common understanding of the services and systems, and in guaranteeing the expandability of systems as well as their interoperability and compatibility. The ITS reference architecture (ISO 14813 series) was established for reference in developing architectures and as a model to compare architectures in different countries.

Continuous maintenance is required to deal with new services and systems arising from technological advances. With R&D for automated driving-related services gaining momentum in recent years, Japan proposed adding them to Part 1 during the 2014 systematic review. Regular revisions will also serve as opportunities to gradually update and discard the remaining parts to reflect the new versions of data description languages and the ISO 14187 series. In addition, Japan proposed use cases and a reference architecture (NP TR 23254) for cooperative automated vehicles.

ISO	Titles	Outline
ISO 14813-1	ITS service domains, service groups and services	Definition of service classes (categories, groups)
ISO/DIS 14813-5	Requirements for architecture description in ITS standards	Terms and forms to be used for documentation or reference of architecture
ISO 14813-6	Data presentation in ASN.1	Relation of Description of ASN.1 to be used for normal syntax notation with other data description languages

Requirements for the ITS Central Data Registry and Data Dictionary (ISO 14817)

While it is extremely important that the various system components in ITS use consistent names for the data they handle for reasons that include ensuring interoperability and improving the efficiency of system development through the sharing of data, the large number of people involved in system development makes this very difficult.

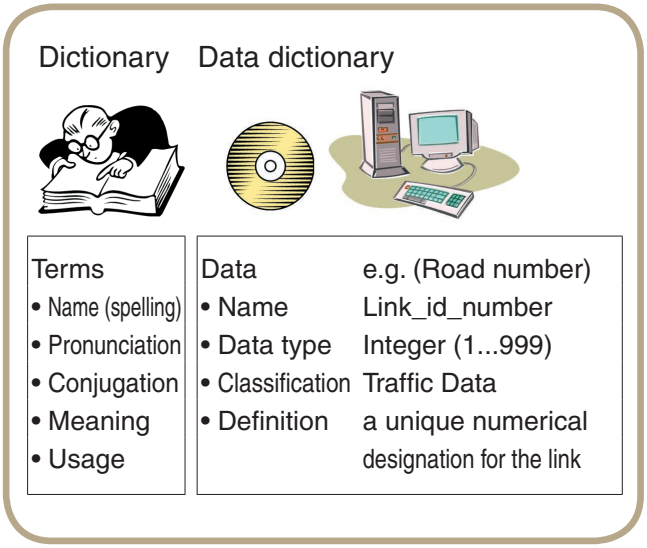
Data dictionaries are designed to promote sharing by managing dictionaries of information about the definitions and formats of data subject to shared use.

In the data dictionaries prepared for each functional field, the mechanism used to register and manage the interdisciplinary data used among multiple fields is called a data registry. The development of new systems is made more efficient by studying the use of shared data stored in the data registry.

Although WG 1 developed the ISO 14817 series around the year 2000, and has conducted data registry trial operations in the past, it has yet to move to actual operations. With the recent stepping up of standardization activities of cooperative ITS, the early introduction of the data registry was deemed necessary, and WG 1 conducted trial operations again in 2013 in parallel with the revision of the ISO 14817 series.

The ISO 14817 series has been developed to define the framework, format and procedures for information and data exchange used in the ITS field. Part 1 describes the logical structure of the data dictionary and registered data, Part 2 the operation of data registry, and Part 3 the adoption of the OID (Object Identifier) layered in a tree format within the data management system.

In conjunction, the use of data registry is apparently promoted to manage application ID (ITS-AID) of ITS. Until now, the ITS-AID registration status has been posted on the ISO maintenance portal. Standards for Part 2 (registration method to the data registry) and Part 3 (architecture requirements in ITS-AID application) of ISO 17419, an ITS-AID related standard, have already been developed, and selection of their registry management organization has been prepared.

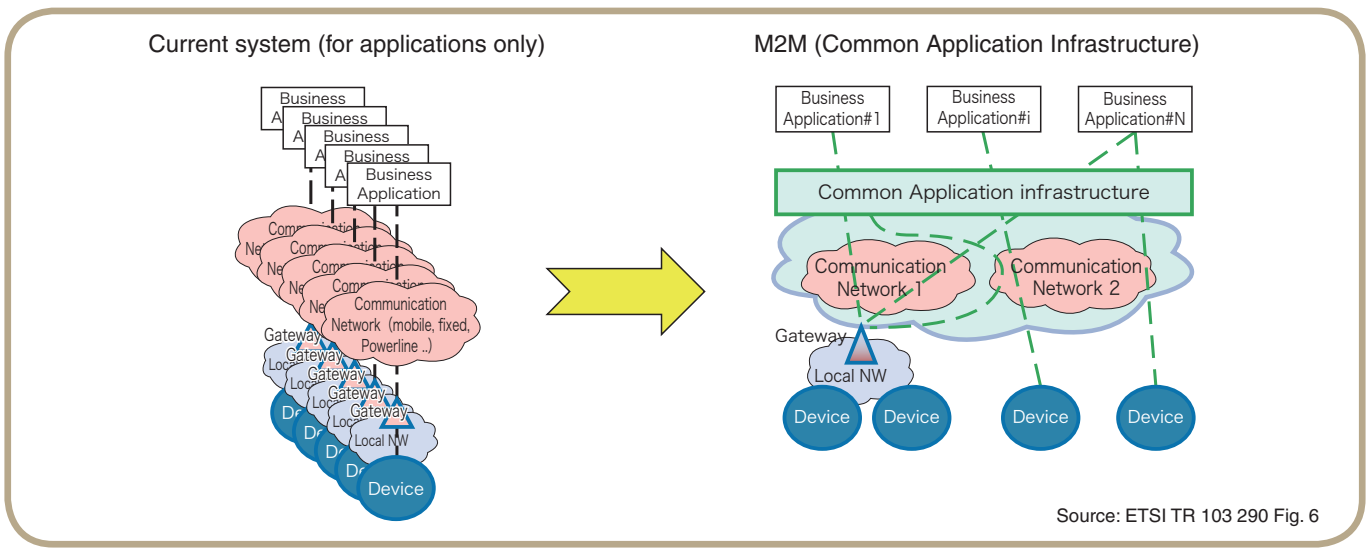


Application of IT-related technologies in ITS

Although TC 204 uses UML and ASN.1 as standard languages to describe information models and data content subject to standardization, recent system implementations increasingly use XML to send and receive data between subsystems. The use of consortium standards such as the Internet of Things (IoT) or machine-to-machine delivery (M2M) are increasingly adopted as standard procedures for coordinating systems on the Internet.

A high degree of safety and reliability, as well as information security, must be ensured for ITS, since it will see longterm and widespread use. WG 1 is working on standardizing the rules and guidelines required for leveraging the rapidly advancing technologies in the IT field in the construction of the overall ITS structure.

The development of guideline related to quality of service (DTR 24097-3) was finished, following the standards for use of web service (ISO 24097-1) that is also expected to become widely adopted in the ITS arena in the future and the standard for interoperability (TR 24097-2). The guideline is soon to be issued.



Source: ETSI TR 103 290 Fig. 6

WG 3 ITS Database Technology

Most applications in ITS involve services relating to the movement of people, goods and vehicles. As they require information on starting point/destination and routes in addition to data such as time or cost, these services use geographic data. The rapid growth of in-car navigation systems and the imminent deployment of cooperative ITS makes the role of geographic data critical. In addition, information comprising high-precision 3D images of the road environment and dynamic spatio-temporal information which supersedes the conventional concepts of geographic data are likely to play an important role in rapidly evolving automated driving technology.

WG 3 has been involved in standardizing exchange formats between geographic data providers, as well as compact storage formats allowing high-speed searching. It has also worked on developing functional requirement specifications, data models, and data elements for geographic data. WG 3 has limited its scope to static geographic data, but seeks to take part in the standardization of dynamic data.

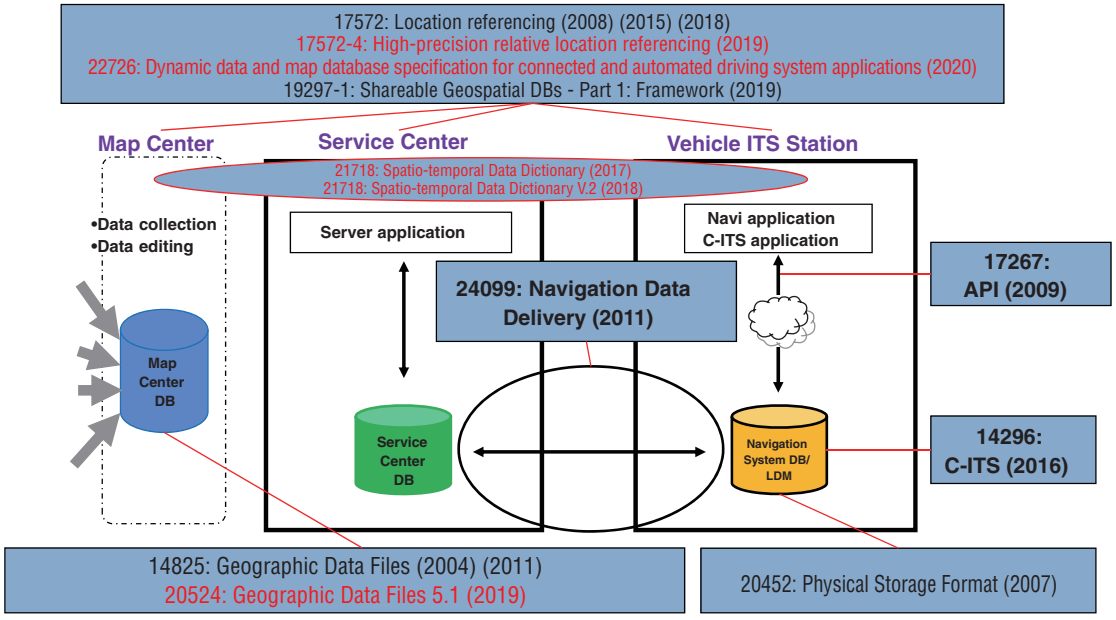
List of WG 3 work items

		Standardization themes	ISO Number	Content
★	1	Geographic Data Files – GDF5.0	ISO 14825	Standard for data exchange of geographical databases serving as the basis for geographical data used for navigation
★	2	Requirements and Logical Data Model for a Physical Storage Format (PSF) and an Application Program Interface (API) and Logical Data Organization for PSF used in Intelligent Transport Systems (ITS) Database Technology	TS 20452	Standardization of physical storage format for hard discs and etc. used for navigation
★	3	Navigation data delivery structures and protocols	ISO 24099	Standardization of data structures and protocols to transmit map data
★	4	Location referencing for geographic databases	ISO 17572-1 to 3	Standardization of location referencing when exchanging data between different applications or geographic databases
	5	Navigation systems – Application programming interface (API)	ISO 17267	Standardization of data access methods for application programs such as navigation systems
★	6	Extension of map database specifications for applications of cooperative ITS	ISO 14296	Building functional requirements and data models concerning the application of map databases in cooperative systems (including ADAS) within ITS
	7	Shareable geospatial databases for ITS applications	DIS 19297-1	Presenting the new framework which enables access to various geographic databases and data sharing between them
★	8	Geographic Data Files – GDF5.1 Part 1	DIS 20524-1	Standard (Part 1) for data exchange in geospatial databases for applications such as cooperative ITS, multi-modal navigation, and automated driving systems
★	9	Geographic Data Files – GDF5.1 Part 2	AWI 20524-2	Standard (Part 2) for data exchange in geospatial databases for applications such as cooperative ITS, multi-modal navigation, and automated driving systems
★	10	Precise Relative Location Referencing for Geographic Databases	CD 17572-4	Addition of the forth profile that permits location referencing of “Which lane?” and “Where in lane” for the cooperation/automated driving system
★	11	Spatio-temporal Data Dictionary	TR 21718/ DTR 21718	Data dictionary first edition (TR) and second edition (PWI) of static/dynamic data about spatio-temporal object for ITS and the cooperative/automated driving systems
★	12	Dynamic data and map database specification for connected and automated driving system applications	NP/ TS 22726-1	Standardization of static, semi-static, and semi-dynamic map data elements and their data model used for applications of ADS and C-ITS systems (Part 1)
★	13	Dynamic data and map database specification for connected and automated driving system applications	PWI/ TS 22726-2	Standardization of static, semi-static, and semi-dynamic map data elements and their data model used for applications of ADS and C-ITS systems (Part 2)

★ Item(s) that Japan is / has been actively working on

Relationship Diagram for WG 3 Work Items

Items in red: Related to automated driving systems (expected year of issue/year of issue); Items in black = Not related to automated driving systems (expected year of issue/year of issue)



Geographic Data Files

GDF 5.0 (ISO 14825)

This is the standard for the exchange of data between geographic databases providing the basic map data used for navigation.

As the files are not used directly for navigation, emphasis is placed on ease of editing (genre-based data compilation) rather than on compactness and speed relative to physical storage. In other words, the emphasis is on production.

Work on the GDF format was implemented based on European CEN-GDF studies supplemented with concepts from the Japan digital road map database and other standards. Thanks to the existing standardization efforts by CEN, work proceeded more smoothly than for other items, and GDF 4.0 was issued as ISO 14825 in February 2004.

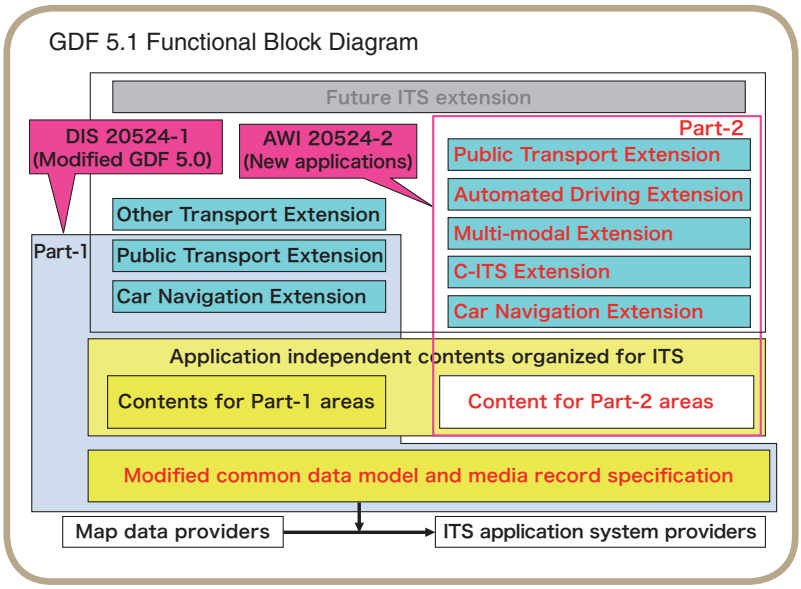
Then, as review work, discussions on a new GDF were launched for the required performances and models. The Japan side proposed a structure that performs time management based on KIWI+*, a new standard formulated by the Japan Digital Road Map Association. KIWI+ evolved from KIWI, which was widely used in Japan and served as a basis for the proposed physical storage. The final draft, centering on a time-managed structure, was proposed by Japan and gained approval from the US and Europe. Through close collaboration with TC 211, which handles geographical information on a comprehensive basis, the UML was adopted for the concept model and the draft was reviewed under TC 211. The resulting ISO was published in July 2011.

GDF 5.1 (DIS 20524-1, AWI 20524-2)

In terms of applications, GDF 5.0 primarily deals with geographic databases for navigation systems, but there is a growing need to update it in response to the emergence of new applications for cooperative ITS, multi-modal navigation, and automated driving systems. In October 2014, PWI 20524 was approved, and the process of revising GDF 5.0 was underway. The ISO is expected to be issued in October 2019 for Part 1 and in April 2020 for Part 2.

Led by Japan, work toward applying the ISO 14296 specifications to cooperative ITSs is moving forward, with specifications being prepared that allow regionally-limited high-precision transmissions that match GDF 5.0 precision for all areas. For multi-modal navigation, France is taking the lead in preparing specifications to achieve compatibility between the EN 12986 Reference Data Model for Public Transport (Transmodel) and GDF 5.0. Regarding automated driving systems, amidst expectations of future Japanese, European and U.S. input, Japan will be taking the lead in this area.

In April 2018, Part 1 was approved in consequence of DIS ballot. For Part 2, the final edition of the working draft is currently under development.



Navigation Data Delivery and Structures and Protocols (ISO 24099)

In Japan, there is rising demand for higher-resolution map data in the navigation system and ADAS fields. Addressing this demand requires the study of systems that enable only the necessary map data (necessary portions) to be transmitted when needed in real time. A map data transmission structure and protocol was initiated and proposed by Japan, and the NP was approved at the TC meeting in April 2006. It was issued as an ISO in January 2011.

Note that the systematic review was launched in January 2016, and the ISO 24099 was approved again.

Physical Storage Format (TS 20452) and API Standards (ISO 17267)

Discussions on drafts for Physical Storage Format (NP 14826), API Standard (NP 17267) and Updating (NP 17517) were delayed, and work on these items had to be finished in compliance with the new ISO rules.

An NP ballot to register NP 14826 agreements on standardization as official documents was proposed and approved. It was published as TS 20452 in June 2007. A new PWI was approved in October 2003 for NP 17267. The NP/CD ballot ended in October 2007 and was established as an ISO in November 2009.

In consequence of the systematic review started in November 2014, ISO 17267 was approved again.

Location Referencing (ISO 17572)

This covers methods for location referencing when information is exchanged between different applications and geographic databases. It is designed to find locations in different map databases when traffic information is exchanged between systems.

Initially, it was decided that a method based on coordinate systems and road descriptors would be adopted as an option, pending the results of demonstration experiments in Europe and the United States. However, progress in this field was stalled for some time because the results were not readily available.

During the stalemate, the need for standardization of generalpurpose LR grew sharply as the information community moved rapidly toward standardization. WG 3 therefore decided to broaden its focus from coordinate systems and road descriptors and work to establish a more comprehensive standard. Discussions took place on two methods: pre-coded profiling (pre-coded location references: a referencing method assuming common pre-coded location tables like VICS or TMC), and dynamic profiling (dynamic location references: a method which varies in real time), were launched in 2000. The draft was completed in November 2006. The CD ballot was completed in July 2007 and the FDIS ballot was completed in November 2008, followed by its issuance as an ISO in December 2008.

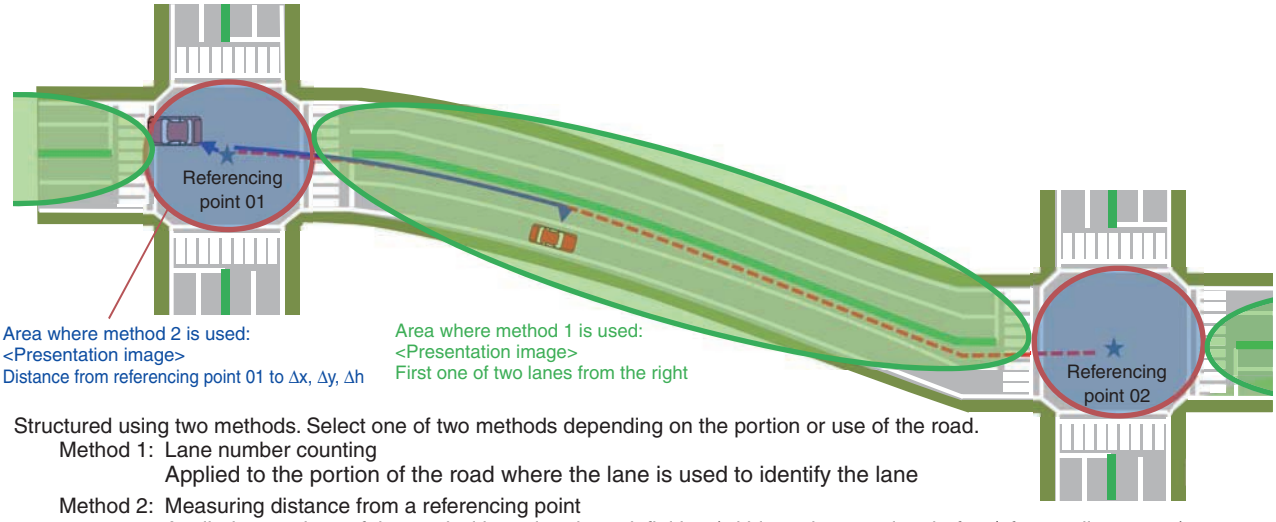
Dynamic Profiling evolved from the European proposal (AGORA C) and incorporated Japan's proposal on using coordinates.

The systematic reviews carried out since 2011 provided the opportunity to add Japan's Section ID Method as a new sample location reference method. An updated version was issued as ISO 17572 in January 2015.

Following the NP/CD ballot to revise ISO 17572 Part 2 so as to include WG 10's NP 21219- 20 (see the WG 10 work item list) to Precoded Profiles, The NP/CD ballot to revise ISO 17572 Part 2 was conducted, and it is now waiting to be issued as an ISO.

In April 2016, addition of the 4th profile "High-precision relative location referencing method" was accepted. It permits location referencing of "Which lane?" for the cooperative/automated driving systems. The work has already been started as NP 17572-4, and CD ballot is currently being conducted. The ultimate aim is publication of ISO.

Basic Concept Diagram of High-precision Relative Location Referencing Method



Structured using two methods. Select one of two methods depending on the portion or use of the road.

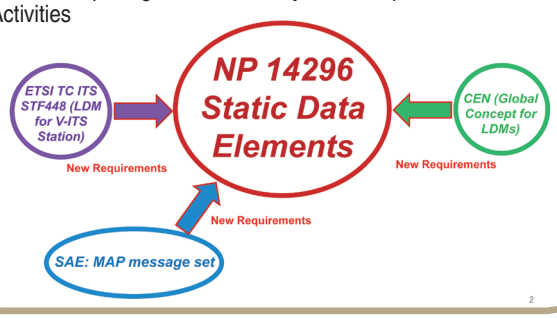
Method 1: Lane number counting
Applied to the portion of the road where the lane is used to identify the lane

Method 2: Measuring distance from a referencing point
Applied to portions of the road with unclear lane definition (within an intersection, before/after a tollgate, etc.)
Applied to the area within 200 m from a referencing point
Used as positional representation relative to the road (positional accuracy: 25 cm or less)

Extension of Map Database Specifications for Applications of Cooperative ITS (ISO 14296)

For in-vehicle digital map databases, Japan proposed a new PWI, "Extension of current specification of in-vehicle digital map databases" in response to new requirements such as ADAS and multi-modal navigation. This was approved in May 2009. The scope was then expanded to cover static information in Local Dynamic Maps in Cooperative Systems, and this working item, with the title of "Extension of map database specifications for applications of cooperative ITS" was approved as an NP at the April 2011 TC meeting. The opening of CD/DTS voting for this item was approved in April 2012. WG 3 concluded one phase of the standardization activities for static information in Local Dynamic Maps at the end of 2012, and which was issued as TS 17931 prior to NP 14296, as explained in the next paragraph. Further, starting in 2012, ADAS and multimodal navigation was studied, and the expansion of specifications for functional requirements, data models and data elements was done, and the resulting ISO was published in February 2016.

Relationship Diagram for Local Dynamic Map Standardization Activities

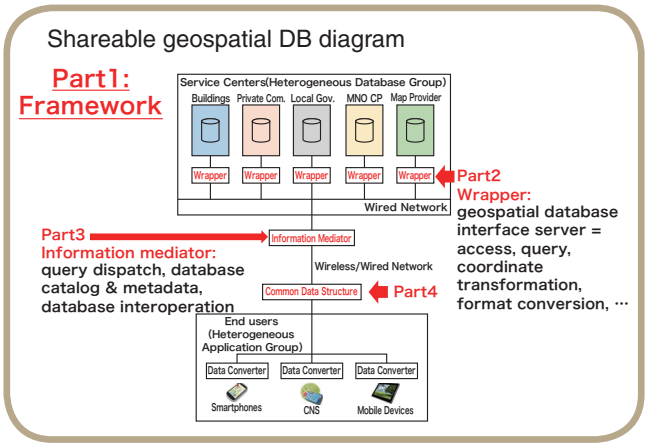


Standardization procedures for static information in Local Dynamic Maps have been moving forward in cooperation with European and American standardization bodies such as CEN, ETSI and SAE while respecting the relationships shown above.

Sharable Geospatial Databases for ITS Applications (DIS 19297-1)

Developments in communications and database technologies are allowing the introduction of new services such as indoor and multi-modal navigation for mobile devices such as smartphones. New future services will require more extensive and detailed geospatial databases than the current car navigation map databases. This work item aims at standardizing the framework for new database services allowing the use and sharing of various geospatial databases.

The scope of this work item comprises four Parts, and voting on the NP ballot for Part 1, which covers the framework, began and was approved in April 2015. Now it is under DIS ballot.



Spatio-temporal data dictionary (TR 21718/DTR 21718)

Data dictionary of static data (map elements, etc) and dynamic data (traffic jam, vehicle speed, etc) about Spatio-temporal objects for ITS and cooperative/automated driving system. The key objective is to rectify disorder of terminology in the automated driving systems, and TR first edition was created in 2016 by compiling data names/types/definitions/structures. Since 2017, TR second edition has been created, and DTR ballot is currently under way. This work is aiming to reach global agreement by collaborating with standardization bodies in Europe and the U.S., such as SAE and ETSI, and the third edition is expected to start being prepared in 2018.

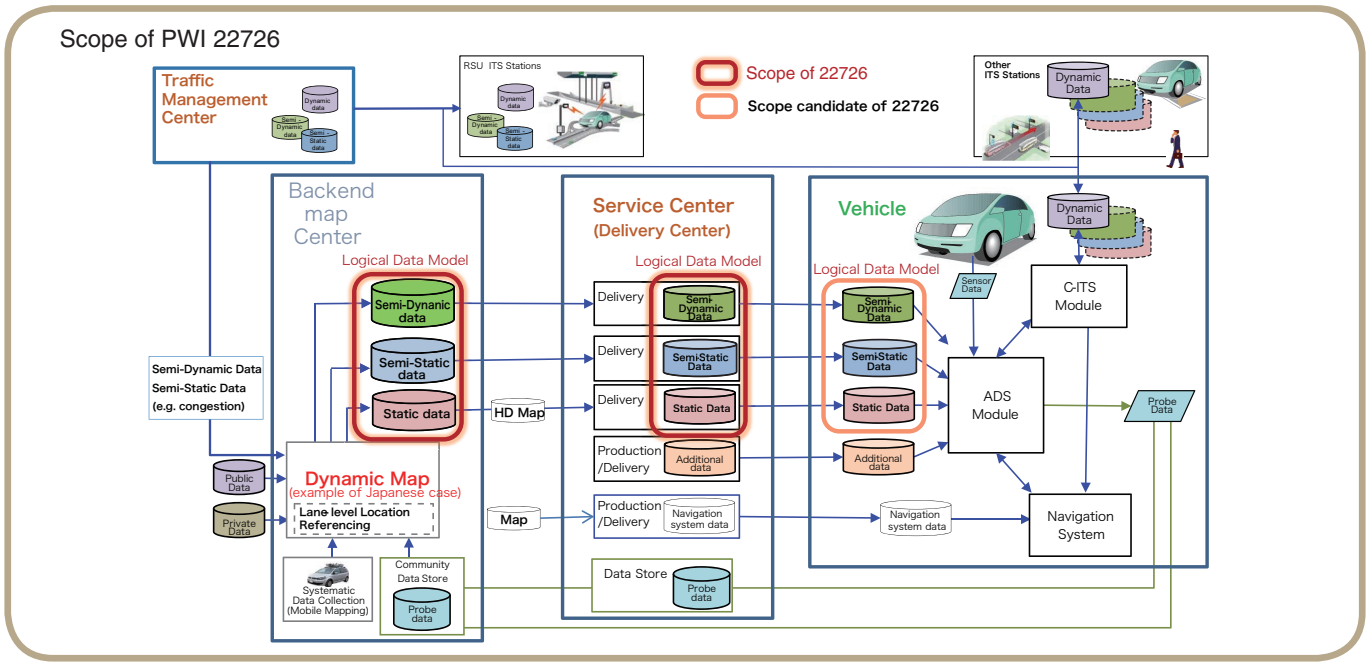
Dynamic data and map database specification for connected and automated driving system applications (NP/TS 22726-1 and PWI/TS 22726-2)

While the static map data model required for cooperative ITS is standardized as ISO 14296, this work item standardizes the logical data model of static map data required for new applications including self-driving system. In addition, the logical data model for semi-static/ semi-dynamic data, like traffic jam, accident and weather information, is defined without collision with multiple existing standards (including them instead). Also, by defining relationship between semi-static/semi-dynamic data and static map data, the logical data model is provided that includes resulting three types of data items: static/semi-static/semi-dynamic.

Currently, Part 1 is at NP ballot phase and Part 2 at PWI stage.

The final aim for both is publication of TS, and Part 1 is scheduled to be published in April 2020.

ADAS: Advanced Driver Assistance Systems
PSF: Physical Storage Format
UML: Unified Modeling Language



WG 4 Automatic Vehicle and Equipment Identification

The AVI/AEI discussed in WG 4 is a system that automatically identifies cars (Vehicles) and freight (Equipment) using onboard devices or simple media such as tags. It also plays the role of standardizing items required for interoperability between systems.

Since its launch, WG 4 has been discussing standardization for land transportation, such as trucks, and later, as a discussion topic, added standardization of an intermodal AVI/AEI system that supports movement through different modes of transportation, such as by air and sea.

In the wake of a proposal from CEN, deliberations began on Electronic Registration Identification (ERI) standards as an AVI/AEI applied system designed for environmental protection, and ISO added this as an official discussion item.

ISOs 14814, 14815, and 14816, which deal with AVI/AEI systems were all published as ISOs by March 2006.

Three intermodal-AVI/AEI-related ISO standards: 17261, 17262 and 17263, were issued as ISO documents by September 2012 through collaborative work with WG 7.3 (Data transfer of freight conveyance information). ISO 17264 was issued as an ISO document in November 2009.

In ERI, standardization discussion was conducted in two parts: full ERI (Parts 1 to 5) ISO 24534 and simplified ERI (US proposal) ISO 24535. Parts 1 to 4 of ISO 24534 were issued in July 2010 as an ISO publication, followed by Part 5, which adopts the Japanese proposal of the Symmetric Key Method, in December 2011. ISO 24535 was published in September 2007.

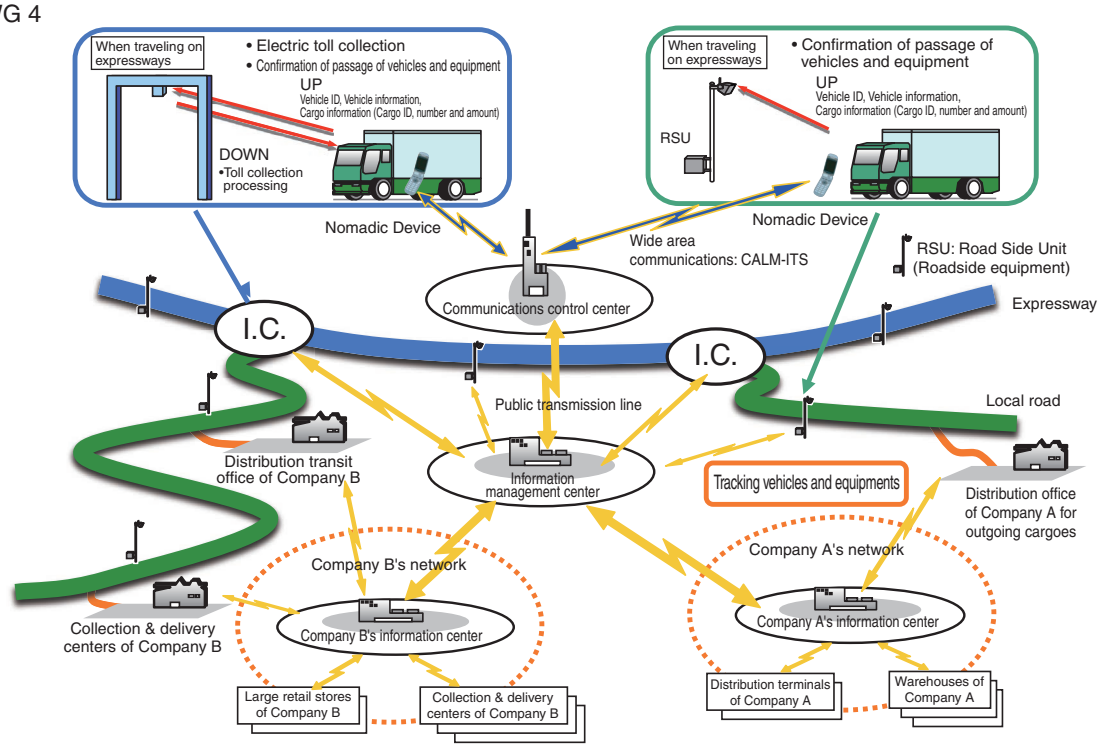
In October 2014, Japan and three other countries formed the ASN.1 Task Team to work on ensuring compatibility between, and to correct errors in, existing ISO documents using ASN.1 notation. Five ISO standards, 14816, 17262, 17264, 24534-4, and 24534-5 were revised by the task team, and a DIS ballot was conducted for these revised documents. The process is now moving to the next stage, following the formulation procedure.

List of WG 4 work items

		Standardization themes	ISO Number	Content
	1	Automatic vehicle and equipment identification - Reference architecture and terminology	ISO 14814	Standardization of architecture of AVI/AEI system
	2	Automatic vehicle and equipment identification - System specifications	ISO 14815	Standardization of classification of AVI/AEI system requirements
	3	Automatic vehicle and equipment identification - Numbering and data structure	ISO 14816	Standardization of data compatibility of AVI/AEI system
	4	Automatic vehicle and equipment identification -- Intermodal goods transport architecture and terminology	ISO 17261	Standardization of architecture of intermodal AEI system
	5	Automatic vehicle and equipment identification -- Numbering and data structures	ISO 17262	Standardization of data structure of intermodal AEI system
	6	Automatic vehicle and equipment identification -- System parameters	ISO 17263	Standardization of classification of intermodal AEI system
	7	Automatic vehicle and equipment identification -- Interfaces	ISO 17264	Standardization of interface specifications of intermodal AEI system
	8	Electronic registration identification (ERI) for vehicles - Part 1 to 4	ISO 24534	Standardization of specifications for a system where roadside equipment reads vehicle data electronically registered in on-board equipment
★	9	Electronic Registration Identification (ERI) for vehicles - Part5	ISO 24534-5	Standardization of security using the symmetric key method in the above ERI system
	10	Basic electronic registration identification (Basic ERI)	ISO 24535	Standardization of specifications for more simpler ERI system

★ Item(s) that Japan is / has been actively working on

Scope of WG 4

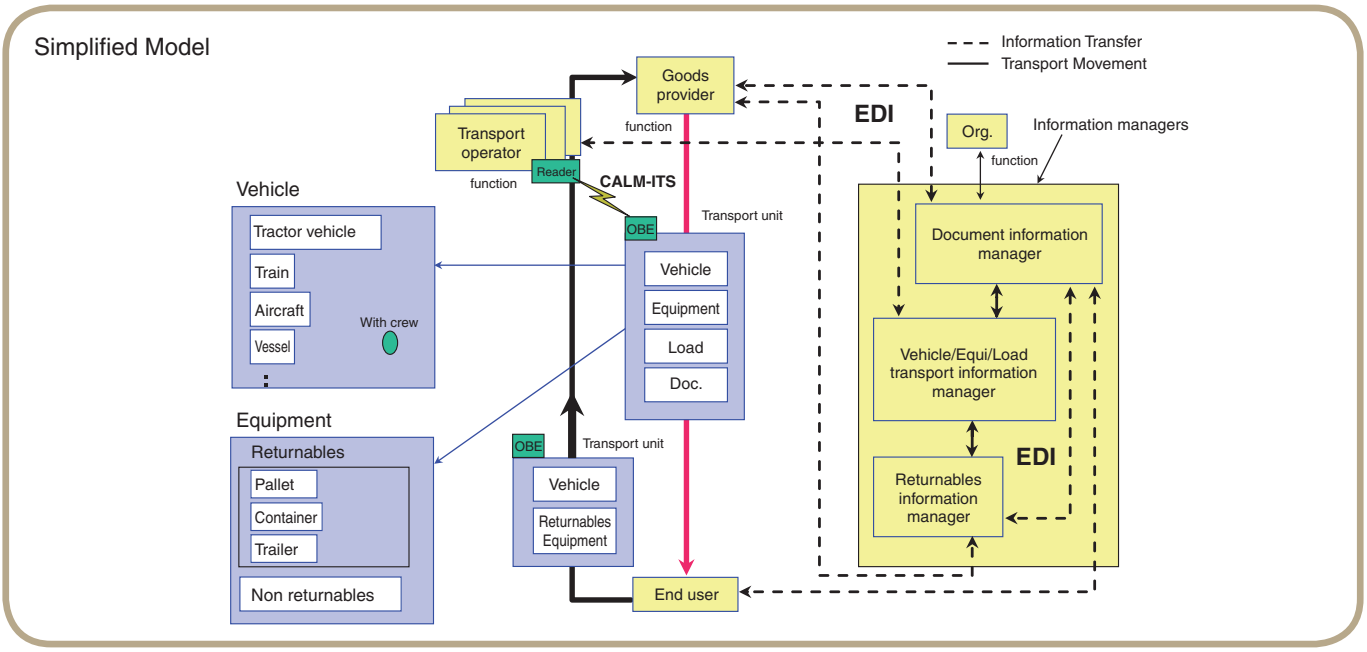


Intermodal AVI/ AEI Systems

Intermodal AVI/AEI are systems for logistics that use different transport modes, such as land transportation, aircraft, or ships. The standard specifies the handling of freight transport information for vehicles, transport devices and loaded trucks, etc., between onboard equipment and roadside units.

A conceptual diagram of the intermodal logistics system is shown below. In this system, access from many access points to vehicles, transport devices and freight is anticipated.

To comply with these needs, the standards for intermodal systems are summarized in the following four standards: (1) ISO 17261: Reference architecture, (2) ISO 17262: System data and addition of its description structure (CSI: Coding Structure Identifier), (3) ISO 17263: Classification of system according to requirements, and (4) ISO 17264: Interface specifications.



Electronic Registration Identification (ERI)

ERI, designed for environment protection and other benefits, defines the framework of a system that establishes communication between roadside devices and onboard equipment to electronically identify vehicles.

To do this, the system assigns a unique identification number to each vehicle to allow devices on both sides to exchange information. The purpose of the ERI system is to ensure minimum compatibility between them.

ERTICO was requested from the EC (European Commission) to carry out "an investigation on ERI system operation (the European EVI project)" in February 2003. This program resulted in compilation of the following nine reports as application areas for the ERI system. (1) prevention of vehicle theft, (2) access control, (3) road pricing, (4) vehicle registration, (5) vehicle tax management, (6) traffic flow control, (7) traffic rules and observance, (8) environment protection from manufacturing to disposal of vehicles, and (9) hazardous material transportation management

In Japan, due to anticipation of a broad range of ERI applications and the large number of related organizations, the ERI Business Team (a deliberative organization) administered by the Japan Automobile Research Institute (JARI) was established by related organizations and people in August 2003. Until 2005, the ERI Business Team worked to have the ERI-related specifications likely to be necessary for operation in Japan reflected in ISO standards.

The CEN-proposed standard was approved as an ISO formal work item at the TC 204 plenary meeting in June 2003. After follow-up discussions, based on the assumption that ability of onboard equipment is selectable according to the ERI application system, it was issued as ISO publications for the ERI system in two forms: Full ERI containing data encryption and Basic ERI that utilizes simplified RF tags.

Liaison Activities of TC 204/WG 4

TC 204/WG 4 engages in liaison activities with IEC JTC 1/SC 31/WG 4 (Standardization committee for automatic identification and data acquisition technology/RFID). SC 31/WG 4 is discussing standardization of item RF tags and the compatibility of roadside modules with RF tags. In that, the TC 204 field is positioned as one of applications using roadside modules. Thus TC 204/WG 4 is working in coordination with SC 31/WG 4 for application to AVI/AEI system, and TC 204/WG 4 takes on the summarization task.

In addition, TC 204/WG 4 has established liaison with TC 204/WG 5 (Fee and Toll Collection) and TC 204/WG 7 (General Fleet Management and Commercial/Freight) to proceed with collaborative discussions on standards, such as (1) Interface definition between DSRCOBE and external in-vehicle devices, (2) Investigation of EFC Standards for Common Payment Schemes for Multi-Modal Transport Services, (3) Data Structure for International Intermodal Transportation, and (4) Framework for collaborative telematics applications for regulated commercial freight vehicles.

WG 5 Fee and Toll Collection

WG 5 is working on standardizing Electronic Fee Collection (EFC), which includes ETC (Electronic Toll Collection) as well as all other charging and settlement types such as tolls for roads, fees for parking lots and ferries. This WG is currently focusing on ETC systems. Communication between vehicle and roadside equipment is based on Dedicated Short-Range Communications (DSRC) and additionally based on GNSS/CN which uses global navigation satellite systems (GNSS) and cellular networks (CN). The GNSS/CN system was renamed as an autonomous system at the 2008 TC 204 plenary meeting. The autonomous system is a joint task shared between the ISO and CEN, and its main standards were completed in 2010.

In April 2004, the European Union (EU) issued "the Directive on the interoperability of electronic road toll systems in the Community" (Directive 2004/52/EC). The directive recommends the adoption of the GNSS/CN (autonomous) system as the electronic road tolling system in Europe, but it does not exclude coexistence with the conventional DSRC system. On October 6, 2009, the EC adopted a decision establishing detailed definitions for the European Electronic Toll Service (EETS). Although the EETS was scheduled to apply to heavy goods vehicles in October 2012 and to light vehicles in October 2014, progress on the EETS was slow. In September 2012, the European Commission called for the development of regional EETS systems. In April 2016, operation of autonomous EFC systems was launched in Belgium. To solve problems that prevented the launch of EETS, Directive 2004/52/EC is now being reviewed.

Three new working items, recent proposals from Japan, were approved at the October 2015 plenary meeting. In collaboration with members in Europe and Korea, the WG is working on new proposals, such as common payment schemes that can be used across various transport modes and research on traffic management supported by tolling and toll technologies in relation to new dynamic route selection with variable toll in Japan, aimed at reaching international standardization.

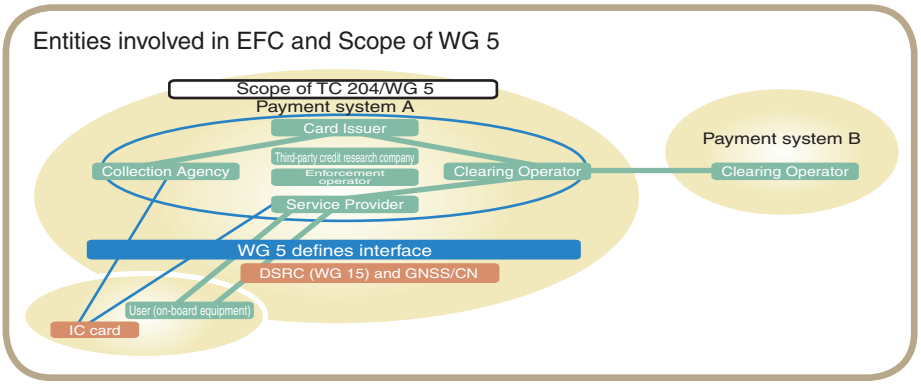
List of WG 5 work items

		Standardization themes	ISO Number	Content
	1	Electronic fee collection -- Application interface definition for dedicated short-range communication	ISO 14906	Prescription of data structures, commands and other factors to ensure the interoperability of 1 EFC applications for DSRC based EFC
★	2	Electronic fee collection -- Test procedures for user and fixed equipment-Part 1 to 2	TS 14907	Part 1 defines procedures and conditions for tests of EFC-related equipment. 2 Part 2 defines conformance tests for onboard equipment, conforming to the EFC application interface definition (ISO 14906).
	3	Electronic fee collection -- Systems architecture for vehicle-related tolling	ISO 17573	Definition of reference architecture for the entire EFC system and prescription of frameworks of various EFC-related conditions
★	4	Electronic fee collection -- Guidelines for security protection profiles	TS 17574	Provision for EFC security establishment in reference to IEC 15408 (IT security evaluation standard)
★	5	Electronic fee collection -- Security framework	TS 19299	Prescribe the framework to develop EFC security system by risk assessment and definition of system model.
	6	Electronic fee collection -- Application interface definition for autonomous systems	ISO 17575	Prescription of data structures, commands and other factors to ensure the interoperability of 6 EFC applications for autonomous systems (GNSS/CN)
★	7	EFC - Interface Definition for On-board Account Using Integrated Circuit Cards	ISO 25110	Interface definition between roadside equipment and onboard equipment using IC cards 7 that enable reading and writing of EFC information and account information on IC cards
★	8	Electronic fee collection -- Compliance check communication for autonomous syste	ISO 12813	Checking the correct charging of autonomous EFC OBE by downloading the vehicle data via 8 DSRC initiated by roadside equipment.
	9	Electronic fee collection -- Information exchange between service provision and toll charging	ISO 12855	Describes the information flow between EFC service providers and parties who charge fees.
★	10	Electronic fee collection -- Localisation augmentation communication for autonomous systems	ISO 13141	Describes the communication requirements for enhancing the locating function of OBE for the autonomous system (GNSS/CN) using DSRC
	11	Electronic fee collection -- Evaluation of on-board and roadside equipment for conformity to ISO 12813-Part 1 & 2	ISO 13143	Defines conformity evaluation methods for the interfaces defined in TS 12813 (Compliance check 11 communication for autonomous systems) between OBE and roadside equipment
	12	Electronic fee collection -- Evaluation of on-board and roadside equipment for conformity to ISO 13141-Part 1 & 2	ISO 13140	Defines conformity evaluation methods for the interfaces defined in DTS 13141 (Localization augmentation communication for autonomous systems) between OBE and roadside equipment
	13	Electronic fee collection -- Evaluation of equipment for conformity to TS 17575-1 to 3	TS 16407 TR 16401 TS 16410	Conformity evaluation methods for TS 17575 (Application interface definition for autonomous systems) Part 1: Charging, Part 2: Communication and connection to the lower layers, Part 3: Context data
	14	Electronic fee collection -- Charging performance part 1 & 2	TS 17444	EFC performance standard (metrics) and inspection framework
★	15	Electronic Fee Collection (EFC) -- Interface definition between DSRC-OBE and external in-vehicle devices	TS 16785	Interface for extending DSRC OBE to autonomous systems (EFC using GNSS/CN)
★	16	Electronic fee collection -- Investigation of EFC standards for common payment schemes for multi-modal transport services	TR 19639	Scheme for the common use of cards and other media for transport services
★	17	Electronic fee collection -- Investigation of charging policies and technologies for future standardization	DTR 21190	Proposing new work items based on research on new toll policy and corresponding technologies that are under consideration for adoption in all countries.
★	18	Electronic fee collection -- Support for traffic management	DTS 21192	Creating a common concept model of traffic management with dynamic tolling, and defining data exchange between entities.
★	19	Electronic fee collection -- Requirements for EFC application interfaces on common media	DTS 21193	In accordance with the proposals in TR 19639, describes the requirement and data definition of common 19 media for allowing common usage among various modes of transportation.
	20	Electronic fee collection -- Personalization of on-board equipment	TS 21719	Describes a method of setting up EFC onboard equipment: Part 1 defines its framework, Part 2 defines specifications of set-up via DSRC, and Part 3 defines specifications of set-up via Bluetooth.

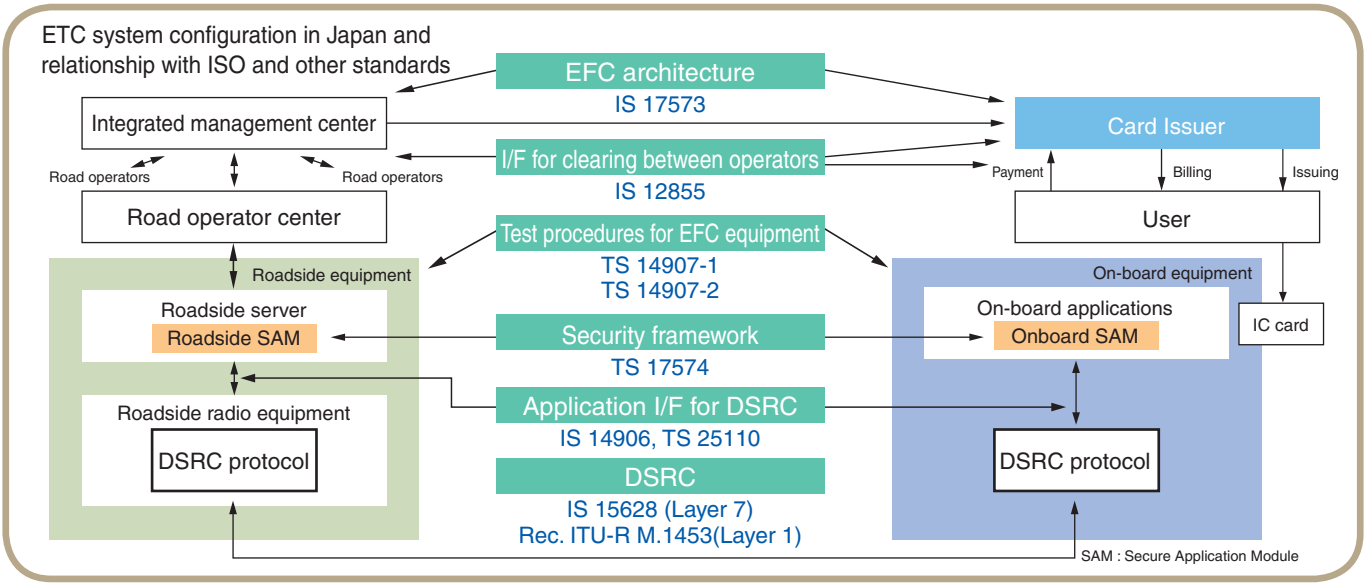
★ Item(s) that Japan is / has been actively working on

Overall Structure of EFC, Scope of WG 5, and DSRC method EFC

EFC-related entities include Card Issuers, Service Providers, Clearing Operators, and Collection Agencies, whose relationship is shown in the Figure on the right. WG 5 is working on the standardization of the EFC application interface (data elements, command definitions, and other factors) both for DSRC and GNSS/CN, which are means of communication between Service Providers and Users, and on the standardization of the test procedures and data security. Work on the standardization of DSRC has been completed by TC 204 WG 16 (former WG 15) and ITU-R SG 5.



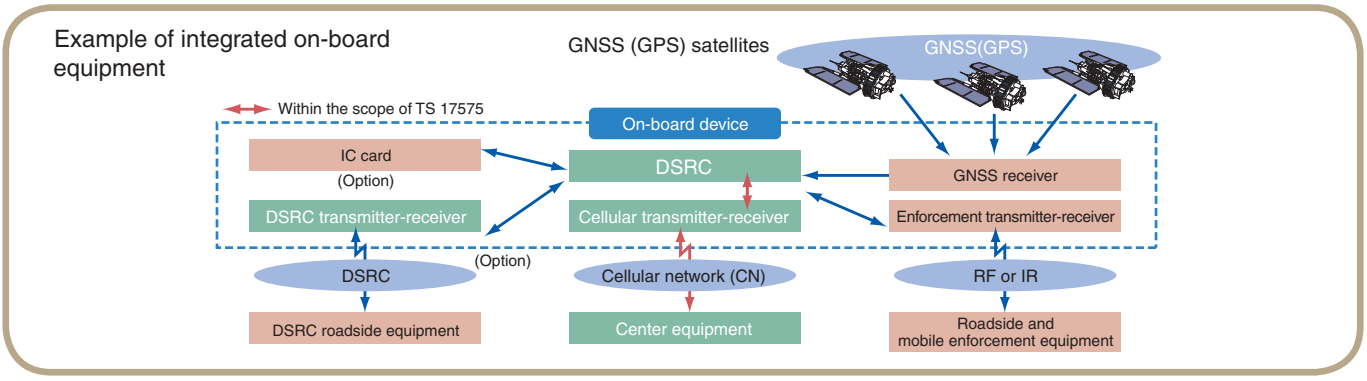
The figure below shows the ETC system configuration in Japan, and the corresponding ISO standards and ITU recommendations



Application Interface Definition for Autonomous Systems (GNSS/CN) (ISO 17575)

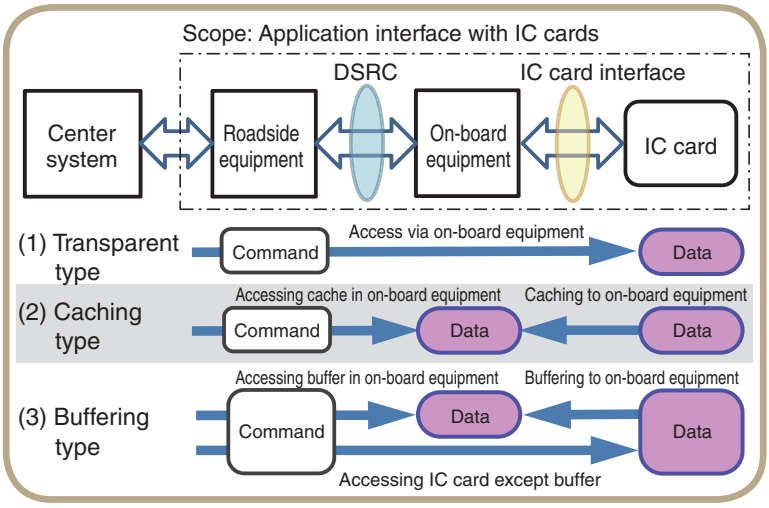
The GNSS/CN based EFC was approved as a work item in 1997. The toll collection system for Heavy Goods Vehicles (HGV) in Germany since 2005, and Belgium since 2016 adopted this system. The onboard equipment continuously positions the geodetic coordinates of the present location with the built-in GNSS (GPS) receiver, and executes toll collection referring to tariff data downloaded via the cellular network.

Various means of calculating fees, including on-board processing or central processing, are available. A variety of charging methods can be applied, such as zone charging for each virtual charging area entered, and distance-based charging applied to how far the vehicle has traveled. The Figure illustrates integrated onboard equipment using the DSRC method.



Interface Definition for Onboard Account Using Integrated Circuit Cards (ISO 25110)

There are two major EFC-related charging methods. One is the central account system predominant in Europe and the US, and the other is the onboard account system using IC cards, used in Japan, Korea and other Asian countries. The ISO 25110 application interface defines three types, (1) the transparent type (2) the caching type (3) the buffering type, that enables roadside equipment to access IC cards via DSRC and onboard equipment is modeled on the Japanese and South Korean ETC and other systems. Japanese ETC using the caching type provides a secure data handling mechanism by equipping a SAM (Secure Access Module) on the onboard equipment and retaining storing privacy information from an IC card in the SAM.

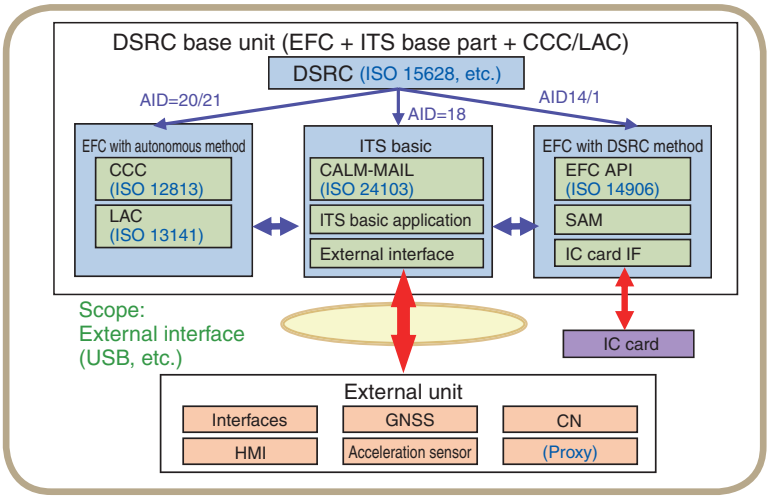


Interface definition between DSRC-OBE and external in-vehicle devices (TS 16785)

This task item aims to add an external unit to DSRC onboard equipment and to define the application interface between them when improving functionality. It was formally issued in 2014.

This defines the expandable DSRC-OBE to allow its use as, for example, an autonomous EFC-OBE that connects the DSRC-OBE and an external in-vehicle device. The DTS ballot was held in December 2013, and this item was officially published in 2014.

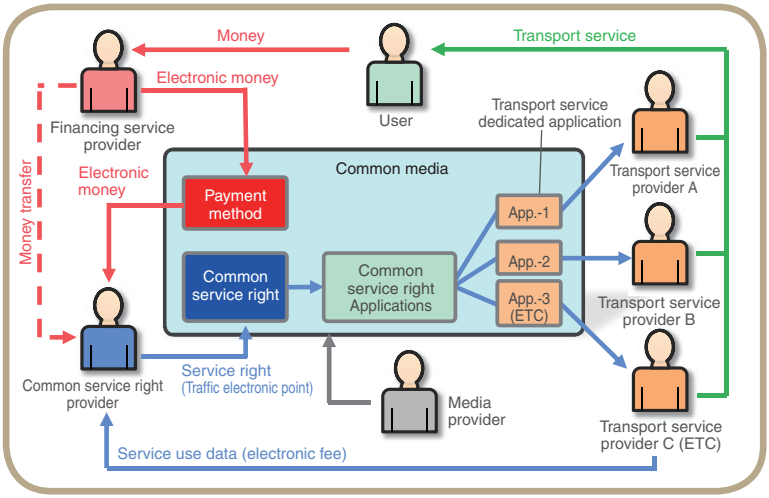
Installing an external connection interface in DSRC OBE for expandability enables itself to perform autonomous charging by connecting an external in-vehicle device with GNSS reception and cellular communication module for improving the onboard equipment functionality.



Investigation of EFC Standards for Common Payment Scheme for Multi-Modal Transport Services (TR 19639, DTS 21193)

In Asian countries, there is a need to make payments with a single card for public transport, toll road and others. Many countries connected by road are seeking the possibility to make payments with single card and account for all transport service in future. Common platform for inter-operable usage crossing over multiple transport services discussed in Urban ITS and Smart city like MaaS is anticipated for big data analysis in transport, for traffic demand management and for provision of incentives to users.

TR 19639 describes research into schemes allowing the use of ETC and/or public transportation cards as common payment media and new work item proposals. DTS 21193, a series standard, is working on standardization of EFC requirement items to media where various types of transportation are commonly available, and standardization of data definition with support from South Korea.



Charging policy and technology (DTR 21190)

While WG 5 has been working on the international standardization of EFC in DSRC and GNSS/CN methods to date, in recent trends in road pricing, new charging policies have been proposed and gradually brought into practical use with new technologies, including (1) toll method through guiding routes using ETC 2.0 in Japan, and (2) toll method using odometers in US.

In addition, the development of new technologies that can be applied to toll charging is under way, including 5th generation cellular and RFID that support high driving speeds. This work item comprises research on new toll policies and technologies enabling them to be adopted in countries that are considering introducing them, and proposing new work items.

Relationship between charging policy and charging technology (Portion applied with charging policy based on new technology becomes a new candidate item)

Charging technology \ Charging policy		Financing of road infrastructure			Traffic management	
		Toll road (ETC)	Inter-city road (Heavy goods vehicle charge)	Every road	Urban road (Rush hour charge)	Inter-city road
ANPR: Identification plate scan					London Stockholm	
DSRC		World wide (More than 50 countries)	Austria, Czech Republic Poland, (Slovenia)		Oslo, Bergen, etc. Singapore	
GNSS	Mobile phone network		Germany, Slovakia, Hungary, Belgium, Russia (Bulgaria)		(Singapore)	
	Odometer			USA Toll charge		
	DSRC					Japan Charge by guiding routes
RFID: Electronic tag		North America, South and Central America India, Taiwan, etc.				USA High-speed lane
WAVE: New DSRC		(South Korea)				
WIM: Dynamic load measuring apparatus		China				

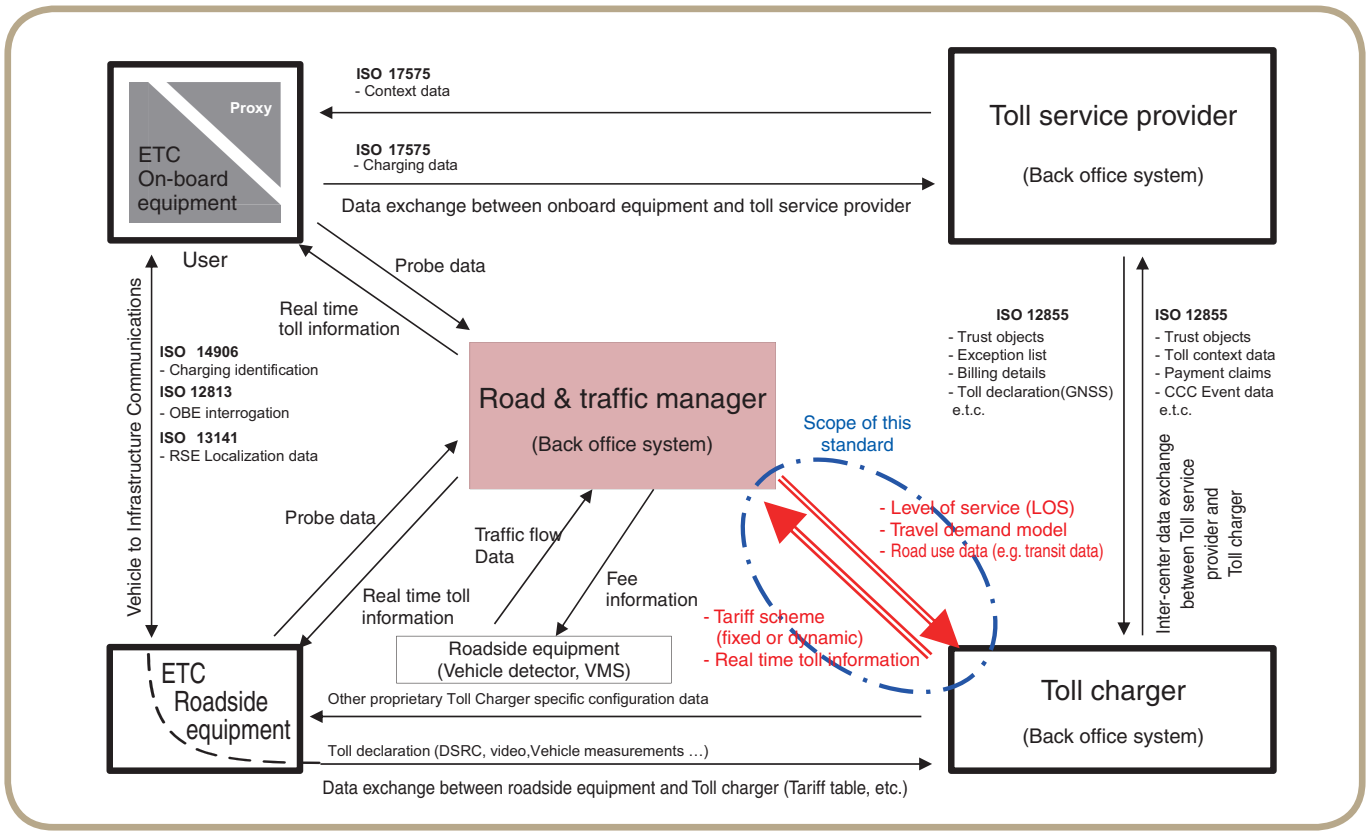
EFC based on existing technology

EFC based on new technology

Note: Countries in parentheses planning to introduce in near future

EFC support for traffic management (DTS 21192)

This item was approved as a new work item that adding "Road & Traffic Manager" to the traditional EFC operation model and proposing the concept of providing a "traffic management via EFC support" service in collaboration with Toll Charger. Referring to traffic management such as smart route-selection and tolling discussed in Japan, ERP (Electronic Road Pricing) in Singapore and HOT (High-occupancy Toll) lane in US, this item is working on defining the common concept model of traffic management based on traffic-demand-dependent dynamic tolls and defining the data exchange between Road & Traffic Operator and Toll Charger.



WG 7 General Fleet Management and Commercial/Freight

In WG 7, the transport of hazardous goods and freight multi-modal transport have been standardized (a merger of previous WG 6 (General Fleet Management) and WG 7 (Commercial/Freight) agreed upon at the Montreal meeting in November 1999). Specific work items being discussed for standardization include the operational monitoring of commercial freight vehicles, data dictionary and message sets for international multi-modal transport, and commercial freight vehicle monitoring.

List of WG 7 work items

		Standardization themes	ISO Number	Content
	1	General fleet management and commercial freight operations -- Data dictionary and message sets for electronic identification and monitoring of hazardous materials/dangerous goods transportation	ISO 17687	Definition of data dictionary and message sets supporting automatic identification, monitoring, and exchange of emergency response data for hazardous materials loaded on vehicles (SWG 7.1)
	2	Electronic information exchange to facilitate the movement of freight and its intermodal transfer -- Road transport information exchange methodology	TS 24533	Definition of data concept applied to freight multi-modal transport. Includes data exchanging message through transport interface along logistic chains. (SWG 7.2)
	3	Electronic information exchange to facilitate the movement of freight and its intermodal transfer -- Governance rules to sustain electronic information exchange methods	TS 17187	Definition of governance rules for electronically conducting organization process inter-connected by business entities for electronic commerce under secure and open environment through a standard framework of the data exchange. (SWG 7.2)
★	4	Freight land conveyance content identification and communication	ISO 26683-1 ISO 26683-2 CD 26683-3	Definition of application interface profiles and context for land transportation data exchange related to freight identification, package identification, container identification, and freight movement. (SWG 7.3)
★	5	Automotive visibility in the distribution supply chain -- Part 1: Architecture and data definitions	ISO 18945-1	Establishes the framework and architecture of data collection, and provides data definition for visibility of vehicles, self-driving construction machines, and agriculture machines in distribution supply chains. (SWG 7.3)
★	6	Framework for cooperative telematics applications for regulated commercial freight vehicles (TARV)	ISO 15638-1 to 22	Definition of collaborative telematics application of regulated commercial freight vehicles. (SWG 7.4)

★ Item(s) that Japan is / has been actively working on

Data Dictionary and Message Sets for Electronic Identification and Monitoring of Hazardous Materials/Dangerous Goods Transportation (ISO 17687)

Subject to this standardization are the data dictionary and message sets for supporting the exchange of information on hazardous materials as well as automatic identification and monitoring.

Effects of standardization are:

1. Real-time information collection (identification of vehicles, information on hazardous materials)
2. Support for cooperation between control center operators and emergency responders on site (police, firefighters, etc.) when an accident occurs during hazardous material transport
3. Monitoring of physical conditions (temperature and pressure, etc.) during hazardous material transport

In Europe and the United States, intermodal transport involving ships, railways and trucks is common in hazardous material transport. These items destined to be standardized are considered effective in providing one-stop service at borders.

Electronic information exchange to facilitate the movement of freight and its intermodal transfer -- Road transport information exchange methodology (TS 24533)
Electronic information exchange to facilitate the movement of freight and its intermodal transfer -- Governance rules to sustain electronic information exchange methods (TS 17187)

Work is progressing on the standardization necessary for electronic information exchange between shippers and logistics operators in international multi-modal transport. Since it is difficult to unify the international logistics data standards that differ by country and transport mode, a new concept called Electronic Supply Chain Manifest (ESCM) has been developed.

Freight land conveyance content identification and communication, architecture, reference standards, and monitoring (ISO 26683-1, -2, -3)

The system architecture for cargo management in surface transport aims to standardize application profiles (usage) applied to international multi-modal transport through the combined use of existing international standards and other rules, and to standardize the monitoring architecture for freight tracking.

Automotive visibility in the distribution supply chain- Part 1: Architecture and data definitions (ISO 18495-1)

It is intended for the international standardization of monitoring systems encompassing identification (ID) and database (types of data: what, when, where, and how) for the transport of fully assembled vehicles, from delivery from the factory until the time of sale.

Framework for collaborative Telematics Applications for Regulated commercial freight Vehicles (TARV) (ISO 15638-1 to 22)

This set of standards is applied to the framework for conducting data collection/value information provisioning services assuming a system to provide users (freight operators) with regulatory and operational information through installation of vehicle sensors and GPS reception equipment in regulated commercial freight vehicles and transmission of data generated by these devices to service providers. It includes authentication for private IT providers. It is also assumed that information on violations of the regulation be provided by service providers to the regulatory authorities. In Europe, operational management of commercial vehicles is planned to be conducted through making the adoption of digital tachographs mandatory (in June 15 2019 use of a next-generation tachograph is mandated in Europe).

At the April 2015 Hangzhou meeting, Part 20: Weigh in motion proposed by the EU and Part 21: Enhancements using roadside sensors (proposed by Japan), and at the October 2016 Auckland meeting, Part 22: Vehicle stability monitoring were approved as new items.

In the future, ISO 15638 series is supposed to enable driver management, operational management and weight monitoring of heavy vehicles, and stable driving through combination of standards for each Part. The intention is to make it a valuable standard to improve efficiency of urban logistics.

Part 21 includes examples of use of onboard and roadside equipment, and focuses on worldwide deployment of the Japanese ETC 2.0 service.

Part 22 is a framework for monitoring freight balance and informing the driver of the state of freight to protect heavy vehicles from the risk of rollover accidents.

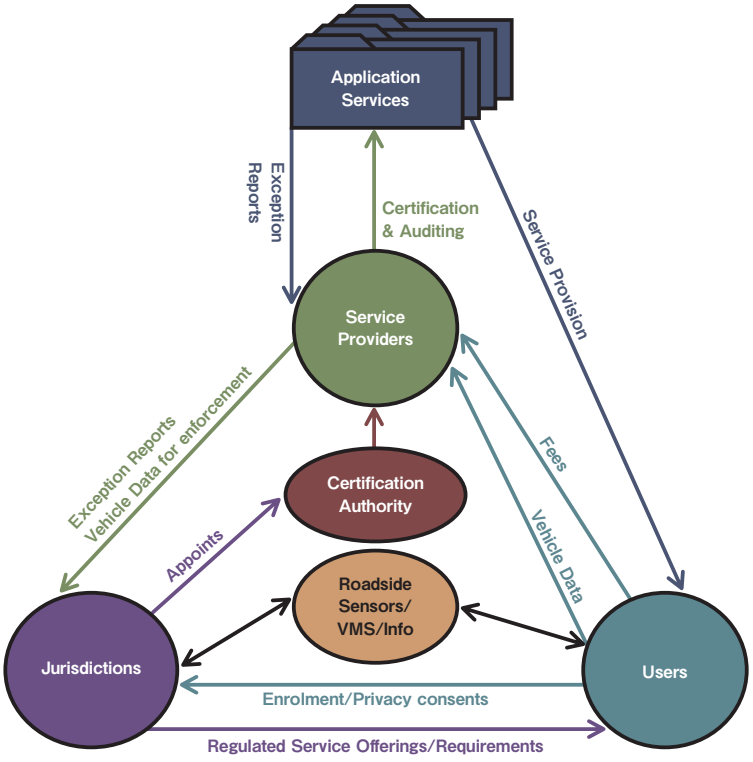


Figure Framework diagram of ISO 15638

15638 series

ISO Number	Title
ISO 15638-1	Framework and architecture
ISO 15638-2	Common platform parameters using CALM
ISO 15638-3	Operating requirements, 'Approval Authority' procedures, and enforcement provisions for the providers of regulated services
CD 15638-4	System security
ISO 15638-5	Generic vehicle information
ISO 15638-6	Regulated applications
ISO 15638-7	Other applications
ISO 15638-8	Vehicle access management
FDIS 15638-9	Remote electronic tachograph monitoring (RTM)
DIS 15638-10	Emergency messaging system/eCall (EMS)
ISO 15638-11	Driver work records (work and rest hours compliance) (DWR)
ISO 15638-12	Vehicle mass monitoring (VMM)
TS 15638-13	'Mass' information for jurisdictional contntrol and enforcement (MICE)
ISO 15638-14	Vehicle access control (VAC)
ISO 15638-15	Vehicle location monitoring (VLM)
ISO 15638-16	Vehicle speed monitoring (VSM)
ISO 15638-17	Consignment and location monitoring (CLM)
ISO 15638-18	ADR (dangerous goods) transport monitoring (ADR)
TS 15638-19	Vehicle parking facilities (VPF)
CD 15638-20	Weigh-in-motion (WIM) monitoring
ISO 15638-21	Enhancements using roadside sensors (ERS)
DIS 15638-22	Vehicle stability monitoring

WG 8 Public Transport and Emergency

WG 8 is responsible for the standardization of public transport. Public transport includes buses, trains, trams and emergency vehicles.

As one specific standardization item, CEN has conducted discussions on Interoperable Fare Management Systems (IFMS). IFMS Parts 2 and 3 have been issued as TRs, and Part 1 was reviewed in 2014. The public transport user information Part 1 proposed by Japan in autumn 2010, which encompasses the CEN TransModel, the US PTCIP and Japanese standards on passenger information in public transport, was issued as an ISO in the spring of 2014.

In the spring of 2016, a report was published by CEN/TC 278 to support Urban ITS. Standardization is now expected to be handled based on the contents of this report. It is necessary to pay close attention to these developments.

List of WG 8 work items

		Standardization themes	ISO Number	Content
★	1	Data dictionary and message sets for preemption and prioritization signal systems for emergency and public transport vehicles (PRESTO)	ISO 22951	Standardization of data dictionary and message sets for traffic signal preemption and prioritization for emergency and public transport vehicles
★	2	Public transport -- Interoperable fare management system -- Part 1: Architecture	ISO 24014-1	Definition of conceptual architecture to establish a public transport fare management system that accommodates multiple operators and services
★	3	Public transport -- Interoperable fare management system -- Part 2: Business practices	TR 24014-2	Description of the set of rules necessary for installing IFMS based on the architecture specified in Part 1 and the relationship among the rules
	4	Public transport -- Interoperable fare management system -- Part 3: Complementary concepts to Part 1 for multi-application	TR 24014-3	Description of business practices within applications in multi-application environments and interoperability between applications
	5	Public transport requirements for the use of payment applications for fare media	TR 14806	Standardization of IC card and other payment methods
★	6	Public transport user information -- Part 1: Standards framework for public information systems	ISO 17185-1	Establishment of a comprehensive standard including public transport user information in various countries
	7	Public transport user information -- Part 2: Public transport data and interface standards catalogue and cross references	TR 17185-2	Standardization of public transport user information interfaces and use cases
★	8	Public transport user information -- Part 3: Use cases for journey planning systems and their interoperation	TR 17185-3	Standardization of use cases for journey planning systems and collaboration among them
	9	Public transport user information -- Part 4: Use cases for mobility journey planning systems and their inter-operation	PWI 17185-4	Standard to define use case for trip planning systems to make them interoperable
	10	Emergency evacuation and disaster response and recovery -- Part 1: Framework and concept of operation	TR 19083-1	Standardization of evacuation and restoration in an emergency
	11	Account-based ticketing state of the art report	TR 20526	Compiles latest trends in account-based ticketing as TRs
	12	Interoperability between IFM systems and NFC mobile devices	AWI 20527	Standard for interoperability between IFMS system and mobile equipment using near field communication devices
	13	Common transport service account systems -- Part 1:Framework and use cases	DTR 21724-1	Definition of framework and use cases for the account system for public transport payment

★ Item(s) that Japan is / has been actively working on

The Importance of Public Transport

WG 8 has adopted public transport as an important standardization subject, as excessive dependence on automobiles for moving passengers and cargo causes serious harm to our society and wellbeing, and damages sustainability. Reducing dependence on automobiles requires increasing urban density and making cities more compact, to permit a shift of transport modes from automobiles to walking, cycling and the use of public transport. Automobiles, however, provide door-to-door transport and comfort, and the out-of-pocket costs borne by drivers are considered to be generally lower than those of public transport.

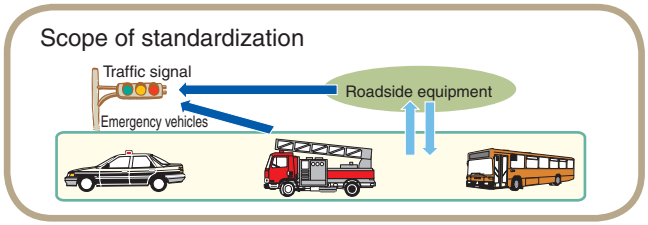
An effective way to promote a move to public transport is to enhance its appeal. Information has an extremely important role to play in this respect. The development of ICT has made it possible to select the most appropriate route using information such as public transport routes, transfers, operating conditions, required time and fare before starting out and while traveling.

To dramatically improve the attractiveness of public transport, it is necessary to provide everybody with seamless mobility by utilizing advanced information technology. With the introduction of on-demand traffic operation, the launch of MaaS (Mobility as a Service) in Europe represents how public transport will develop in the future.

Data Dictionary and Message Sets for Pre-emption and Prioritization Signal Systems for Emergency and Public Vehicles: PRESTO (ISO 22951)

PRESTO is designed to exchange data efficiently for traffic signal preemption and prioritization so that public transport vehicles such as emergency vehicles, buses and trams can pass intersections preferentially over other vehicles. Data is exchanged principally between vehicles and roadside units. The standardization scope includes data dictionaries and message sets in the V2I/I2V communication fields.

Traffic signals can be controlled by prolonging a green light or shortening a red light based on information about the location, speed, destination and direction of travel of emergency vehicles at intersections so they can pass through them without hindrance. Other vehicles and pedestrians can be made aware of the presence of the arriving emergency vehicle and avoid a potential collision. An ISO was issued in January 2009. In 2014, it was subjected to a systematic review and approved in June of the same year.



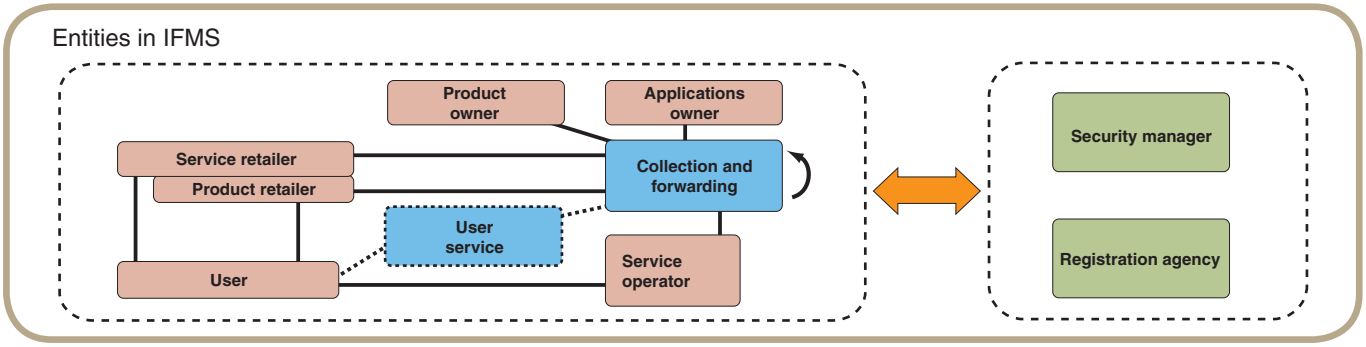
Interoperable Fare Management System: IFMS (ISO 24014)

The Interoperable Fare Management System (IFMS) is a conceptual architecture for the overall coordination of related systems to realize efficient operation and management of fare collection through IC cards and other payment methods in railways, buses and other types of public transport. In Europe, CEN/TC 278/WG 3 is leading the standardization of the system. In view of its significance, WG 8 decided to standardize IFMS in cooperation with CEN, and the PWI proposal for Part 1 was approved in October 2003.

Subsequently, the FDIS ballot was held in February 2007 and the ISO was published in June 2007. The experts and participants from Japan showed great persistence in negotiating with CEN and succeeded in having Japanese input included in the ISO. The systematic review of Part 1 was completed in 2015.

Following Part 1, the standardization of Part 2 began. However, because its content covered a wide range of topics, they were split into new Parts 2 and 3. Japan served as editor for the new Part 2, in which a set of rules necessary for the actual application of IFMS has been compiled based on the architecture specified in Part 1. Parts 2 and 3 have been issued as TRs.

Following the publication of Parts 2 and 3, the need for revision of Part 1 became apparent. In consequence, Germany and Japan have embarked on this task.



Public Transport User Information (ISO 17185)

Regarding information related to public transport, it was agreed in April 2007 that the standardization of a reference model be started based on the TransModel established by CEN. As part of the preparation, it was agreed to prepare catalogs of public transport in member countries, but this was postponed for a year due to budgetary constraints. This item was later approved as a PWI at the Barcelona meeting in September 2009.

However, preparing catalogs of public transport information in individual countries takes a lot of time and effort, but offers limited practical value. It was, therefore, decided to propose a comprehensive standard including information for users of public transport in member countries. In addition to the European Trans-Model and American PTCIP, Japanese standards will be included in it. "Public transport user information Part 1: Framework" was proposed at the Jeju meeting in autumn 2010 and approved as a PWI. Standardization proceeded smoothly thereafter, and it was published as an ISO in 2014. The standardization of Parts 2 and 3 was performed in parallel, and Part 3 was published as a TR in 2015.

Standardization for Urban ITS

In the spring of 2016, PT 1701, one of the project teams of CEN/TC 278, released a report titled "Standards and actions necessary to enable urban infrastructure coordination to support Urban ITS." The report summarizes the discussion results on standards needed to support deployment of Urban ITS required for operation and management of urban areas, and includes the following eight fields that have higher priorities:

- Location referencing harmonization
- Mixed vendor environment
- Urban-ITS issues associated with autonomous/automated vehicles
- Traffic management system status, fault and quality standards
- ITS communication and information protocols
- Data models and definitions for new modes
- Emissions management in urban areas
- Traffic management data models and interfaces

Standardization items closely connected with public traffic include Transmodel (an existing CEN standard), IFOPT (standardization for stations of mass transportation), and programs for revision and expansion of NeTEx/SIRI.

Because these items of standardization significantly affect urban traffic in Japan, we must press for our opinions to be included in standardization while carefully watching future CEN developments.

WG 9 Integrated Transport Information, Management and Control

WG 9 is working on the standardization of traffic management (traffic information and control, etc.). Specifically, it is working on the systematization of information and standardization of communication systems between traffic management centers, between centers and roadside modules, and between roadside modules, to enable efficient data exchange and to provide information to outside organizations.

List of WG 9 work items

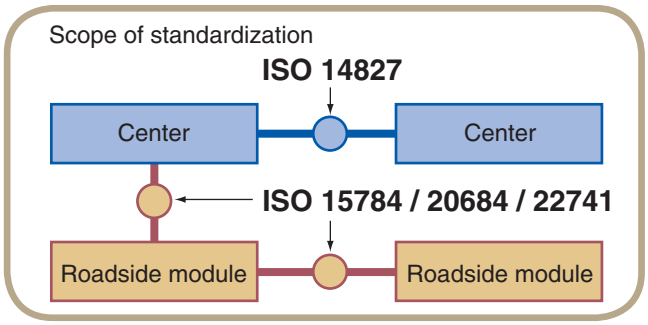
		Standardization themes	ISO Number	Content
	1	Data interfaces between centres for transport information and control systems -- Part 1: Message definition requirement	ISO 14827-1	Definition of message forms between centers for transport information and control systems
	2	Data interfaces between centres for transport information and control systems -- Part 2: DATEX-ASN application	ISO 14827-2	Definition of a DATEX-ASN-based communication protocol between centers for transport information and control systems
★	3	Data interfaces between centres for transport information and control systems -- Part 3: Data interfaces between centres for intelligent transport systems (ITS) using XML	DIS 14827-3	Definition of an XML-based communication protocol between centers for transport information and control systems
★	4	Data exchange involving roadside modules communication - Part 1 : General principles and documentation framework of application profiles	ISO 15784-1	Principles underlying application profiles and framework for documentation regarding communication between centers and roadside modules
	5	Data exchange involving roadside modules communication -- Part 2: Centre to field device communications using SNMP	ISO 15784-2	Application profile based on TMP of communication between roadside modules (NTCIP 1103)
★	6	Data exchange involving roadside modules communication - Part 3 : Application profile-data exchange(AP-DATEX)	ISO 15784-3	Application profile based on DATEX-ASN (ISO 14827) for communication between centers and roadside modules
	7	Integrated transport information, management and control -- Data quality in ITS systems	TR 21707	Definition of data quality for ITS
	8	Interface protocol and message set definition between traffic signal controllers and detectors (IPMSTSCD)	ISO 10711	Definition of interface and message set between vehicle detectors and traffic signal controllers
★	9	The use of simulation models for evaluation of traffic management systems -- Input parameters and reporting template for simulation of traffic signal control systems	TR 16786	Specification of input parameters and report templates in evaluating signal control systems through simulation
★	10	Definition of data elements and data frames between roadside units and signal controllers for cooperative signal control	CD 19082	The definition of a use-case, requirements and data concepts for traffic signal control, incorporating probe data
	11	Data interfaces between centres for transport information and control systems -- Platform independent model specifications for data exchange protocols for transport information and control systems	CD 19468	Platform independent model specifications for data exchange protocols for transport information and control systems
	12	Roadside modules SNMP data interface	CD 20684-1, 2, 3, 4, 10	Definition of application interface using SNMP between roadside modules and the center
★	13	Roadside modules AP-DATEX data interface	PWI 22741-1, 2, 10	Definition of application interface using DATEX-ASN between roadside modules and the center

★ Item(s) that Japan is / has been actively working on

Scope of standardization

The scope (center-to-center, centers-to-roadside) of standardization that WG 9 is working on is shown in the Figure. Centers refer to transport management centers. Roadside modules include signal control devices, information boards and sensors installed along roads.

Ensuring interconnectivity is one advantage of promoting the standardization of information and communication between centers as well as centers and roadside modules. It also reduces the risks involved in purchasing modules by procurers, and in development by module suppliers.



Definition of data elements and data frames between roadside units and signal controllers for cooperative signal control (CD 19082)

Recently, in addition to vehicle detectors, road-to-vehicle communications are making it possible to collect traffic information (probe data). Under the circumstances, Japan made a proposal for standardizing data usable for signal control to facilitate the construction of signal control system based on this information. For this item CD voting was completed in 2016. Currently DIS voting is being prepared.

Communication between Centers (ISO 14827, CD 19468)

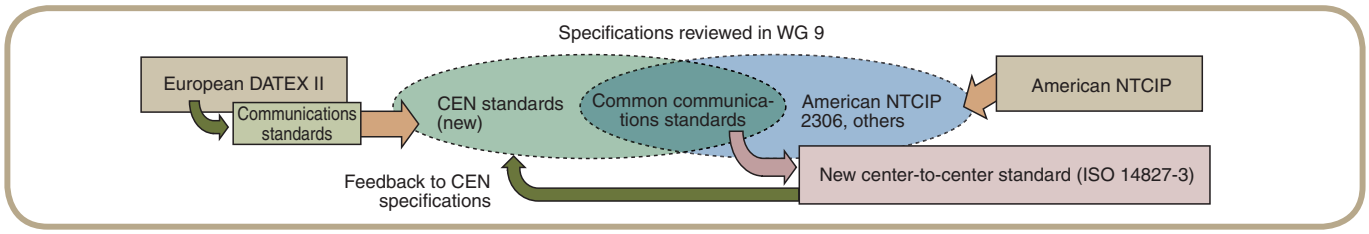
Communication between centers refers to communication between traffic management centers, in which information collected by one transport management center is exchanged with neighboring centers, enabling the implementation of extensive transport management. WG 9 stipulates the definition forms of messages and the protocol for the exchange of messages of communication between centers.

Definition forms of messages prescribe what should be described when defining messages. This includes the name of the message, text and format (data type).

The DATEX-ASN protocol has been specified for the application layer. It is based on DATEX-Net, the former European center-to-center communication standard, revised by the US to incorporate the ASN.1 notation language and converted into an international standard.

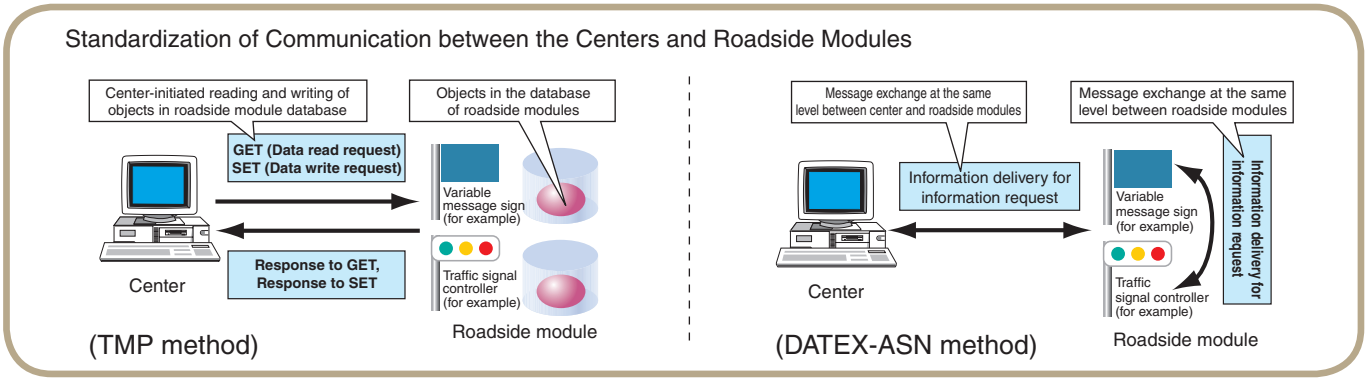
This item was established as ISO 14827 Part 1 and Part 2 in November 2005. Part 3, in which Japan is leading discussions, is about trying to define messaging rules using an XML-based protocol in a form compatible with both the European DATEX II and the American NTCIP standards for communication between centers.

In Europe, formulation of platform-independent communications as CD 19468 based on DATEX II is under way, and 14827-3 is now preparing FDIS voting.



Communication between Centers and Roadside Modules (ISO 15784)

Communication between centers and roadside modules refers to the exchange of information between the central modules of a transport management center and modules installed along roads, as well as between different roadside modules. WG 9 prescribes communication by specifying an array of underlying standards for the upper layer 3 of OSI, and formulating methods of using them as an application profile. Specifically, the group has defined Part 2, which specifies TMP (Transportation Management Protocols) formulated as part of NTCIP (National Transportation Communication for ITS Protocol), a communication standard in the ITS field in the US, and Part 3, which specifies DATEX-ASN of ISO 14827-2, along with their use of an international standard for intertraffic- management-center communications. Each part has been issued as an ISO document.



Communication Interface between Centers and Roadside Modules (CD 20684, PWI 22741)

This item is aimed at standardization of the data set used between the transport management center and roadside modules or between roadside modules using the application profile defined in ISO 15784.

ISO 20684 series, led by the U.S. based on SNMP, and ISO 22741 series, led by Japan based on DATEX-ASN, have been examined concurrently.

South Korea proposed Part 10 of each series as communications with variable message signs and the proposition was approved as NP in 2016.

Interface Protocol and Message Set Definition between Traffic Signal Controllers and Detectors (ISO 10711)

The scope of this item is to standardize message sets for information from vehicle detectors to generate signal control parameters.

The standard is classified into two methods: one is bulk transmission of every item simultaneously, and the other is individual transmission in some separate groups. South Korea proposed this item in 2006, and Japan actively joined the standardization work, focusing on incorporating the separate transmission method for data sets in the draft. Consequently it was approved as an ISO and published in 2012.

WG 10 Traveler Information Systems

Traveler information systems, subject to standardization by WG 10, constitute a core part of ITS. This working group has work items designed to study data dictionaries and message sets to provide information to drivers through various communication media, such as FM broadcasting, DSRC, and digital broadcasting. Recently, the Transport Protocol Experts Group (TPEG) has stepped up its UML modeling activities.

List of WG 10 work items

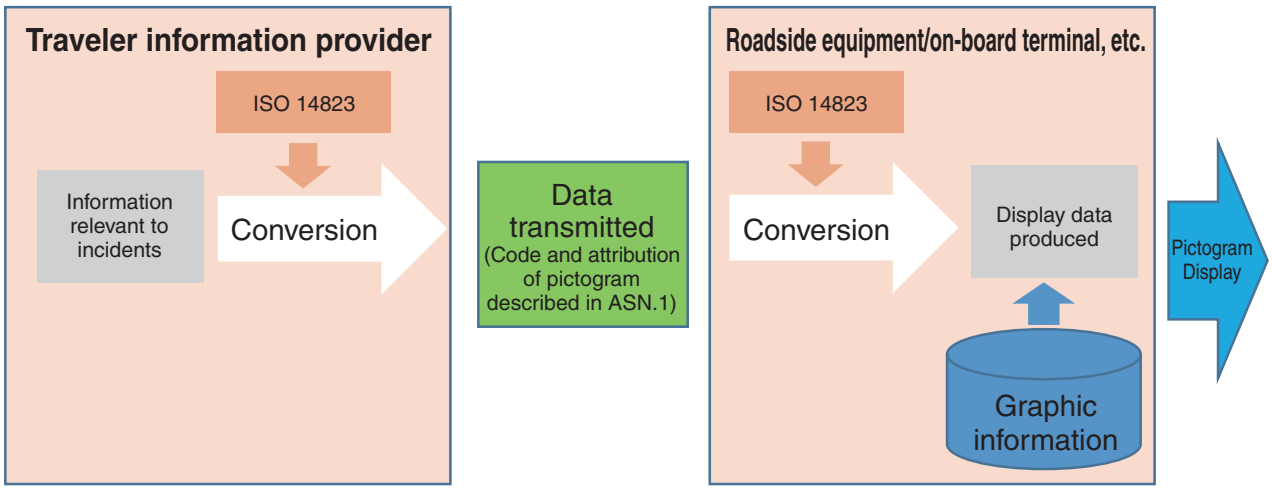
		Standardization themes	ISO Number	Content
	1	TTI messages via traffic message coding	ISO 14819-1	Standardization of the RDS-TMC system
			ISO 14819-2	Code definition of TTI messages
			ISO 14819-3	Location referencing method
			ISO 14819-6	Regulation of conditional access
★	2	Intelligent transport systems -- Graphic data dictionary	ISO 14823 AWI 14823-2	Example of pictogram data dictionary codes transmission message description
	3	Traffic and Travel Information via Transport Protocol Experts Group	TS 18234-1	Standardization of traveller information delivery services (TPEG) using digital broadcasting Introduction
			TS 18234-2	TPEG1 binary version; Syntax, frame structure
			TS 18234-3	TPEG1 binary version; Services and network information
			TS 18234-4	TPEG1 binary version; Road transport message applications
			TS 18234-5	TPEG1 binary version; Public transport information
			TS 18234-6	TPEG1 binary version; Location referencing
			TS 18234-7	TPEG1 binary version; Parking lot information
			TS 18234-8	TPEG1 binary version; Information on congestion and traveling time
			TS 18234-9	TPEG1 binary version; Traffic event information
			TS 18234-10	TPEG1 binary version; Weather information
			TS 18234-11	TPEG1 binary version; Location referencing
			TS 24530-1	TPEG XML version; Introduction, common data type
			TS 24530-2	TPEG XML version; Location referencing
			TS 24530-3	TPEG XML version; Road traffic message
			TS 24530-4	TPEG XML version; Transit information
			TS 21219-1	TPEG2 UML version; Introduction, numbering, version management
			TS 21219-2	TPEG2 UML version; UML modeling rule
			TS 21219-3	TPEG2 UML version; UML-binary conversion rule
			TS 21219-4	TPEG2 UML version; UML-XML conversion rule
			TS 21219-5	TPEG2 UML version; Service framework
			TS 21219-6	TPEG2 UML version; Message management
			TS 21219-7	TPEG2 UML version, Location referencing container
			TS 21219-9	TPEG2 UML version; Service network information
			TS 21219-10	TPEG2 UML version; Conditioned access information
			TS 21219-14	TPEG2 UML version; Parking lot information
			TS 21219-15	TPEG2 UML version; Simplified event information
			TS 21219-16	TPEG2 UML version; Fuel charge information
			TS 21219-18	TPEG2 UML version; Traffic flow estimation
			TS 21219-19	TPEG2 UML version; Weather information
			DTS 21219-21	TPEG2 UML version; Geographic Location Referencing
			TS 21219-22	TPEG2 UML version; Open Location Referencing
			TS 21219-23	TPEG2 UML version; Multi modal roots
			TS 21219-24	TPEG2 UML Version: Standardization of simplified encryption method for TEPG
			TS 21219-25	TPEG2 UML Version: Standardization of information for electric vehicle charging stations
			DTS 21219-26	TPEG2 UML Version: Standardization of information for vigilance location

Note: TTI: Traffic and Travel Information, RDS-TMC: Radio Data System-Traffic Message Channel
★ Item(s) that Japan is / has been actively working on

Graphic Data Dictionary (ISO 14823)

This work item involves the standardization of a graphic data dictionary (GDD) of pictograms, including road traffic signs and designs. This is intended to display pictograms corresponding to transmitted GDD codes on variable information boards or on-board devices. As pictograms vary from country to country, only the codes and their attributions (time, distance, direction, vehicle width/height, etc.) they represent, rather than the actual pictograms or designs, are subject to standardization. Japan took the lead for this work item, which was published as TS in 2008. Later, the standard has got to be revised at the strong request of WG 18 DT 8.3. The group conducted major revision in collaboration with WG 1. The standard was published as ISO in 2017. The group plans to compile examples of codes and attributions described in ASN.1 as TR (14823 part 2) in the future.

Example of data and process flow for ISO 14823

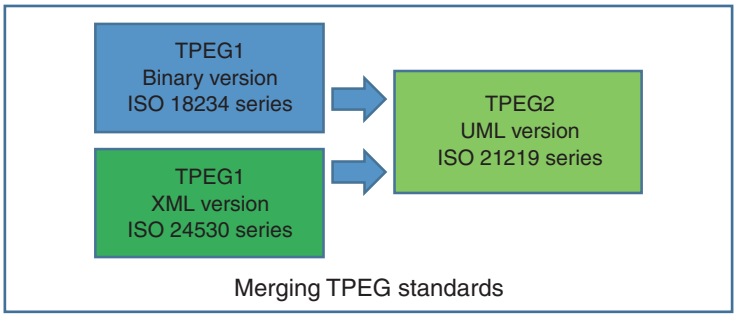


TTI Messages Using Broadcasting-Type Digital Media (TS 18234-1 to 11, NP/DTS/TS 21219-1 to 25, TS 24530-1 to 4)

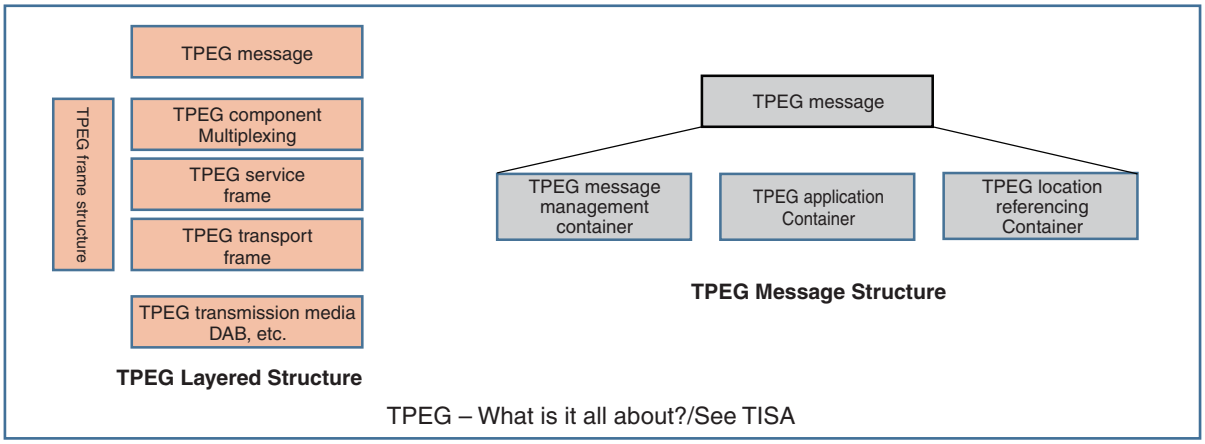
TPEG is a proposal to standardize a method of providing traffic information using high-speed digital data broadcasting.

TPEG standardization has progressed in the binary and XML categories, with UML currently being advanced for the next-generation TPEG. Further, official liaison has been established between WG 10 and the Traffic Information Service Association (TISA), a European organization engaged in the actual preparation of drafts for TPEG. While TISA is energetically working on those drafts, actual systems making use of TPEG are becoming more widespread, particularly in Europe and North America.

In the future, there are plans to proceed with information gathering, to cooperate with the domestic and foreign parties concerned, and to promote the presentation of comments and counter-proposals.



Merging TPEG standards



TPEG – What is it all about?/See TISA

WG 14 Vehicle/Roadway Warning and Control Systems

WG 14 is working on the standardization of driving control technology to reduce driver workload, improve convenience, raise awareness of danger, prevent accidents and mitigate damage using advanced technologies. Vehicles equipped with systems such as Adaptive Cruise Control (ACC) and Forward Vehicle Collision Mitigation Systems (FVCMS) are already available on the market.

Chaired by Japan, WG 14 includes many participating countries and is widely recognized as one of the most active groups in TC 204.

List of WG 14 work items

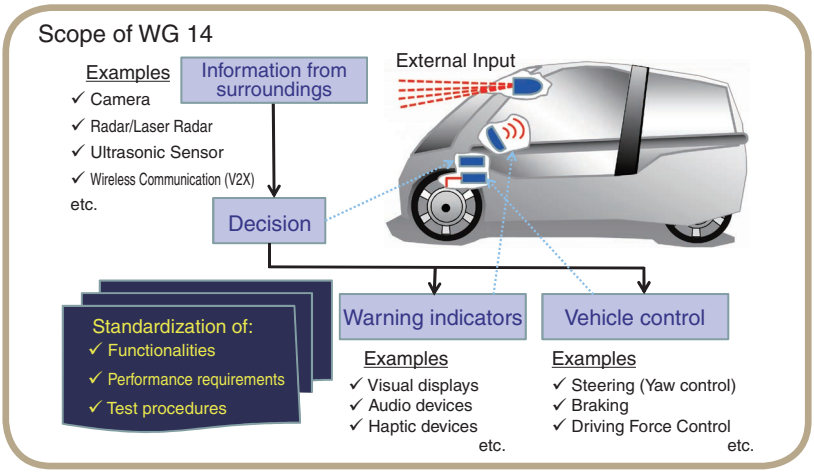
		Standardization themes	ISO Number	Content
	1	Adaptive Cruise Control systems -- Performance requirements and test procedures	ISO 15622	System for maintaining a certain distance from the vehicle ahead Specification of classification according to the existence of a clutch or active braking, control strategy, and driver intervention characteristics Currently in revision to include ISO 22179 FSRA and add new contents.
	2	Forward vehicle collision warning systems -- Performance requirements and test procedures	ISO 15623	System for preventing rear-end collisions by activating a warning system whenever the vehicle in front is too close and prompting the driver to maneuver to avoid collision Specification of detection range and performance, as well as evaluation methods concerning the vehicle ahead
★	3	Transport information and control systems -- Traffic Impediment Warning Systems (TIWS) -- System requirements	TS 15624	System that identifies obstacles in curves ahead of the vehicle through roadside sensors, and informs the driver using roadside message boards Has been established as TS without progressing to ISO status as the infrastructure depends on unique factors that vary from one country to another
	4	Manoeuvring Aids for Low Speed Operation (MALSO) -- Performance requirements and test procedures	ISO 17386	System to inform the driver of obstacles found at the rear or corners of the vehicle when backing up and turning at low speed Specification of classification based on detection areas, system operation conditions, and test methods
★	5	Lane departure warning systems -- Performance requirements and test procedures	ISO 17361	System to warn the driver of an actual or possible departure from a lane due to inattention. Specification of lane departure definition, warning conditions, and test methods
	6	Lane change decision aid systems (LCDAS) -- Performance requirements and test procedures	ISO 17387	System to inform the presence of a vehicle in a blind spot or a vehicle approaching from behind when a driver is trying to change lanes Specification of classification based on areas covered, warning conditions, and test methods
★	7	Low speed following (LSF) systems -- Performance requirements and test procedures	ISO 22178	System that controls following a slow-moving vehicle in conditions such as traffic congestion In addition to items common to FSRA, specification of control methods when the vehicle ahead changes
	8	Forward vehicle collision mitigation systems -- Operation, performance, and verification requiremen	ISO 22839	System that automatically applies emergency braking to mitigate collision damage if there is a risk of collision with the vehicle ahead Operational concepts, system requirements, and evaluation procedures are specified
	9	Devices to aid reverse manoeuvres -- Extended-range backing aid systems (ERBA)	ISO 22840	System to provide information on obstacles at the rear of the vehicle when backing up for a relatively long distance. Specification of the scope, obstacles concerned, detection area and system operation conditions, in comparison with MALSO
	10	Cooperative intersection signal information and violation warning systems (CIWS) -- Performance requirements and test procedures	ISO 26684	System based on roadside and vehicle cooperation that displays current traffic light information on onboard equipment and uses it to activate a warning system if the driver is about to ignore a red light Specifies basic structures such as basic functions, standardization items and information contents
	11	Curve speed warning systems (CSWS) -- Performance requirements and test procedures	ISO 11067	System alerting the driver, using a navigation map for example, if a safe speed is exceeded as the vehicle approaches a curve Specifies system definition and required items
	12	Lane keeping assistance systems (LKAS) -- Performance requirements and test procedures	ISO 11270	System that recognizes the lane ahead and automatically controls steering to help keep the vehicle in it Specifies system definition and requirements
	13	Full speed range adaptive cruise control (FSRA) systems -- Performance requirements and test procedures	ISO 22179	System to expand ACC follow functionality to stop control Specification of the definition of the vehicle running ahead, restarting, and system operation limits
★	14	Assisted Parking System (APS) -- Performance requirements and test procedure	ISO 16787	System that detects parking spaces and provides automatic steering while parking Specifies system definition and requirements
★	15	External hazard detection and notification systems -- Basic requirements	ISO 18682	Specification of fundamental concepts for notifications and warnings in cooperative and autonomous systems
★	16	Pedestrian Detection and Collision Mitigation Systems (PDCMS)	ISO 19237	System that automatically applies emergency braking to mitigate collision damage if there is a risk of colliding with a pedestrian ahead Operation concepts, performance requirements, and evaluation procedures are specified
★	17	Report on standardisation for vehicle automated driving systems (RoVAS)/Beyond driver assistance systems	TR 20545	A technical report with a broad view of automated driving functions, with items to standardize spanning many fields.
★	18	Road Boundary Departure Prevention Systems (RBDPS) -- Performance requirements and test procedures	PRF 19638	The system will control the vehicle's braking and steering to prevent departure from the road boundary.
	19	Cooperative Adaptive Cruise Control (CACC)	DIS 20035	The system maintains a suitable distance to the vehicle ahead using V2V and V2I communication with multiple vehicles and the infrastructure.
★	20	Partially Automated Parking System	DIS 20900	The system controls both the longitudinal and lateral movement of the vehicle during parking maneuvers. The driver remains in the car in Type 1, and remotely supervised by the drive outside the car in Type 2.
	21	Emergency Electronic Break Light systems	CD 20901	The system warns the driver against danger caused by emergency braking of forward vehicles on the upcoming road.
★	22	Partially Automated Lane Change Systems	AWI 21202	The system recognizes lane markings and conditions around the vehicle through sensors, and changes lanes automatically upon receiving instructions or confirmation from the driver.
	23	Partially Automated In-lane Driving Systems	PRF 21717	The system automatically controls the vehicle in longitudinal and lateral directions within the lane.
	24	Bicyclist detection and collision mitigation systems	CD 22078	System that automatically applies emergency braking to mitigate collision damage if there is a risk of colliding with a bicyclist ahead. Operation concepts, performance requirements, and evaluation procedures are specified.
	25	Low Speed Automated Driving systems for limited operational design domain	NP 22737	System that, in the limited operational design domain, automatically operates vehicles in low speed.
	26	Taxonomy and definitions for terms related to driving automation systems for on-road motor vehicles	NP 22736	Public available specifications describing taxonomy and definitions for terms related to driving automation systems for on-road motor vehicles. ISO and SAE work collaboratively on revision of draft of SAE issued standard.
★	27	Automated Valet Parking System	PWI 23374	System that provides parking lot vacancy information and automatically operates the vehicle between the location where the driver gets on/off and the parking spot. Consisting of four parts.
★	28	Collision Avoidance in-lane Lateral Control system	PWI 23375	System using in-vehicle sensors that detects an object to be avoided and controls the lateral movement of the vehicle to avoid colliding with the object.
	29	Vehicle to Vehicle Intersection Collision Warning system	PWI 23376	System using vehicle-to-vehicle communications that alerts the driver if the vehicle is predicted to collide with another at an intersection in the direction that the vehicle is moving.

★ Item(s) that Japan is / has been actively working on

WG 14 is broad in scope, as it covers standalone/cooperative warnings and control systems, including vehicle control, sensing of the surrounding environment, communications, and presenting information to drivers. To date, the group has issued 20 international standards, and has 14 standards currently under development as shown below describing part of them.

WG 14 also has established collaborative relationships with standardization bodies including ETSI TC-ITS[*1], DSRC TC[*2] and ORAD TC[*3] from SAE, and TC 22/SC 33[*4] from ISO to develop portions of standards.

*1 European Telecommunications Standards Institute Technical Committee of ITS
*2 Dedicated Short Range Communication Technical Committee
*3 On-Road Automated Driving Technical Committee
*4 Road vehicles - Vehicle dynamics and chassis components

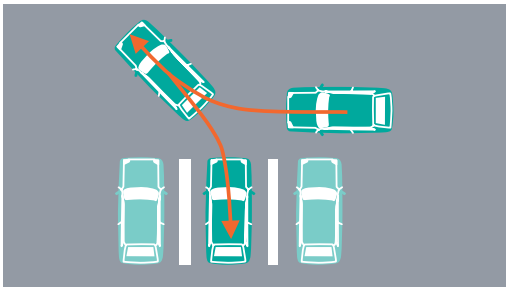


DIS 20900 Partially Automated Parking System (PAPS)

This standard defines systems that detect parking spaces and then control steering, acceleration and braking to make parking partially automated.

While detecting a parking spot typically enclosed with the white frame and adjacent vehicles, the standard covers all situations of parallel and retreat parking.

Japan is developing Type 1 of the standard, involving the driver staying in the vehicle and constantly monitoring the surroundings, and Germany is developing Type 2, in which the driver operates the vehicle remotely from outside. Type 2 is intended to be used for a narrow parking spaces which might make it difficult for passengers to exit the vehicle. It also defines movement conditions at the time of unloading.

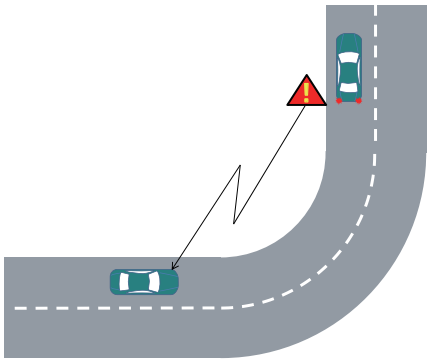


Proposing country: Japan and Germany

CD 20901 Emergency Electronic Brake Light systems (EEBL)

This standard defines a system that detects activation of the brake of the vehicle in a state of emergency and transmits information to following vehicles and surrounding infrastructure facilities.

It specifies the requirements of the vehicle transmitting information and presents examples of data processing and alarm contents in the vehicle receiving the data.

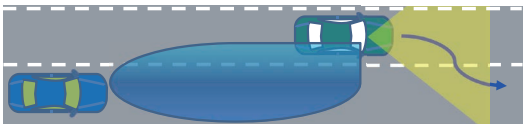


Proposing country: South Korea

AWI 21202 Partially Automated Lane Change Systems (PALS)

This standard defines systems that detect lane markings and change the lane partially automatically.

It consists of two categories: Type 1 changes the lane with directions from the driver. Type 2 starts changing the lane according to the timing determined by the system. In Type 2, the system must accurately capture the relative speed of other vehicles driving in the destination lane.

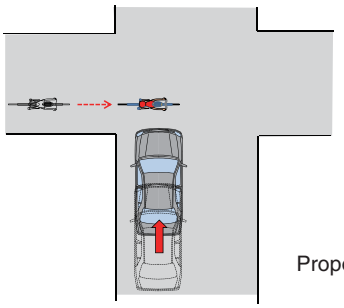


Proposing country: Japan

CD 22078 Bicyclist Detection and Collision Mitigation Systems (BDCMS)

This standard defines a system to mitigate damage caused by collision by activating an automatic braking mechanism if collision with a bicyclist is unavoidable.

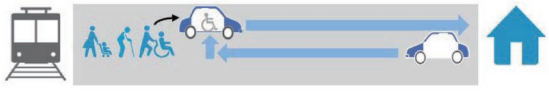
Because the moving speed of the object to be detected is faster than that of a pedestrian, the minimum performance requirements need to be stricter. As with ISO 19237 (PDCMS: Pedestrian Detection and Damage Mitigation Systems), TC 22/SC 33/WG 16 is developing specifications for the test target with a dummy. Both groups (WG 14 and 16) are continuing to develop the standard collaboratively.



Proposing country: The US

NP 22737 Low Speed Automated Driving systems for limited operational design domain (LSAD)

This standard defines a system that controls small vehicles used, for instance, as a means of moving from a train station to a major city facility or to a home in regions that lack public transportation. It consists of three Types: Type 1, with a supervisor remaining in the car; Type 2 with a supervisor present outside the car but within view; and Type 3 with a supervisor present at a remote site. Similar types of technologies are attracting attention as potentially the next generation of mobility (moving methods), and various countries are actively developing them.



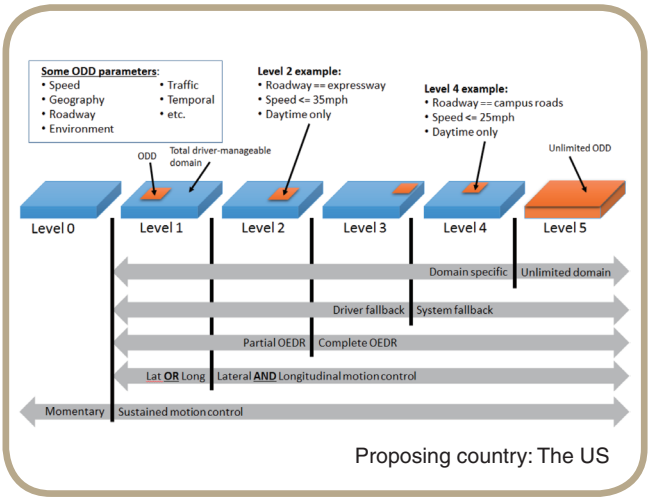
Proposing country: The UK

ISO/SAE NP PAS 22736 Taxonomy and definitions for terms related to driving automation systems for on-road motor vehicles

The SAE ORAD committee and WG 14 are collaboratively promoting this document by revising a document with the same title (SAE J3016) issued by SAE in June 2018 with approval of SAE PSDO (codeveloper of standard). This item continues to have its standards developed by a co-working group comprising representatives from both ISO and SAE.

The standard consists of six levels of driving automation systems: levels 0 to 5. Levels 3 to 5, where the system basically plays the role of monitoring the driving environment are referred to as automated driving systems. Levels 1 and 2 are classified as driver assistance systems.

ISO aims at early publication of the document as PAS (public available specifications).

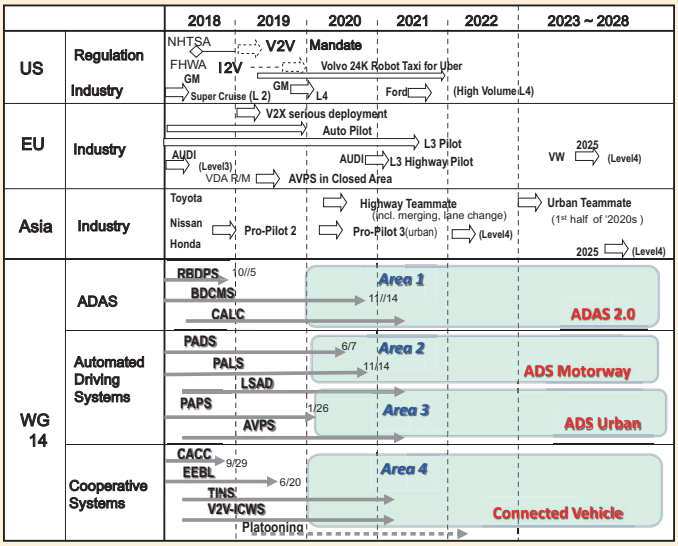


Proposing country: The US

Reference: Reviewing WG 14 road map

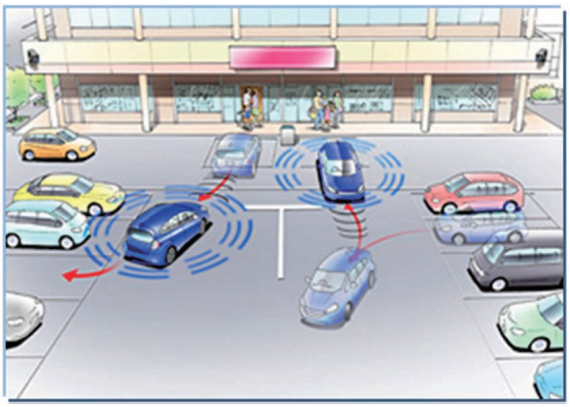
WG 14 periodically discusses which themes should be standardized and updates the road map according to timings of product development and marketing in the industry. The chairman presented the following four key themes and is currently asking countries to propose work items.

1. ADAS 2.0 - More advanced driving assistance systems (Example: Navigation integrated cruise control)
2. ADS Motorway - Automated driving systems on highways (Example: Highway chauffeur, automatic emergency stop)
3. ADS Urban - Automated driving systems on local roads (Example: Intersection automated driving)
4. Connected Vehicle - Systems using communications (Example: Merging assistance, platooning)

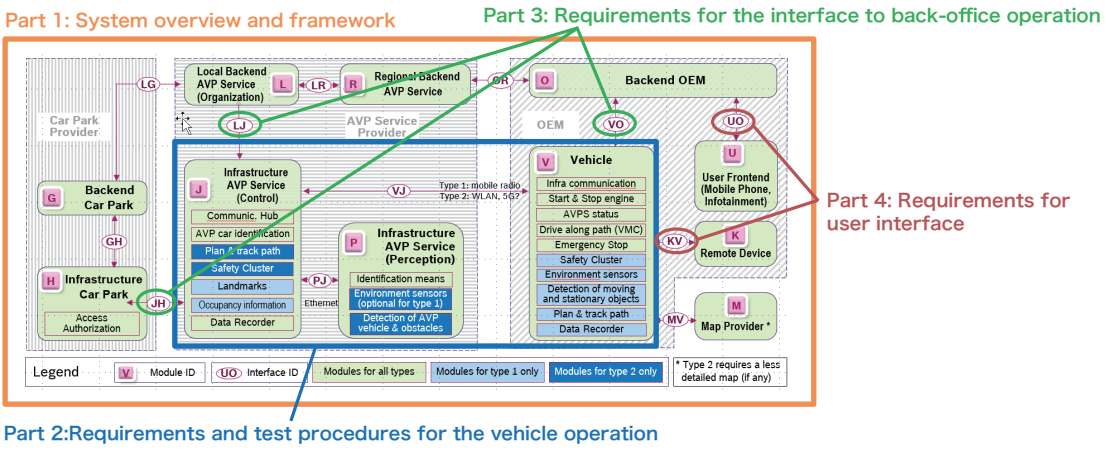


PWI 23374-1 to 4 Automated Valet Parking System (AVPS)

The automated valet parking system automatically drives the vehicle between the location where the user gets on/off and the parking spot and parks it. This is intended to reduce the number of accidents in parking lots, to lighten the load and increase convenience for users, to utilize a narrow space and to reduce energy consumed by parking spot search and accompanied unnecessary traffic jam.
Standardization is expected to push for faster spread of the automated valet parking system and to improve interoperability between different parking lot equipment and different vehicle manufacturers. The basic requirements for the standard include an interface to a back office system and a user interface for parking lot reservation management and vehicle control. The overall picture is to define a common system configuration as shown in the figure, to divide the target domain into the following four parts, and to discuss each part.

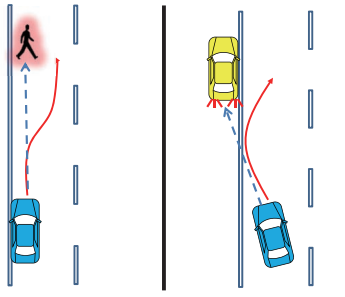


Proposing country: Japan and Germany



PWI 23375 Collision Avoidance In-lane Lateral Control System (CALC)

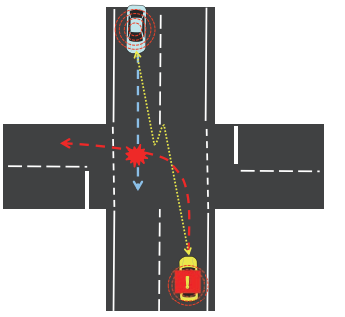
In recent years, the collision damage mitigation system, which detects vehicles and pedestrians, and the lane departure prevention system, which detects lanes on roads, have become widely prevalent in the market. This standard defines a system that controls the lateral movement of the vehicle to avoid a collision with an object (pedestrian, vehicle, artificial structure such as guardrail, etc.) that is not avoided using these safety prevention systems. The target scope of the standard is under discussion to cover a wide range of use cases.



Proposing country: Japan

PWI 23376 Vehicle-to-vehicle Intersection Collision Warning System (VVICW)

Vehicles have been increasingly equipped with a function that continually broadcasts the location, speed and breaking status of its running vehicle using a wireless communication technology. Other examples of vehicles that receive this kind of information include CACC (Cooperative Adaptive Cruise Control) and EEBL (Emergency Electronic Break Light), but this standard specifies a system that alerts the user when it predicts a collision at an intersection.



Proposing country: The US

WG 16: Communications

WG 16 is involved in standardizing the communication systems used in ITS. This working group holds discussions on the CALM systems used in ITS and the DSRC inherited from the now disbanded WG 15 (Dedicated Short Range Communications), as well as on probe data systems.

List of WG 16 work items

		Standardization themes	ISO Number	Content
★	1	Wide area communication -- Protocol management information	ISO 15662	Defines a checklist for ITS applications in wide area communication systems between service centers and user terminals. Japan is taking the lead in preparing a draft standard
	2	Communications access for land mobiles (CALM) -- Architecture	ISO 21217	An overview of the core aspects of CALM that specifies the CALM concept, an outline of functions and communication scenarios
	3	Communications access for land mobiles (CALM) -- ITS station management	ISO 24102	Specifies management of all CALM management entities, and management functions for communication between different CALM media
	4	Communications access for land mobiles (CALM) -- Access technology support	ISO 21218	Specifies interfaces for third layer connections between different CALM communication media, and interfaces for connecting to communication interface management entities
	5	CALM 2G, CALM 3G	ISO 21212 ISO 21213	Standardization of interfaces for receiving ITS services via 2nd and 3rd generation mobile communications. References existing mobile telephony standards and specifies a framework that complies with CALM.
	6	Communications access for land mobiles (CALM) -- Infra-red systems	ISO 21214	Standardization of interfaces for receiving ITS services via infrared. Japan's optical beacon is outside of its scope
	7	Communications access for land mobiles (CALM) -- M5	ISO 21215	Standardization of interfaces for receiving ITS services via CALM M5 5 GHz band. Uses IEEE 802.11p as a base
★	8	Communication access for land mobiles (CALM) -- Millimetre wave air interface	ISO 21216	Standardization of interfaces for receiving ITS services via millimeter waves
★	9	Communications access for land mobiles (CALM) -- Media adapted interface layer (MAIL)	ISO 24103	Specifies media conversion for the use of ASL (Application Sub-Layer; ARIB STD-T88 and ITU-R M.1453- 2) functions with DSRC that comply with ISO 15628 (DSRC L7)
	10	Communications access for land mobiles (CALM) -- General requirements for using public networks	ISO 25111	Specifies interface requirements for receiving ITS services using Mobile Broadband Wireless Access (MBWA)
	11	Communications access for land mobiles (CALM) -- Mobile wireless broadband using IEEE 802.16	ISO 25112	Standardization of interfaces for receiving ITS services using WiMAX (IEEE 802.16)
★	12	Communications access for land mobiles (CALM) -- Mobile wireless broadband using HC-SDMA	ISO 25113	Standardization of interfaces for receiving ITS services using HC-SDMA (iBurst, etc.)
	13	Communications access for land mobiles (CALM) -- Satellite networks	ISO 29282	Use of satellite communication for ITS
	14	ITS CALM Mobile Wireless Broadband applications using Communications in accordance with IEEE 802.20	ISO 29283	Standardization of interfaces for receiving ITS services using IEEE 802.20
	15	Communications access for land mobiles (CALM) -- Using broadcast communications	ISO 13183	Standardization concerning management interfaces and session connections required to receive broadcast communication in the CALM environment
	16	Communications access for land mobiles (CALM) -- Evolved Universal Terrestrial Radio Access Network (E-UTRAN) -- Part 1: General usage	ISO 17515	Standardization of the use of LTE (Long Term Evolution) for ITS, and standardization of D2D and LTE-V2X communications
	17	Communications access for land mobiles (CALM) -- 6LoWPAN networking	ISO 19079	Standardization for conformity between 6LowPAN, the Personal Area Network (PAN) network layer equivalent of short-range wireless networks, and CALM
	18	Communications access for land mobiles (CALM) -- CoAP facility	ISO 19080	Standardization for conformity between CoAP, a simplified, HTTP-like high level machine-to-machine (M2M) protocol, and CALM
★	19	Communications access for land mobiles (CALM) -- IPv6 Networking	ISO 21210	Study of functions that achieve a seamless communication environment in CALM (handover between identical media, media switching, etc.)
★	20	Communication access for land mobiles (CALM) -- Non-IP networking	ISO 29281	Standardization of concepts, mechanisms and interfaces for non-IP communications in CALM
	21	Communications access for land mobiles (CALM) -- Communication protocol messages for global usage	TS 16460	Method for interoperation between WAVE (Wireless Access in Vehicular Environments) and CALM FAST
	22	Communications access for land mobiles (CALM) - IPv4-IPv6 interoperability	NP 18380	Standardization to secure IPv4-IPv6 interoperability in CALM networking
★	23	Communications access for land mobiles (CALM) -- Application management -- Part 1: General requirements	ISO 24101	Specification of mechanisms and conformance test to add, modify, or delete ITS applications using CALM
	24	Communications access for land mobiles (CALM) - Multicast	NP 18378	Definition of multicast application in CALM
★	25	Dedicated short range communication (DSRC) -- DSRC application layer	ISO 15628	Interface for roadside-to-vehicle communication equivalent to communication protocol Layer 7 (including some functions equivalent to Layers 3 to 6)
★	26	Vehicle probe data for wide area communications	ISO 22837	Standardization of core data elements and typical probe messages for probe data services
★	27	Basic principles for personal data protection in probe vehicle information services	ISO 24100	Standardization of basic rules for the protection of personal information in probe data services
	28	Probe data reporting management (PDRM)	TS 25114	Examination of commands for directing uplink conditions to probe vehicles
★	29	Event-based probe vehicle data	TS 29284	Standard concerning event-based probe data
★	30	Criteria for privacy and integrity protection in probe vehicle information systems	ISO 16461	Readjustment of anonymity requirements and evaluation criteria in probe data systems
★	31	Service architecture of probe vehicle systems	DIS 19414	Standardization of a service framework to examine the definition of service areas, use of common services and centralization of services in probe data systems Work item proposed by Japan
★	32	Pre-emption of ITS communication networks for disaster and emergency communication -- Use case scenarios	TR 18317	Method for securing ITS communication networks during an emergency
	33	Communications access for land mobiles (CALM) -- Security considerations for lawful interception	TR 11766	Identification of the definition, architecture and mechanisms for Lawful Interception in ITS. Examination of elements (interfaces) for common use and general procedure for LI. TR (technical documents) issued
	34	Communications access for land mobiles (CALM) -- Data retention for law enforcement	TR 11769	Identification of data retention methods associated with lawful interception. Examination of data types and schemes for retention TR (technical documents) also issued
	35	ITS Safety and emergency messages using any available wireless media -- Data registry procedures	ISO 24978	Standardization of message data registry used for vehicle collision notification via wireless communications
	36	Optical camera communication	NP 22738	V2X communications mostly using visible light communications

★ Item(s) that Japan is / has been actively working on

What is CALM?

CALM (Communications Access for Land Mobiles) system is a communications system using a structure called CALM architecture. The system is based on the concept of serving as a wide-range ITS application platform (CALM concept), as it allows the use of various wireless communications media and continuous communications through handover.

Protocol Management Information (ISO 15662)

Shows the information items necessary for data exchange relying on long-range communications in ITS applications. This information serves as meta-information (attribute information) for messages defined by the TC 204 WGs, and functions as a checklist when creating systems that process those messages. It was issued as an ISO in 2006.

- Selection of a communications system (Response speed, directivity, use environment, service area, service time, band and connection cost)
- Application identifier (Message ID, message number and message transmission time)
- Address (Sender and destination)
- Priority (Interruption processing and blocking control)
- Security (Mutual authentication, data authentication and hiding)
- Execution of application (Reasonable time, timestamp and objective range)

CALM Architecture

CALM Architecture (ISO 21217)

The CALM architecture standard (ISO 21217) specifies the reference architecture for ITS (communication) stations commonly used in CALM systems, and plays an important role in connecting the CALM standards family. The standardization work was conducted by SWG 16.1, established as an ISO in 2010, and has been revised and a new revision was issued in 2014.

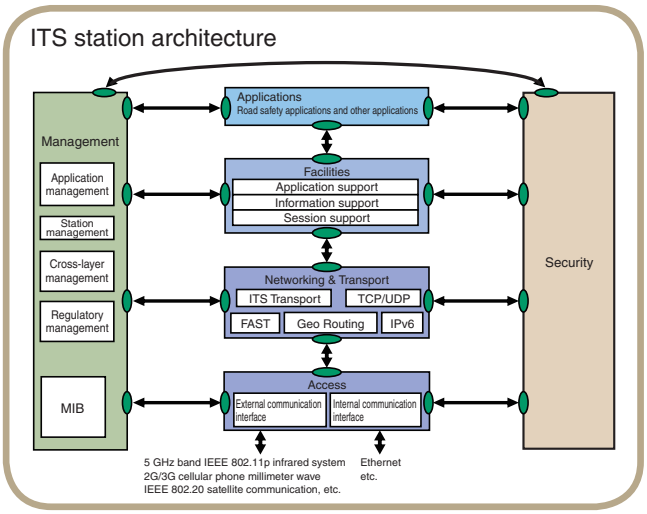
The CALM system consists of four subsystems: roadside equipment, onboard equipment, personal devices and the central system. Subsystems include an ITS station, which necessary for communications. The ITS station is configured in accordance with the reference architecture shown in the Figure on the right.

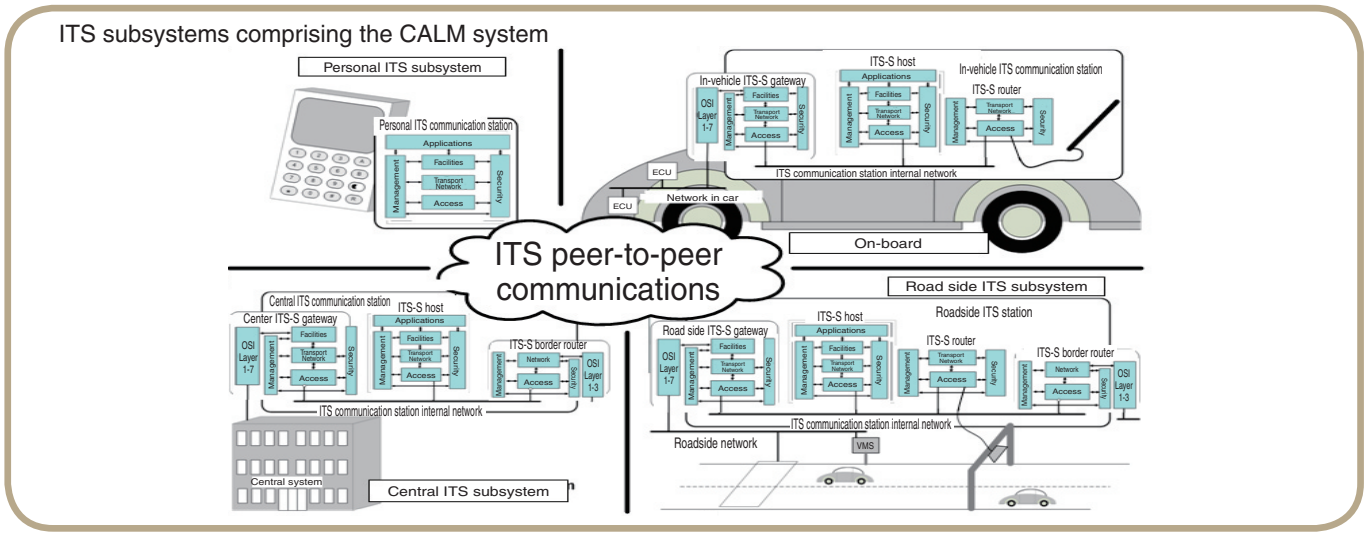
ITS stations in CALM systems feature various communications formats. The architecture standard divides them into 16 communications classes, depending on whether or not 1) multihop communications are used, 2) IPv6 or a non-IP protocol is used for the network layer, 3) handover is conducted, and 4) there is an Internet connection.

Handover, the functional feature that defines CALM, is performed not only between identical types of communication media but also between different ones.

CALM ITS Station Management (ISO 24102)

This was made an ISO in 2010 with the aim of organizing all aspects of management entities and communications between CALM media. When it was revised, ITS station communication functions were stipulated in detail, the document was subdivided into 6 parts and examined, and five were issued as ISOs by 2016.





CALM Media (Lower Layer)

Multiple media can use CALM, with more to be added based on future technological advances or changes in demand.

CALM MSAP (ISO 21218)

Standardization work focusing on service access point specifications acting as interfaces between different communication media, the upper layer, and the management entities in CALM. It was issued as an ISO in 2008, and later renamed (Hybrid communications - Access technology support).

CALM M5 (ISO 21215)

Among existing CALM media, wireless LAN technology-based M5 is expected to play a central role.

In 2004, work on IEEE 802.11p was launched as an official IEEE 802.11 task group. Using this as a base, functional parts adapting it for use with CALM were added, and an ISO was issued in 2010. Descriptions were added, and renamed (Localized communications -- ITS-M5) in 2018.

CALM IR (ISO 21214)

Standardization work was led by Austria and Germany, and an ISO was established in 2006. It is used to check for fraudulent practices in systems using GNSS/cellular (GNSS/CN) for heavy vehicle charges. It clarifies characteristics of the standard that uses a method different from the optical beacon already in wide use in Japan. A new revision was published in 2015.

CALM MM (ISO 21216)

At the Chengdu meeting in 2002, an editor from Japan was elected. The physical layer was determined based on examining relevant system case studies and investigating millimeter-wave communications and application characteristics. It was made an ISO in 2012. Revisions have been discussed since 2015.

CALM 2G, 3G (ISO 21212, ISO 21213)

This standardizes interfaces for the use of 2nd and 3rd generation mobile communications for CALM. This was established as an ISO standard in 2008.

CALM MAIL (ISO 24103)

Following the development of DSRC as ITS 5 GHz band media, 5.8 GHz band DSRC is used in many regions including ARIB STD-T75 in Japan (standardized as ISO 15628).

The method of using DSRC as CALM communication media was standardized as CALM MAIL (Media Adapted Interface Layer) by referring to ARIB STD-T88 (ASL: Application sub-layer), and was issued as an ISO standard in 2009. DSRC has been widely used and has already established a solid position as communications dedicated to ITS. It can be applied to CALM, thus increasing the possibility of wider use of CALM.

CALM ITS using public wireless networks

Since around 2005, wireless broadband communication, which allow IP-based high-speed, high volume data process, has been gaining attention. An examination of CALM-MWB aimed at making use of its performance and functionality in the ITS field has been launched. In 2007, the name of the item was changed to “CALM-ITS using public wireless networks” to allow a broader, more comprehensive examination of wireless systems.

- CALM ITS using public wireless networks - General requirements (ISO 25111)
  CALM ITS using public wireless networks - General requirements (ISO 25111)
- ITS-CALM Mobile wireless broadband using IEEE 802.16e/IEEE 802.16g(ISO 25112)
  ITS-CALM Mobile wireless broadband using IEEE 802.16e/IEEE 802.16g (WiMAX) (ISO 25112 published in 2010)
- ITS-CALM Mobile wireless broadband using HC-SDMA(ISO 25113)
  ITS-CALM Mobile wireless broadband using ANSI ATIS HC-SDMA (iBurst) (ISO 25113 published in 2010)
- ITS-CALM Mobile wireless broadband using IEEE 802.20 (ISO 29283)
  ITS-CALM Mobile wireless broadband using IEEE 802.20 (625k-MC mode/Wideband mode)
  (ISO 29283 published in 2011)

CALM Satellite (ISO 29282)

Standardization work based on the European SISTER project for aimed at allowing use of satellite communications in CALM. It was published as an ISO in 2011.

CALM broadcast (ISO 13183)

U. K. proposed standardization for an interface to use broadcast communications (DAB, DVB, etc.) with CALM. It was published as an ISO in 2012.

CALM LTE (ISO 17515)

Standardization is being carried out to adapt the LTE (E-UTRAN) 3.9th generation mobile communications to CALM. As a first step, Part 1, which concerns the standardization of general usage, has been published. The standardization for ad hoc communication of D2D (Device-to-Device) is being discussed as Part 2, and its application to V2X communications has been newly added to Part 3.

Optical camera communication (NP 22738)

This is designed to communicate by receiving the blinking state of a light source, such as LED, through an optical camera. This communication method uses the blinking pattern of a light source, which has also been adopted in Japan.

CALM Network

CALM network (ISO 21210)

This standard will provide functionality to achieve a seamless communication environment (handover between identical media, media switching, etc.) using IPv6.

In application development, a platform using the CALM environment will be provided regardless of expertise on communication media and networks. The Internet and IPv6 will be taken into consideration.

Media selection through CALM CME

A CME (CALM System Management Entity) standard for functionality was studied that selects appropriate media by comparing the application’s media requirements with media properties and characteristics. The results of the CME study will be transferred to ISO 24102 for conformity with non-IP communications.

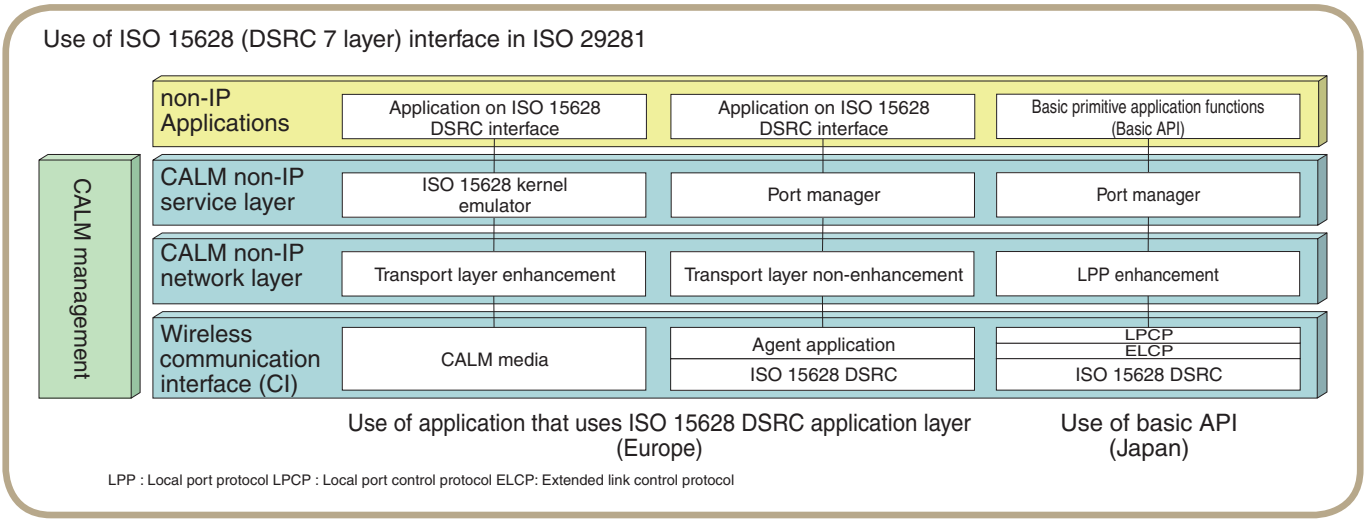
CALM non-IP networking (ISO 29281)

CALM non-IP (ISO 29281)

The CALM FAST subsystem was proposed as a PWI at the Cape Town meeting in 2006, and renamed to CALM non-IP communication mechanisms. The standardization plan is under examination in the context of the operating conditions and mechanisms for roadside and on-board equipment required to provide immediate and reliable roadside-to-vehicle as well as vehicle-to-vehicle communications us-

ing CALM. The examination assumes non-IP communication concepts and mechanisms other than Internet-based network communications. In that context, it also emphasizes the inclusion of existing systems, such as the CEN and Japanese DSRC systems, to ensure that the effective use of such systems is taken into consideration.

The framework for DSRC and the basic API is the Japanese DSRC application system described in ARIB STD-T88 (Association of Radio Industries and Businesses), DSRC basic application interface specifications (ITS Info-Communications Forum) and Joint research into next generation road service provision systems (National Institute for Land and Infrastructure Management, Ministry of Land, Infrastructure, Transport and Tourism (MLIT) and 23 private companies). This CALM-related international framework puts Japanese technology in the global spotlight, and is expected to ease coordination between countries in terms of technological cooperation and the adoption and deployment of technology. First issued as an ISO in April 2011, it was reissued in two parts in April 2013.



Dedicated Short Range Communication (DSRC)

Dedicated Short Range Communication (DSRC)

Short-range data communication used in ITS applications such as ETC is called Dedicated Short Range Communication (DSRC). The actual operating range is covered by the OSI (Open Systems Interconnection) seven-layer model communication protocol. Standardization of the radio communications protocol corresponding to Layer 1 was conducted by ITU-R, and the recommendation, which includes Japanese and European protocols, has been approved. ISO is focused on standardization of Layer 7. In parallel with international standardization work, the standardization of DSRC was promoted in member countries and regions. Europe adopted the 5.8 GHz passive DSRC (CEN DSRC) as a standard (EN), while the 5.8 GHz active DSRC standard (ARIB STD-T75) was established in Japan. There are also IR-based DSRC systems. Many countries have been considering adopting DSRC, with some exceptions like Italy installing their own local systems. Korea and China have been working on DSRC standardization based on the Japanese system.

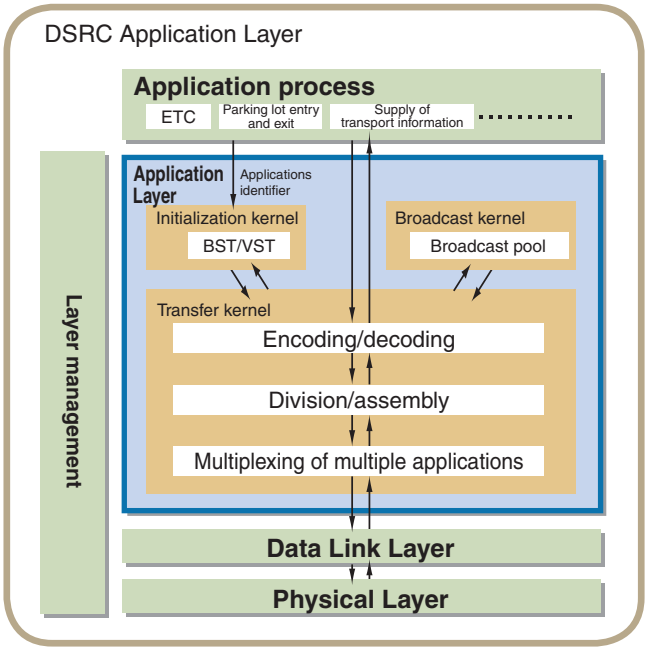
In Japan, the ASL (Application Sub Layer) standards and basic application interface technical specifications have been positioned above the 7th layer.

DSRC Layer 7 (ISO 15628)

In DSRC, Layers 3 to 6 are usually omitted so that vehicles moving at high speeds can communicate directly with road side equipment within a limited communication range. The functions required by these layers are included in the application layer. Various applications are available through DSRC, and an application entity identifier (AID) is stipulated in the application layer. Roadside or on-board application processes specify the AID to communicate with the opposite (on-board or roadside) process via layers at or below the application level. Communication functions are performed mainly by the transfer kernel. These functions include information encoding/decoding, division/assembly of fixed frames and multiplexing/subdivision of data from multiple applications.

WG 15 (disbanded in 2014) incorporated requests from member countries and regions, and Japan took the lead in creating the draft. The ISO standard was published in 2007. A systematic review vote subsequently conducted in 2010 resulted in a decision to make editorial revisions, which were published in 2013.

WG 16 will take the task of maintaining the standard over from the former WG 15.

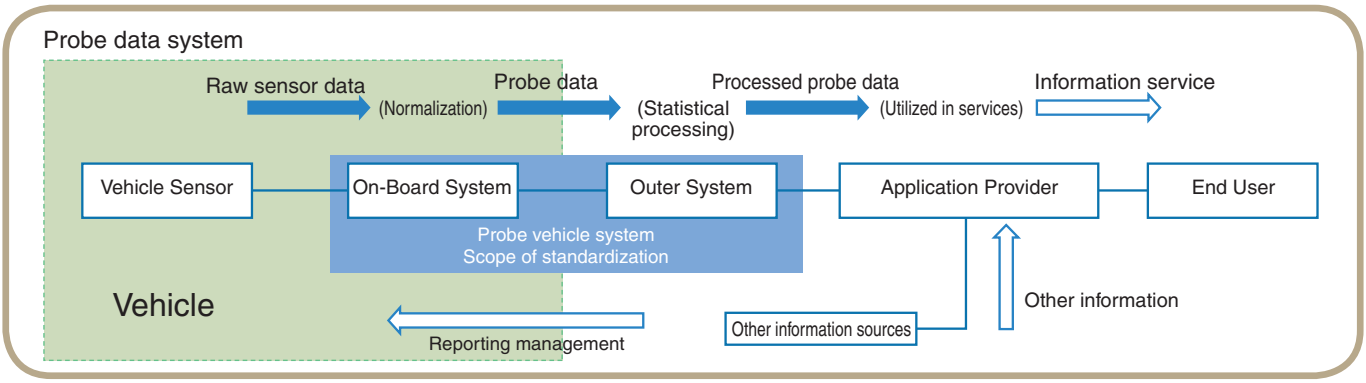


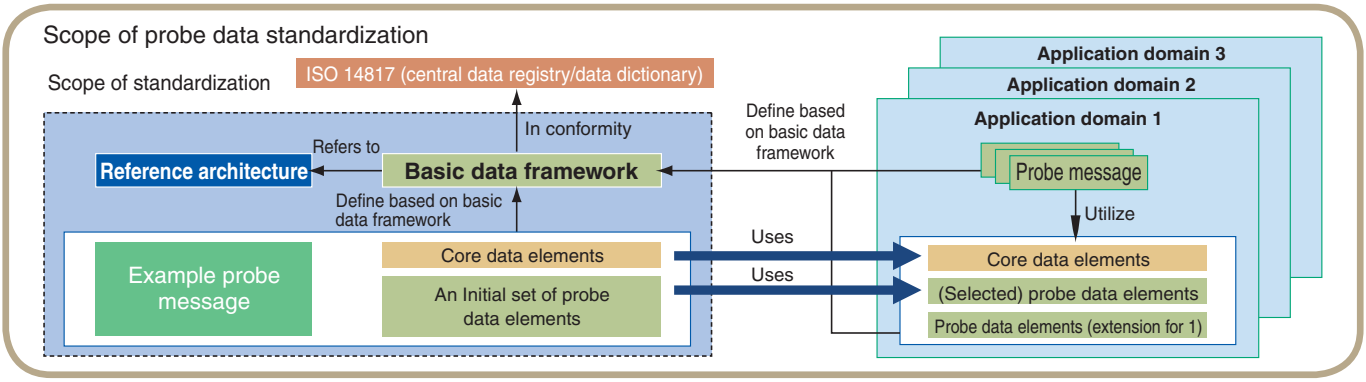
Probe Data

What is probe data standardization?

A system consisting of a group of vehicles that uses medium-to-wide area wireless communications to collect and transmit various types of data, and of center functions that statistically process that data to acquire information on traffic, road, and environmental conditions, is called a probe vehicle system. Probe data refers to the data sent to centers and other external systems by on-board systems. Speed and other basic data elements in probe data are known as probe data elements, and a set of multiple data elements is a probe message. Probe messages always contain time and location stamps.

SWG 16.4 is working on the probe information system and chaired by Japan. It is in charge of standardization for the probe data itself, standardization for the instructions on probe data reporting management, standardization for the architecture of probe data, and also personal data protection in probe data services.





The three standards already published as ISOs or TSs are currently under systematic review.

Vehicle probe data for wide area communications (ISO 22837)

For probe data, standardization of the items below has been established It was published as an ISO standard in 2009.

- Basic framework: Specifies the methods to define probe data elements and probe messages. Expansion and revision of the standard will be performed in accordance with this framework.
- Reference architecture: Defines the structure of the probe data system covered by this standard and the semantic structure of probe data.
- Core data element: Defines a group of probe data elements showing the time and location stamps included in all probe messages.
- Initial set of probe messages: Defines a group of typical probe messages.

Event-based Probe Data (TS 29284)

Event-based congestion probe data obtained after sensor value-based processing and evaluation by on-board systems was studied.

Probe data reporting management (TS 25114)

Reporting management is a set of instructions regarding transmission of probe data to groups of vehicles. It includes:

- Instructions to start and stop transmitting probe data
- Specification of the type of probe data to be transmitted
- Adjustment of the threshold value to determine the necessity of transmission

Transmitting these instructions from the center to vehicles makes it possible to control the unnecessary transmission of data and obtain detailed reports on what data is desirable to achieve effective data collection.

This TS was published in 2008.

Basic principles for personal data protection in probe vehicle information services (ISO 24100)

The following are defined as personal data handled by probe vehicle information services: contract registration information with probe data suppliers, communication IDs, passwords for certification, communication logs and personal data included in probe data itself.

To enable probe data suppliers to provide data without undue concern, the strict observance of personal data protection laws is being complemented by the preparation of guidelines to be followed by stakeholders and the standardization of design guidelines necessary for that purpose. This was established as an ISO in 2010.

Evaluation standards for probe privacy (ISO 16461)

Unified standards of anonymity and security for the probe data system will be established, and the infrastructure for secure use by information suppliers will be developed. Mutual recognition and interconnection between probe information systems are defined.

This was established as ISO in 2018.

Probe services architecture (DIS 19414)

The Japan-proposed PWI aiming to standardize the service framework by examining clear definitions as well as sharing and centralization in the service field was approved as an NP in 2013 and is now being drafted as the final edition.

Application Management

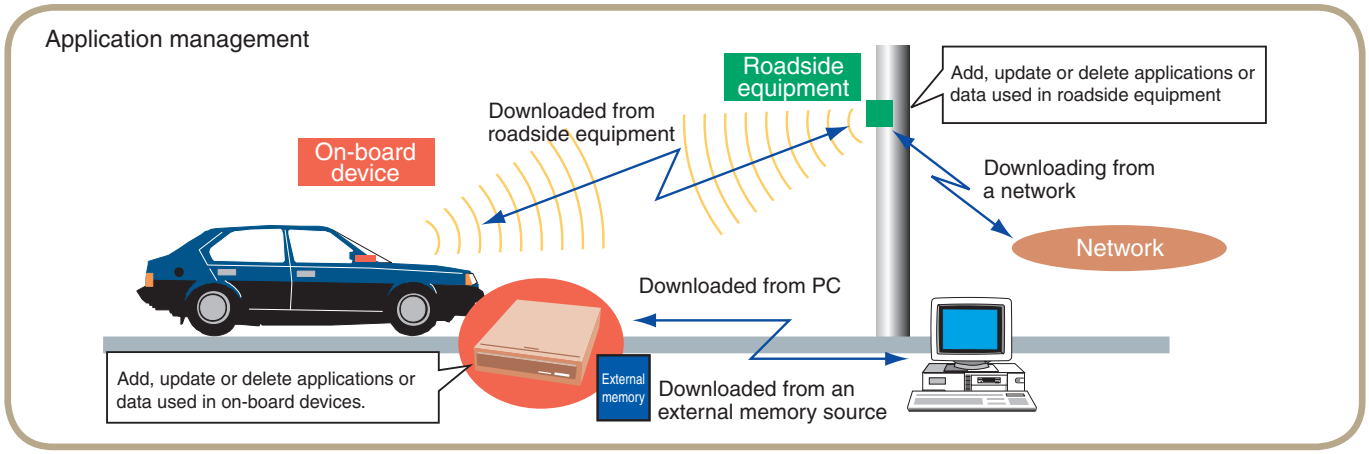
Application management (ISO 24101-1)

This item examines methods for installing applications on equipment featuring ITS communications functionality (roadside equipment or on-board devices that execute ITS applications). Standardization work on mechanisms, structures and methods for adding, updating, or deleting applications is then conducted.

Methods for managing, installing, updating and uninstalling applications, as well as structures for application management security, were standardized, issued as an ISO standard in 2008.

Application Management - Conformance Test (ISO 24101-2)

After the completion of ISO 24101-1, standardization efforts turned to items related to compliance tests. TTCN-3 (Testing and Test Control Notation Version 3) is used for the description of test procedures. This was established as an ISO in 2010.



Pre-emption of ITS Communication Networks

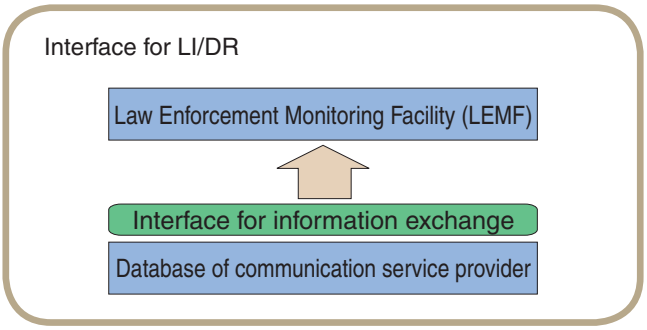
In the wake of the Great East Japan earthquake, this SWG launched a study on securing emergency communications in the event of a disaster, particularly in terms of road traffic. Chaired by Japan, this item worked on possible basic requirements with the close examination of use cases. Disaster recovery preemption (TR 18317) compiled use case scenarios and communication requirements, and issued as a TR in 2017.

Lawful Interception/Data Retention

Lawful Interception/Data Retention

Europe has worked on standardizing mechanisms to intercept communications sent through such means as cellular phones, e-mail, or the Internet, as well as to track vehicles, as countermeasures against terrorism. ETSI has already established LI/DR study groups to work on standardization. Further, the ISO provided a discussion forum for international cooperation that includes countries outside of Europe. WG 16 analyzed threat at ITS field and CALM, and compiled the definition, architecture and methods of legitimate interception, and data retention methods associated with the legitimate interception.

Two work items (TR 11766/TR 11769) that include information on conditions in individual regions were published as TRs.



eCall

Standardization of the following items started in 2005.

- Emergency Call using Cellular Network (24977)
- Automatic Crash Notification using Any Available Wireless Media - Data Registry (ISO 24978)

The title of item ISO 24798 was subsequently changed to "ITS Safety and Emergency Notifications using any Available wireless Media - Data Registry", as its contents cover the specifications and operation of the registry for emergency notification messages. Discussions continued under the new title and the item was published as an ISO standard in 2009. As of 2015, installation of eCall in new vehicles will become mandatory in Europe.

WG 17 Nomadic Devices in ITS Systems

This work group is in charge of developing standards targeting ITS services using nomadic devices such as smartphones and portable navigation devices which are rapidly disseminating worldwide. It covers the standardization of vehicle interfaces, guidance protocols for safety assistance systems, and services that provide information to travelers.

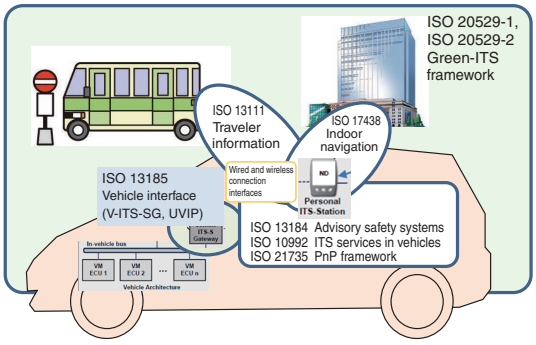
List of WG 17 work items

	Standardization themes	ISO Number	Contents
1	Use of nomadic and portable devices to support ITS service and multimedia provision in vehicles	TR 10992	Defines use cases to support ITS services and multimedia contents tor nomadic and mobile devices used in vehicles.
2	Use of nomadic and portable devices to support ITS service and multimedia provision in vehicles – Part 2: Definition and use cases for mobile service convergence	TR 10992-2	Definition and use case of platforms intended for various nomadic devices and Cloud utilizing services.
3	Vehicle interface for provisioning and support of ITS services -- Part 1: General information and use case definition	TR 13185-1	Part 1 of the provisioning of ITS services related to vehicle interface. Defines general information and use cases for Vehicle ITS Station Gateway (V-ITS-SG)*
4	Vehicle interface for provisioning and support of ITS services -- Part 2: Unified gateway protocol (UGP) requirements and specification for vehicle ITS station gateway (V-ITS-SG) interface	ISO 13185-2	Part 2 of the provisioning of ITS services related to vehicle interface proposed by WG 17. Defines requirements and specification of protocols for Vehicle ITS Station Gateway (VITS-SG).
5	Vehicle interface for provisioning and support of ITS Services -- Part 3: Unified vehicle interface protocol (UVIP) server and client API specification	FDIS 13185-3	Part 3 of the provisioning of ITS services related to vehicle interface. Defines the specification of UVIP, a type of application interface protocol, between nomadic devices as clients to vehicle information interface like Vehicle ITS Station Gateway (V-ITS-SG)*.
6	Guidance protocol via personal ITS station for advisory safety systems -- Part 1: General information and use case definitions	TR 13184-1	Part 1 of the guidance protocol for safety support systems making use of the personal ITS station. Defines general information and use cases.
7	Guidance protocol via personal ITS station for advisory safety systems -- Part 2: Road guidance protocol (RGP) requirements and specification	ISO 13184-2	Part 2 of the guidance protocols for safety support systems making use of the personal ITS station. Defines requirements and specifications of protocols (RGP).
8	Guidance protocol via personal ITS station for advisory safety systems -- Part 3: Road guidance protocol (RGP) conformance test specification	DIS 13184-3	Part 3 of the guidance protocols for safety driving support systems making use of personal ITS stations. Stipulates guidelines for validation test suites for protocols (RGP).
9	The use of personal ITS station to support ITS service provision for travellers -- Part 1: General information and use case definitions	ISO 13111-1	Defines use examples for provisions of ITS services intended for travelers to nomadic and mobile devices.
10	The use of personal ITS station to support ITS service provision for travelers -- Part 2: General requirements for data exchange between personal ITS station and other ITS stations	PWI 13111-2	Defines data exchange requirements and specifications for provisions of ITS services intended for travelers to nomadic and mobile devices.
11	Indoor navigation for personal and vehicle ITS station -- Part 1: General information and use case definition	ISO 17438-1	Part 1 of the indoor navigation standardization jointly prepared by WGs 3, 8 and 18. Defines general information and use cases.
12	Indoor navigation for personal and vehicle ITS stations -- Part 4: Requirements and specification for interface between Personal/Vehicle and Central ITS stations	CD 17438-4	Part 4 of the indoor navigation standardization jointly prepared by WGs 3, 8 and 18. Defines the requirements and specification for interfaces between nomadic devices and ITS stations.
13	The use of personal ITS station for green transport information and management -- Part 1: General information and use cases definition	PWI 18561-1	Defines general information and use cases in the aim of TR publication for route planning and management of Green (low CO2 emissions) transportation using nomadic devices in designated areas and road sections during international events such as the FIFA World Cup or the Olympic Games.
14	Framework for green ITS (G-ITS) standards -- Part 1: General information and use cases definition	DTR 20529-1	Framework for using ITS to reduce CO2 emissions. Includes the concept of G-ITS, use examples, and guidelines.
15	Framework for green ITS (G-ITS) standards -- Part 2: Integrated mobile service application and specification	CD 20529-2	Framework for using ITS to reduce CO2. Includes integration of mobile services and use example definition.
16	Information for emergency service support via personal ITS station -- General requirements and technical definition	NP 20530	Requirements and technical definitions for sending automobile emergency information (such as on crashes) via nomadic devices
17	Framework architecture for plug & play (PnP) functionality in vehicles utilizing nomadic devices	NP 21735	Defines general information and use cases with the aim of TR publication for frameworks to manage the addition and deletion of automobile function using nomadic devices (plug & play).
18	Nomadic device service platform for micro mobility -- Part 1: General information and use cases definition	NP 22085-1	Defines general information and use cases for a service platform using nomadic devices to utilize micro mobility with one or two passengers.
19	Exchanging driving experience information collected by nomadic devices	PWI 22087	Aims to establish a framework for collecting environmental information and driving behavior data via nomadic devices to enable AI used in autonomous driving to learn them, and sharing the data with surrounding vehicles.
20	Network based precise positioning infrastructure for land transportation -- Part 1: General information and use cases description	NP 22086-1	Aims to establish precise (about 20 - 30 cm accuracy) positioning infrastructure using a DGPS system with four ground-based reference stations based on the results from experimental tests in South Korea.
21	Vehicle interface for provisioning and support of ITS Services -- Part 3: Unified vehicle interface protocol (UVIP) server and client API specification	NP 13185-4	Part 4 of the provisioning of ITS services related to vehicle interface. Defines conformance tests for UVIP, a type of application interface protocol, between nomadic devices as clients to vehicle information interface like Vehicle ITS Station Gateway (V-ITS-SG)*.
22	Nomadic device service platform for micro mobility -- Part 2: Functional requirements and data set definitions	PWI 22085-2	Functional requirements and definition of used data sets for a service platform using nomadic devices to utilize micro mobility with one or two passengers.
23	Nomadic device service platform for micro mobility -- Part 3: Data structure and data exchange procedures	PWI 22085-3	Data structure and replacement procedure for a service platform using nomadic devices to utilize micro mobility with one or two passengers.
24	Indoor navigation for personal and vehicle ITS stations -- Part 2: Requirements and specification for indoor maps	PWI 17438-2	Requirements and specifications for an indoor map as Part 2 of the indoor navigation standardization jointly prepared by WGs 3, 8 and 18.
25	Indoor navigation for personal and vehicle ITS stations -- Part 3: Requirements and specification for indoor positioning references	PWI 17438-3	Requirements and specifications for indoor location referencing as Part 3 of the indoor navigation standardization jointly prepared by WGs 3, 8 and 18.

* V-ITS-SG: Information gateway of vehicles that comply with ITS Station architecture proposed by WG 17

Overview of standardization proposals under discussion by WG 17

Scope of tasks: standardization of ITS that makes use of nomadic devices

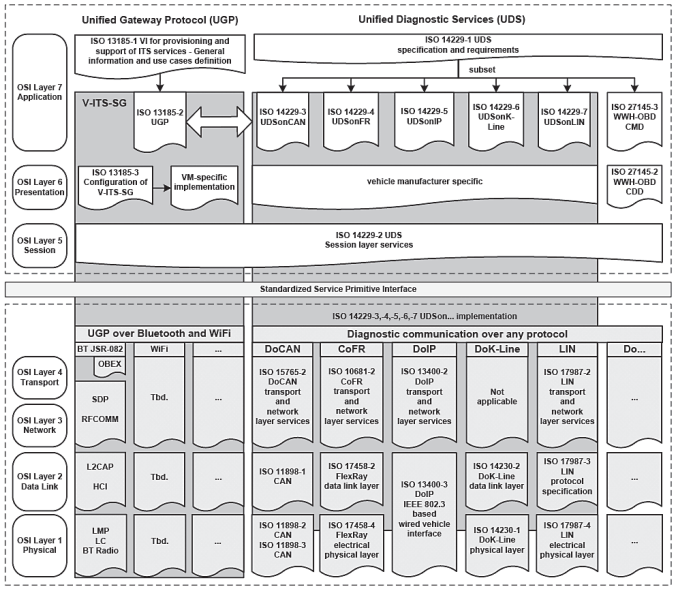


Vehicle Interface for the Provisioning and Support of ITS Services (ISO 13185-1 to 4)

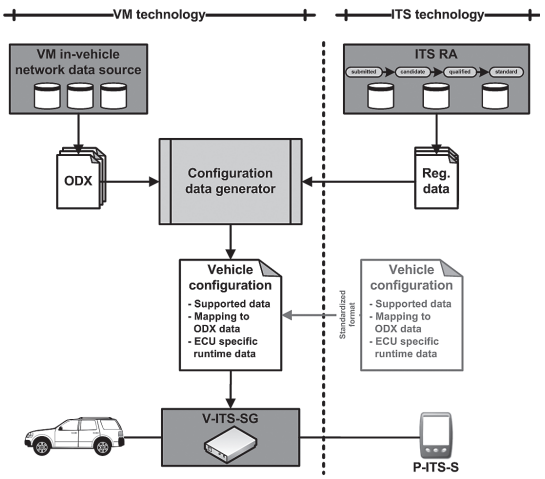
This is a standardization proposal for gateways to allow applications in nomadic devices to use vehicle information. Discussion on this item was conducted in collaboration with TC 22/SC 3/WG 1 (Road vehicles/Electrical devices/Serial data communications, current TC 22/SC 31) that is in charge of standardization for vehicles.

Four parts are planned. Currently, Part 1 (general information and use cases) has been published as a TR, and Part 2 (protocol requirements) as an IS. Structural requirements for which standardization had previously been planned as Part 3 were discussed at a joint working group (JWG) with TC 22. It was put on the ballot as a new work item at the JWG, but turned down in 2014. As a result of follow-up discussions with people involved in TC 22 and TC 204, the policy not to use the term "gateway" is likely to be agreed. On the one hand, a standard proposal for API of vehicle interface server/client model was additionally proposed as Part 3, and a standardization proposal for a conformance testing was presented as Part 4 in 2017.

Relationship between ISO 13185 and other vehicle information standards



Sample ISO 13185 V-ITS-SG configuration image process



Indoor navigation for personal and vehicle ITS stations (ISO 17438-1 to 4)

This is a standardization item on the use of mobile devices to provide guidance indoors. As indicated in the title ("for personal and vehicle ITS stations"), seamless integration of nomadic devices with on-board devices (e.g., telematics or navigation) is assumed to be General information. Use examples are defined in Part 1.

In addition to representing indoor spaces using four layers (background, space, network, and POI*), maps incorporating additional information such as opening hours are also being considered. This standardization item will be dealt with in the TC in consultation with the relevant WGs.

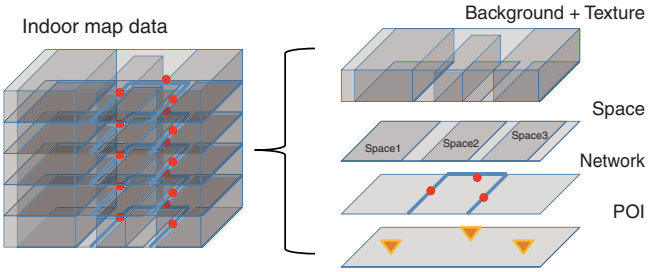


Diagram of indoor map

*POI: Point of Interest

Guidance protocol via personal ITS station for advisory safety systems (ISO 13184-1 to 3)

This is a standardization proposal for the use of mobile devices to support safety on the road and in car parks. Three parts are planned. Part 1 will contain general information and use examples, Part 2 will contain protocol requirements and Part 3 will contain the definitions of protocol conformity test cases. Part 1 was issued as a TR in 2013. Requirements and specifications for existing services and communications were integrated in Part 2. However, since only the requirements and specifications for existing services are dealt with, it was decided to study communications as a separate general-purpose protocol, and the result was issued as an IS in 2016.

WG 18 Cooperative ITS

Cooperative ITS integrates vehicle-to-vehicle (V2V), vehicle-to-infrastructure (V2I) and infra-structure-to-infrastructure (I2I) communications, and simultaneously supports extensive ITS services via the communications system.

List of WG 18 work items

	Standardization themes	ISO Number	Contents
1	Classification and management of ITS applications in a global context	ISO 17419	Standardization of ITS application classes and management
2	ITS application requirements and objectives for selection of communication profiles	TS/DIS 17423	Standardization of requirements when applications select communication interface
3	State of the art of Local Dynamic Maps concepts	TR 17424	Reports collating existing Local Dynamic Map (LDM) concepts
4	Definition of a global concept for Local Dynamic Maps	ISO 18750	Stipulations for defining Local Dynamic Map (LDM) concepts
5	Roles and responsibilities in the context of co-operative ITS architecture(s)	ISO 17427-1	Standardization of roles and responsibilities for agents in cooperative ITS
6	TR's re to C-ITS deployment support	TR 17427-2 to 4, 6 to10 CD TR 17427-5, 12 to 14	Reports (TRs) on support for actual dissemination based on the roles and responsibilities of the entities stipulated in ISO 17427-1
7	Data exchange specification for in-vehicle presentation of external road and traffic related data	TS 17425	Standardization of system for providing data about road traffic on on-board equipment using the same format as roadside VMS
8	ITS station facilities for the transfer of information between ITS stations	TS 17429	Stipulation of shared functionality for the transfer and processing of information between ITS stations
9	Contextual speeds	TS 17426	Specification of systems for presenting speed limits and recommendations based on factors such as location, weather, and traffic conditions
10	Using V2I and I2V Communications for Applications Related to Signalized Intersections (SPaT, MAP, SRM and SSM)	TS 19091	Definition of V2I/I2V messages and related data structures and data elements for applications related to signalized intersections
11	Using I2V communications for applications related to in-vehicle information (IVI)	TS 19321	Stipulations concerning data structure dictionaries for applications providing in-vehicle information
12	Test Architecture	TS 20026	Stipulations concerning the architecture of validation test suites for cooperative systems
13	Guidelines on the use of C-ITS standards for hybrid communications	AWI TR 21186	Guidelines for using mixed multiple communication media with cooperative ITS
14	ITS-Station security services for secure session establishment and rapid authentication Data dictionary of vehicle-based information for C-ITS applications Communication profiles foe secure connection between ITS-Station and vehicle	AWI TS 21177 AWI TS 21184 AWI TS 21185	Stipulations concerning required items for secure connections between in-vehicle ITS communication station and vehicle information systems
15	Position, Velocity and Time functionality in the ITS Station	AWI TS 21176	Stipulations concerning the architecture of validation test suites for cooperative systems

Background behind the establishment of WG 18

In October 2009, Mandate M/453 on the standardization of cooperative ITS was released by the European Commission (EC), and standardization tasks were assigned to ETSI TC ITS and CEN/TC 278.

CEN/TC 278 then established WG 16 as the group in charge of cooperative ITS, with standardization being performed in cooperation with TC 204. According to the resolution adopted at the September 2009 Barcelona plenary meeting, WG 18 was established in TC 204 as a counterpart to the CEN work group.

Roles and tasks of WG 18

WG 18 not only conducts its own standardization work but also coordinates related work items in other WGs with due respect for their work completed to date.

At the Vienna meeting in March 2011, WG 18 set up SWG 1 to handle overall coordination and DTs (Drafting Teams) to separately discuss individual items. The framework was established to specifically discuss the scope and items of standardization.

Further, European road operators and corporations called for the early standardization of infrastructure-related applications with cooperative ITS, such as safety applications for intersections as well as the provision of probe data and road traffic information. Consequently, at the Delft meeting in February 2013, programs to develop standards were additionally launched.

At the same time, in response to the immediate outcome (Release 1) released from European Commission Mandate M/453, SWG 2 was set up to identify and study work items that require further standardization, primarily from the perspective of road managers, and has launched projects in which Japan takes a leading role.

Japanese Framework

The Japanese WG 18 domestic committee was established in August 2010 under the auspices of the Highway Industry Development Organization (HIDO) and, in coordination with existing domestic committees, began its activities in October of the same year.

Systems already scheduled for deployment in Japan are closely related to infrastructure-related applications. Japan will therefore present necessary opinions and make appropriate international contributions.

As previously stated, Japan is leading SWG 2, which is responsible for identifying and studying the next series of work items.

Outline and status of major study items

The following describes overviews and the current state of major study items worked with WG 18.

Local Dynamic Maps (LDM)

Local Dynamic Maps (LDM) are databases being studied in Europe for use in ITS, which feature superimposed location referencing and dynamic information. In ITS station architecture, they are a function of the facility layer, and are mainly used for safety applications.

Their fundamental structure consists of temporary information concerning congestion, traffic obstacles, the weather, and other factors, with information on dynamic objects, targets and objectives (including current signals) acquired mainly through communication with ITS stations and sequentially layered on the location referencing information.

The State of the art of Local Dynamic Maps concepts (TR 17424) report, which consolidates the various LDM concepts that have mainly been studied by various European development organizations, was issued as a TR. Also, the Definition of a global concept for Local Dynamic Maps (ISO 18750) defines completed concept based on the above TR, and was published as IS in 2018.

For the time being, the group is studying only LDM concept definitions. Concrete database structures, APIs, and other implementation specifications remain issues to study at a future date.

In-Vehicle Signage

In-vehicle signage, which displays a range of road traffic information in vehicles in response to road traffic operator intent, is a system similar to the VICS and ITS spot services used in Japan to provide simplified graphic information.

"Data exchange specification for in-vehicle presentation of external road and traffic related data (TS 17425)" compiles functional requirements of In-vehicle Signage and requests communications messages. It was issued as a TS in 2016.

In future, in reference to this, new work items are scheduled to start that incorporate the outcome of advance cooperative ITS deployment plans in the EU, such as SCOOP@F led by France or ITS Corridor led by the Netherlands, Germany, and Austria.

SPaT, MAP, SRM and SSM

Using SPaT, MAP, SRM and SSM signal control to develop safety/environment applications for areas around intersections requires sending information on current signal conditions and related information on areas around intersections.

This work item specifies topology information on the locations of stop lines, the configuration of intersections, and other factors, as well as communications (messages) for priority control information concerning public transport and emergency vehicles (SRM and SSM). In April 2013, work on the use of V2I and I2V communications for applications related to signalized intersections (TS 19091) items began. The result was issued as a TS in 2017.

In-vehicle Information

In-vehicle Information (IVI) is a concept that expands and encompasses In-vehicle Signage (TS 17425) and Contextual Speeds (TS 17426). Even though it describes systems for transmitting road sign and speed limit information from the roadside to the vehicle, this work item covers only the message structure. Specifics of applications will be stipulated in their respective standards. Work on this item was launched in April 2013 as "Dictionary of in-vehicle information (IVI) data structures" (TS 19031). It was issued as a TS in 2015.

Secure connections between in-vehicle ITS communication station and vehicle information systems

Standardization of the system for acquiring information from various sensors built into the vehicle based on connection between onboard ITS devices and vehicle information systems (CAN BUS) has been controversial since the launch of ITS standardization, and it has yet to be realized due to differences in outlook between stakeholders. Finally at the October 2015 Potsdam meeting the conclusion was reached that the study would be launched in a form in which its use is limited to applications allowing for a very short delay, such as collision prevention applications based on communication between vehicles.

Security services at ITS stations for establishing secure sessions and rapid authentication (AWI TS 21177) and "Communication profile for secure connection between ITS stations and vehicles" (AWI TS 21185) are specifications for ensuring security of communication between vehicles and ITS stations, and "Vehicle information data dictionary for cooperative ITS application" (AWI TS 21184) is a specification for the data dictionary used in communication.

Position, Velocity and Time functionality in the ITS Station

Most cooperative ITS applications handle information on vehicle position, speed, and time. In a collision prevention application based on communication between vehicles, for instance, the accuracy (error) of information each vehicle possesses must be appropriately managed.

Function for position, speed, and time information of ITS stations (AWI TS 21176) is a specification for centrally handling location, speed and time information as a function of the ITS station facility layer. Discussion of the standadization was launched at the October 2015 Potsdam meeting.

Identifying and studying potential work items

As stated earlier, in the context of the search for use cases as not yet standardized as cooperative ITS applications and the compilation of requirements, Japan is taking the lead in bringing forward new items for potential standardization.

It was decided to adopt the viewpoint of road operators, who are both developers and users of cooperative ITS, and work is proceeding in coordination with the World Road Association (PIARC). In 2016, the details of TC 204 activities were presented to an SC (TC 2.1: road network operations) studying ITS in PIARC through outreach activities. In addition, to discover future items for potential standardization, gap/overlap analysis was applied to information on cooperative-ITS-related programs that are studied by PIARC or road administrators in various countries.

Related Standardization Activities

ITS Standardization at CEN/TC 278

The CEN (European Standards Committee)/TC 278 is a European technical committee responsible for ITS which was established in 1992 before the creation of ISO/TC 204. Previously known as Road Transport and Traffic Telematics (RTTT), it was renamed as ITS at the TC 278 plenary meeting in March 2013. At CEN, standards are usually prepared according to the following procedure. They are first formalized as technical specifications (TS), and then are subject to review before finally either becoming a European standard (EN) or being cancelled. Technical standards developed in European standard organizations such as CEN, are in principle, optional. However, the binding power of Directive 98/34/EC - Procedures based on the New Approach, technical standards developed under the standardization directive become virtually mandatory European standards. European EN standards differ from ISOs in that: (1) once detailed work on an EN has started, similar standardization work in individual European countries ceases; (2) once an EN is established, any standard in individual European countries that no longer compatible with the new one is abolished; and (3) EN is mandatory in public procurement. At present, CEN/TC 278 has 15 active Working Groups (WGs) all of which have a close relation with the WGs of ISO/TC 204 in working on standardization. In addition, CID (Commission Implementing Decision) for promoting standardization of Urban ITS was issued in February 2016, and WG 17 was created within CEN/TC 278 in April. The first meeting was held in November 2016 and the fifth meeting in March 2018. Standardization work is in progress. Prior to this, the Urban ITS project team PT 1701 meeting was held in Brussels in February 2016. From TC 204 a liaison person joined the discussion in the WG 17 meeting. Items including Multimodal travel information, urban logistics and traffic management were selected as Urban ITS standardization targets for intensive work, and a pre-study was conducted for proposing items for possible standardization. In January 2016, a report was submitted from project team PT 1701, in which items that should be standardized were proposed. This report was published from CEN as TR (Technical Report). CEN/TC 278/WG 17 had the following nine active project teams:

PT 1703 location referencing: Location information accuracy of each application

PT 1704 traffic management: traffic jam reduction, traffic management for accident prevention

PT 1705 emission management: traffic management to reduce the influence of exhaust emissions

PT 1706, 07, 08 multiple-vendor purchase environmental management

PT 1709, 10 traffic management

PT 1711 model definition of new mobility

Each PT also includes an electronic legal information provisioning application, "METR," in anticipation of universal autonomous transportation. Every PT aims to formulate toolkits that will enable the government to realize Smart cities. The next and sixth meeting is scheduled to take place in Brussels in October 2018.

List of CEN/TC 278 working groups

CEN/TC 278 Working Group	Working Group	Lead Country	Corresponding TC 204 Working Group
WG 1	Electronic Fee Collection(EFC)	Sweden	WG 5
WG 2	Freight, Logistics and Commercial Vehicle Operations	United Kingdom	WG 7
WG 3	Public Transport	France	WG 8
WG 4	Traffic and Traveler Information	United Kingdom	WG 10
WG 5	Traffic Control Systems	United Kingdom	WG 9
WG 7	ITS Spatial Data	Germany	WG 3
WG 8	Road Traffic Data	Netherlands	
WG 9	Dedicated Short-Range Communications (DSRC)	Germany	WG 16
WG 10	Human-Machine Interfacing	Germany	(TC 22/SC 13/WG 8)
WG 12	Automatic Vehicle and Equipment Identification (AVI/AEI)	Norway	WG 4
WG 13	Architecture and Terminology	United Kingdom	WG 1
WG 14	Recovery of Stolen Vehicles	France	
WG 15	eSafety / eCall	United Kingdom	
WG 16	Cooperative ITS	Germany	WG 18
WG 17	Urban ITS	Norway	Ad hoc group

●Why is Urban ITS needed now?

1. Issues that cities currently face

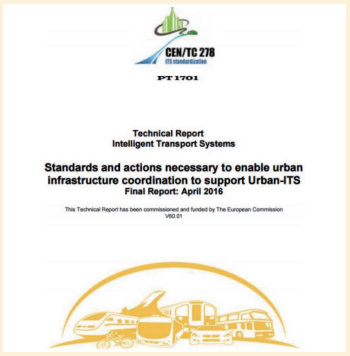
Seventy percent of the global population will live at close quarters in cities in 2050. Various problems encountered in current cities have negative effects on their citizens' standard of living. These are, typically, growing traffic congestion due to larger numbers of cars, an increase in traffic accidents, and environmental pollution caused by exhaust emissions.

2. Countermeasures to these problems

There is a growing perception that implementation of electrical mobility using autonomous vehicles will contribute in a major way to solving these problems. It is also thought that automated driving will make it possible to implement significant shared mobility that will largely eliminate citizens' needs to own cars and therefore the demand for parking spaces within the city, and that it will promote the effective use of city space, thus allowing people to live more comfortable lives. There is also a view that automated driving will contribute to reducing traffic congestion and the number of road lanes, possibly allowing urban space to be reconfigured.

3. Ideas on Urban ITS

The program for establishing standards required for city governments to realize necessary measures to bring about smart transportation on a practical level is called Urban ITS. It is led by the EC federal government in Europe. The standardization work is being accelerated by the newly created CEN/TC 278/WG 17: the Group plans to complete the work by around 2020. They say they are focusing on using and updating existing standards, and are working on issues in connectivity.



https://docs.wixstatic.com/ugd/a7dbd0_8cc42a2831df44f6a2e040f65036579c.pdf

●The Vienna Agreement

Background and significance of the Vienna Agreement

The Vienna Agreement, concluded in 1990, aims to foster close cooperation between CEN (the European Committee for Standardization) and ISO standardization programs. The Vienna Agreement defines cooperation between both organizations on the following three points.

1) Document exchange between TC and CEN/TC:
   Documented draft standards prepared by the committees of each group will be exchanged through their respective coordinating countries.
2) Dispatching mutual representatives to committees and WGs:
   Per agreement between the TC and CEN/TC committees, up to four representatives may attend meetings of the other party's committee. In such instances, non-CEN national members are given priority as representatives. •1 Formal appointment by the ISO/CEN committee is required. •2 Representatives are expected to have an interest in the subject and contribute constructively at the meeting. The representatives do not have voting rights.
3) Parallel inquiries in developing standards:
   The ISO has priority in leading work items when the NP requirement is met. Leadership by CEN is only exceptionally permitted, with the approval of a simple majority of P-member of non-CEN nations in the ISO committee. However, ISO leadership is required for later revisions to standards developed under the CEN lead. Exceptions are only made upon approval by a simple majority of P-members of non-CEN nations. When the development of the standard is led by CEN, it is important to participate in CEN meetings, in accordance with the Vienna Agreement, at the development stage, since voting in TC is to be made in parallel at the DIS phase.
4) Others:
   The CS (Central Secretariat), CEN, and the NSB (National Standardization Body) are responsible for the correct implementation of the Vienna Agreement. The ISO Central Secretariat and CCMC (CEN/CENELEC management center) are responsible for ordinary transaction and management. Secretary-generals of ISO and CCMC are responsible for making decisions of necessary actions when problems emerge in the enforcement and functionality of the Vienna Agreement and its guidelines. The Vienna Agreement plays a special role in the ISO standard development to CEN standardization activities, and as such, non-European countries may feel it gives European countries an unfair advantage. On the other hand, it is also possible to say that it plays a role in preventing disadvantages from being passed to non-European countries, with internationally influential European standardization activities completed within Europe. Thus it is important to use the rights given to non-European countries via the Vienna Agreement as tools to counter standardization in progress at the initiative of Europe.

Reference 1: The Agreement on technical cooperation between ISO and CEN (ViennaAgreement) www.iso.org/va
Reference 2: Guidelines for the implementation of the Agreement on Technical Co-operation between ISO and CEN (Vienna Agreement), Seventh Edition dated 2016.
http://isotc.iso.org/livelink/livelink/fetch/2000/2122/3146825/4229629/4230450/4230458/02__Guidelines_for_TC_SC_Chairmen_and_Secretariats_on_the_implementation4230458_of_the_Vienna_Agreement.pdf?nodeid=4230689&vernum=0
English and Japanese parallel translation issued by Japanese Standards Association, JSA:
http://data.jsa.or.jp/itn/pdf/shiryo/iso_cen_vienna03.pdf

Reference: Implementation of the Smart City concept

Recently, the concept of realization of an environment-friendly and sustainable society through the design and planning of cities has seen a surge in interest. That is the concept referred to as Smart City.

- Smart citizens
- Smart government and education institutes
- Smart healthcare
- Smart energy control
- Smart use of technology
- Smart infrastructure
- Smart buildings
- Smart mobility (or smart transportation)

The size of the Smart City market is expected to grow to around 350 trillion yen by 2025.

Commitment to smart transportation is becoming increasingly significant, as its market share is expected to account for about 10% of the entire market.

Smart City pilot project in the United States

The federal government has started moving towards the realization of Smart Cities for smart transportation in the US, with the Department of Transportation (US DOT) leading a Smart City pilot project. The US DOT and private capital plan to invest about 4 billion yen and 9 billion yen, respectively. US society faces a broad range of issues due to unaffordability of housing resulting from income disparities. To improve the situation with ITS and other technologies and to increase land prices in the region, a project design called 'SMARTCOLUMBUS' was launched in Columbus, Ohio aiming to begin its operation in 2019. Besides US DOT, other departments including Department of Energy have begun Smart City pilot projects to promote streamlining of urban energy in Columbus, making the location literally an experimental Smart City site.

ISO/TC 22 (Road Vehicles) Standardization Activities

Founded at the same time as ISO in 1947, TC 22 is one of the oldest TCs. The following diagram shows its scope and structure. TC 22 plenary meetings are held every 18 months, and the following eight member countries regularly attend: France, Germany, USA, Japan, Italy, Sweden, South Korea and Malaysia. There are 872 TC 22-published international standards as of June 2018, and 256 draft standards are currently under development.

Scope and structure of TC 22

ISO/TC 22

Chair: France
P member: 27 countries
O member: 47 countries

Secretariat: AFNOR
International secretariat: BNA

[Scope]
All questions of standardization concerning compatibility, interchangeability and safety, with particular reference to terminology and test procedures (including the characteristics of instrumentation) for evaluating the performance of the following types of road vehicles and their equipment as defined in the relevant items of Article 1 of the convention on Road Traffic, Vienna in 1968 concluded under the auspices of the United Nations: Moped (item m), Motor cycle (item n), Motor vehicle (item p), Trailer (item q), Semi-trailer (item r), Light trailers (item s), Combination vehicles (item t), Articulated vehicle (item u)

SC	Name	Chair
SC 31	Data communication	Germany/ France
SC 32	Electrical and electronic components/systems	Japan
SC 33	Vehicle dynamics and chassis components	Germany
SC 34	Powertrain	US
SC 35	Lighting and visibility	Italy
SC 36	Safety and impact tests	US
SC 37	Electrically propelled vehicles	Germany
SC 38	Motorcycles and mopeds	Japan
SC 39	Ergonomics	US
SC 40	Commercial vehicles, buses and trailers	Italy
SC 41	Gasoline engine vehicles	Italy

AFNOR: Association Française de Normalisation; BNA: Bureau de Normalisation de l'Automobile (France)

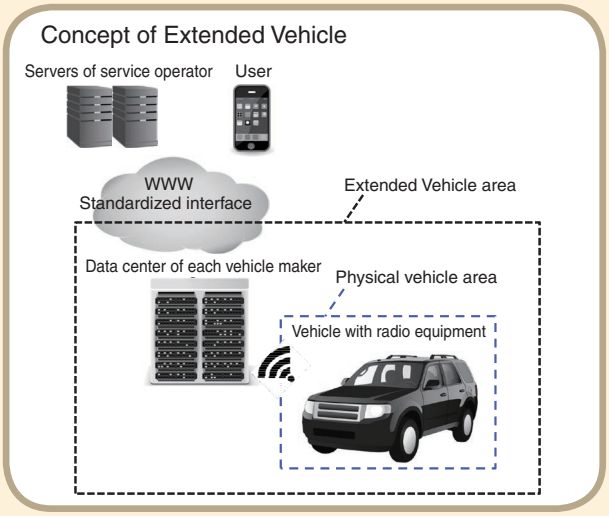
●Memorandum of Understanding between TC 22 and TC 204

Due to developments in driving assistance technology and embodiment of standardization work with progress in driving automation technology, duplicated content of duties between TC 22 and TC 204 were revealed. A memorandum of understanding for establishing cooperation procedures between both TCs was therefore agreed in June 2014. The memorandum describes procedures including that the scopes of both TCs and liaison between remain unchanged, but problems of duplicated standardization work should be solved between both WGs, and problems not solvable between the WGs should be resolved between the chairmen of the WGs.

As a result of the cooporative activity based on this memorandum, TC 22/SC 33/WG 16 (Active safety test equipment) has developed the pedestrian dummy standards (ISO/DIS 19206-1) which will be published soon. TC 204/WG 14 has published standards for performance requirements and test methods for pedestrian detection and collision mitigation systems (ISO 19237). To promote future standardization activities, which are crucial for the automotive industry, the need for flexible handling of cooperation between both TC/WGs is becoming an issue of concern.

●SC 31 Extended Vehicle Overview

The standardization programs began with the standardization of interfaces between vehicles and nomadic devices such as cellphones, discussed under TC 204/WG 17. In ISO 13185 Intelligent transport systems: Vehicle interfaces for provisioning and support of ITS services Part 3 developed under TC 204/WG 17, the structure of Vehicle Station Gateway (hereafter VSG) connected with devices external to vehicles was targeted for standardization. Since this needed to be discussed jointly by both TC 22/SC 3 (current SC 31) responsible for standardization of in-vehicle electronic equipment and TC 204 WG 17, a Joint Working Group (TC 22/SC 3/JWG 2) was created in June 2013. The scope of standardization necessary for a remote failure diagnosis service was discussed as a typical case example, and the concept of the Extended Vehicle was additionally proposed for standardization of interface to information external to the vehicle in May 2014. Responding to the proposal, TC 22/SC 31/WG 6 Extended Vehicle (ExVe)/Remote Diagnostic Support was created, and standardization is currently under discussion. This standardization aims to reduce the risk of information security and to provide vehicle data for outside-vehicle services. New services using vehicle data are likely to spread in the future. Over the medium- to long-term, it is possible that additional use cases using the Extended Vehicle concept will be examined. In Japan, the issue has been handled since 2015 by setting up the vehicle information interface subcommittee under the vehicle communications committee.



●SC 33/WG 3 (driver assistance and active safety) and WG 16 (active safety test equipment) Activity Overview

Since the standardization of test methods and test equipment currently under progress in WGs 3 and 16 is also required to harmonize with domestic assessment methods, Japan will actively participate so that its opinions are included in the standards.

Both WG 3 and WG 16 are in the field related to ITS active safety. In the future, since the field relevant to autonomous driving will be handled by these groups, they are promoting standardization in collaboration with TC 204 National Committee and the Automated Driving Standardization committee to enable Japan to lead this technology field. The following table lists items currently promoted by the two WGs.

WG 3	Standardization themes	ISO Number	Content
1	Test method to evaluate the performance of autonomous emergency braking systems -- Part 1: Car-to-car	DIS 22733-1	Standardizing AEBS (car-to-car) test methods
2	Test method to evaluate the performance of lane-keeping assistance systems	DIS 22735	Standardizing LKAS test methods
3	Test method to evaluate the performance of autonomous emergency braking systems -- Part 2: Car-to-pedestrian	PWI 22733-2	Standardizing AEBS (car-to-pedestrian) test methods
WG 16	**Standardization themes**	**ISO Number**	**Content**
1	Test devices for target vehicles, vulnerable road users and other objects, for assessment of active safety functions -- Part 1: Requirements for passenger vehicle rear-end targets	DIS 19206-1	Standardizing the dummy target at the rear of the vehicle used in the active safety function test.
2	Test devices for target vehicles, vulnerable road users and other objects, for assessment of active safety functions -- Part 2: Requirements for pedestrian targets	DIS 19206-2	Standardizing the pedestrian dummy target of used in the active safety function test.
3	Test devices for target vehicles, vulnerable road users and other objects, for assessment of active safety functions -- Part 3: Requirements for passenger vehicle 3D targets	WD 19206-3	Standardizing the vehicle dummy target in 3D shape used in the active safety function test.
4	Test devices for target vehicles, vulnerable road users and other objects, for assessment of active safety functions -- Part 4: Requirements for bicyclist targets	WD 19206-4	Standardizing the bicyclist dummy target used in the active safety function test.
5	Test devices for target vehicles, vulnerable road users and other objects, for assessment of active safety functions -- Part 5: Requirements for powered two-wheeler targets	PWI 19206-5	Standardizing the two-wheeler dummy target used in the active safety function test.
6	Test object monitoring and control for active safety and automated/ autonomous vehicle testing -- Part 1: Functional requirements, specifications and communication protocol	WD 22133-1	Standardizing the data communications used in the evaluation of automated driving vehicles and active safety function at the test site, and the communication protocols and interfaces used for controlling vehicles tested.
7	Test object monitoring and control for active safety and automated/autonomous vehicle testing -- Part 2 Test scenario description formats	PWI 22133-2	Standardizing the description format of test scenarios used in the evaluation of automated driving vehicles and active safety function at the test site.

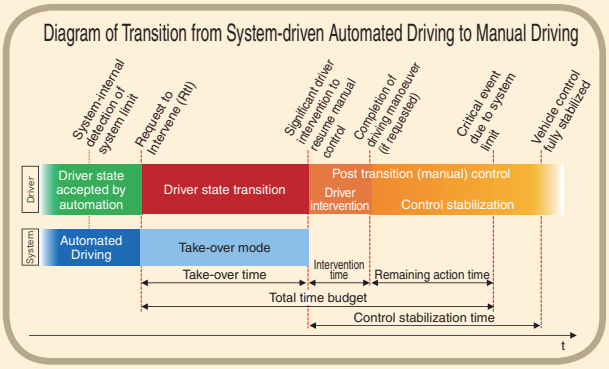
●SC 39 (Ergonomics)/WG 8(Transport Information and Control System on board Man Machine Interface) Activity Overview

WG 8 is working on the standardization of the human machine interface (hereafter HMI) for in-vehicle information equipment. Especially, "Human Performance and State in the Context of Automated Driving and "Ergonomic Aspects of External Visual Communication from Automated Vehicles to Other Road Users" are the issues to be addressed and following describes the latest state of the standardization.

Even in level 3 automated driving, which many countries are competing fiercely to develop, the system can execute a dynamic driving task only within a limited domain, so the driver is expected to respond to an intervention request issued by the system when it finds it difficult to continue driving. Since HMI plays an important role in this operation, WG 8 first standardized the terminology and definitions of items to be taken into consideration in HMI for automated driving status transition, led by Japan and the U.S. This is scheduled to be published as Technical Report in summer 2018.
(The right figure shows the diagram of automated driving status transition.)

Elements (driver state in automated driving, etc.) that affect safe transition and their measurement methods will also be standardized as experimental guidance.

In Japan, luckily, related studies are in progress under the SIP-adus project promoted by the Cabinet Office, so we will bring the outcome to ISO to contribute to international standardization activities.



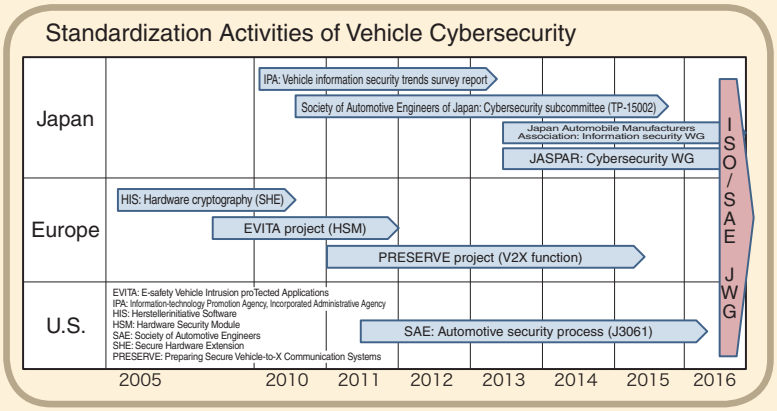
●SC 32/WG 11 (Cybersecurity Engineering) Activity Overview

With digitization of in-vehicle function control, integration between systems via in-vehicle network, and improvement of services by extending connection to outside-vehicle communications, more vehicles are having the same configurations as that of information systems such as PCs and mobile devices. However, this has caused major cybersecurity challenges for automobiles like information systems and PCs, and cases of vehicle device hacking have been reported in papers since 2010. There is a growing need for cybersecurity measures for automobiles as one of the essential technologies to support more advanced digitization including automated driving. Against such a background, a standardization activity for the cybersecurity engineering process started in October 2016.

In this activity, Joint Working Group (JWG), where experts from both ISO/TC 22/SC 32/WG 11 and SAE participate, is standardizing the process based on Partner Standards Development Organization (PSDO) jointly agreed by ISO and SAE so that it is published at the May 2020 ISO/SAE 21434.

ISO/SAE 21434 is based on the cybersecurity standardization activities conducted individually in Japan, Europe and the U.S.

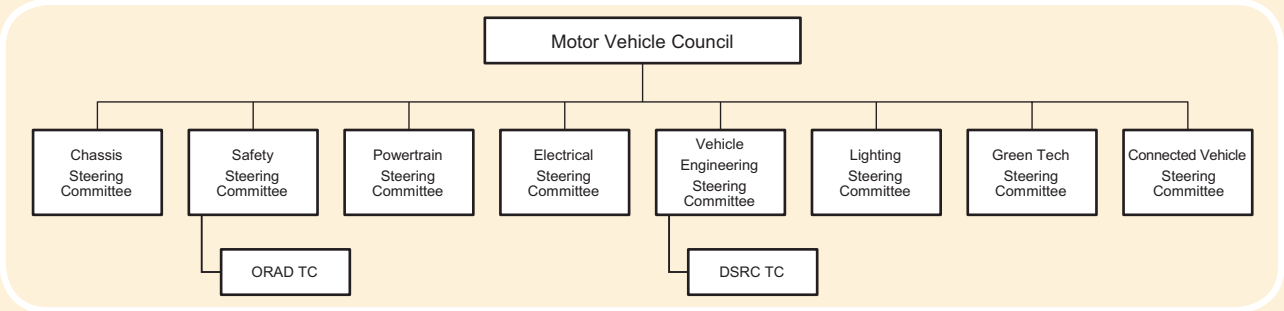
The formulation of ISO/SAE 21434 includes the following objectives: "international standards including the U.S.," "cybersecurity measures meeting the needs of the times," "accountability for cybersecurity validity," and "practical engineering process." This is the activity with incorporated knowledge of international experts from the automobile industry, such as ISO and SAE, and the information security industry.



SAE International Standardization Activities

SAE International is a non-profit organization whose aim is to create standards and promote related programs. The origin of the organization can be traced to the Society of Automobile Engineers, founded in 1904 in the United States. In the process of expanding its scope, originally that of motor vehicles exclusively, to include aircraft, ships, railway and other modes of transport, it began to use the term "Automotive," meaning a self-propelling conveyance, and to deploy branch offices in Canada and Brazil. It thus became known as the Society of Automotive Engineers or SAE International.

It now has more than 145,000 members worldwide, of whom 20,000 are engaged in standardization work. The standardization organization comprises more than 600 technical committees under six councils. The council that is most relevant to TC 204 is the Motor Vehicle Council. Unique to SAE is that specialists participate in the organization's standardization work for voting and other activities in a private capacity, unlike other bodies, where they act as representatives of countries or organizations.



●Agreement on Standard Co-Development between ISO and SAE

The SAE agreed with the PSDO (Partnership Standards Development Organization) on TC 22 (Road Vehicles) and TC 204 (ITS) in September 2016. The agreement aims to achieve the collaborative creation of common standards to avoid creating conflicting standards in the same technology field, so that especially CAV (Connected and Automated Vehicles) and C-ITS (Cooperative ITS) using communications can smoothly develop and prevail.

For a co-developed standard to be published with the ISO-SAE double logo, an ordinary approval process (such as voting) is required at each organization. The publication becomes co-owned property of both organizations, with each of them being responsible for selling and other management tasks. If one party denies approval of the standard in the process of its development, the other party can publish it at their own discretion.

SAE and TC 22 have begun to develop standards related to The SAE and TC 204 plan to begin developing standards relevant to the "Taxonomy and Definitions for Terms Related to Driving Automation Systems for On-Road Motor Vehicles" shown in the next page. A wireless power supply method for electric vehicles, etc., is one of the fields the groups are considering for future development.

●SAE J3016 Revision

SAE J3016: Since the publication of its first edition (12 pages in total) in January 2014, "Taxonomy and Definitions for Terms Related to Driving Automation Systems for On-Road Motor Vehicles" it has been widely referenced as a key document defining levels of driving automation.

The segmentation of levels in SAE J3016 is referred in the guideline for self-driving vehicles driving on public roads published by the U.S. NHTSA (National Highway Traffic Safety Administration), and in Japan, standardization in JASO, based on the translation of SAE J3016, is in progress.

Due to acceleration of discussion on automated driving, revision of J3016 is planned to further improve its contents. The revision work is to proceed within the joint task force between the SAE ORAD (On Road Automated Driving) technology committee and TC 204/WG 14, aiming for publication as a SAE co-owned document.

●SAE DSRC Technology Committee Programs

The DSRC (Dedicated Short-Range Communications) technology committee is establishing standards relevant to vehicle-to-vehicle and vehicle-to-roadside communication technologies required to deploy cooperative ITS in the United States.

A well-known standard is SAE J2735: Dedicated Short-Range Communications (DSRC) Message Set Dictionary.

In the notice of proposed rule making of FMVSS (Federal Motor Vehicle Safety Standards) No. 150 published from NHTSA in December 2016, the functionality of BSM (Basic Safety Message) transmission/reception in vehicle-to-vehicle communications for small vehicles is proposed as the legal requirement, and SAE J2735 is referenced for its message format.

A set of standards for J2945 series is also being developed to define DSRC performance requirements.

J2945/0 DSRC Common Performance Requirements
- /1 On-Board System Requirements for V2V Safety Communications
- /2 DSRC Requirements for V2V Safety Awareness
- /4 DSRC Messages for Traveler Information and Basic Information Delivery
- /6 Performance Requirements for Cooperative Adaptive Cruise Control and Platooning
- /9 Vulnerable Road User Safety Message Minimum Performance Requirements
- /10 Recommended Practices for MAP/SPaT Message Development
- /12 Traffic Probe Use and Operation

Since the work of the SAE DSRC technology committee is closely related to the work of TC 204, exchange of information between them is in progress.

ETSI TC ITS Activities

ETSI (European Telecommunication Standards Institute) is a non-profit organization approved by the EU (European Union) as ESO (European Standardization Organization). It is developing standards for the entire telecommunication field.

It is based in Sophia Antipolis, in the suburbs of Nice in southern France. Its logo "World Class Standards" represents the global influence of the organization, which has member companies and organizations in more than 60 countries.[1]

Unlike the ISO membership structure in which each country is represented in the organization, any company, organization or individual paying the membership fee becomes a member of ETSI.

It has numerous member companies and organizations in the United States and in Asian countries including Japan, in addition to countries in Europe.

Among more than 40 TCs (technical committees) including those for wireless, wired, broadcast and network, TC ITS is responsible for standardization of ITS. It comprises five working groups, as shown in Table 1, that are developing standards corresponding to each technical field.

Table 1 ETSI TC ITS Structure Diagram

WG 1	Application requirements and services
WG 2	Architecture and cross-layer items
WG 3	Networking and Transport
WG 4	Communication media and media-related items
WG 5	Security

The cooperative ITS standardization directive (M453) was presented by European Committee and approved by the European Committee and approved by ETSI and CEN (the European Committee for Standardization) in October 2009. Consequently, even at the initial stage, called Release 1, more than 110 relevant standards were published.[2]

ETSI has published many standards related to communications for vehicle-to-vehicle and roadside-to-vehicle using 5.9 GHz band DSRC. Two European standards (ENs) shown in Table 2 are especially well known.

Table 2 Typical European Standards published by ETSI TC ITS

EN 302 637-2	Specification of Cooperative Awareness Basic Service	Definition of transmission/reception, etc., of CAMs (Cooperative Awareness Message) to steadily provide other participants in traffic at a certain interval with data of positions, movement and attributions, etc., in vehicle-to-vehicle and roadside-to-vehicle communications to promote their awareness.
EN 302 637-3	Specifications of Decentralized Environmental Notification Basic Service	Definition of transmission/reception, etc., of DENMs (Decentralized Environmental Notification Message) to provide details at random times, mainly when dangerous incidents occur in road traffic.

These standards are implemented in roadside devices and invehicle equipment from a variety of equipment vendors. Conformance and interoperability between devices is tested in events called C-ITS Plugtests™ held by ETSI every year.

The development of other standards is in progress in preparation for actual deployment of cooperative ITS, planned for 2019, including congestion control in case of growth in numbers of vehicles equipped with ITS devices, and discussion on issues in multi-channel communications.

ETSI/TC-ITS has also begun to develop a set of standards in anticipation of automated driving technologies called Release 2. Examples of these include:

- Cooperative Adaptive Cruise Control (C-ACC); Pre-standardization study
- Platooning; Pre-standardization study
- Vulnerable Road Users (VRU) awareness
- Collective Perception Service

The major topics in 2018 include that WG 2 has started working on interoperability among heterogeneous ITS systems, such as LTE-V2X, using a mobile phone communication technology, and ITS G5 (5.9 GHz, dedicated short range communication), and backward compatibility.

ETSI TR 103 576 -2:

Pre-standardization study on ITS architecture;

Part 2: Interoperability among heterogeneous ITS systems and backward compatibility

Since communications among heterogeneous ITS systems require installation of at least two receivers, animated discussions continue about technical feasibilities and challenges.

Work on ETSI TC-ITS is closely related to that in SAE DSRC TC (Dedicated Short-Range Communications Technical Committee). Both groups are closely exchanging information to arrive at the harmonization and co-development of standards.

Verification of harmonization and information sharing in relation to work items of ETSI/TC ITS are also in progress under TC 204.

References

(1) http://www.etsi.org/about, ETSI Annual Report, April 2017,

(2) Japan Automobile Research Institute: Analysis and verification report of standardization of ITS cooperative system information items, 2014

ITS-related standardization in ITU

●What is ITU?

ITS international standardization is under discussion in TC 204 of ISO, and the ITU (International Telecommunication Union) is working on standardization, including the creation of Recommendations.

ITU Recommendations define technological requirements, etc., that communication systems and equipment should comply with, as recommendations. Countries and companies will adopt the required recommendations as mandatory.

ITU is the United Nations specialized agency for information and communication technologies whose membership includes 193 Member States, as well as Sector Members and Associates from nearly 800 organizations as of June 2018. ITU is composed of three sectors: ITU-R (Radio communications), ITU-T (Telecommunications), and ITU-D (Telecommunications development).

ITU-R is involved in the adoption of international regulations and international treaties regarding terrestrial and space (satellite) frequency allocation and the orbital position of geostationary satellites. Countries must establish relevant laws and regulations in accordance with the rules and treaties. Recommendations, which are the basic principles for wireless communications, were created by study groups (SGs), which are lower-level bodies under ITU-R. The SGs were reorganized in 2007, with SG 5 (Terrestrial services) chosen to handle ITS. Below SG 5 there are are WPs (working parties). WP 5A (Land mobile services above 30 MHz (excluding IMT); wireless access in fixed services; amateur and amateur-satellite services) is in charge of ITS-related standardization.

ITU-T is also responsible for creating recommendations for research and standardization with respect to the technologies and the usage of telecommunications. SG12 (Performance), SG16 (Multimedia applications), and SG17 (Security) are working on standardization in fields that are relevant to ITS communications.

ITU-D is promoting the development of Telecommunications through global technology assistance activities in the telecommunications field.

●Standardization of ITS in ITU-R

ITS standardization in ITU-R originated with the proposal of a new Study Question in 1994 that was adopted in 1995. Subsequently, M.1310, which describes the wireless requirements for ITS, was approved as a recommendation in 1997. This recommendation is a document that lays out the architecture of ITS radio communications. Based on this policy, three recommendations were drafted and approved in 2000: Functionalities, 60/76 GHz short-range radar, and 5.8 GHz dedicated short-range communications.

A study of millimeter-wave ITS communication was discussed and added to the existing recommendation (M.1452) related to millimeter-wave radar, and a revision of the recommendation took place in 2012.

Further, through Japan-led efforts, the Land Mobile Handbook Volume 4 (Intelligent Transport Systems) was published in 2007. It contains all the international trends in ITS radio communications.

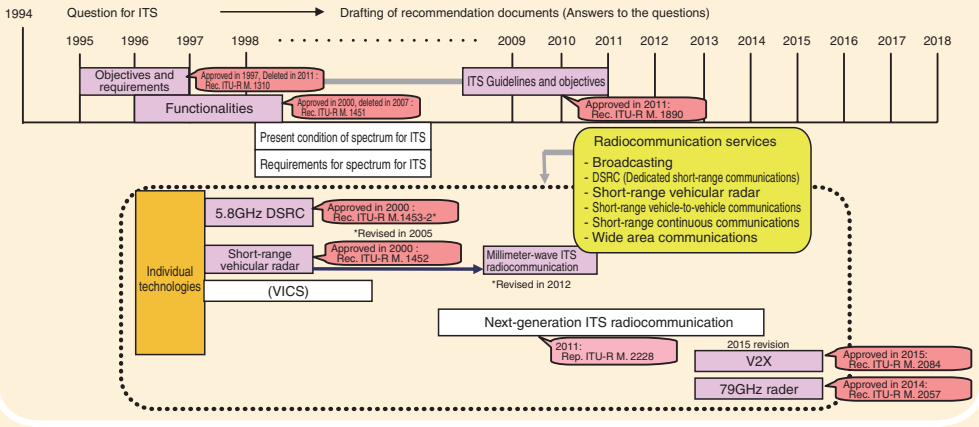
Currently, to realize systems such as driving safety support systems that contribute to reducing traffic accidents, studies on the application of advanced ITS radio communication sys tems using road-to-vehicle and vehicle-to-vehicle communications are under way in Japan, the US, and Europe. In light of such trends, Japan proposed replacing Recommendation M. 1310 with it sown ITS Guidelines and Objectives, which became a Recommendation in April 2011. Moreover, Japan has made technical proposals on advanced ITS wireless systems using the 700 MHz band, and this system was included in the Report ITU-R M.2228 in November 2011 (Revised in 2015).

Since 2013, a new vehicle communications recommendation that incorporates the results of the standardization of 700-MHz advanced ITS wireless systems and the European ETSI has been prepared. Work was also carried out on a recommendation for high-resolution radar using the 79 GHz band.

Key ITS-related agendas will be presented to WRC-19 (World Radio Communication Conference 19), to be held in 2019. Agenda 1.12, ITS Applications, will discuss worldwide or regional harmonization of frequencies for ITS application. Agenda 1.16, Use of wireless access systems and wireless LAN in the 5150 to 5925 MHz band, will discuss the use of wireless LAN in the 5 GHz band used by ITS (5.8 GHz band is used for ETC in Japan). Currently, the groups concerned are discussing the handling of these items in preparation for the meeting in 2019.

The following section describes the background to the creation of the ITS recommendations and outlines related documents.

The process of formulating the recommendations for ITS



Outline of recommendation documents

Name of the document	Document number	Content
Millimetre wave radiocommunication systems for intelligent transport system applications	ITU-R M.1452-2	Recommendation for millimeter wave ITS radiocommunication on technical standards and parameters of low power collision-prevention radar at 60 GHz/76 GHz and radiocommunication at 60 GHz.
Dedicated Short Range Communications (DSRC)at 5.8GHz	ITU-R M.1453-2	Recommendation for dedicated short-range communications in the 5.8 GHz band comprising the active method in Japan, the passive method in Europe and the high data-rate passive method in Italy; In 2002, the recommendation was revised in response to the promotion of high data rate DSRC in Japan, and in 2005, it was revised again to incorporate the Japanese ASL (Application Sub Layer)
ITS⊖Guidelines and Objectives	ITU-R M.1890	A new recommendation to replace ITU-R M.1310 (deleted in 2011), which mainly documents the architecture of ITS communications providing the ITS communications requirements
76-81GHz Automotive raders	ITU-R M.2057	System characteristics of the automotive radar operated in the 76 - 81 GHz frequency band for ITS applications
V2V,V2I Communications for ITS	ITU-R M.2084	Interface for V2V and V2X wireless communication.

●ITS-related Standardizations in ITU-T

In ITU-T, eleven SGs (Study Groups) share the standardization work in the ICT field.

Focusing on the importance of ITS communications, ITU held a Fully Networked Car Workshop in collaboration with ISO and IEC as one of the events at the Salon International de l'Auto in Geneva from 2005 through 2013. From 2014, it has been hosting a Future Networked Car Symposium collaboratively with UNECE.

Before beginning the process of actual recommendation development, by leveraging a mechanism referred to as FG (focus groups) that allows non-members to participate in preliminary discussions, four FGs, FG-FITCAR, FG-FITCAR II and FG-CarCom, which discussed voice calls from vehicles, and FG-Driver Distraction, which discussed what ICT technology can do to reduce auto accidents based on the UN report and ITU Council Resolution, have been organized from 2007 through 2013. They resulted in related recommendation developments in SG12.

The main items discussed at ITU-T include the standardization of network architectures and gateway platforms for ITS communications, security in ITS communications, and quality of service using ITS communications. (For its most recent status, refer to the following ITU-T Website: http://www.itu.int/en/ITU-T/Pages/default.aspx)

ITS communications study group (SG) in ITU-T

Study group	Fields in charge and main standardization fields in ITS communications
SG12 (Performance)	In charge of performance, QoS (Quality of Service) and QoE (Quality of Experience) of the info-communication network. Discussing standardization of in-vehicle communication via handover, etc.
SG16 (Multimedia)	In charge of multimedia applications using the info-communication network Discussing requirements and architecture (including gateway platform) to the info-communication network from the point of view of various applications including ITS communications
SG17 (Security)	In charge of security of the info-communication network Discussing standardization of security guideline in ITS communications

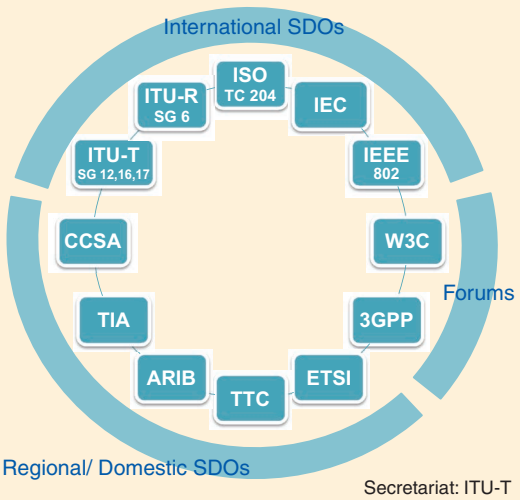
Outline of recommendation documents

SG	Name of the document	Document number	Content
SG12	Narrowband hands-free communication in motor vehicles	ITU-T P.1100	Hands-free communication adapter using in-vehicle narrow band voice encoding.
	Wideband hands-free communication in motor vehicles	ITU-T P.1110	Hands-free communication adapter using in-vehicle wide band voice encoding.
	Super-wideband and fullband stereo hands-free communication in motor vehicles	ITU-T P.1120	Hands-free communication adapter using in-vehicle ultra wide band and full -band stereo voice encoding.
	Subsystem requirements for automotive speech services	ITU-T P.1130	In-vehicle subsystem requirements for speech services.
	Speech communication requirements for emergency calls originating from vehicles	ITU-T P.1140	Speech communication requirements for emergency calls from vehicles.
SG16	Functional requirements for vehicle gateways	ITU-T F.749.1	Functional requirements for in-vehicle gateways.
	Service requirements for vehicle gateway platforms	ITU-T F.749.2	Service requirements for in-vehicle gateway platforms.
	Architecture and functional entities of vehicle gateway platforms	ITU-T H.550	Architecture and functional entities of in-vehicle gateway platforms.
	Communications interface between external applications and a vehicle gateway platform	ITU-T H.560	Communication interface between external applications and an in-vehicle gateway platform.
SG17	Secure software update capability for intelligent transportation system communication devices	ITU-T X.1373	Security guideline for remote updating of ITS communication device software.

●CITS (Collaboration on ITS Communication Standards)

CITS (Collaboration on ITS Communication Standards) was structured as a framework to provide a place where standardization institutions/bodies involved, including ITU-R, ISO, IEC, IEEE, regional standardization bodies and various forums, etc., establish collaboration and cooperation on the initiative of ITU-T. It aims to foster informationsharing and opinion exchange in the form of workshops and meetings, and for work sharing, cross-citation and revision of standard drafts based on agreements. Since the preparatory meeting held by TC 204 and ITU-T SG16 in August 2011, 22 CITS meetings have been held as of March 2018, at which participants exchanged and shared meaningful information about what had been achieved by each standardization body.

Concept of CITS



Secretariat: ITU-T

ITS-related Standardizations by IEEE

●Standardizations by the IEEE 802 Committee

IEEE (The Institute of Electrical and Electronics Engineers) is the institution for electricity and electronics specialists. Based in the United States, it proceeds with discussions on electronics, communications and information, etc., and is working on standardization. IEEE 802, one of IEEE's technical committees, is conducting LAN (Local Area Network) and MAN (Metropolitan Area Network)-related standardization activities. It includes Working Groups (WGs) for both wired and wireless technologies. Table 1 lists wireless technology WGs related to ITS.

Table 1 ITS related Working Groups under IEEE 802 Committee

802.11	Wireless Local Area Network (WLAN)	Deals with technologies for wireless communication within a building and/ or facility (Several tens to several hundreds meters)
802.15	Wireless Personal Area Network (WPAN)	Deals with technologies for wireless communication within a room (Several to several tens meters)
802.16	Wireless Metropolitan Area Network (WMAN)	Deals with technologies for wireless communication within a region like a city (Several to several ten kms)
802.20	Mobile Broadband Wireless Access (MBWA)	Deals with broadband IP wireless communication in high speed mobile environments such as vehicles
802.21	Handover between heterogeneous networks	Deals with technologies to continue communication by switching across different kind of networks
802.22	Wireless Regional Area Network (WRAN)	Deals with cognitive radio technologies enabling communications in TV broadcast band without causing interference

WLANs, WMANs and MBWAs are considered applicable as media for ITS communications between roadside and vehicle and between vehicles. WPANs can be used as a communication medium for short distances such as inside a vehicle. WRANs may also be applicable to ITS. Future ITS equipment is expected to use multiple communication media, and technology capable of continuing communication by switching across different kind of networks (handover) is considered necessary.

The IEEE 802.11 WG, which functions as WLAN (wireless LAN) used in various occasions, is engaged in a range of standardization activities with many Task Groups under it. Of these, Task Group p has enhanced the functions of the IEEE 802.11 wireless LAN protocol and issued it as the IEEE 802.11p standard. This protocol uses OFDM modulation to achieve efficient data transmission in harsh environments, and is suitable for applications that require a fast response, as it uses a communication control method that allows links to be established quickly.

The US allocated the 5.9 GHz band for ITS communications in 1999, and conducted various tests using IEEE 802.11p which at that time was not yet a finalized standard. The draft of IEEE 802.11p was provisionally completed at the beginning of 2006. Since then it has been refined through repeated revisions, with final approval being received in June 2010. It was published in July the same year. In August 2014, the National Highway Traffic Safety Administration (NHTSA) agency of the US Department of Transportation presented an Advance Notice of Proposed Rulemaking (ANPRM) and started procedures to systematize the installation of IEEE 802.11p-based vehicle-to-vehicle communication devices in new light vehicles. Draft rules were released as NPRM and opened for public comment in December 2016. The rules governing NPRM have been expected to be published in 2019. Promotion of installation will be carried out in a stepwise manner, whereby some cars newly manufactured in 2021 will partly installed with the devices, and in 2023 every new car will be equipped with one. Even in June 2018, more than one year after the comment entry was closed, the rules have not yet taken effect, but the US Department of Transportation said that it does not mean they discarded the institutional policies.

Table 2 Outline of IEEE 802.11p Specifications

Frequency band to be used	5.85-5.925 GHz
Channel band width	10 MHz (optionally 20 MHz available in part)
Number channels	7
Modulation method	OFDM (same as IEEE 802.11a)
Max. transmission power/ communication distance	Class A: 0 dBm/ 15m, Class B: 10 dBm/ 100m Class C: 20dBm/ 400m, Class D: 28.8dBm/ 1000m
Medium access benefit	RSU and OBU are substantially equal. Quick link establishment

The 5.9 GHz band was also allocated in Europe in 2008 in anticipation of the use of IEEE 802.11p, and a great deal of testing was conducted. In 2009, the ITS technical committee of the European Telecommunications Standards Institute (ETSI) agreed on the ITS-G5 communication standard using IEEE 802.11p. Meanwhile, the use of IEEE 802.11p as a communication medium in CALM systems (which are being standardized by TC 204/WG 16) was also standardized as ISO 21215. It is anticipated that this will be one of the most commonly-used communication media.

●Standardizations in IEEE 1609 Project

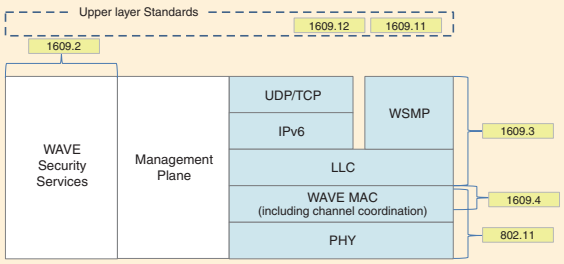
The ITS communication system in the U.S. is referred to as WAVE (Wireless Access in Vehicular Environments). While WAVE communication media will use the above-mentioned IEEE 802.11p, the other parts are likely to use the IEEE 1609 standards prepared in IEEE 1609 project.

Based on 1609.0 (Architecture), which describes the overall configuration, the standards have been issued, and some are still being examined for revision. However, some parts are no longer being revised or were abandoned after being issued.

Table 3 Standardization Items in IEEE 1609

1609.0	WAVE Architecture
1609.2	Security Services for Applications and Management Messages
1609.3	Networking Services (under revision)
1609.4	Multi-Channel Operation (under revision)
1609.11	Over-the-Air Electronic Payment Data Exchange Protocol for ITS
1609.12	Identifier Allocations (under revision)
1609.1	Resource Manager (abandoned)
1609.5	Communication Manager (cancelled)
1609.6	Remote Management Services (cancelled)

Overall WAVE architecture



TC 204 List of Work Items and Progress Stages as of June 2018

WG	ISO Number	Title	Stage						Published
			PWI	NP	WD	CD	DIS	FDIS	
TC 204	ISO 15075:2003	Transport information and control systems -- In-vehicle navigation systems -- Communications message set requirements							○
TC 204	ISO/TR 17384: 2008	Intelligent transport systems -- Interactive centrally determined route guidance (CDRG) -- Air interface message set, contents and format							○
TC 204	ISO/TR 28682:2008	Intelligent transport systems -- Joint APEC-ISO study of progress to develop and deploy ITS standards							○
WG 1	ISO/NP TR 12859	Intelligent transport systems -- System architecture -- Privacy aspects in ITS standards and systems		○					
WG 1	ISO/TR 12859:2009	Intelligent transport systems -- System architecture -- Privacy aspects in ITS standards and systems							○
WG 1	ISO/NP TR 14812	Intelligent transport systems - Terminology		○					
WG 1	ISO/NP 14813-1	Intelligent transport systems -- Reference model architecture(s) for the ITS sector -- Part 1: ITS service domains, service groups and services		○					
WG 1	ISO 14813-1:2015	Intelligent transport systems -- Reference model architecture(s) for the ITS sector -- Part 1: ITS service domains, service groups and services							○
WG 1	ISO/DIS 14813-5	Intelligent transport systems -- Reference model architecture(s) for the ITS sector -- Part 5: Requirements for architecture description in ITS standards					○		
WG 1	ISO 14813-5:2010	Intelligent transport systems -- Reference model architecture(s) for the ITS sector -- Part 5: Requirements for architecture description in ITS standards							○
WG 1	ISO 14813-6:2017	Intelligent transport systems -- Reference model architecture(s) for the ITS sector -- Part 6: Use of ASN.1							○
WG 1	ISO/PWI 14813-7	Intelligent transport systems -- Reference model architecture(s) for the ITS sector -- Part 7: ITS standards framework	○						
WG 1	ISO 14817-1:2015	Intelligent transport systems -- ITS central data dictionaries -- Part 1: Requirements for ITS data definitions							○
WG 1	ISO 14817-2:2015	Intelligent transport systems -- ITS central data dictionaries -- Part 2: Governance of the Central ITS Data Concept Registry							○
WG 1	ISO 14817-3:2017	Intelligent transport systems -- ITS data dictionaries -- Part 3: Object identifier assignments for ITS data concepts							○
WG 1	ISO/AWI 17419-2	Intelligent transport systems -- Identifiers -- Part 2: Management and operation of registries			○				
WG 1	ISO/PWI 17419-3	Intelligent transport systems -- Identifiers -- Part 3: Architecture requirements for ITS-AID requests	○						
WG 1	ISO/TR 17452:2007	Intelligent transport systems -- Using UML for defining and documenting ITS/TICS interfaces							○
WG 1	ISO/TR 17465-1:2014	Intelligent transport systems -- Cooperative ITS -- Part 1: Terms and definitions							○
WG 1	ISO/TR 17465-2:2015	Intelligent transport systems -- Cooperative ITS -- Part 2: Guidelines for standards documents							○
WG 1	ISO/TR 17465-3:2015	Intelligent transport systems -- Cooperative ITS -- Part 3: Release procedures for standards documents							○
WG 1	ISO/NP TR 23254	Intelligent transport systems -- Architecture -- Use cases and high-level reference architecture for connected, automated vehicles		○					
WG 1	ISO/AWI TR 23255	Intelligent transport systems -- Architecture -- Applicability of data distribution technologies within ITS			○				
WG 1	ISO/PWI 23507	Intelligent transport systems -- Management of electronic privacy regulations (MEPR)	○						
WG 1	ISO 24097-1:2017	Intelligent transport systems -- Using web services (machine-machine delivery) for ITS service delivery -- Part 1: Realization of interoperable web services							○
WG 1	ISO/TR 24097-2:2015	Intelligent transport systems -- Using web services (machine-machine delivery) for ITS service delivery -- Part 2: Elaboration of interoperable web services' interfaces							○
WG 1	ISO/PRF TR 24097-3	Intelligent transport systems -- Using web services (machine-machine delivery) for ITS service delivery -- Part 3: Quality of service						○	
WG 1	ISO/NP TR 24098	Intelligent transport systems -- System architecture, taxonomy and terminology -- Procedures for developing ITS deployment plans utilizing ITS system architecture		○					
WG 1	ISO/TR 24098:2007	Intelligent transport systems -- System architecture, taxonomy and terminology -- Procedures for developing ITS deployment plans utilizing ITS system architecture							○
WG 1	ISO/TR 24529:2008	Intelligent transport systems -- Systems architecture -- Use of unified modelling language (UML) in ITS International Standards and deliverables							○
WG 1	ISO/NP 24531-2	Intelligent transport systems -- System architecture, taxonomy and terminology -- Part 2: Using ASN.1 in ITS standards, data registries and data dictionaries		○					
WG 1	ISO 24531:2013	Intelligent transport systems -- System architecture, taxonomy and terminology -- Using XML in ITS standards, data registries and data dictionaries							○
WG 1	ISO/TR 24532:2006	Intelligent transport systems -- Systems architecture, taxonomy and terminology -- Using CORBA (Common Object Request Broker Architecture) in ITS standards, data registries and data dictionaries							○
WG 1	ISO/TR 25100:2012	Intelligent transport systems -- Systems architecture -- Harmonization of ITS data concepts							○

WG	ISO Number	Title	Stage						Published
			PWI	NP	WD	CD	DIS	FDIS	
WG 1	ISO/TR 25102:2008	Intelligent transport systems -- System architecture -- 'Use Case' pro-forma template							○
WG 1	ISO/TR 25104:2008	Intelligent transport systems -- System architecture, taxonomy, terminology and data modelling -- Training requirements for ITS architecture							○
WG 1	ISO/TR 26999:2012	Intelligent transport systems -- Systems architecture -- Use of process-oriented methodology in ITS International Standards and other deliverables							○
WG 3	ISO 14296:2016	Intelligent transport systems -- Extension of map database specifications for applications of cooperative ITS							○
WG 3	ISO 14825:2011	Intelligent transport systems -- Geographic Data Files (GDF) -- GDF5.0							○
WG 3	ISO 17267:2009	Intelligent transport systems -- Navigation systems -- Application programming interface (API)							○
WG 3	ISO 17572-1:2015	Intelligent transport systems (ITS) -- Location referencing for geographic databases -- Part 1: General requirements and conceptual model							○
WG 3	ISO/PRF 17572-2	Intelligent transport systems (ITS) -- Location referencing for geographic databases -- Part 2: Pre-coded location references (pre-coded profile)						○	
WG 3	ISO 17572-2:2015	Intelligent transport systems (ITS) -- Location referencing for geographic databases -- Part 2: Pre-coded location references (pre-coded profile)							○
WG 3	ISO 17572-3:2015	Intelligent transport systems (ITS) -- Location referencing for geographic databases -- Part 3: Dynamic location references (dynamic profile)							○
WG 3	ISO/CD 17572-4	Intelligent transport systems -- Location referencing for geographic databases -- Part 4: Lane-level location referencing				○			
WG 3	ISO/DIS 19297-1	Intelligent transport systems -- Shareable geospatial databases for ITS applications -- Part 1: Framework					○		
WG 3	ISO/TS 20452:2007	Requirements and Logical Data Model for a Physical Storage Format (PSF) and an Application Program Interface (API) and Logical Data Organization for PSF used in Intelligent Transport Systems (ITS) Database Technology							○
WG 3	ISO/DIS 20524-1	Intelligent transport systems -- Geographic Data Files (GDF) -- GDF5.1 -- Part 1: Application independent map data shared between multiple sources					○		
WG 3	ISO/AWI 20524-2	Intelligent transport systems -- Geographic Data Files (GDF) GDF5.1 -- Part 2: Map data used in automated driving systems, Cooperative ITS, and multi-modal transport			○				
WG 3	ISO/DTR 21718	Intelligent transport systems -- Spatio-temporal data dictionary for cooperative ITS and automated driving systems 2.0						○	
WG 3	ISO/TR 21718:2017	Intelligent transport systems -- Spatio-temporal data dictionary for cooperative ITS and automated driving systems							○
WG 3	ISO/NP TS 22726-1	Intelligent transport systems -- Dynamic data and map database specification for connected and automated driving system applications -- Part 1: Architecture and data model for harmonization of static map data		○					
WG 3	ISO/PWI TS 22726-2	Intelligent transport systems -- Dynamic data and map database specification for connected and automated driving system applications -- Part 2: Data model of static transitory and dynamic transitory data	○						
WG 3	ISO 24099:2011	Navigation data delivery structures and protocols							○
WG 4	ISO 14814:2006	Road transport and traffic telematics -- Automatic vehicle and equipment identification -- Reference architecture and terminology				○			
WG 4	ISO 14815:2005	Road transport and traffic telematics -- Automatic vehicle and equipment identification -- System specifications							○
WG 4	ISO 14816:2005/ DAmd 1	Road transport and traffic telematics -- Automatic vehicle and equipment identification -- Numbering and data structure -- Amendment 1							○
WG 4	ISO 14816:2005	Road transport and traffic telematics -- Automatic vehicle and equipment identification -- Numbering and data structure							○
WG 4	ISO 17261:2012	Intelligent transport systems -- Automatic vehicle and equipment identification -- Intermodal goods transport architecture and terminology							○
WG 4	ISO 17262:2012/ DAmd 1	Intelligent transport systems -- Automatic vehicle and equipment identification -- Numbering and data structures -- Amendment 1							○
WG 4	ISO 17262:2012	Intelligent transport systems -- Automatic vehicle and equipment identification -- Numbering and data structures							○
WG 4	ISO 17262:2012/ Cor 1:2013	Intelligent transport systems -- Automatic vehicle and equipment identification -- Numbering and data structures -- Technical Corrigendum 1							○
WG 4	ISO 17263:2012	Intelligent transport systems -- Automatic vehicle and equipment identification -- System parameters							○
WG 4	ISO 17263:2012/ Cor 1:2013	Intelligent transport systems -- Automatic vehicle and equipment identification -- System parameters -- Technical Corrigendum 1							○
WG 4	ISO 17264:2009/ DAmd 1	Intelligent transport systems -- Automatic vehicle and equipment identification -- Interfaces -- Amendment 1						○	
WG 4	ISO 17264:2009	Intelligent transport systems -- Automatic vehicle and equipment identification -- Interfaces							○
WG 4	ISO 24534-1:2010	Automatic vehicle and equipment identification -- Electronic registration identification (ERI) for vehicles -- Part 1: Architecture							○
WG 4	ISO 24534-2:2010	Automatic vehicle and equipment identification -- Electronic registration identification (ERI) for vehicles -- Part 2: Operational requirements							○
WG 4	ISO 24534-3:2016	Intelligent transport systems -- Automatic vehicle and equipment identification -- Electronic registration identification (ERI) for vehicles -- Part 3: Vehicle data							○

WG	ISO Number	Title	Stage						Published
			PWI	NP	WD	CD	DIS	FDIS	
WG 4	ISO 24534-4:2010/ DAmd 1	Automatic vehicle and equipment identification -- Electronic registration identification (ERI) for vehicles -- Part 4: Secure communications using asymmetrical techniques -- Amendment 1						○	
WG 4	ISO 24534-4:2010	Automatic vehicle and equipment identification -- Electronic registration identification (ERI) for vehicles -- Part 4: Secure communications using asymmetrical techniques							○
WG 4	ISO 24534-5:2011/ DAmd 1	Intelligent transport systems -- Automatic vehicle and equipment identification -- Electronic Registration Identification (ERI) for vehicles -- Part 5: Secure communications using symmetrical techniques -- Amendment 1						○	
WG 4	ISO 24534-5:2011	Intelligent transport systems -- Automatic vehicle and equipment identification -- Electronic Registration Identification (ERI) for vehicles -- Part 5: Secure communications using symmetrical techniques							○
WG 4	ISO 24535:2007	Intelligent transport systems -- Automatic vehicle identification -- Basic electronic registration identification (Basic ERI)							○
WG 5	ISO/CD 12813	Electronic fee collection -- Compliance check communication for autonomous systems				○			
WG 5	ISO 12813:2015	Electronic fee collection -- Compliance check communication for autonomous systems							○
WG 5	ISO 12813:2015/ Amd 1:2017	Electronic fee collection -- Compliance check communication for autonomous systems -- Amendment 1							○
WG 5	ISO 12855:2015	Electronic fee collection -- Information exchange between service provision and toll charging							○
WG 5	ISO 13140-1:2016	Electronic fee collection -- Evaluation of on-board and roadside equipment for conformity to ISO 13141 -- Part 1: Test suite structure and test purposes							○
WG 5	ISO 13140-2:2016	Electronic fee collection -- Evaluation of on-board and roadside equipment for conformity to ISO 13141 -- Part 2: Abstract test suite							○
WG 5	ISO 13141:2015	Electronic fee collection -- Localisation augmentation communication for autonomous systems							○
WG 5	ISO 13141:2015/ Amd 1:2017	Electronic fee collection -- Localisation augmentation communication for autonomous systems -- Amendment 1							○
WG 5	ISO 13143-1:2016	Electronic fee collection -- Evaluation of on-board and roadside equipment for conformity to ISO 12813 -- Part 1: Test suite structure and test purposes							○
WG 5	ISO 13143-2:2016	Electronic fee collection -- Evaluation of on-board and roadside equipment for conformity to ISO 12813 -- Part 2: Abstract test suite							○
WG 5	ISO/FDIS 14906	Electronic fee collection -- Application interface definition for dedicated short-range communication						○	
WG 5	ISO 14906:2011	Electronic fee collection -- Application interface definition for dedicated short-range communication							○
WG 5	ISO 14906:2011/ Amd 1:2015	Electronic fee collection -- Application interface definition for dedicated short-range communication -- Amendment 1							○
WG 5	ISO 14906:2011/ Cor 1:2013	Electronic fee collection -- Application interface definition for dedicated short-range communication -- Technical Corrigendum 1							○
WG 5	ISO/TS 14907-1:2015	Electronic fee collection -- Test procedures for user and fixed equipment -- Part 1: Description of test procedures							○
WG 5	ISO/TS 14907-2:2016	Electronic fee collection -- Test procedures for user and fixed equipment -- Part 2: Conformance test for the on-board unit application interface							○
WG 5	ISO/TR 16401-1:2018	Electronic fee collection -- Evaluation of equipment for conformity to ISO/TS 17575-2 -- Part 1: Test suite structure and test purposes							○
WG 5	ISO/TR 16401-2:2018	Electronic fee collection -- Evaluation of equipment for conformity to ISO 17575-2 -- Part 2: Abstract test suite							○
WG 5	ISO 16407-1:2017	Electronic fee collection -- Evaluation of equipment for conformity to ISO 17575-1 -- Part 1: Test suite structure and test purposes							○
WG 5	ISO/DIS 16407-2	Electronic fee collection -- Evaluation of equipment for conformity to ISO 17575-1 -- Part 2: Abstract test suite					○		
WG 5	ISO/TS 16407-2:2012	Electronic fee collection -- Evaluation of equipment for conformity to ISO/TS 17575-1 -- Part 2: Abstract test suite							○
WG 5	ISO 16410-1:2017	Electronic fee collection -- Evaluation of equipment for conformity to ISO 17575-3 -- Part 1: Test suite structure and test purposes							○
WG 5	ISO/DIS 16410-2	Electronic fee collection -- Evaluation of equipment for conformity to ISO 17575-3 -- Part 2: Abstract test suite					○		
WG 5	ISO/TS 16410-2:2012	Electronic fee collection -- Evaluation of equipment for conformity to ISO/TS 17575-3 -- Part 2: Abstract test suite							○
WG 5	ISO/NP TS 16785	Electronic Fee Collection (EFC) -- Interface definition between DSRC-OBE and external in-vehicle devices		○					
WG 5	ISO/TS 16785:2014	Electronic Fee Collection (EFC) -- Interface definition between DSRC-OBE and external in-vehicle devices							○
WG 5	ISO/TS 17444-1:2017	Electronic fee collection -- Charging performance -- Part 1: Metrics							○
WG 5	ISO/TS 17444-2:2017	Electronic fee collection -- Charging performance -- Part 2: Examination framework							○
WG 5	ISO/DIS 17573-1	Electronic fee collection -- Systems architecture for vehicle-related tolling -- Part 1: Reference model						○	

WG	ISO Number	Title	Stage						Published
			PWI	NP	WD	CD	DIS	FDIS	
WG 5	ISO/PWI TR 17573-2	Electronic fee collection -- System architecture for vehicle related tolling -- Part 2: Terminology	○						
WG 5	ISO 17573:2010	Electronic fee collection -- Systems architecture for vehicle-related tolling							○
WG 5	ISO/TS 17574:2017	Electronic fee collection -- Guidelines for security protection profiles							○
WG 5	ISO 17575-1:2016	Electronic fee collection -- Application interface definition for autonomous systems -- Part 1: Charging							○
WG 5	ISO 17575-2:2016	Electronic fee collection -- Application interface definition for autonomous systems -- Part 2: Communication and connection to the lower layers							○
WG 5	ISO 17575-3:2016	Electronic fee collection -- Application interface definition for autonomous systems -- Part 3: Context data							○
WG 5	ISO/TS 19299:2015	Electronic fee collection -- Security framework							○
WG 5	ISO/TR 19639:2015	Electronic fee collection -- Investigation of EFC standards for common payment schemes for multi-modal transport services							○
WG 5	ISO/CD TR 21190	Electronic fee collection -- Investigation of charging policies and technologies for future standardization				○			
WG 5	ISO/AWI TS 21192	Electronic fee collection -- Support for traffic management			○				
WG 5	ISO/AWI TS 21193	Electronic fee collection -- Requirements for EFC application interfaces on common media			○				
WG 5	ISO/TS 21719-1:2018	Electronic fee collection -- Personalization of on-board equipment (OBE) -- Part 1: Framework							○
WG 5	ISO/TS 21719-2:2018	Electronic fee collection -- Personalization of on-board equipment (OBE) -- Part 2: Using dedicated short-range communication							○
WG 5	ISO/PWI TS 21719-3	Electronic fee collection -- Personalization of on-board equipment -- Part 3: Using bluetooth	○						
WG 5	ISO 25110:2017	Electronic fee collection -- Interface definition for on-board account using integrated circuit card (ICC)							○
WG 7	ISO 15638-1:2012	Intelligent transport systems -- Framework for collaborative Telematics Applications for Regulated commercial freight Vehicles (TARV) -- Part 1: Framework and architecture							○
WG 7	ISO 15638-2:2013	Intelligent transport systems -- Framework for collaborative Telematics Applications for Regulated commercial freight Vehicles (TARV) -- Part 2: Common platform parameters using CALM							○
WG 7	ISO 15638-3:2013	Intelligent transport systems -- Framework for collaborative telematics applications for regulated commercial freight vehicles (TARV) -- Part 3: Operating requirements, 'Approval Authority' procedures, and enforcement provisions for the providers of regulated services							○
WG 7	ISO/CD 15638-4	Intelligent transport systems -- Framework for cooperative telematics applications for regulated commercial freight vehicles (TARV) -- Part 4: System security requirements				○			
WG 7	ISO 15638-5:2013	Intelligent transport systems -- Framework for collaborative Telematics Applications for Regulated commercial freight Vehicles (TARV) -- Part 5: Generic vehicle information							○
WG 7	ISO 15638-6:2014	Intelligent transport systems -- Framework for collaborative Telematics Applications for Regulated commercial freight Vehicles (TARV) -- Part 6: Regulated applications							○
WG 7	ISO 15638-7:2013	Intelligent transport systems -- Framework for collaborative Telematics Applications for Regulated commercial freight Vehicles (TARV) -- Part 7: Other applications							○
WG 7	ISO 15638-8:2014	Intelligent transport systems -- Framework for cooperative telematics applications for regulated vehicles (TARV) -- Part 8: Vehicle access management							○
WG 7	ISO/DIS 15638-9	Intelligent transport systems -- Framework for cooperative telematics applications for regulated commercial freight vehicles (TARV) -- Part 9: Remote electronic tachograph monitoring (RTM)					○		
WG 7	ISO/TS 15638-9:2013	Intelligent transport systems -- Framework for collaborative Telematics Applications for Regulated commercial freight Vehicles (TARV) -- Part 9: Remote electronic tachograph monitoring (RTM)							○
WG 7	ISO 15638-10:2017	Intelligent transport systems -- Framework for cooperative telematics applications for regulated commercial freight vehicles (TARV) -- Part 10: Emergency messaging system/eCall							○
WG 7	ISO 15638-11:2014	Intelligent transport systems -- Framework for cooperative telematics applications for regulated vehicles (TARV) -- Part 11: Driver work records							○
WG 7	ISO 15638-12:2014	Intelligent transport systems -- Framework for cooperative telematics applications for regulated vehicles (TARV) -- Part 12: Vehicle mass monitoring							○
WG 7	ISO/TS 15638-13:2015	Intelligent transport systems -- Framework for cooperative telematics applications for regulated commercial freight vehicles (TARV) -- Part 13: "Mass" information for jurisdictional control and enforcement							○
WG 7	ISO 15638-14:2014	Intelligent transport systems -- Framework for cooperative telematics applications for regulated vehicles (TARV) -- Part 14: Vehicle access control							○
WG 7	ISO 15638-15:2014	Intelligent transport systems -- Framework for cooperative telematics applications for regulated vehicles (TARV) -- Part 15: Vehicle location monitoring							○
WG 7	ISO 15638-16:2014	Intelligent transport systems -- Framework for cooperative telematics applications for regulated vehicles (TARV) -- Part 16: Vehicle speed monitoring							○
WG 7	ISO 15638-17:2014	Intelligent transport systems -- Framework for cooperative telematics applications for regulated vehicles (TARV) -- Part 17: Consignment and location monitoring							○
WG 7	ISO 15638-18:2017	Intelligent transport systems -- Framework for cooperative telematics applications for regulated commercial freight vehicles (TARV) -- Part 18: ADR (Dangerous Goods)							○
WG 7	ISO/TS 15638-19:2013	Intelligent transport systems -- Framework for collaborative Telematics Applications for Regulated commercial freight Vehicles (TARV) -- Part 19: Vehicle parking facilities (VPF)							○

WG	ISO Number	Title	Stage						Published
			PWI	NP	WD	CD	DIS	FDIS	
WG 7	ISO/AWI 15638-20	Intelligent transport systems -- Framework for cooperative telematics applications for regulated commercial freight vehicles (TARV) -- Part 20: Weigh in motion (WIM)			○				
WG 7	ISO 15638-21:2018	Intelligent transport systems -- Framework for cooperative telematics applications for regulated commercial freight vehicles (TARV) -- Part 21: Monitoring of regulated vehicles using roadside sensors and data collected from the vehicle for enforcement and other purposes							○
WG 7	ISO/DIS 15638-22	Intelligent transport systems ITS -- Framework for collaborative telematics applications for regulated commercial freight vehicles (TARV) -- Part 22: Freight vehicle stability monitoring					○		
WG 7	ISO/DTS 17187	Intelligent transport systems -- Electronic information exchange to facilitate the movement of freight and its intermodal transfer -- Governance rules to sustain electronic information exchange methods						○	
WG 7	ISO/TS 17187:2013	Intelligent transport systems -- Electronic information exchange to facilitate the movement of freight and its intermodal transfer -- Governance rules to sustain electronic information exchange methods							○
WG 7	ISO 17687:2007	Transport Information and Control Systems (TICS) -- General fleet management and commercial freight operations -- Data dictionary and message sets for electronic identification and monitoring of hazardous materials/dangerous goods transportation							○
WG 7	ISO 18495-1:2016	Intelligent transport systems -- Commercial freight -- Automotive visibility in the distribution supply chain -- Part 1: Architecture and data definitions							○
WG 7	ISO/DTS 24533	Intelligent transport systems -- Electronic information exchange to facilitate the movement of freight and its intermodal transfer -- Road transport information exchange methodology						○	
WG 7	ISO/TS 24533:2012	Intelligent transport systems -- Electronic information exchange to facilitate the movement of freight and its intermodal transfer -- Road transport information exchange methodology							○
WG 7	ISO 26683-1:2013	Intelligent transport systems -- Freight land conveyance content identification and communication -- Part 1: Context, architecture and referenced standards							○
WG 7	ISO 26683-2:2013	Intelligent transport systems -- Freight land conveyance content identification and communication -- Part 2: Application interface profiles							○
WG 7	ISO/CD 26683-3	Intelligent transport systems -- Freight land conveyance content identification and communication -- Part 3: Monitoring cargo condition information during transport				○			
WG 8	ISO/TR 14806:2013	Intelligent transport systems -- Public transport requirements for the use of payment applications for fare media							○
WG 8	ISO 17185-1:2014	Intelligent transport systems -- Public transport user information -- Part 1: Standards framework for public information systems							○
WG 8	ISO/TR 17185-2:2015	Intelligent transport systems -- Public transport user information -- Part 2: Public transport data and interface standards catalogue and cross references							○
WG 8	ISO/TR 17185-3:2015	Intelligent transport systems -- Public transport user information -- Part 3: Use cases for journey planning systems and their interoperation							○
WG 8	ISO/NP 17185-4	Intelligent transport systems -- Public transport user information -- Part 4: Use cases for mobility journey planning systems and their inter-operation		○					
WG 8	ISO/NP 17185-5	Intelligent transport systems -- Part 5: Governance of mandatory public transport standards		○					
WG 8	ISO/NP 17185-6	Intelligent transport systems -- Part 6: Modelling stops and network topology		○					
WG 8	ISO/NP 17185-7	Intelligent transport systems -- Part 7: Conformance test of interoperable fare management system (ISO 24014-1)		○					
WG 8	ISO/NP 17185-8	Intelligent transport systems -- Part 8: Framework message architecture		○					
WG 8	ISO/TR 19083-1:2016	Intelligent transport systems -- Emergency evacuation and disaster response and recovery -- Part 1: Framework and concept of operation							○
WG 8	ISO/NP 19083-3	Intelligent transport systems -- Public transport -- Emergency evacuation and disaster response and recovery -- Part 3: Use cases		○					
WG 8	ISO/TR 20526:2017	Account-based ticketing state of the art report							○
WG 8	ISO/AWI TR 20527	Intelligent transport systems -- Interoperability between IFM systems and NFC mobile devices			○				
WG 8	ISO/PWI 20989	Intelligent transport systems -- Public transport -- Conformance testing for fare management systems	○						
WG 8	ISO/PWI 21344	Intelligent transport systems -- Public transport -- Emergency services E-Call device for emergency on connected vehicles using ITS station	○						
WG 8	ISO/PWI 21345	Charging infrastructure for public transport electric bus for Bus Rapid Transit (BRT) applications	○						
WG 8	ISO/DTR 21724-1	Intelligent transport systems -- Common transport service account systems -- Part 1: Framework and use cases						○	
WG 8	ISO/PWI 21733	Intelligent transport systems -- Public transport -- Synchronization of terminology and role models	○						
WG 8	ISO/NP 21734	Intelligent transport systems -- Public transport -- Performance testing for connectivity and safety functions of automated driving bus		○					
WG 8	ISO 22951:2009	Data dictionary and message sets for preemption and prioritization signal systems for emergency and public transport vehicles (PRESTO)							○
WG 8	ISO/NP 24014-1	Public transport -- Interoperable fare management system -- Part 1: Architecture		○					
WG 8	ISO 24014-1:2015	Public transport -- Interoperable fare management system -- Part 1: Architecture							○
WG 8	ISO/TR 24014-2:2013	Public transport -- Interoperable fare management system -- Part 2: Business practices							○

WG	ISO Number	Title	Stage						Published
			PWI	NP	WD	CD	DIS	FDIS	
WG 8	ISO/TR 24014-3:2013	Public transport -- Interoperable fare management system -- Part 3: Complementary concepts to Part 1 for multi-application media							○
WG 9	ISO 10711:2012	Intelligent Transport Systems -- Interface Protocol and Message Set Definition between Traffic Signal Controllers and Detectors							○
WG 9	ISO 14827-1:2005	Transport information and control systems -- Data interfaces between centres for transport information and control systems -- Part 1: Message definition requirements							○
WG 9	ISO 14827-2:2005	Transport information and control systems -- Data interfaces between centres for transport information and control systems -- Part 2: DATEX-ASN							○
WG 9	ISO/DIS 14827-3	Transport Information and control systems -- Data interfaces between centres for transport information and control systems -- Part 3: Data interfaces between centres for intelligent transport sytems (ITS) using XML					○		
WG 9	ISO 15784-1:2008	Intelligent transport systems (ITS) -- Data exchange involving roadside modules communication -- Part 1: General principles and documentation framework of application profiles							○
WG 9	ISO 15784-2:2015	Intelligent transport systems (ITS) -- Data exchange involving roadside modules communication -- Part 2: Centre to field device communications using SNMP							○
WG 9	ISO 15784-2:2015/CD Amd 1	Intelligent transport systems (ITS) -- Data exchange involving roadside modules communication -- Part 2: Centre to field device communications using SNMP -- Amendment 1							○
WG 9	ISO 15784-3:2008	Intelligent transport systems (ITS) -- Data exchange involving roadside modules communication -- Part 3: Application profile-data exchange (AP-DATEX)							○
WG 9	ISO/TR 16786:2015	Intelligent transport systems -- The use of simulation models for evaluation of traffic management systems -- Input parameters and reporting template for simulation of traffic signal control systems							○
WG 9	ISO/CD 19082	Intelligent transport systems -- Definition of data elements and data frames between roadside units and signal controllers for cooperative signal control				○			
WG 9	ISO/DTS 19468	Intelligent transport systems -- Data interfaces between centres for transport information and control systems -- Platform independent model specifications for data exchange protocols for transport information and control systems						○	
WG 9	ISO/AWI 20684-1	Intelligent transport systems -- Roadside modules SNMP data interface -- Part 1: Overview			○				
WG 9	ISO/AWI 20684-2	Intelligent transport systems -- Roadside modules SNMP data interface -- Part 2: Generalized field devices -- Basic management			○				
WG 9	ISO/NP 20684-3	Intelligent transport systems -- Roadside modules SNMP data interface -- Part 3: Generalized field device -- Scheduler		○					
WG 9	ISO/NP 20684-4	Intelligent transport systems -- Roadside modules SNMP data interface -- Part 4: Generalized field device -- Exceptions		○					
WG 9	ISO/AWI 20684-10	Intelligent transport systems -- Roadside modules SNMP data interface -- Part 10: Variable message signs			○				
WG 9	ISO/TR 21707:2008	Intelligent transport systems -- Integrated transport information, management and control -- Data quality in ITS systems							○
WG 9	ISO/PWI 22741-1	Intelligent transport systems -- Roadside modules AP-DATEX data interface -- Part 1: Overview	○						
WG 9	ISO/PWI 22741-2	Intelligent transport systems -- Roadside modules AP-DATEX data interface -- Part 2: Generalized field devices - basic management	○						
WG 9	ISO/PWI 22741-3	Intelligent transport systems -- Roadside modules AP-DATEX data interface -- Part 3: Generalised field device scheduler	○						
WG 9	ISO/PWI 22741-4	Intelligent transport systems -- Roadside modules AP-DATEX data interface -- Part 4: Generalised field device exceptions	○						
WG 9	ISO/PWI 22741-10	Intelligent transport systems -- Roadside modules AP-DATEX data interface -- Part 10: Variable message signs	○						
WG 10	ISO 14819-1:2013	Intelligent transport systems -- Traffic and travel information messages via traffic message coding -- Part 1: Coding protocol for Radio Data System -- Traffic Message Channel (RDS-TMC) using ALERT-C							○
WG 10	ISO 14819-2:2013	Intelligent transport systems -- Traffic and travel information messages via traffic message coding -- Part 2: Event and information codes for Radio Data System -- Traffic Message Channel (RDS-TMC) using ALERT-C							○
WG 10	ISO 14819-3:2013	Intelligent transport systems -- Traffic and travel information messages via traffic message coding -- Part 3: Location referencing for Radio Data System -- Traffic Message Channel (RDS-TMC) using ALERT-C							○
WG 10	ISO 14819-6:2006	Traffic and Traveller Information (TTI) -- TTI messages via traffic message coding -- Part 6: Encryption and conditional access for the Radio Data System -- Traffic Message Channel ALERT C coding							○
WG 10	ISO/AWI TR 14823-2	Intelligent transport systems -- Graphic data dictionary -- Part 2: Examples			○				
WG 10	ISO 14823:2017	Intelligent transport systems -- Graphic data dictionary							○
WG 10	ISO/TS 18234-1:2013	Intelligent transport systems -- Traffic and travel information via transport protocol experts group, generation 1 (TPEG1) binary data format -- Part 1: Introduction, numbering and versions (TPEG1-INV)							○
WG 10	ISO/TS 18234-2:2013	Intelligent transport systems -- Traffic and travel information via transport protocol experts group, generation 1 (TPEG1) binary data format -- Part 2: Syntax, semantics and framing structure (TPEG1-SSF)							○
WG 10	ISO/TS 18234-3:2013	Intelligent transport systems -- Traffic and travel information via transport protocol experts group, generation 1 (TPEG1) binary data format -- Part 3: Service and network information (TPEG1-SNI)							○
WG 10	ISO/TS 18234-4:2006	Traffic and Travel Information (TTI) -- TTI via Transport Protocol Expert Group (TPEG) data-streams -- Part 4: Road Traffic Message (RTM) application							○
WG 10	ISO/TS 18234-5:2006	Traffic and Travel Information (TTI) -- TTI via Transport Protocol Expert Group (TPEG) data-streams -- Part 5: Public Transport Information (PTI) application							○
WG 10	ISO/TS 18234-6:2006	Traffic and Travel Information (TTI) - TTI via Transport Protocol Expert Group (TPEG) data-streams -- Part 6: Location referencing applications							○

WG	ISO Number	Title	Stage						Published
			PWI	NP	WD	CD	DIS	FDIS	
WG 10	ISO/TS 18234-7:2013	Intelligent transport systems -- Traffic and travel information via transport protocol experts group, generation 1 (TPEG1) binary data format -- Part 7: Parking information (TPEG1-PKI)							○
WG 10	ISO/TS 18234-8:2012	Intelligent transport systems -- Traffic and travel information via transport protocol experts group, generation 1 (TPEG1) binary data format -- Part 8: Congestion and Travel Time application (TPEG1-CTT)							○
WG 10	ISO/TS 18234-9:2013	Intelligent transport systems -- Traffic and travel information via transport protocol experts group, generation 1 (TPEG1) binary data format -- Part 9: Traffic event compact (TPEG1-TEC)							○
WG 10	ISO/TS 18234-10:2013	Intelligent transport systems -- Traffic and travel information via transport protocol experts group, generation 1 (TPEG1) binary data format -- Part 10: Conditional access information (TPEG1-CAI)							○
WG 10	ISO/TS 18234-11:2013	Intelligent transport systems -- Traffic and Travel Information (TTI) via transport protocol experts group, generation 1 (TPEG1) binary data format -- Part 11: Location Referencing Container (TPEG1-LRC)							○
WG 10	ISO/TS 21219-1:2016	Intelligent transport systems -- Traffic and travel information (TTI) via transport protocol experts group, generation 2 (TPEG2) -- Part 1: Introduction, numbering and versions (TPEG2-INV)							○
WG 10	ISO/TS 21219-2:2014	Intelligent transport systems -- Traffic and travel information (TTI) via transport protocol experts group, generation 2 (TPEG2) -- Part 2: UML modelling rules							○
WG 10	ISO/TS 21219-3:2015	Intelligent transport systems - Traffic and travel information (TTI) via transport protocol experts group, generation 2 (TPEG2) -- Part 3: UML to binary conversion rules							○
WG 10	ISO/TS 21219-4:2015	Intelligent transport systems -- Traffic and travel information (TTI) via transport protocol experts group, generation 2 (TPEG2) -- Part 4: UML to XML conversion rules							○
WG 10	ISO/TS 21219-5:2015	Intelligent transport systems - Traffic and travel information (TTI) via transport protocol experts group, generation 2 (TPEG2) -- Part 5: Service framework (TPEG2-SFW)							○
WG 10	ISO/TS 21219-6:2015	Intelligent transport systems - Traffic and travel information(TTI) via transport protocol experts group, generation 2 (TPEG2) -- Part 6: Message management container (TPEG2-MMC)							○
WG 10	ISO/TS 21219-7:2017	Intelligent transport systems -- Traffic and travel information (TTI) via transport protocol experts group, generation 2 (TPEG2) -- Part 7: Location referencing container (TPEG2-LRC)							○
WG 10	ISO/TS 21219-9:2016	Intelligent transport systems -- Traffic and travel information (TTI) via transport protocol experts group, generation 2 (TPEG2) -- Part 9: Service and network information (TPEG2-SNI)							○
WG 10	ISO/TS 21219-10:2016	Intelligent transport systems -- Traffic and travel information (TTI) via transport protocol experts group, generation 2 (TPEG2) -- Part 10: Conditional access information (TPEG2-CAI)							○
WG 10	ISO/TS 21219-14:2016	Intelligent transport systems -- Traffic and travel information (TTI) via transport protocol experts group, generation 2 (TPEG2) -- Part 14: Parking information application (TPEG2-PKI)							○
WG 10	ISO/TS 21219-15:2016	Intelligent transport systems -- Traffic and travel information (TTI) via transport protocol experts group, generation 2 (TPEG2) -- Part 15: Traffic event compact (TPEG2-TEC)							○
WG 10	ISO/TS 21219-16:2016	Intelligent transport systems -- Traffic and travel information via transport protocol exports group, generation 2 (TPEG2) -- Part 16: Fuel price information and availability (TPEG2-FPI)							○
WG 10	ISO/TS 21219-18:2015	Intelligent transport systems - Traffic and travel information (TTI) via transport protocol experts group, generation 2 (TPEG2) -- Part 18: Traffic flow and prediction application (TPEG2-TFP)							○
WG 10	ISO/TS 21219-19:2016	Intelligent transport systems -- Traffic and travel information (TTI) via transport protocol experts group, generation 2 (TPEG2) -- Part 19: Weather information (TPEG2-WEA)							○
WG 10	ISO/NP TS 21219-20	Intelligent transport systems -- Traffic and travel information (TTI) via transport protocol expert group, generation 2 (TPEG2) -- Part 20: Extended TMC location referencing (TPEG2-ETL)		○					
WG 10	ISO/TS 21219-21:2018	Intelligent transport systems -- Traffic and travel information via transport protocol experts group, generation 2 (TPEG2) -- Part 21: Geographic location referencing (TPEG-GLR)							○
WG 10	ISO/TS 21219-22:2017	Intelligent transport systems -- Traffic and travel information (TTI) via transport protocol experts group, generation 2 (TPEG2) -- Part 22: OpenLR location referencing (TPEG2-OLR)							○
WG 10	ISO/TS 21219-23:2016	Intelligent transport systems - Traffic and travel information (TTI) via transport protocol experts group, generation 2 (TPEG2) -- Part 23: Roads and multimodal routes (TPEG2-RMR)							○
WG 10	ISO/TS 21219-24:2017	Intelligent transport systems -- Traffic and travel information (TTI) via transport protocol experts group, generation 2 (TPEG2) -- Part 24: Light encryption (TPEG2-LTE)							○
WG 10	ISO/TS 21219-25:2017	Intelligent transport systems -- Traffic and travel information (TTI) via transport protocol experts group, generation 2 (TPEG2) -- Part 25: Electromobility charging infrastructure (TPEG2-EMI)							○
WG 10	ISO/DTS 21219-26	Intelligent transport systems -- Traffic and travel information via transport protocol experts group, generation 2 (TPEG2) -- Part 26: Vigilance location information (TPEG2-VLI)						○	
WG 10	ISO/TS 24530-1:2006	Traffic and Travel Information (TTI) -- TTI via Transport Protocol Experts Group (TPEG) Extensible Markup Language (XML) -- Part 1: Introduction, common data types and tpegML							○
WG 10	ISO/TS 24530-2:2006	Traffic and Travel Information (TTI) -- TTI via Transport Protocol Experts Group (TPEG) Extensible Markup Language (XML) -- Part 2: tpeg-locML							○
WG 10	ISO/TS 24530-3:2006	Traffic and Travel Information (TTI) -- TTI via Transport Protocol Experts Group (TPEG) Extensible Markup Language (XML) -- Part 3: tpeg-rtmML							○
WG 10	ISO/TS 24530-4:2006	Traffic and Travel Information (TTI) -- TTI via Transport Protocol Experts Group (TPEG) Extensible Markup Language (XML) -- Part 4: tpeg-ptiML							○
WG 14	ISO 11067:2015	Intelligent transport systems -- Curve speed warning systems (CSWS) -- Performance requirements and test procedures							○
WG 14	ISO 11270:2014	Intelligent transport systems -- Lane keeping assistance systems (LKAS) -- Performance requirements and test procedures							○
WG 14	ISO/PRF 15622	Intelligent transport systems -- Adaptive cruise control systems -- Performance requirements and test procedures						○	
WG 14	ISO 15622:2010	Intelligent transport systems -- Adaptive Cruise Control systems -- Performance requirements and test procedures							○
WG 14	ISO 15623:2013	Intelligent transport systems -- Forward vehicle collision warning systems -- Performance requirements and test procedures							○

WG	ISO Number	Title	Stage						Published
			PWI	NP	WD	CD	DIS	FDIS	
WG 14	ISO/TS 15624:2001	Transport information and control systems -- Traffic Impediment Warning Systems (TIWS) -- System requirements							○
WG 14	ISO 16787:2017	Intelligent transport systems -- Assisted parking system (APS) -- Performance requirements and test procedures							○
WG 14	ISO 17361:2017	Intelligent transport systems -- Lane departure warning systems -- Performance requirements and test procedures							○
WG 14	ISO 17386:2010	Transport information and control systems -- Manoeuvring Aids for Low Speed Operation (MALSO) -- Performance requirements and test procedures			○				○
WG 14	ISO 17387:2008	Intelligent transport systems -- Lane change decision aid systems (LCDAS) -- Performance requirements and test procedures							○
WG 14	ISO 18682:2016	Intelligent transport systems -- External hazard detection and notification systems -- Basic requirements		○					○
WG 14	ISO 19237:2017	Intelligent transport systems -- Pedestrian detection and collision mitigation systems (PDCMS) -- Performance requirements and test procedures							○
WG 14	ISO/PRF 19638	Intelligent transport systems -- Road boundary departure prevention systems (RBDPS) -- Performance requirements and test procedures						○	
WG 14	ISO/DIS 20035	Intelligent transport systems -- Cooperative adaptive cruise control systems (CACC) -- Performance requirements and test procedures					○		
WG 14	ISO/TR 20545:2017	Intelligent transport systems -- Vehicle/roadway warning and control systems -- Report on standardisation for vehicle automated driving systems (RoVAS)/Beyond driver assistance systems							○
WG 14	ISO/DIS 20900	Intelligent transport systems -- Partially automated parking systems (PAPS) -- Performance requirements and test procedures					○		
WG 14	ISO/CD 20901	Intelligent transport systems -- Emergency electronic brake light systems (EEBL) -- Performance requirements and test procedures				○			
WG 14	ISO/AWI 21202	Intelligent transport systems -- Partially Automated Lane Change Systems (PALS) -- Functional / operational requirements and test procedures			○				
WG 14	ISO/PRF 21717	Intelligent transport systems -- Partially Automated In-Lane Driving Systems (PADS) -- Performance requirements and test procedures						○	
WG 14	ISO/CD 22078	Intelligent transport systems -- Bicyclist detection and collision mitigation systems (BDCMS) -- Performance requirements and test procedures				○			
WG 14	ISO/PWI 22084	Intelligent transport systems -- Traffic incident notification systems (TINS) -- System requirements	○						
WG 14	ISO 22178:2009	Intelligent transport systems -- Low speed following (LSF) systems -- Performance requirements and test procedures							○
WG 14	ISO 22179:2009	Intelligent transport systems -- Full speed range adaptive cruise control (FSRA) systems -- Performance requirements and test procedures							○
WG 14	ISO/SAE NP PAS 22736	Intelligent transport systems -- Taxonomy and definitions for terms related to driving automation systems for on-road motor vehicles		○					
WG 14	ISO/PWI 22737	Intelligent transport systems -- Low-speed automated driving systems for limited operational design domain (LSAD) -- Performance requirements, system requirements and performance test procedures	○						
WG 14	ISO 22839:2013	Intelligent transport systems -- Forward vehicle collision mitigation systems -- Operation, performance, and verification requirements							○
WG 14	ISO 22840:2010	Intelligent transport systems -- Devices to aid reverse manoeuvres -- Extended-range backing aid systems (ERBA)							○
WG 14	ISO/PWI 23374-1	Intelligent transport systems -- Automated valet parking systems (AVPS) -- Part 1: System overview and framework	○						
WG 14	ISO/PWI 23374-2	Intelligent transport systems -- Automated valet parking systems (AVPS) -- Part 2: Requirements and test procedures for the vehicle, parking facility, and the communication interface	○						
WG 14	ISO/PWI 23374-3	Intelligent transport systems -- Automated valet parking systems (AVPS) -- Part 3: Requirements for the interface to back-office operation	○						
WG 14	ISO/PWI 23374-4	Intelligent transport systems -- Automated valet parking systems (AVPS) -- Part 4: Requirements for user interface	○						
WG 14	ISO/PWI 23375	Intelligent transport systems -- Collision avoidance in-lane lateral control systems (CALC) -- Performance requirements and test procedures	○						
WG 14	ISO/PWI 23376	Intelligent transport systems -- Vehicle-to-vehicle intersection collision warning systems (V2VICWS) -- Performance requirements and test procedures	○						
WG 14	ISO/PWI 23377-1	Intelligent transport systems -- Functional safety for vehicle-to-vehicle cooperative functions (FSV2V) -- Part 1: Platooning	○						
WG 14	ISO 26684:2015	Intelligent transport systems (ITS) -- Cooperative intersection signal information and violation warning systems (CIWS) -- Performance requirements and test procedures							○
WG 16	ISO/TR 11766:2010	Intelligent transport systems -- Communications access for land mobiles (CALM) -- Security considerations for lawful interception							○
WG 16	ISO/TR 11769:2010	Intelligent transport systems -- Communications access for land mobiles (CALM) -- Data retention for law enforcement							○
WG 16	ISO 13183:2012	Intelligent transport systems -- Communications access for land mobiles (CALM) -- Using broadcast communications							○
WG 16	ISO 15628:2013	Intelligent transport systems -- Dedicated short range communication (DSRC) -- DSRC application layer							○
WG 16	ISO 15662:2006	Intelligent transport systems -- Wide area communication -- Protocol management information							○

WG	ISO Number	Title	Stage						Published
			PWI	NP	WD	CD	DIS	FDIS	
WG 16	ISO/TS 16460:2016	Intelligent transport systems -- Communications access for land mobiles (CALM) -- Communication protocol messages for global usage							○
WG 16	ISO/PRF 16461	Intelligent transport systems -- Criteria for privacy and integrity protection in probe vehicle information systems						○	
WG 16	ISO 17515-1:2015	Intelligent transport systems -- Communications access for land mobiles (CALM) -- Evolved universal terrestrial radio access network (E-UTRAN) -- Part 1: General usage							○
WG 16	ISO/AWI 17515-2	Intelligent transport systems -- Communications access for land mobiles (CALM) -- Evolved universal terrestrial radio access network (E-UTRAN) -- Part 2: Device to device communications (D2D)			○				
WG 16	ISO/DIS 17515-3	Intelligent transport systems -- Evolved-universal terrestrial radio access network -- Part 3: LTE-V2X					○		
WG 16	ISO/TR 18317:2017	Intelligent transport systems -- Pre-emption of ITS communication networks for disaster and emergency communication -- Use case scenarios							○
WG 16	ISO/NP 18376	Intelligent Transport Systems -- Criteria for Privacy and Integrity protection in Probe Vehicle Information Systems		○					
WG 16	ISO/NP 18378	Intelligent Transport Systems -- Communications access for land mobiles (CALM) -- Multicast		○					
WG 16	ISO/NP 18380	Intelligent Transport Systems -- Communications access for land mobiles (CALM) -- IPv4-IPv6 interoperability		○					
WG 16	ISO 19079:2016	Intelligent transport systems -- Communications access for land mobiles (CALM) -- 6LoWPAN networking							○
WG 16	ISO 19080:2016	Intelligent transport systems -- Communications access for land mobiles (CALM) -- CoAP facility							○
WG 16	ISO/CD 19414	Intelligent transport systems -- Service architecture of probe vehicle systems				○			
WG 16	ISO/AWI 21210	Intelligent transport systems -- Communications access for land mobiles (CALM) -- IPv6 Networking			○				
WG 16	ISO 21210:2012	Intelligent transport systems -- Communications access for land mobiles (CALM) -- IPv6 Networking							○
WG 16	ISO 21210:2012/ Amd 1:2017	Intelligent transport systems -- Communications access for land mobiles (CALM) -- IPv6 Networking -- Amendment 1							○
WG 16	ISO 21212:2008	Intelligent transport systems -- Communications access for land mobiles (CALM) -- 2G Cellular systems							○
WG 16	ISO 21213:2008	Intelligent transport systems -- Communications access for land mobiles (CALM) -- 3G Cellular systems							○
WG 16	ISO 21214:2015	Intelligent transport systems -- Communications access for land mobiles (CALM) -- Infra-red systems							○
WG 16	ISO 21215:2018	Intelligent transport systems -- Localized communications -- ITS-M5							○
WG 16	ISO 21216:2012	Intelligent transport systems -- Communication access for land mobiles (CALM) -- Millimetre wave air interface							○
WG 16	ISO 21217:2014	Intelligent transport systems -- Communications access for land mobiles (CALM) -- Architecture							○
WG 16	ISO 21218:2018	Intelligent transport systems -- Hybrid communications -- Access technology support							○
WG 16	ISO 22418:2018	Intelligent transport systems -- Fast service announcement protocol (FSAP)							○
WG 16	ISO/NP 22738	Intelligent transport systems -- Localized communications -- Optical camera communication		○					
WG 16	ISO/NP 22837	Vehicle probe data for wide area communications		○					
WG 16	ISO 22837:2009	Vehicle probe data for wide area communications							○
WG 16	ISO/NP 24100	Intelligent transport systems -- Basic principles for personal data protection in probe vehicle information services		○					
WG 16	ISO 24100:2010	Intelligent transport systems -- Basic principles for personal data protection in probe vehicle information services							○
WG 16	ISO 24101-1:2008	Intelligent transport systems -- Communications access for land mobiles (CALM) -- Application management -- Part 1: General requirements							○
WG 16	ISO 24101-2:2010	Intelligent transport systems -- Communications access for land mobiles (CALM) -- Application management -- Part 2: Conformance test							○
WG 16	ISO/PRF 24102-1	Intelligent transport systems -- ITS station management -- Part 1: Local management						○	
WG 16	ISO 24102-1:2013	Intelligent transport systems -- Communications access for land mobiles (CALM) -- ITS station management -- Part 1: Local management							○
WG 16	ISO 24102-1:2013/ Amd 1:2017	Intelligent transport systems -- Communications access for land mobiles (CALM) -- ITS station management -- Part 1: Local management -- Amendment 1						○	
WG 16	ISO/PRF 24102-2	Intelligent transport systems -- ITS station management -- Part 2: Remote management of ITS-SCUs						○	
WG 16	ISO 24102-2:2015	Intelligent transport systems -- Communications access for land mobiles (CALM) -- ITS station management -- Part 2: Remote management of ITS-SCUs							○

WG	ISO Number	Title	Stage						Published
			PWI	NP	WD	CD	DIS	FDIS	
WG 16	ISO/PRF 24102-3	Intelligent transport systems -- ITS station management -- Part 3: Service access points						○	
WG 16	ISO 24102-3:2013	Intelligent transport systems -- Communications access for land mobiles (CALM) -- ITS station management -- Part 3: Service access points							○
WG 16	ISO 24102-3:2013/ Amd 1:2017	Intelligent transport systems -- Communications access for land mobiles (CALM) -- ITS station management -- Part 3: Service access points -- Amendment 1							○
WG 16	ISO/PRF 24102-4	Intelligent transport systems -- ITS station management -- Part 4: Station-internal management communications						○	
WG 16	ISO 24102-4:2013	Intelligent transport systems -- Communications access for land mobiles (CALM) -- ITS station management -- Part 4: Station-internal management communications							○
WG 16	ISO 24102-4:2013/ Amd 1:2017	Intelligent transport systems -- Communications access for land mobiles (CALM) -- ITS station management -- Part 4: Station-internal management communications -- Amendment 1							○
WG 16	ISO 24102-5:2013/ Amd 1:2017	Intelligent transport systems -- Communications access for land mobiles (CALM) -- ITS station management -- Part 5: Fast service advertisement protocol (FSAP) -- Amendment 1							○
WG 16	ISO 24102-6:2018	Intelligent transport systems -- Communications access for land mobiles (CALM) -- ITS station management -- Part 6: Path and flow management							○
WG 16	ISO 24103:2009	Intelligent transport systems -- Communications access for land mobiles (CALM) -- Media adapted interface layer (MAIL)							○
WG 16	ISO 24978:2009	Intelligent transport systems -- ITS Safety and emergency messages using any available wireless media -- Data registry procedures							○
WG 16	ISO 25111:2009	Intelligent transport systems -- Communications access for land mobiles (CALM) -- General requirements for using public networks							○
WG 16	ISO 25112:2010	Intelligent transport systems -- Communications access for land mobiles (CALM) -- Mobile wireless broadband using IEEE 802.16							○
WG 16	ISO 25113:2010	Intelligent transport systems -- Communications access for land mobiles (CALM) -- Mobile wireless broadband using HC-SDMA							○
WG 16	ISO/NP TS 25114	Intelligent transport systems -- Probe data reporting management (PDRM)		○					
WG 16	ISO/TS 25114:2010	Intelligent transport systems -- Probe data reporting management (PDRM)							○
WG 16	ISO 29281-1:2018	Intelligent transport systems -- Localized communications -- Part 1: Fast networking & transport layer protocol (FNTP)							○
WG 16	ISO/DIS 29281-2	Intelligent transport systems -- Localized communications -- Part 2: Legacy system support					○		
WG 16	ISO 29281-2:2013	Intelligent transport systems -- Communication access for land mobiles (CALM) -- Non-IP networking -- Part 2: Legacy system support							○
WG 16	ISO 29281-2:2013/ Amd 1:2014	Intelligent transport systems -- Communication access for land mobiles (CALM) -- Non-IP networking -- Part 2: Legacy system support -- Amendment 1							○
WG 16	ISO 29282:2011	Intelligent transport systems -- Communications access for land mobiles (CALM) -- Satellite networks							○
WG 16	ISO 29283:2011	ITS CALM Mobile Wireless Broadband applications using Communications in accordance with IEEE 802.20							○
WG 16	ISO/TS 29284:2012	Intelligent transport systems -- Event-based probe vehicle data							○
WG 17	ISO/TR 10992-2:2017	Intelligent transport systems -- Use of nomadic and portable devices to support ITS service and multimedia provision in vehicles -- Part 2: Definition and use cases for mobile service convergence							○
WG 17	ISO/TR 10992:2011	Intelligent transport systems -- Use of nomadic and portable devices to support ITS service and multimedia provision in vehicles							○
WG 17	ISO 13111-1:2017	Intelligent transport systems (ITS) -- The use of personal ITS station to support ITS service provision for travellers -- Part 1: General information and use case definitions							○
WG 17	ISO/NP 13111-2	Intelligent transport systems (ITS) -- The use of personal ITS station to support ITS service provision for travelers -- Part 2: General requirements for data exchange between personal ITS station and other ITS stations		○					
WG 17	ISO/TR 13184-1:2013	Intelligent transport systems (ITS) -- Guidance protocol via personal ITS station for advisory safety systems -- Part 1: General information and use case definitions							○
WG 17	ISO 13184-2:2016	Intelligent transport systems (ITS) -- Guidance protocol via personal ITS station for advisory safety systems -- Part 2: Road guidance protocol (RGP) requirements and specification							○
WG 17	ISO 13184-3:2017	Intelligent transport systems (ITS) -- Guidance protocol via personal ITS station for advisory safety systems -- Part 3: Road guidance protocol (RGP) conformance test specification							○
WG 17	ISO/TR 13185-1:2012	Intelligent transport systems -- Vehicle interface for provisioning and support of ITS services -- Part 1: General information and use case definition							○
WG 17	ISO 13185-2:2015	Intelligent transport systems -- Vehicle interface for provisioning and support of ITS services -- Part 2: Unified gateway protocol (UGP) requirements and specification for vehicle ITS station gateway (V-ITS-SG) interface							○
WG 17	ISO 13185-3:2018	Intelligent transport systems -- Vehicle interface for provisioning and support of ITS Services -- Part 3: Unified vehicle interface protocol (UVIP) server and client API specification							○
WG 17	ISO/CD 13185-4	Intelligent transport systems -- Vehicle interface for provisioning and support of ITS Services -- Part 4: Unified vehicle interface protocol (UVIP) conformance test specification				○			
WG 17	ISO 17438-1:2016	Intelligent transport systems -- Indoor navigation for personal and vehicle ITS station -- Part 1: General information and use case definition							○

WG	ISO Number	Title	Stage						Published
			PWI	NP	WD	CD	DIS	FDIS	
WG 17	ISO/NP 17438-2	Intelligent transport systems -- Indoor navigation for personal and vehicle ITS station -- Part 2: TBD		○					
WG 17	ISO/NP 17438-3	Intelligent transport systems -- Indoor navigation for personal and vehicle ITS station -- Part 3: TBD		○					
WG 17	ISO/DIS 17438-4	Intelligent transport systems -- Indoor navigation for personal and vehicle ITS station -- Part 4: Requirements and specification for interface between Personal/Vehicle and Central ITS stations					○		
WG 17	ISO/NP 18561-1	Intelligent transport systems -- Urban mobility applications via nomadic device for green transport management -- Part 1: Requirements for interface between ITS stations		○					
WG 17	ISO/TR 20529-1:2017	Intelligent transport systems -- Framework for green ITS (G-ITS) standards -- Part 1: General information and use case definitions							○
WG 17	ISO/CD 20529-2	Intelligent transport systems -- Framework for green ITS (G-ITS) standards -- Part 2: Integrated mobile service application and specification				○			
WG 17	ISO/CD 20530	Intelligent transport systems -- Information for emergency service support via personal ITS station -- General requirements and technical definition				○			
WG 17	ISO/DTR 21735	Intelligent transport systems -- Framework architecture for plug & play (PnP) functionality in vehicles utilizing nomadic devices						○	
WG 17	ISO/PWI 22085-2	Intelligent transport systems -- Nomadic device service platform for micro mobility -- Part 2: Functional requirements and data set definitions	○						
WG 17	ISO/PWI 22085-3	Intelligent transport systems -- Nomadic device service platform for micro mobility -- Part 3: Data structure and data exchange procedures	○						
WG 17	ISO/DTR 22086-1	Intelligent transport systems -- Network based precise positioning infrastructure for land transportation -- Part 1: General information and use cases description						○	
WG 17	ISO/PWI 22087	Intelligent transport systems -- Exchanging driving experience information collected by nomadic devices	○						
WG 18	ISO 17419:2018	Intelligent transport systems -- Cooperative systems -- Globally unique identification							○
WG 18	ISO 17423:2018	Intelligent transport systems -- Cooperative systems -- Application requirements and objectives							○
WG 18	ISO/TR 17424:2015	Intelligent transport systems -- Cooperative systems -- State of the art of Local Dynamic Maps concepts							○
WG 18	ISO/TS 17425:2016	Intelligent transport systems -- Cooperative systems -- Data exchange specification for in-vehicle presentation of external road and traffic related data							○
WG 18	ISO/TS 17426:2016	Intelligent transport systems -- Cooperative systems -- Contextual speeds							○
WG 18	ISO 17427-1:2018	Intelligent transport systems -- Cooperative ITS -- Part 1: Roles and responsibilities in the context of co-operative ITS architecture(s)							○
WG 18	ISO/TR 17427-2:2015	Intelligent transport systems -- Cooperative ITS -- Part 2: Framework overview							○
WG 18	ISO/TR 17427-3:2015	Intelligent transport systems -- Cooperative ITS -- Part 3: Concept of operations (ConOps) for 'core' systems							○
WG 18	ISO/TR 17427-4:2015	Intelligent transport systems -- Cooperative ITS -- Part 4: Minimum system requirements and behaviour for core systems							○
WG 18	ISO/CD TR 17427-5	Intelligent transport systems -- Cooperative ITS -- Part 5: Common approaches to security				○			
WG 18	ISO/TR 17427-6:2015	Intelligent transport systems -- Cooperative ITS -- Part 6: 'Core system' risk assessment methodology							○
WG 18	ISO/TR 17427-7:2015	Intelligent transport systems -- Cooperative ITS -- Part 7: Privacy aspects							○
WG 18	ISO/TR 17427-8:2015	Intelligent transport systems -- Cooperative ITS -- Part 8: Liability aspects							○
WG 18	ISO/TR 17427-9:2015	Intelligent transport systems -- Cooperative ITS -- Part 9: Compliance and enforcement aspects							○
WG 18	ISO/TR 17427-10:2015	Intelligent transport systems -- Cooperative ITS -- Part 10: Driver distraction and information display							○
WG 18	ISO/CD TR 17427-12	Intelligent transport systems -- Cooperative ITS -- Part 12: Release processes				○			
WG 18	ISO/CD TR 17427-13	Intelligent transport systems -- Cooperative ITS -- Part 13: Use case test cases				○			
WG 18	ISO/CD TR 17427-14	Intelligent transport systems -- Cooperative ITS -- Part 14: Maintenance requirements and processes				○			
WG 18	ISO/NP 17429	Intelligent transport systems -- Cooperative ITS -- ITS station facilities for the transfer of information between ITS stations		○					
WG 18	ISO/TS 17429:2017	Intelligent transport systems -- Cooperative ITS -- ITS station facilities for the transfer of information between ITS stations							○
WG 18	ISO 18750:2018	Intelligent transport systems -- Co-operative ITS -- Local dynamic map							○
WG 18	ISO/DTS 19091	Intelligent transport systems -- Cooperative ITS -- Using V2I and I2V communications for applications related to signalized intersections						○	
WG 18	ISO/TS 19091:2017	Intelligent transport systems -- Cooperative ITS -- Using V2I and I2V communications for applications related to signalized intersections							○

WG	ISO Number	Title	Stage						Published
			PWI	NP	WD	CD	DIS	FDIS	
WG 18	ISO/TS 19321:2015	Intelligent transport systems -- Cooperative ITS -- Dictionary of in-vehicle information (IVI) data structures							○
WG 18	ISO/TS 20026:2017	Intelligent transport systems -- Cooperative ITS -- Test architecture							○
WG 18	ISO/PWI TS 20594	Intelligent transport systems -- Cooperative ITS -- Test requirements and protocol implementation conformance statements (PICS) pro forma for TS 17429	○						
WG 18	ISO/PWI TS 20597	Intelligent transport systems -- Cooperative ITS -- Test requirements and protocol implementation conformance statements (PICS) pro forma for TS 19321	○						
WG 18	ISO/PWI TS 20598	Intelligent transport systems -- Cooperative ITS -- Test requirements and protocol implementation conformance statements (PICS) pro forma for TS 19091	○						
WG 18	ISO/AWI TS 21176	Intelligent transport systems -- Cooperative ITS -- Position, velocity and time functionality in the ITS station			○				
WG 18	ISO/AWI TS 21177	Intelligent transport systems -- ITS station security services for secure session establishment and authentication between trusted devices			○				
WG 18	ISO/AWI TS 21184	Intelligent transport systems -- Management of messages containing information of sensor and control networks specified in data dictionaries			○				
WG 18	ISO/AWI TS 21185	Intelligent transport systems -- Communication profiles for secure connections between trusted devices			○				
WG 18	ISO/AWI TR 21186	Intelligent transport systems -- Cooperative ITS -- Guidelines on the use of C-ITS standards for hybrid communications			○				
WG 18	ISO/NP TS 21189	Intelligent transport systems -- Cooperative ITS -- Test requirements and protocol implementation conformance statement (PICS) pro forma for CEN ISO TS 17426		○					

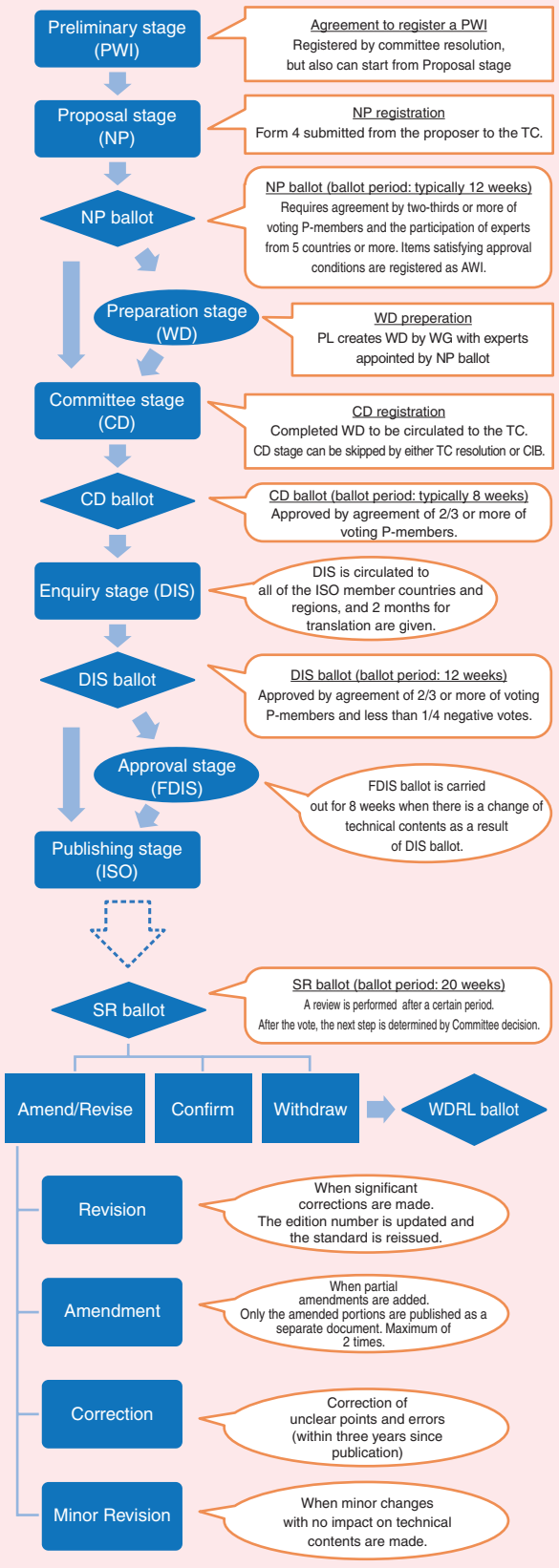
Venues of TC 204 Plenary Meetings

TC 204 holds two plenary meetings per year, with the host country rotated between the North America, Europe, and Asia Pacific regions.

Number of times	Year/ month	Venue	Country	Number of times	Year/ month	Venue	Country
1st	1993.04	Washington	U.S.	26th	2005.11	Portland	U.S.
Special Meeting	1993.06	Stuttgart	Germany	27th	2006.04	Busan	Korea
2nd	1993.11	Tokyo	Japan	28th	2006.11	Cape Town	South Africa
3rd	1994.04	Atlanta	U.S.	29th	2007.04	Lexington	U.S.
4th	1994.12	Paris	France	30th	2007.11	Qingdao	China
5th	1995.05	Sidney	Australia	31st	2008.04	Munich	Germany
6th	1995.11	Yokohama	Japan	32nd	2008.11	Ottawa	Canada
7th	1996.05	London	U.K.	33rd	2009.05	Chiang Mai	Thailand
8th	1996.10	Orland	U.S.	34th	2009.09	Barcelona	Spain
9th	1997.03	Noosa	Australia	35th	2010.04	New Orleans	U.S.
10th	1997.10	Berlin	Germany	36th	2010.11	Jeju	Korea
11th	1998.04	Toronto	Canada	37th	2011.04	Prague	Czech Rep.
12th	1998.10	Seoul	Korea	38th	2011.10	Tampa	U.S.
13th	1999.06	Amsterdam	Netherlands	39th	2012.04	Melbourne	Australia
14th	1999.11	Montreal	Canada	40th	2012.10	Moscow	Russia
15th	2000.06	Kyoto	Japan	41st	2013.04	Seattle	U.S.
16th	2000.11	Napoli	Italy	42nd	2013.10	Kobe	Japan
17th	2001.04	Honolulu	U.S.	43rd	2014.04	Oslo	Norway
18th	2001.10	Queens Land	Australia	44th	2014.10	Vancouver	Canada
19th	2002.05	London	U.K.	45th	2015.04	Hangzhou	China
20th	2002.10	Chicago	U.S.	46th	2015.10	Potsdam	Germany
21st	2003.06	Nagano	Japan	47th	2016.04	Concord	U.S.
22nd	2003.10	Wein	Austria	48th	2016.10	Auckland	New Zealand
23rd	2004.05	Vancouver	Canada	49th	2017.04	Paris	France
24th	2004.10	Beijing	China	50th	2017.10	San Antonio	U.S.
25th	2005.04	Paris	France	51th	2018.04	Seoul	Korea

Development of International Standards

TC 204 has published numerous international standards on subjects pertaining to ITS. Standards are developed by discussing and voting upon those subjects in accordance with the rules on developing standards specified in the ISO Directives. The following shows an overview of the workflow.



Target deadlines for standard publication

Development stage	Document	Target deadline (months)			
		18 months	Fast (24)	Standard (36)	Prolonged (48)
Proposal stage	NP	Proposal → Approval → Registration	Proposal → Approval → Registration	Proposal → Approval → Registration	Proposal → Approval → Registration
Preparation stage	WD	-	-	12	12
Committee stage	CD	-	6	6	12
Enquiry stage	DIS	13	12	12	19
Approval stage	FDIS/IS	5	6	6	5

Conditions for automatically deleting work items
- A PWI does not move to the NP stage within 3 years.
- No decision on follow-up actions is made within six months following the DIS or FDIS target deadline.
- If DIS approval is not reached within five years after NP registration.

Definitions and abbreviations

TC : Technical Committee
SC : Sub Committee
WG : Working Group
PL : Project Leader
PWI : Preliminary Work Item
NP : New Work Item Proposal
AWI : Approved Work Item
WD : Working Draft
CD : Committee Draft
DIS : Draft International Standard
FDIS : Final Draft International Standard
ISO : International Standard
SR : Systematic Review
WDRL: Withdrawal
TS : Technical Specification
Document published when agreement on an international standard cannot be reached immediately for a standardization item because it is still at the development stage, or for any other reason, even if such agreement is likely to be reached in the future.
PAS : Publicly Available Specification
Intermediate specification published ahead of the completion of an international standard. Agreement is reached at the NP stage.
TR : Technical Report
Document containing data different from an international standard. It must not include matter implying that it is normative contents.

Timing of systematic reviews

Deliverable	Max. elapsed time before systematic review	Max. number of times deliverables may be confirmed	Max. life
IS	5 years	No limit	No limit
TS	3 years	Once recommended	Preferably 6 times
PAS	3 years (No default action by ISO CS)	Once	6 years If not converted after this period, the deliverable is proposed for withdrawal
TR	Not specified	Not specified	No limit

Websites related to ITS

National and regional ITS representative organizations

ITS America	www.itsa.org	ITS Germany	www.itsgermany.org
ITS Australia	www.its-australia.com.au	ITS Netherlands(Connekt)	www.connekt.nl
ITS China	www.itschina.org	ITS Norway	www.its-norway.no
ITS Canada	www.itscanada.ca	ITS Russia	its-russia.ru
ITS Chile	www.itschile.cl	ITS Spain	www.itsespana.com
ITS Czech Republic	www.itsnetwork.org	ITS Singapore	www.itssingapore.org.sg
ITS Finland	www.its-finland.fi	ITS South Africa	www.itssa.org
ITS France	www.atec-itsfrance.net	ITS Sweden	www.its-sweden.se
ITS Hong Kong	www.itshk.org	ITS Taiwan	www.its-taiwan.org.tw
ITS India	www.itsindia.org	ITS Thailand	www.its.in.th
ITS Japan	www.its-jp.org	ITS United Kingdom	www.its-uk.org.uk
ITS Korea	www.itskorea.or.kr	REAM (Malaysia)	www.ream.org.my
ITS Malaysia	www.itsmalaysia.com.my		

Organizations involved in standardization of ITS (Intternational)

AASHTO (America)	www.aashto.org	ISO	www.iso.org
ANSI (America)	www.ansi.org	ISO/TC204	www.iso.org/committee/54706.html
ASECAP	www.asecap.com		
ASTM (America)	www.astm.org	ITE	www.ite.org
CEN (Europe)	www.itsstandards.eu	ITU	www.itu.int
CEN/TC 278 (Europe)	www.itsstandards.eu	ISO/IEC JTC1	www.jtc1.org
ERTICO (Europe)	www.ertico.com	NEMA (America)	www.nema.org
ETSI (Europe)	www.etsi.org	OMG	www.omg.org
ETSI ITS(Europe)	www.etsi.org/index.php/technolo gies-clusters/technologies/intelligent-transport	PIARC	www.piarc.org
		SAE International	www.sae.org
IEC	www.iec.ch	INEA	inea.ec.europa.eu
IEEE	www.ieee.org	US-DOT (America)	www.dot.gov

Ministries and organizations involved in standardization of ITS (Japan)

Cabinet Office	www.cao.go.jp	Vehicle Information and Communication System Center	www.vics.or.jp
Ministry of Internal Affairs and Communications	www.soumu.go.jp	ITS Technology Enhancement Organization	www.its-tea.or.jp
Ministry of Economy, Trade and Industry	www.meti.go.jp	Highway Industries Development Organization	www.hido.or.jp
Ministry of Land, Infrastructure, Transport and Tourism	www.mlit.go.jp	Japan Standards Association	www.jsa.or.jp
National Police Agency	www.npa.go.jp	Japan Traffic Management Technology Association	www.tmt.or.jp
Japanese Industry Standard Committee	www.jisc.go.jp	Japan Automobile Research Institute	www.jari.or.jp
Japan Institute of Country-ology and Engineering	www.jice.or.jp	JIPDEC	www.jipdec.or.jp
Society of Automotive Engineers of Japan	www.jsae.or.jp	Japan Digital Road Map Association	www.drm.jp
Japan Electronics and Information Technology Industries Association	www.jeita.or.jp	ITS Info-Communications Forum	www.itsforum.gr.jp
Association of Radio Industries and Businesses	www.arib.or.jp	UTMS Society of Japan	www.utms.or.jp
Telecommunication Technology Committee	www.ttc.or.jp	Japan Automobile Manufacturers Association	www.jama.or.jp

Published by: **Society of Automotive Engineers of Japan, Inc.**

10-2 GOBANCHO, CHIYODA-KU, TOKYO, 102-0076 JAPAN
TEL. +81-3-3262-8294
FAX. +81-3-3261-2204
Email tc204@jsae.or.jp
URL. www.jsae.or.jp

Publication : September 2018

This publication is prepared as a part of the ITS Standardization Project commissioned to JSAE by the Ministry of Economy, Trade and Industry, FY 2018.