ITS Standardization Activities in Japan

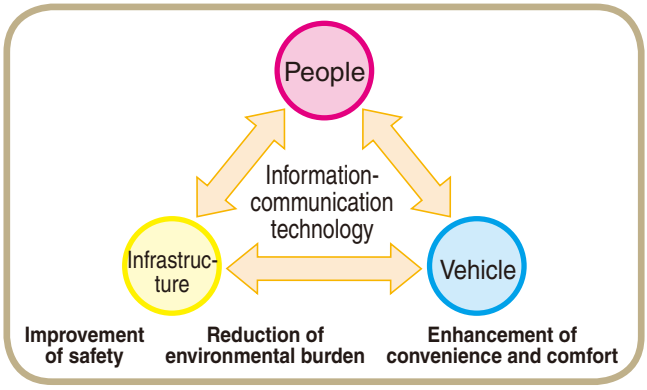
2017

Standardization of ITS

What is ITS?

ITS (Intelligent Transport Systems) has been developed to solve various issues, such as road traffic safety, transport efficiency, and environmental measures, by using communication technologies to exchange information between people, infrastructure and vehicles. ITS enables optimization of road traffic,elimination of road accidents and traffic jams, and co-existence with energy conservation and the environment by utilizing state-of-the-art communication and control technologies.

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.



What are standardization and standards?

• 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

• Significance 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. To realize this, intensive efforts are needed to position Japan's human-/environment-friendly ITS technology as the international standard.

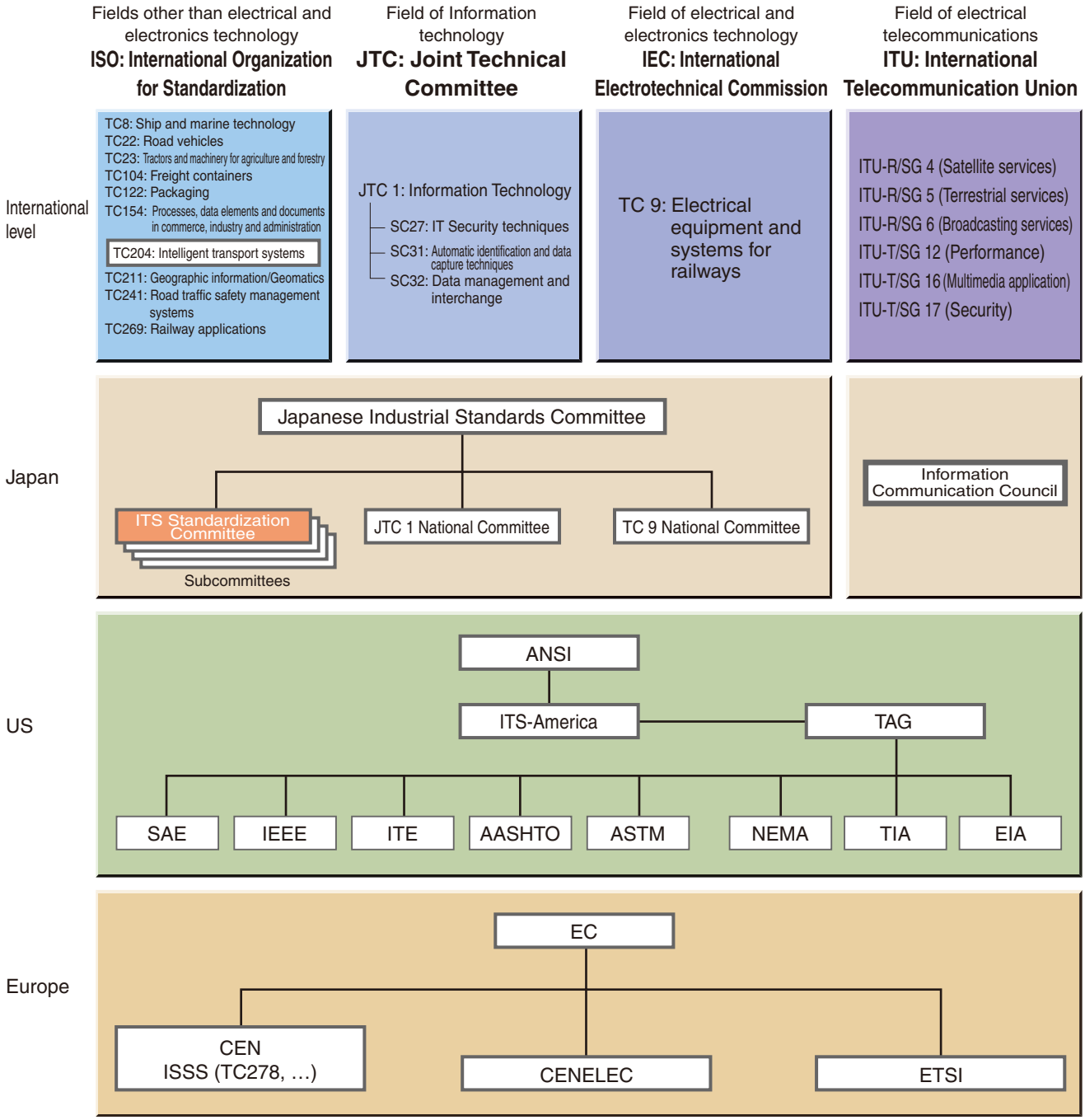
Landscape of standardization of ITS (related standardization bodies)

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 Figure below, 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..

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, TC204 has published numerous international standards. (As of June 2017)

Deliverable	Published	Under development
International Standards	126	80
Technical Specifications	66	18
Publically Available Specifications	0	1
Technical Reports	40	18
Other (Amendments, etc.)	13	29*
Total	245	146

*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 (TC 22).

Note : 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 : ITS America

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)
- CEN/TC 278 (Intelligent transport systems)
- ETSI (European Telecommunication Standards Institute)
- IEEE (Institute of Electrical and Electronic Engineers)
- ITU (International Telecommunication Union)
- OGC (International Geographical Union)
- SAE (SAE International)
- TISA (Travelers Information Services Association)
- ISOC (Internet Association)
- NFC Forum (Near Field Communication Forum)

Working Group	Convenor
WG1 : Architecture	USA
WG3 : ITS database technology	Japan
WG4 : Automatic vehicle and equipment identification	Norway
WG5 : Fee and toll collection	Sweden
WG7 : General fleet management and commercial/freight	Canada
WG8 : Public transport/emergency	USA
WG9 : Integrated transport information, management and control	Australia
WG10 : Traveller information systems	UK
WG14 : Vehicle/roadway warning and control systems	Japan
WG16 : Communications	USA
WG17 : Nomadic Devices in ITS Systems	Korea
WG18 : 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, Czech Republic, France, Ethiopia, Germany, Hungary, India, Islamic Republic of Iran, Israel, Italy, Japan, Republic of Korea, Malaysia, Netherlands, New Zealand, Norway, Russian Federation, 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, Cyprus, Denmark, Egypt, Finland, Greece, Hong Kong China, Indonesia, Ireland, Israel, Mexico, Mongolia, Montenegro, Pakistan, Philippines, Poland, Romania, Serbia, Singapore, Slovakia, Sri Lanka, Thailand, Turkey

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 2017, 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)	Japan Automobile Research Institute
ITS Database Technology (WG 3)	Japan Digital Road Map Association
Automatic Vehicle and Equipment Identification (WG 4)	Universal Traffic Management Society of Japan
Fee and Toll Collection (WG 5)	Highway Industry Development Organization
General Fleet Management and Commercial/ Freight (WG 7)	Highway Industry Development Organization
Public Transport/Emergency (WG 8)	Japan Institute of Constructions Engineering
Integrated Transport Information, Management and Control (WG 9)	Universal Traffic Management Society of Japan
Traveler Information Systems (WG 10)	Universal Traffic Management Society of Japan
Vehicle/ Roadway Warning and Control Systems (WG 14)	Society of Automotive Engineers of Japan
Communications (WG 16)	Japan Electronics and Information Technology Industries Association
Nomadic Devices in ITS Systems (WG 17)	Japan Electronics and Information Technology Industries Association
Cooperative ITS (WG 18)	Highway Industry Development Organization

New Developments in the International Standardization of ITS Communications

Standardization of Communications within TC 204

TC 204 WG 16: (Communications) is promoting the standardization of communications systems used in ITS. In recent years, with ever-growing interest in the practical use of Connected/Automated Driving, ITS communications are becoming increasingly important, and diversification is also expected. This report describes new developments and changes in the landscape of WG 16 programs, and selects related topics to illustrate the roles played by the Group.

Foundation and Changes in WG 16

(1) Foundation of WG 16

TC 204 was set up in 1992 to discuss the standardization of ITS, within which WG 16 was launched, with the US playing the role of convener, as a working group (WG) dealing with themes relevant to wide-area communications.

A systematic and periodical review of the DSRC standard (ISO15628:2007) issued by WG 15 (DSRC: Dedicated Short-Range Communications) was later conducted in 2010. At that time, the revision work was assigned to WG 16 instead of WG 15, as the latter's activities had temporarily halted. The revised edition was then published by WG 16.

In 2014, following abandonment of WG 15, its items destined to be standardized were moved to WG 16 and merged with the original WG 16 items. As a result, WG 16 is now the one and only WG relevant to ITS communications within TC 204. Its work continues. Seven sub working groups (SWGs) are in charge of the standardization areas. As seen by the fact that Japan leads three SWGs of the seven, WG 16 demonstrates the significance of Japan's contribution.

(2) Standardization relevant to ITS communications

Initially the versatile header items were taken into consideration allowing for determination of selection and handling method, etc., of communication media for sending/receiving of communication messages used in ITS. Then, the standardization was compiled with requirements and check items positioned as key elements instead of actual message headers, and finally published as ISO15662:2006. Following the extension of this standardization work, the CALM (Communication Air-interface Long and Medium range) concept was proposed in 2000 as standardization to be utilized in actual communication. This proposal included a mechanism for switching between various communication media and flexibly providing communications optimized for ITS services. In 2001, items destined to be standardized based on this concept were proposed. Specifically included in these items (ISO21210 to ISO21218, etc.) are communication media (cellular communication, infrared communication, microwave communication, millimeter-wave communication), common communication interface positioned on top of the communication media, and network interfaces for the different use of these communication media. Later, CALM came to be referred to as "Communications Access to Land Mobiles." It is now called "ITS Station". In reality, some dozens of items destined to be standardized making up this concept have been proposed, and many standards have been published or are still under discussion.

(3) Standardization relevant to application, such as probe, using communication

In addition to ITS communication itself, standardization of probe data has become one of major topics of WG 16 to utilize various data sent from vehicles. Even though the probe data transmitted from vehicles is an important application that uses wide-area communications, there was no WG working on the field like this. So WG 16 has taken on the work and has been discussing its standardization since 2001.

Based on items relevant to the probe data that have been issued as ISO22837:2009, standards, including those for collecting probe data, handling personal data within the probe data system, and establishing evaluation criteria, are being discussed and published.

Technical reports (TRs) for legal interception and standards related to emergency notification (e-call) messages have also been discussed under WG 16.

Current WG 16 Activities

As described above, WG 16 has been focusing on standardization of communication systems for dedicated short-range communications and wide-area communications used for ITS. In addition, relevant items, such as application, have been included in the scope of discussion and reviewed by the group. As the group has been actively working on development of standardization since its launch, a number of items were already issued. Consequently the amount of maintenance work for issued standards is increasing.

On the other hand, WG 18 (Cooperative ITS), launched in 2009 by the effort of European countries, began to discuss standardization of specific services as cooperative ITS utilizing ITS communications. The two WGs, 16 and 18, continue to work in close collaboration.

Also aggressive activities related to Connected/Automated Driving are seen mainly in Europe and the U.S. It has become imperative to revise existing standards to reflect projects of each country and to create new standards in accordance with next generation of ITS services.

While 5G (Fifth Generation Mobile Communications) is drawing attention as a wireless communications protocol for use in the next generation of ITS services, WG 16 has already started discussing items for standardization related to LTE (Long Term Evolution) Release 14, so discussions on the utilization of 5G are now beginning to make progress.

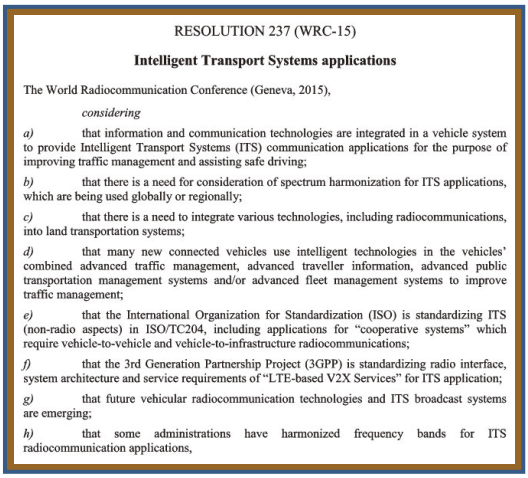
Landscape of standardization of ITS communications

In the area of the frequency of the 5.8/5.9 GHz band used in DSRC that is in practical use across a wide range of countries, significant changes have been seen in the landscape of ITS communications in recent years, including a move toward coutilization with rapidly spreading wireless LAN (IEEE802.11ac), application to ITS in cellular communication, and discussions on communication security supporting more advanced services. In response to these environmental changes, the area of standardization is rapidly expanding to handle ITS as an application area in the IoT world, with various standardization bodies beginning to discuss relevant standards. It is becoming increasingly essential to observe new developments and to respond appropriately to changes based on collaboration between the parties concerned.

(1) ITU-R

The WRC (World Radiocommunication Conference), held by ITU-R, is currently discussing frequency allocation. At WRC-15, held in 2015, it was permitted to secure frequencies (by extension of the 79 GHz band) to realize high-resolution in-vehicle radar. At WRC-19 in 2019, ITS applications will be added to agenda 1.12, and there are plans to discuss a globally or locally common frequency to be used in ITS applications. Consequently, specific discussions will be held to secure the frequencies required for emerging advanced services for automated driving, including cooperative systems (systems used in cooperative ITS) to be discussed under TC 204, in addition to the above-mentioned issue of co-utilization with wireless LAN. In this agenda, "LTE-based

RESOLUTION 237 (WRC-15) excerpt



RESOLUTION 237 (WRC-15)

Intelligent Transport Systems applications

The World Radiocommunication Conference (Geneva, 2015),

considering

a) that information and communication technologies are integrated in a vehicle system to provide Intelligent Transport Systems (ITS) communication applications for the purpose of improving traffic management and assisting safe driving;

b) that there is a need for consideration of spectrum harmonization for ITS applications, which are being used globally or regionally;

c) that there is a need to integrate various technologies, including radiocommunications, into land transportation systems;

d) that many new connected vehicles use intelligent technologies in the vehicles' combined advanced traffic management, advanced traveller information, advanced public transportation management systems and/or advanced fleet management systems to improve traffic management;

e) that the International Organization for Standardization (ISO) is standardizing ITS (non-radio aspects) in ISO/TC204, including applications for "cooperative systems" which require vehicle-to-vehicle and vehicle-to-infrastructure radiocommunications;

f) that the 3rd Generation Partnership Project (3GPP) is standardizing radio interface, system architecture and service requirements of "LTE-based V2X Services" for ITS application;

g) that future vehicular radiocommunication technologies and ITS broadcast systems are emerging;

h) that some administrations have harmonized frequency bands for ITS radiocommunication applications,

Source: https://www.itu.int/dms_pub/itu-r/oth/0c/0a/R0C0A00000C0013PDFE.pdf

V2X Services" for ITS application will also be discussed, and are currently under standardization within 3GPP (3rd Generation Partnership Project).

(2) ITU-T

Even though ITU-T has been working mainly on standardization in the telecoms area in the past, whereas ITU-R is working on standardization of wireless communications, ITU-T is currently proceeding with discussions on items including communication frameworks and applications without restriction of communication media.

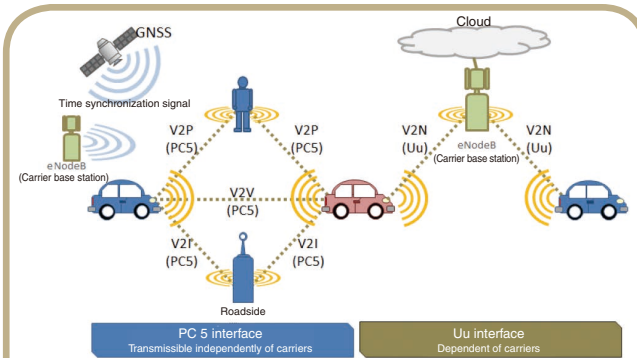
In recent years ITU-T is actively working on alliance for standardization of ITS communication, including management of CITS (Collaboration on ITS Communication Standards) that arranges activities among multiple standardization bodies involved in ITS communications, in addition to discussion on traditional SG (Study Group) and other subjects.

In recent years, ITU-T has been actively working to form an alliance for standardization of ITS communications, including management of CITS (Collaboration on ITS Communication Standards), which arranges projects among multiple standardization bodies involved in ITS communications, in addition to discussion on traditional SGs (Study Groups) and other subjects.

Currently, ITU-T/SG 17 is proposing a liaison with TC 204 WG 18 to develop a standard for security in cooperative ITS.

(3) 3GPP

3GPP is working on standardization of V2X communication utilizing LTE. In Release12 and Release13 already issued, V2V communication has been defined for Public Safety for which D2D (Device to Device) communication is established without transmission through base stations. In Release14 issued in April 2017, the target was extended from V2V to V2X to define requirement specifications that are anticipated to be used in a broader range of operations, including support for vehicle speeds of 250 km/h. For X within V2X, V: Vehicles (cars), I: Infrastructure (roadside equipment), P: Pedestrians (people), and N: Network (cloud) are planned to be allocated.



PC5 and Uu interface
(Based on 3GPP materials)

There are two communication methods: direct communication called PC 5 based on D2D without transmission through base stations, and a type called Uu that employs transmission through base stations. PC 5 allows communication between different carriers. Uu carries out user management for each carrier at base stations. However, with this method, difficulty with immediacy or connectivity can persist in communication between devices from different carriers, and communication over long distances and over wide areas needs to be enhanced.

There are high hopes for cellular communication (LTE to 5G) as the driver for realizing the next generation of ITS services. This expectation is expressed in part in the White Paper submitted from 5GAA (5G Automotive Association, consisting of carriers in different countries, and chiefly European automotive and electric component manufacturers) to 3GPP to be fed through to specifications development.

(4) CEN and ETSI

The European Commission (EC) developed its ITS action plan in 2008, aiming at collaboration across countries in development and deployment of ITS. In addition, based on the notion that for realizing cooperative ITS C(CoIpTeSr:a tive, connected and automated mobility) standardization is essential to promote interoperability, compatibility and other factors, EC directive M/453 was presented in 2009 to call for development of the required standards for CEN and ETSI. As a result, a relevant standard was created as Release 1 in 2015. Discussions are continuing toward the creation of Release 2.

Source: https://english.eu2016.nl/documents/publications/2016/04/14/declaration-of-amsterdam

For communications, ITS-G5 (exclusive communication for ITS complying with ISO21215, based on IEEE 802.11p), which is 5.9 GHz band DSRC, is being experimentally introduced in various projects in Europe. ETSI and other bodies are also working on the necessary standardization. In April 2016, transport ministers from EU member countries signed the Amsterdam Declaration to promote the development and practical use of automated driving technology. In the declaration, the importance of standardization of V2I and V2V communications is emphasized, and hybrid communication including ITS-G5 was requested. According to the declaration it is desirable, if possible, for the framework for connected and autonomous cars to be established by 2019.

(5) SAE, etc.

In the US, ITS America applied to the FCC (Federal Communications Commission) to use the 5.9 GHz band as an exclusive bandwidth for ITS (for DSRC) in 1997. Use of the 5.9 GHz band for ITS was formally granted in 1999. Consequently, the development of a wireless communication protocol for this was initiated at ASTM (American Society for Testing and Materials), and was issued in 2003. This item was handed over to IEEE and issued as IEEE802.11p in 2010. Relevant communication protocols were also issued from IEEE and message sets used from SAE. Standards for using these were also prepared.

On the other hand, for ITS that requires installation in the vehicle and preparation of infrastructure, the use of the allocated bandwidth did not grow significantly. The notion that this bandwidth should be opened up to Wi-Fi (wireless LAN) thus began to emerge around 2013. In 2016, FCC also decided to consider sharing the 5.9 GHz band, and plans for action in this regard are under discussion.

Trends and Progress in ITS Communications in Different Countries

Global Trend on ITS Communication

A commitment to the realization and practical use of cooperative ITS and autonomous driving is growing in Japan and other countries. In the next generation of ITS services, communication will play a far more important role than in the past. Various questions need to be discussed, as part of communications generally, including supporting cybersecurity, in accordance with increasing volumes of data and service expansion due to its deployment in Smart Cities and the IoT world. Here, we discuss projects and topics related to the progress of communications in different countries.

(1) The United States

The ITS communications in the United States, WAVE (Wireless Access in Vehicular Environments), used for V2V/V2I communication, follow the basic specifications laid out in IEEE 802.11p, which utilizes the 5.9 GHz band.

To investigate the effect of reducing traffic accidents through "Connected Vehicles" (CVs) based on this communication and with the consent of drivers, DOTth e (Department of Transportation) began a large-scale verification test, the "Safety Pilot Program," in 2010. In this program, transmission devices were installed on public roadsides in Ann Arbor, Michigan (selected as a model deployment location), for CV security application testing. The devices were also installed on about 3,000 cars, trucks, and buses to collect data.

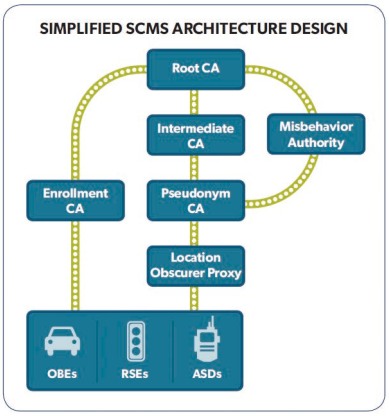
A previous experimental deployment, called the "Connected Vehicle Pilot Deployment Program" was initiated in 2015. It was planned to run until 2020. New York City, Tampa (Florida), and Wyoming were selected as locations for the first stage of the test. Deployment and verification are now in progress. In New York, for instance, V2V transmission devices are installed in 10,000 cars in addition to devices installed in central Manhattan and Brooklyn to carry out verification of V2I. In this program, the review and verification of a security system called "SCMS: Security Credential Management System" used in V2V and V2I are also being conducted.

A comprehensive method for developing urban areas, called "Smart City Challenge" was also launched by the DOT in 2015. In this program, the idea of a Smart City that utilizes IoT and other technologies is merged with "Connected-Automated Vehicles," and the aspects of mitigation of traffic jams, safety support, and environmental protection are taken into consideration. Columbus, Ohio was selected as the location for the program where "SMARTCOLUMBUS" is in progress.

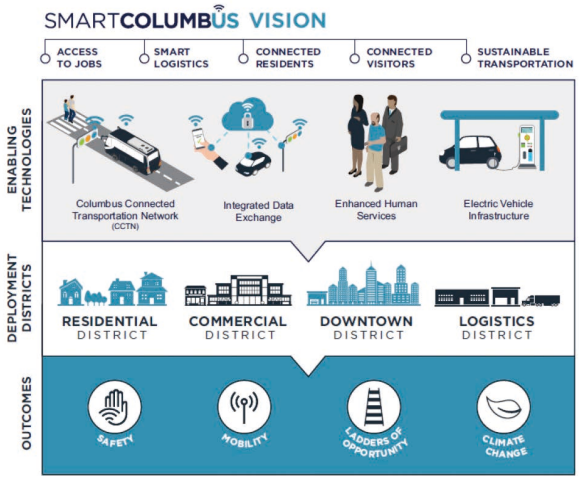
In relation to promoting the installation of transmission devices in cars, NHTSA (the National Highway Traffic Safety Administration) released an NPRM (Notice of Proposed Rule Making) in December 2016, a program to collect public comments on rules that mandate the installation of V2V devices in small vehicles such as passenger cars. The NPRM rules are expected to be published in 2019. Promotion of installation is carried out in a stepwise manner: some cars manufactured in 2021 will be installed with the devices, and in 2023, every new car will be equipped with one. Although the use of IEEE 802.11p, that utilizes the 5.9 GHz band is defined as communications technology, the adoption of other communications techniques is not ruled out.

In addition, discussions are conducted in multimodal manner, including government officials' attendance to conferences on cellular communication standardization, such as 3GPP.

SCM Design



Source: https://www.its.dot.gov/factsheets/pdf/



Realization Vision of Columbus Smart City Challenge

Source: https://www.transportation.gov/sites/dot.gov/files/docs/Smart%20City%20Challenge%20Lessons%20Learned.pdf

(2) Europe

In Europe, even though there have been no moves to mandate the installation of V2V communications devices, the EC has been leading research and development of V2V/R2V (road-to-vehicle) communications. Many projects for cooperative ITS have been led by the EU, and currently the overall coordination of these projects is conducted by COMeSafety and its successor, COMeSafety2. Security mechanisms that differ from those in the US have been reviewed among cooperating ITS projects. Although harmonization between Europe and the US was discussed at one point, no clear agreement has yet been reached.

There are programs being conducted by certain groups, including the Amsterdam Group, which consists of a group of auto manufacturers (C2C-CC: the car-to-car Communication Consortium), a group of road managers (CEDR), a group of toll road operators (ASECAP) and a network of local public bodies (POLIS) for realizing cooperative ITS.

(3) China

In China, the wireless communication used in ETC was standardized using 5.8 GHz band DSRC, and it has been implemented nationwide. They are also focusing on the development of the next generation of mobile communications. According to "Made In China 2025" published by the Ministry of Industry and Information Technology, they are aiming to establish the key technology for intelligent driver support as "Intelligent Connected Vehicles" by 2020, and to possess the key technology for autonomous driving by 2025.

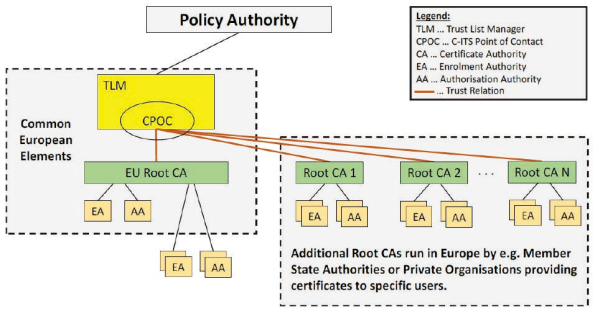
The pilot area for Intelligent Connected Vehicles has been located in Shanghai, with pilot areas for Connected Vehicles allocated in five cities: Beijing, Hangzhou, Chongqing, Changchun, and Shenzhen. Pilot projects have already been launched in Beijing, Hangzhou, and Chongqing. There is tight collaboration between the government and industrial circles, promoting a broad and forward-looking range of proposals at the stage of international standardization, such as ISO, ITU-R, ITU-T, and 3GPP.

(4) Japan

In Japan, the importance of communications is understood. "Connected Vehicle" and "Security" have been adopted as key topics in automated driving systems (SIPadus) in the Strategic Innovation Promotion Program (SIP) launched in 2014. The item concerned is also under discussion in a collaborative trilateral meeting between the United States, Europe and Japan. A large-scale verification test of SIP-adus will begin in 2017 to, for instance, review various forms of data exchange centered on communications and security issues.

In the ITS Info-Communications Forum, specific review is proceeding, including discussion on the interference issues of DSRC/wireless LAN mentioned above and addition of 5G to communications media for V2X communication to promote a review of use, along with case examples of its utilization.

C-ITS Trust model architecture



Source: https://ec.europa.eu/transport/sites/transport/files/c-its_certificate_policy_release_1.pdf

Intelligent Connected Vehicle/
Connected Vehicle Verification Test Locations in China
Source: "Made In China 2025"

Discussions on technology and law, including topics relevant to communications, are conducted toward the realization of self-driving by 2020. These activities are partly reflected in "Public- Private ITS Framework and Road Map 2017" published by the Cabinet Secretariat in May, demonstrating a commitment to preparation of an info-communications infrastructure and the protection of privacy and security.

Future Issues (Summary)

As described above, discussion is taking place on communications used in ITS is in progress, covering not only traditional dedicated communications but also cellular communications, in accordance with the advancement and diversification of services.

For the IoT world, data including probe data generated by various onboard sensors is likely to be of interest for creating additional value. Beyond the ITS field, the concept of seamless connection from the environment surrounding ITS, such as smart cities, is appearing.

As concerns international standardization of ITS communications, in addition to traditional exclusive discussion on ITS at a relevant standards developing organization, in some cases, standardization development is expedited by regarding the ITS field as a public service from each organization's point of view.

In the future, avoidance of duplication of standards and alignment/collaboration between various standards seen in projects on CITS in ITU-T are likely to grow in importance. As for proposals on international standardization from different countries, we believe that it is important to lead and contribute to international standardization by conducting rapid standards development in collaboration between relevant domestic groups, based on a clarification of the policies espoused by each country.

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 WG1 Work Items

		Standardization themes	ISO Number	Content
	1	System architecture -- Privacy aspects in ITS standards and systems	TR 12859	Guidelines for protecting privacy in the development of ITS standards and systems
	2	Reference model architecture(s) for the ITS sector	ISO 14813-1 to 7	Specification of fundamental services, core architecture and descriptive requirements for architectures, for reference in the developing new architectures and comparing different ones
	3	ITS central data dictionaries/Part 1: 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
	4	ITS central data dictionaries -- Part 2: Governance of the Central ITS Data Concept Registry	ISO 14817-2	Management procedures for data registration
	5	ITS data dictionaries -- Part 3: Object identifier assignments for ITS data concepts	FDIS 14817-3	Object Identifier adaptation
	6	Using UML for defining and documenting ITS/TICS interfaces	TR 17452	Guidelines for UML use in defining and documenting ITS interfaces
★	7	Using web services (machine-machine delivery) for ITS service delivery -- Part 1: Realization of interoperable web services	FDIS 24097-1	Stipulation of guidelines on the use of web services designed to support collaboration between Internet-based systems
★	8	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
★	9	Using web services (machine-machine delivery) for ITS service delivery -- Part 3: Quality of service	DTR 24907-3	Quality of services in the context of ITS
★	10	Procedures for developing ITS deployment plans utilizing ITS system architecture	TR 24098	Description of procedures to develop ITS deployment plans utilizing ITS system architecture
	11	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
	12	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
	13	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
	14	Harmonization of ITS data concepts	TR 25100	Provision of guidelines for data concepts related to registration in data registries
	15	'Use Case' pro-forma template	TR 25102	Provision of a template to facilitate use case description
	16	Training requirements for ITS architecture	TR 25104	Definition of requirements concerning training courses about ITS architecture
	17	Use of process-oriented 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
	18	Joint APEC-ISO study of progress to develop and deploy ITS standards	TR 28682	APEC-ISO joint investigation for ITS standards development and/or implementation progress
	19	Cooperative ITS -- Part 1: Terms and definitions	TR 17465-1	Definition of Cooperative ITS
	20	-- Part 2: Guidlines for standard documents	TR 17465-2	Guidelines on the formulation of Cooperative ITS standards documents
	21	-- Part 3:Release procedures for standards documents	TR 17465-3	Release procedure for the development of standards documents on cooperative ITS

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

ITS Reference Model Architecture (ISO 14813-1 to 7)

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 (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. The revised version is scheduled to be issued soon. WG1 has asked the TC to release it free of charge to encourage its wide readership. 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 14187 series.

ISO	Titles	Outline
ISO 14813-1	ITS service domains, service groups and services	Definition of service classes (categories, groups)
NP 14813-2	Core TICS reference architecture	Description of abstract object-oriented system architecture
NP 14813-3	Example elaboration	Description of a specific example of reference architecture with emphasis on traffic management
NP 14813-4	Reference model tutorial	Explanation of basic terms and modeling views in defining object-oriented architecture
ISO 14813-5	Requirements for architecture description in ITS standards	Terms and forms to be used for documentation or reference of architecture
NP 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
PWI 14813-7	ITS standards framework	Mapping of ITS services and relevant standards

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.

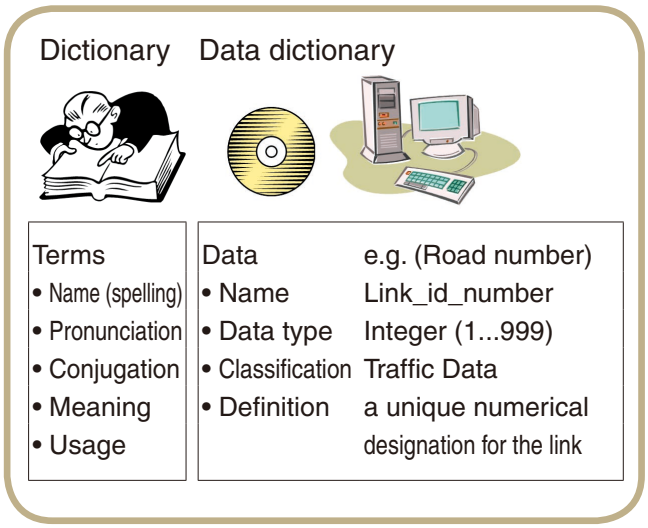
Data dictionaries are designed to promote sharing by managing dictionaries of information about the definitions and formats of data subject to shared use.

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. A standard method to register ITS-AID to the data registry is expected to be developed as Part 2 of ISO 17419, an ITS-AID related standard.



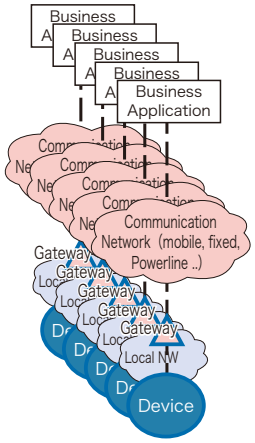
Application of IT-related technologies in ITS

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.

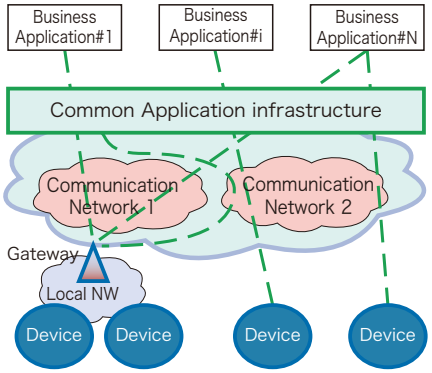
A high degree of safety and reliability, as well as information security, must be ensured for ITS, since it will see longterm and widespread use. WG 1 is working on standardizing the rules and guidelines required for leveraging the rapidly advancing technologies in the IT field in the construction of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

The standards for use of web service (ISO 24097-1), which are expected to become widely adopted in the ITS arena in the future and the standard for interoperability (TR 24097-2) have been developed based on proposals from Japan. The development of a guideline governing quality of service (DTR 24097-3) is currently in progress.

Current system (for applications only)



M2M (Common Application Infrastructure)



Source: ETSI TR 103 290 Fig. 6

WG3 ITS Database Technology

Most applications in ITS involve services relating to the movement of people, goods or 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.

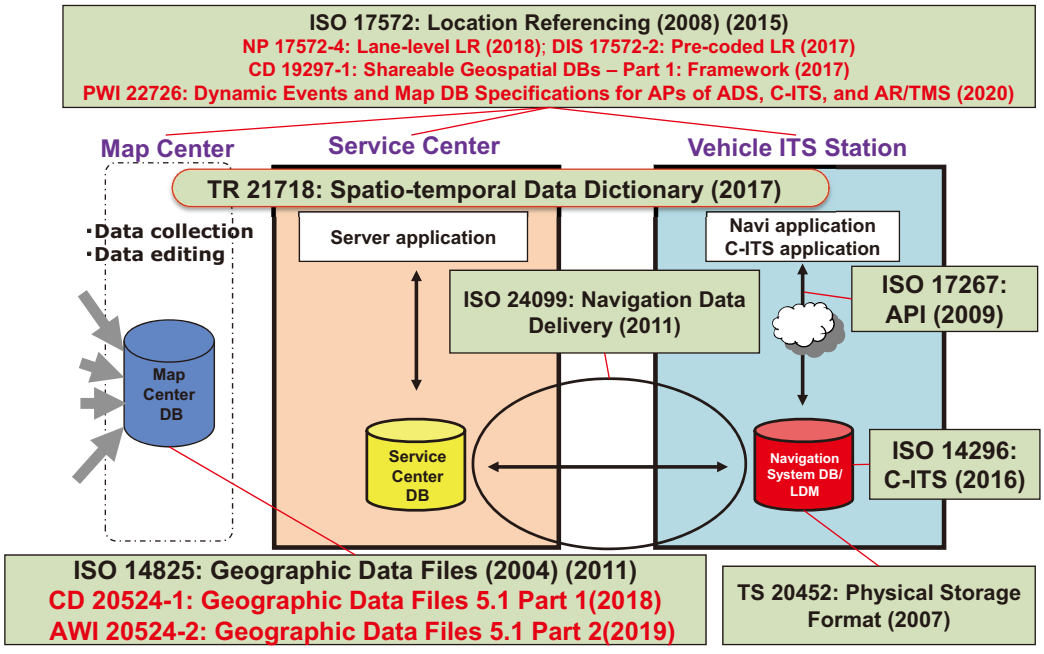
WG 3 has been involved in standardizing exchange formats between geographic data providers, as well as compact storage formats allowing high-speed searching. It has also worked on developing functional requirement specifications, data models, and data elements for geographic data. WG 3 has limited its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

List of WG3 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	CD 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	CD 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	Lane-level Location Referencing for Geographic Databases	NP 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/ PWI 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 events and map database specifications for applications of automated driving systems, cooperative ITS, and advanced road/traffic management systems	PWI 22726	Standardization of static, semi-static, and semi-dynamic map data elements and their logical data model used in ADS, C-ITS, and advanced road/traffic management systems

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

Relationship Diagram for WG3 Work Items



Items in red: Standards under development (target year of issue); Items in black: Standards issued (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 was issued as ISO 14825 in February 2004.

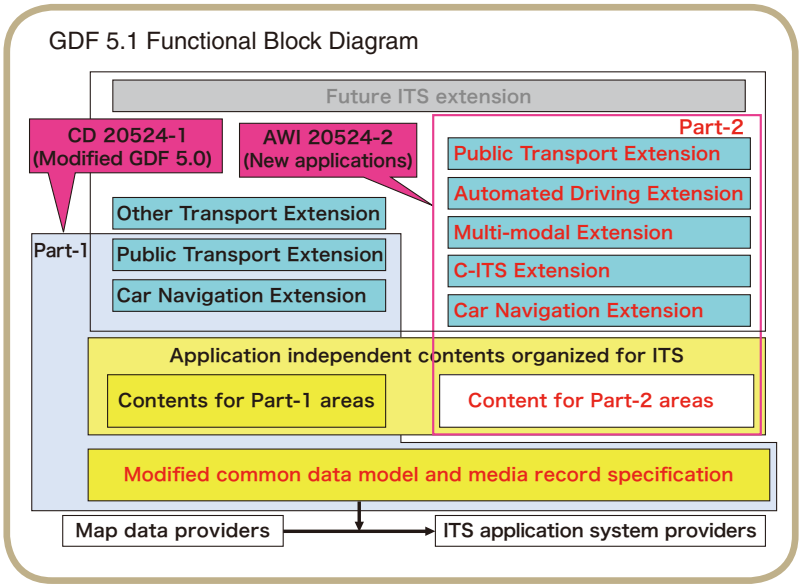
Then, as review work, discussions on a new GDF were launched for the required performances and models. The Japan side proposed a structure that performs time management based on KIWI+*, a new standard formulated by the Japan Digital Road Map Association. KIWI+ evolved from KIWI, which was widely used 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 (CD 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. WG 3 is aiming to have the ISO issued in October 2018.

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. There are still no internationally recognized examples of fully automated driving. Amidst expectations of future Japanese, European and US input, Japan will be taking the lead in this area.

In April 2017, Part 1 and Part 2 were approved in consequence of NP/CD ballot and NP ballot respectively.



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 conference 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 TS20452 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.

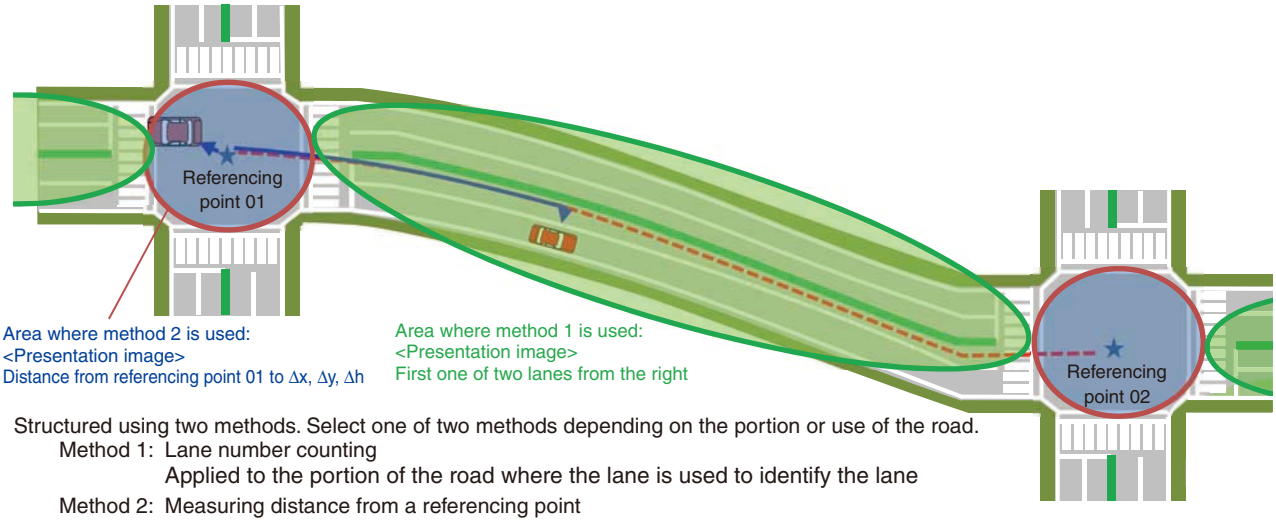
Dynamic Profiling evolved from the European proposal (AGORA C) and incorporated Japan's proposal on using coordinates.

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 Pre-coded Profiles, a DIS ballot was approved.

In April 2016, the addition of the 4th profile, "Lane level location referencing method" was accepted. It permits location referencing of "Which lane?" and "Where in the lane?" for a cooperative/automated driving systems. The work has been started as NP 17572-4. The ultimate aim is publication of ISO.

Basic Concept Diagram of Lane-level 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

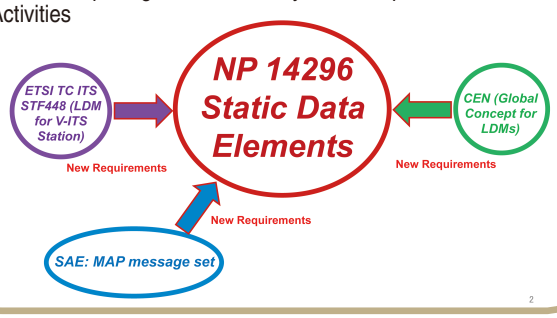
Method 2: Measuring distance from a referencing point
Applied to portions of the road with unclear lane definition (within an intersection, before/after a tollgate, etc.)
Applied to the area within 200 m from a referencing point
Used as positional representation relative to the road (positional accuracy: 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 conference. 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 multi-modal navigation will be studied, and the expansion of specifications for functional requirements, data models and data elements are under way. This work item was approved by DIS ballot.

The resulting ISO was published in February 2016.

Relationship Diagram for Local Dynamic Map Standardization Activities

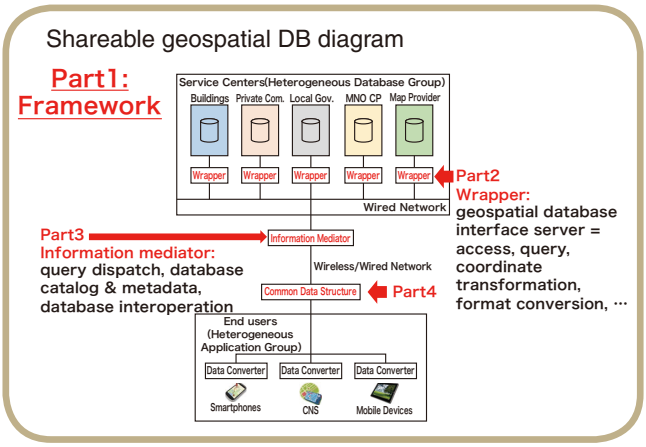


Standardization procedures for static information in Local Dynamic Maps have been moving forward in cooperation with European and American standardization bodies such as CEN, ETSI and SAE while respecting the relationships shown above.

Sharable Geospatial Databases for ITS Applications (CD 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. As of June 2017, the work has reached completion and approval of voting on CD ballot.



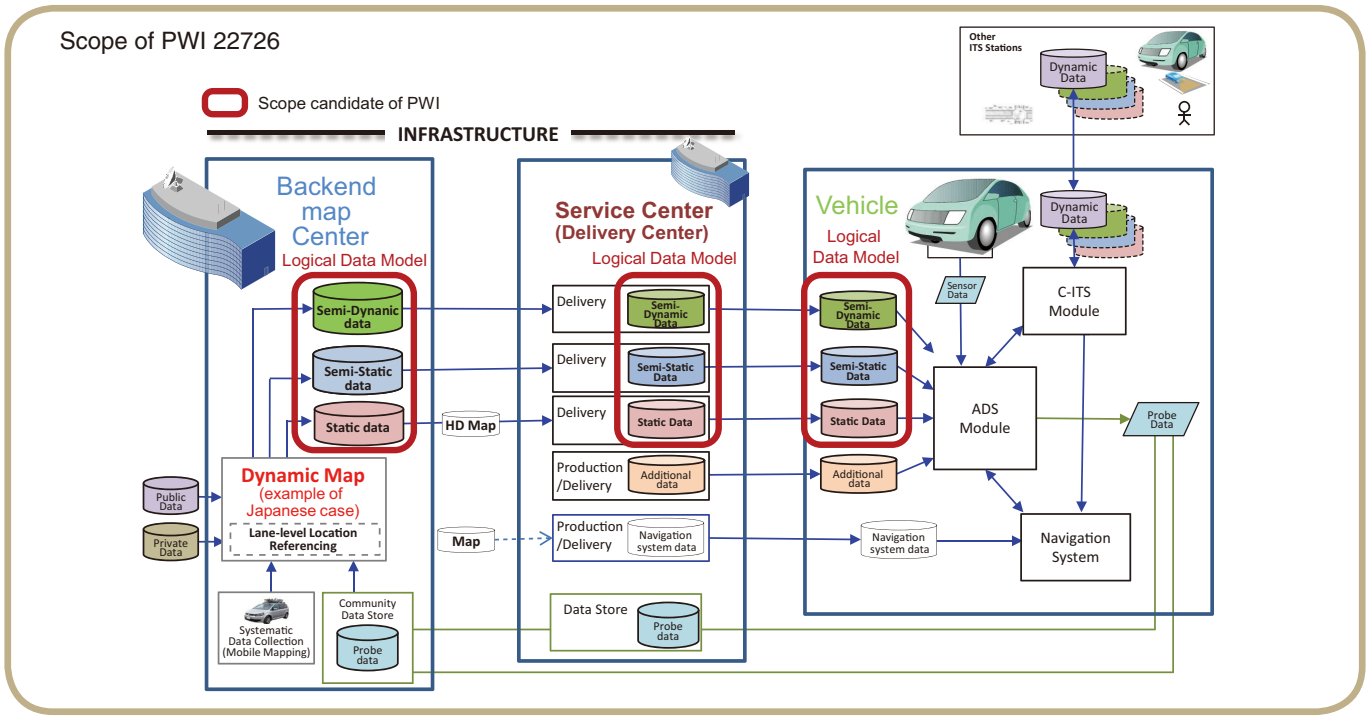
Spatio-temporal data dictionary (TR 21718/PWI 21718)

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 will be published in 2017 by compiling data names/types/definitions/structures. In 2017, following PWI approval in April, TR second edition is expected to be published within the year. The second edition is aiming to reach global agreement by collaborating with standardization bodies in Europe and the U.S., such as CEN and SAE. The work is also aiming to issue as an ISO standard in 2018.

Dynamic events and map database specifications for applications of ADS, C-ITS, and advanced road/traffic management systems (PWI 22726)

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.

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.

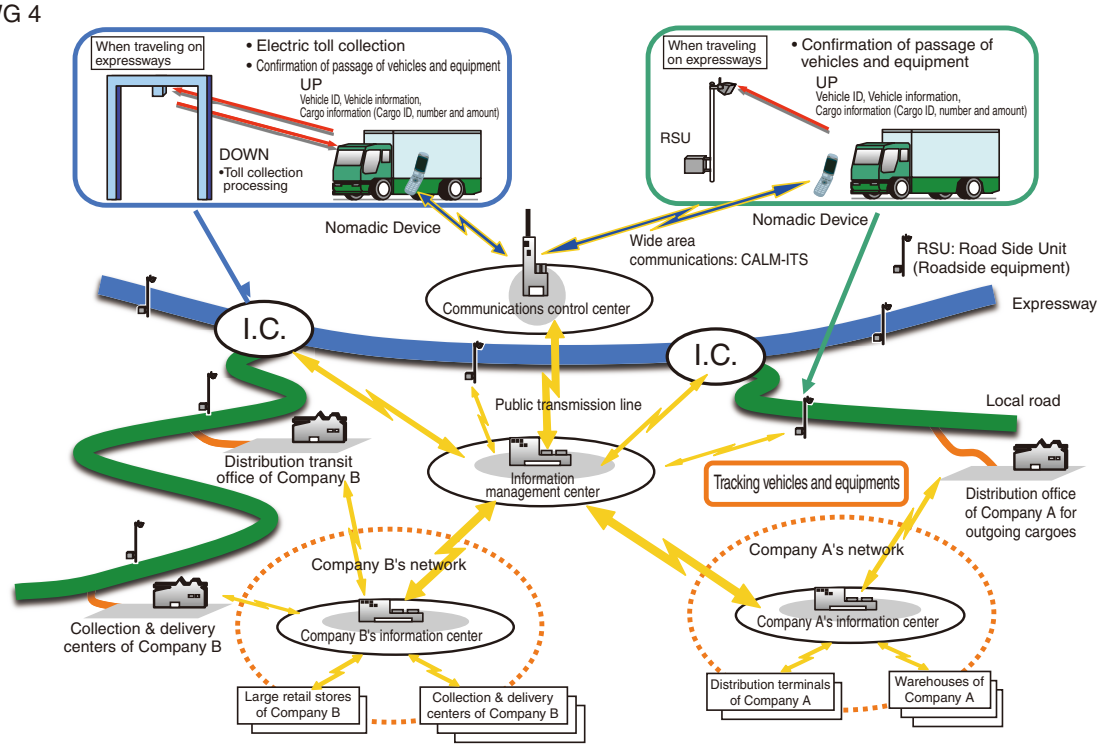
In October 2014, Japan and three other countries formed the ASN.1 Task Team to work on ensuring compatibility between, and to correct errors in, existing ISO documents using ASN.1 notation. Five ISO standards, 14816, 17262, 17264, 24534-4, and 24534-5 were revised by the task team, and a CD ballot was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

List of WG4 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

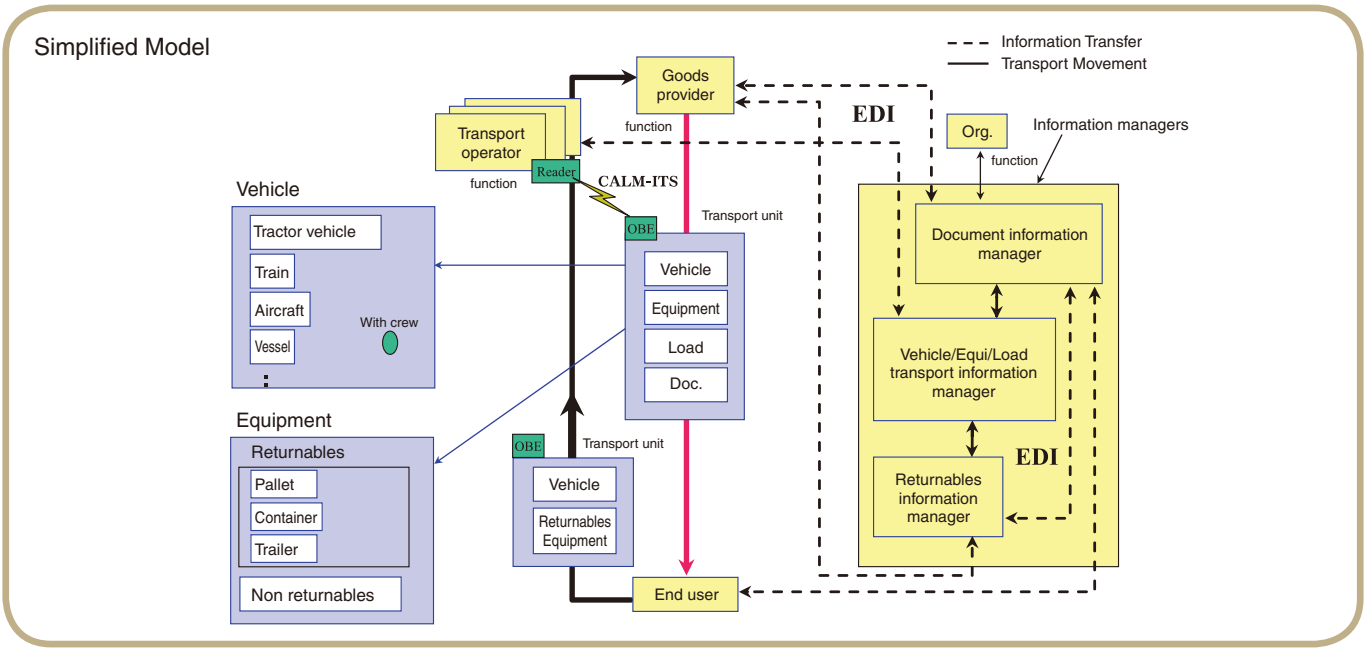


Intermodal AVI/ AEI Systems

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" in February 2003 (the European EVI project). 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 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" (EFC directive). 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.

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 Japan's toll method through capturing routes, aimed at reaching international standardization.

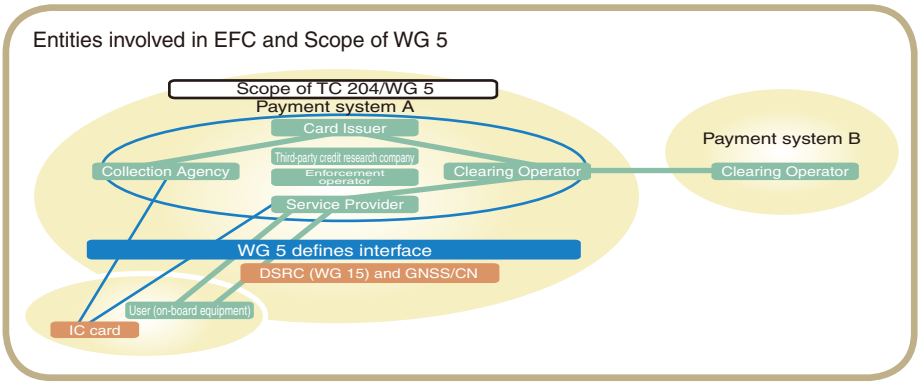
List of WG5 work items

		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 TS12813 (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 DTS13141 (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 TS 16401 TS 16410	Conformity evaluation methods for TS17575 (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	CD TR 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	NP TS 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	NP TS 21193	In accordance with the proposals in TR19639, 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	DTS 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.

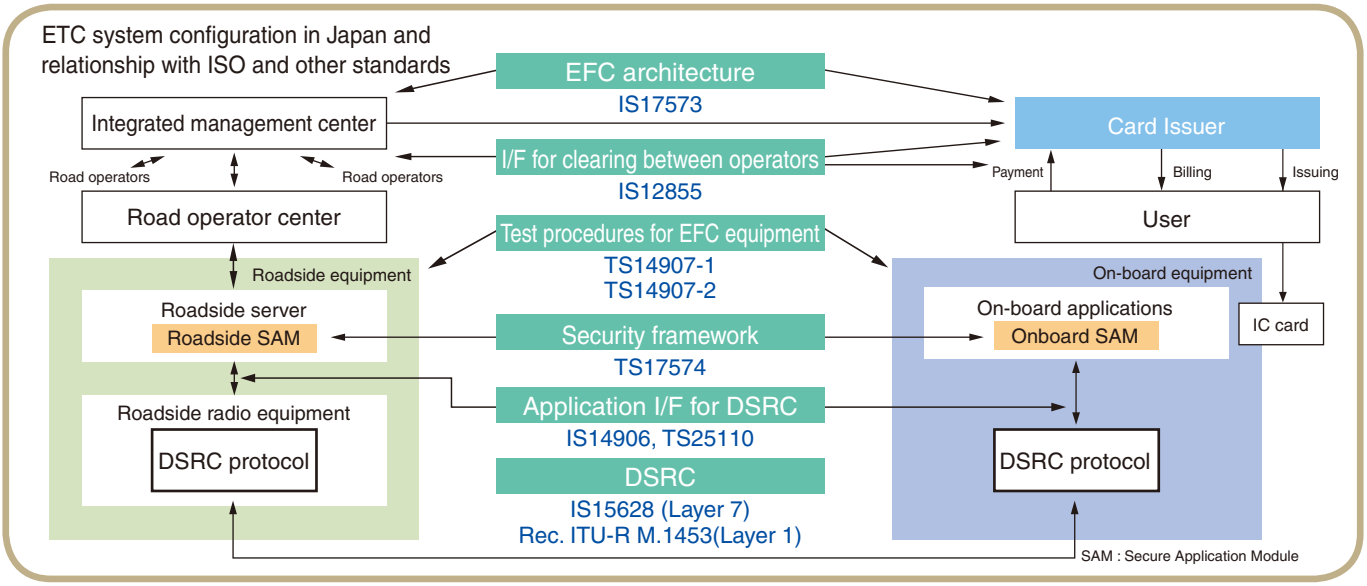
★ Item(s) that Japan is / has been actively working on

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.



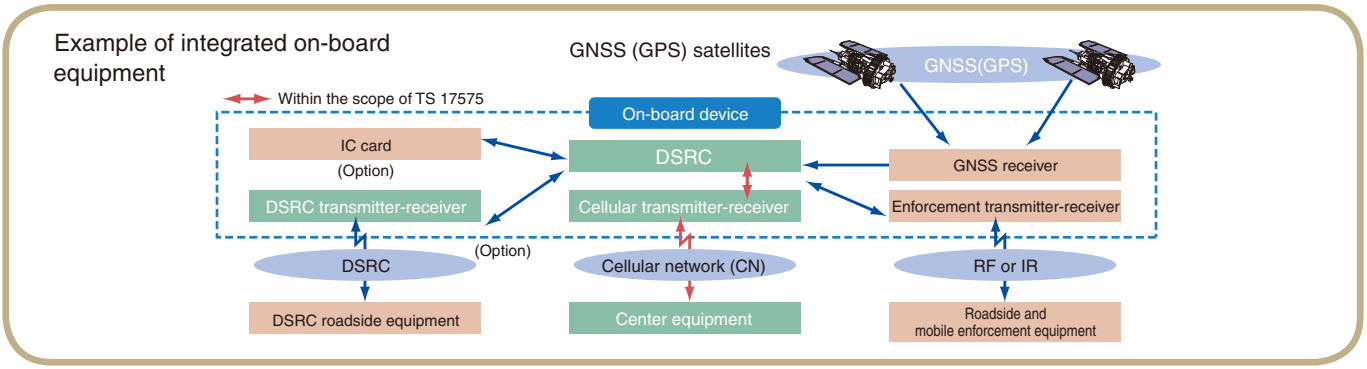
The figure below shows the ETC system configuration in Japan, and the corresponding ISO standards and ITU recommendations



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

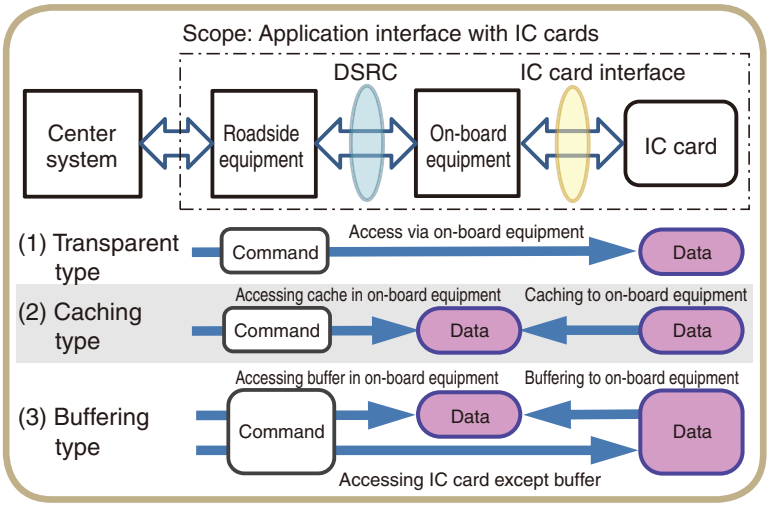
The GNSS/CN based EFC was approved as a work item in 1997. The toll collection system for Heavy Goods Vehicles (HGV) in Germany since 2005, and Belgium since 2016 adopted this system. The onboard equipment continuously positions the geodetic coordinates of the present location with the built-in GNSS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

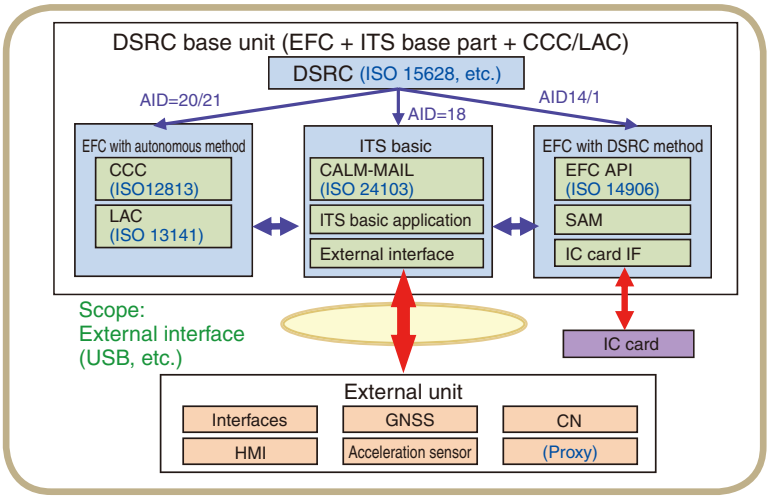


Interface definition between DSRC-OBE and external in-vehicle devices (TS 16785)

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.

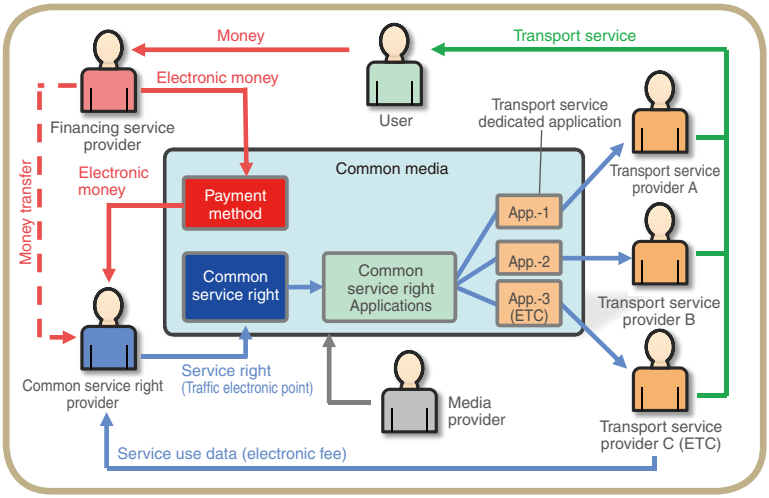
Installing an external connection interface in DSRC OBE for expandability enables itself to perform autonomous charging by connecting an external in-vehicle device with GNSS reception and cellular communication module for improving the onboard equipment functionality.



Investigation of EFC Standards for Common Payment Scheme for Multi-Modal Transport Services (TR 19639, NP TS 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. TS 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 (CD TR 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				

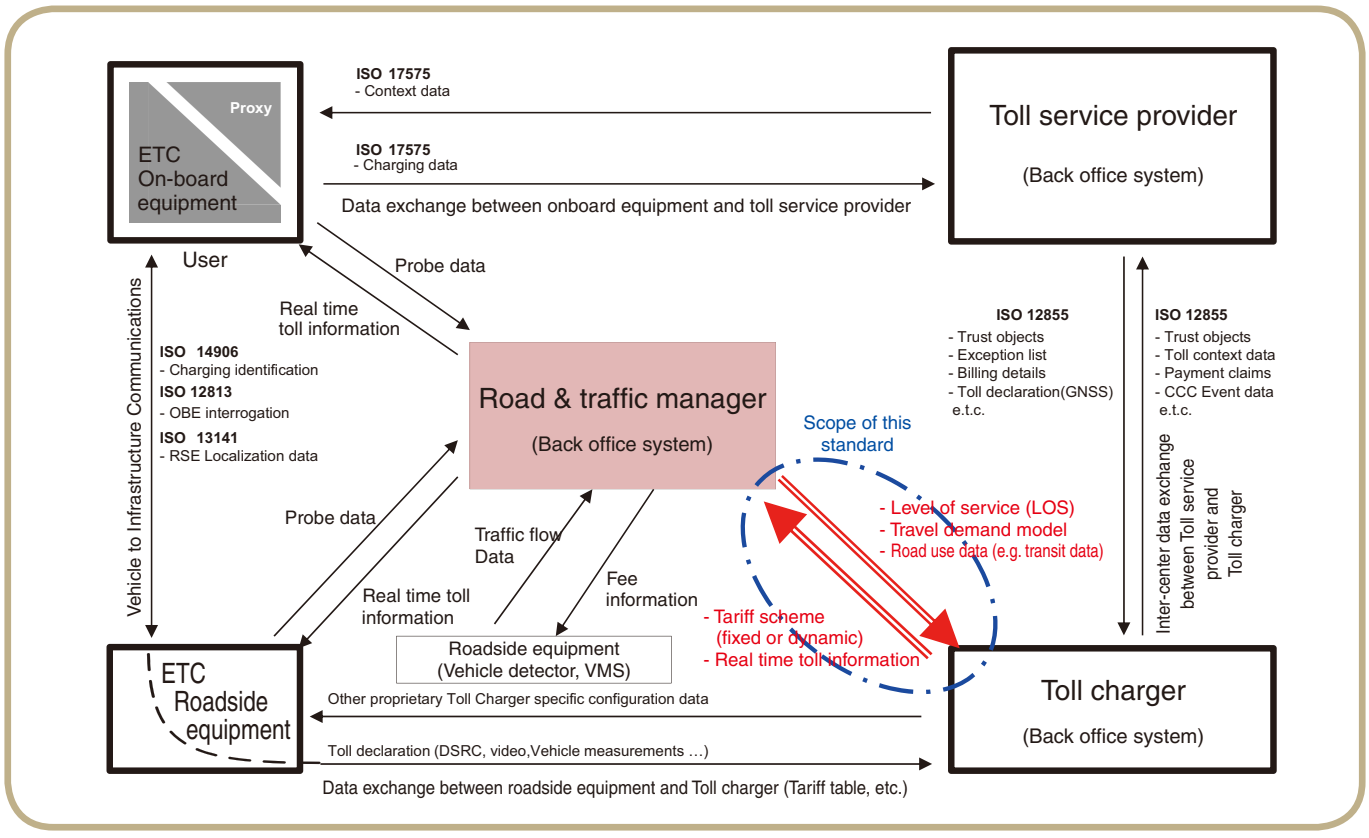
EFC based on existing technology

EFC based on new technology

Note: Countries in parentheses planning to introduce in near future

EFC support for traffic management (NP TS 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

The current WG 7 is a merger of previous WG 6 (General Fleet Management) and WG 7 (Commercial/Freight) agreed upon at the Montreal meeting in November 1999. Standardization topics include the transport of hazardous goods and freight multi-modal transport. Specific work items being readied 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 weight 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 law be provided by service providers to the regulatory authorities. In Europe and the United States, operational management of commercial vehicles is planned to be conducted through making the adoption of digital tachographs mandatory (in 2018 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 valuable standard for 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.

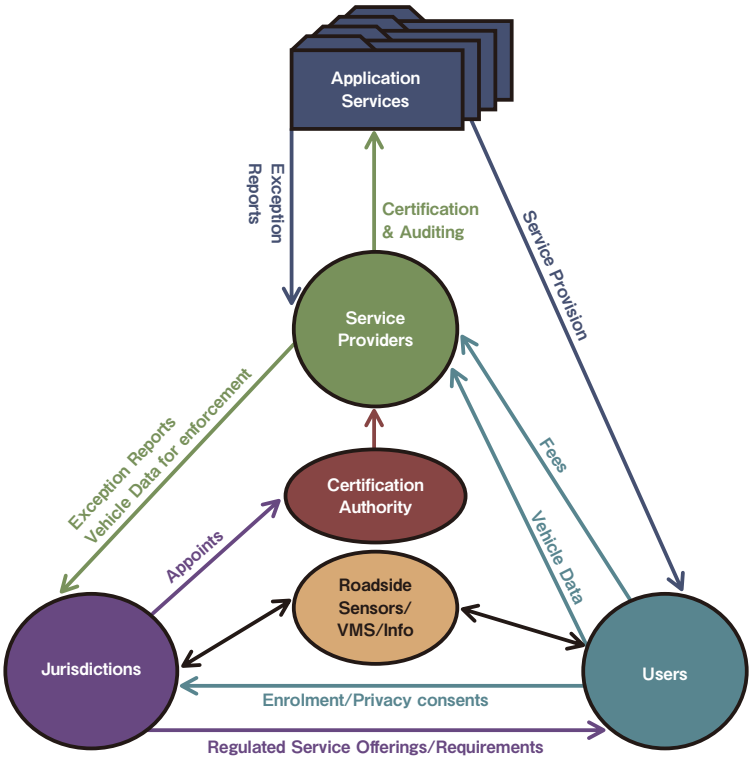


Figure Framework diagram of 15638

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
DIS 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
DIS 15638-21	Enhancements using roadside sensors (ERS)
NP 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 released by CEN/TC 278 to support Urban ITS. Standardization is now expected to be handled based on the content of this report. It is necessary to pay close attention to these developments.

List of WG8 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 media	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	DTR 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	NP 21724-1	Content under development
	14	Bike-share data exchange	NP 22047	Definition of bike-share data exchange

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

The Importance of Public Transport

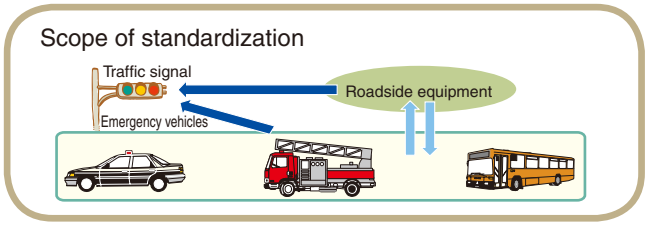
WG 8 has adopted public transport as an important standardization subject, as excessive dependence on automobiles for moving passengers and cargo causes serious harm to our society and wellbeing, and damages sustainability. Reducing dependence on automobiles requires increasing urban density and making 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 in progress, the launch of experimental adoption of MaaS (Mobility as a Service) in Europe represents a preview of how public transport will develop.

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.



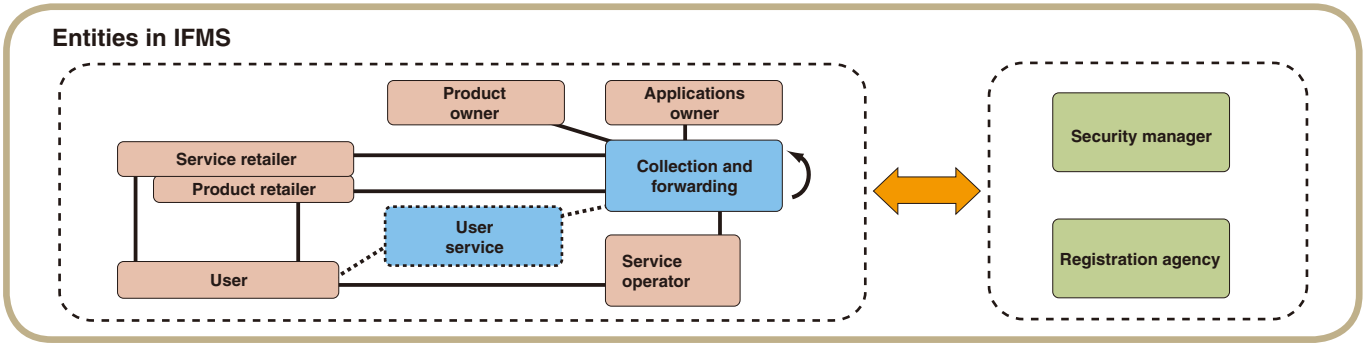
Interoperable Fare Management System: IFMS (ISO 24014)

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 the content 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, PT1701, 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 results from discussions on standards needed to support deployment of Urban ITS required for operation and management of urban areas, and includes the following eight fields that should be highly prioritized.

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.

●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

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 WG9 work items

		Standardization themes	ISO Number	Content
	1	Data interfaces between centres for transport information and control systems -- Part 1: Message definition requirements	ISO 14827-1	Data Interfaces between Centres for Transport Information and Control Systems - Part 1: Message Definition Requirement
	2	Data interfaces between centres for transport information and control systems -- Part 2: DATEX-ASN	ISO 14827-2	Data Interfaces between Centres for Transport Information and Control Systems - Part 2: DATEX-ASN Application
★	3	Data interfaces between centres for transport information and control systems -- Part 3: Data interfaces between centres for Intelligent Transport Sytems (ITS) using XML	DIS 14827-3	Data Interfaces between Centres for Transport Information and Control Systems Part 3 : Data interfaces between centres for Intelligent Transport Systems (ITS) using XML
★	4	Data exchange involving roadside modules communication - Part 1 : General principles and documentation framework of application profiles	ISO 15784-1	Data exchange involving roadside modules communication - Part 1: Definition of general principles and documentation framework of application profiles
	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 roadside modules
	7	Integrated transport information, management and control -- Data quality in ITS systems	TR 21707	Definition of data quality in ITS
	8	Interface Protocol and Message Set Definition between Traffic Signal Controllers and Detectors	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	Definition of data elements and data frames between roadside units and signal controllers for cooperative signal control
	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	PWI 19468	Data interfaces between centres for transport information and control systems — Platform-independent model specifications for data exchange protocols for transport information and control systems
	12	Roadside modules SNMP data interface -- Part 1: Overview -- Part 2: Generalized field devices -- basic management	PWI 20684-1,2	Definition of interface between general roadside modules and the center
	13	Roadside modules SNMP data interface -- Part 10: Variable message signs	WD 20684-10	Definition of interface between the variable message signs and the center

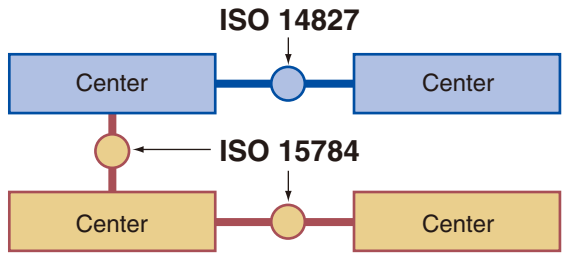
★ Item(s) that Japan is / has been actively working on

Scope of standardization

The scope (center-to-center, centers-to-roadside) of standardization being worked on by WG 9 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 for procurers, and in development for module suppliers.

Scope of standardization



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). Based on this information, Japan made a proposal to facilitate the construction of signal control systems by standardizing data usable for signal control. CD voting was completed for this item in 2016. Currently DIS voting is being prepared.

Communication between Centers (ISO 14827, PWI 19468)

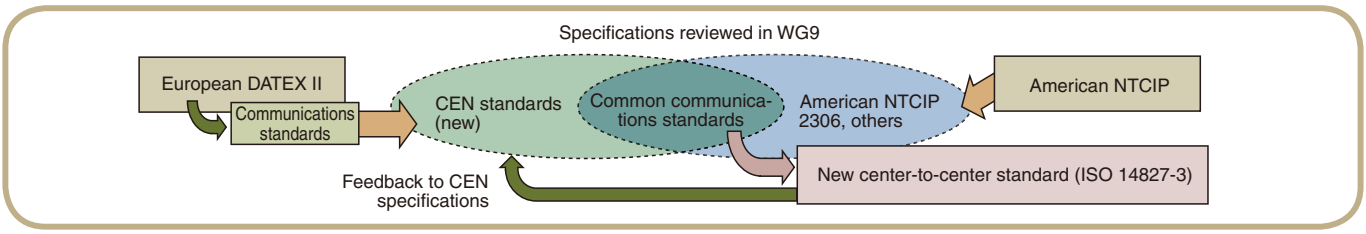
Communication between centers refers to communication between traffic management centers, in which information collected by one transport management center is exchanged with neighboring centers, enabling the implementation of extensive transport management. WG 9 stipulates the definition forms of messages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

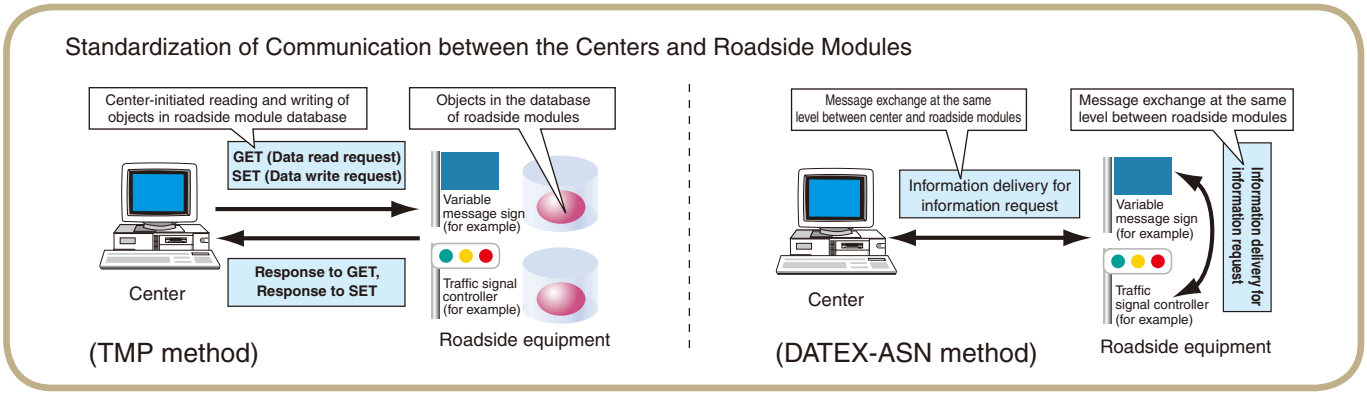
This item was established as ISO 14827 Part 1 and Part 2 in November 2005. Part 3, in which Japan is leading discussions, is about trying to define messaging rules using an XML-based protocol in a form compatible with both the European DATEX II and the American NTCIP standards for communication between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

In Europe, formulation of platform-independent communications as PWI 19468 based on DATEX II is under way, and 14827-3 is now preparing DIS voting in alignment with the PWI.



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 top three layers 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 ISO14827-2, 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 (WD 20684)

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.

The US is taking the lead in formulation of the basic part for the entire standard (Part 1 and 2). South Korea proposed to standardize communications with variable message signs, and it was approved as NP in 2016 (Part 10).

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 WG10 work items

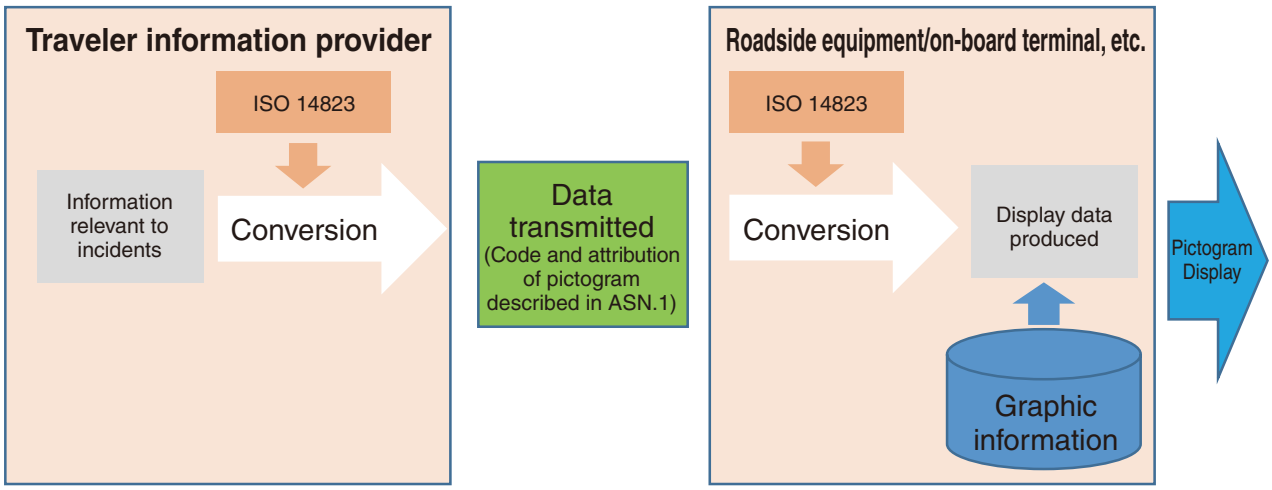
		Standardization themes	ISO Number	Content
	1	TTI messages via traffic message coding	ISO 14819-1	Standardization of the RDS-TMC system
			ISO 14819-2	Code definition of TTI messages
			ISO 14819-3	Location referencing method
			ISO 14819-6	Regulation of conditional access
★	2	Intelligent transport systems -- 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	TEPG1 binary version; Syntax, frame structure
			TS 18234-3	TEPG1 binary version; Services and network information
			TS 18234-4	TEPG1 binary version; Road transport message applications
			TS 18234-5	TEPG1 binary version; Public transport information
			TS 18234-6	TEPG1 binary version; Location referencing
			TS 18234-7	TEPG1 binary version; Parking lot information
			TS 18234-8	TEPG1 binary version; Information on congestion and traveling time
			TS 18234-9	TEPG1 binary version; Traffic event information
			TS 18234-10	TEPG1 binary version; Weather information
			TS 18234-11	TEPG1 binary version; Location referencing
			TS 21219-1	TEPG2 UML version; Introduction, numbering, version management
			TS 21219-2	TEPG2 UML version; UML modeling rule
			TS 21219-3	TEPG2 UML version; UML-binary conversion rule
			TS 21219-4	TEPG2 UML version; UML-XML conversion rule
			TS 21219-5	TEPG2 UML version; Service framework
			TS 21219-6	TEPG2 UML version; Message management
			TS 21219-7	TPEG2 UML version, Location referencing container
			TS 21219-9	TEPG2 UML version; Service network information
			TS 21219-10	TEPG2 UML version; Conditioned access information
			TS 21219-14	TEPG2 UML version; Parking lot information
			TS 21219-15	TEPG2 UML version; Simplified event information
			TS 21219-16	TEPG2 UML version; Fuel charge information
			TS 21219-18	TEPG2 UML version; Traffic flow estimation
			TS 21219-19	TEPG2 UML version; Weather information
			DTS 21219-21	TEPG2 UML version; Geographic Location Referencing
			TS 21219-22	TEPG2 UML version; Open Location Referencing
			TS 21219-23	TEPG2 UML version; Multi modal roots
			TS 24530-1	TEPG1 XML version; Introduction, common data type
			TS 24530-2	TEPG1 XML version; Location referencing
			TS 24530-3	TEPG1 XML version; Road traffic message
			TS 24530-4	TEPG1 XML version; Transit information
			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

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

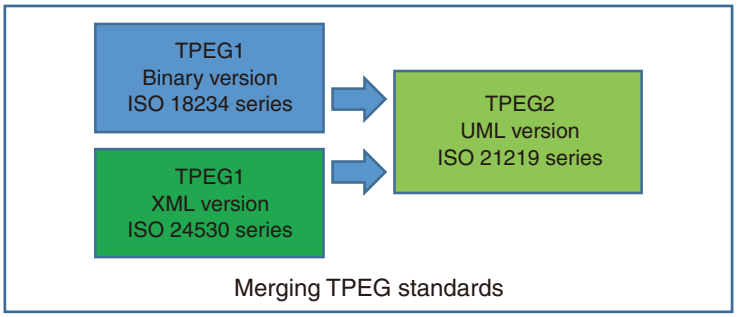


TTI Messages Using Broadcasting-Type Digital Media (TS 18234-1 to 11, NP/DTS/TS 21219-1 to 25, TS 24530-1 to 4)

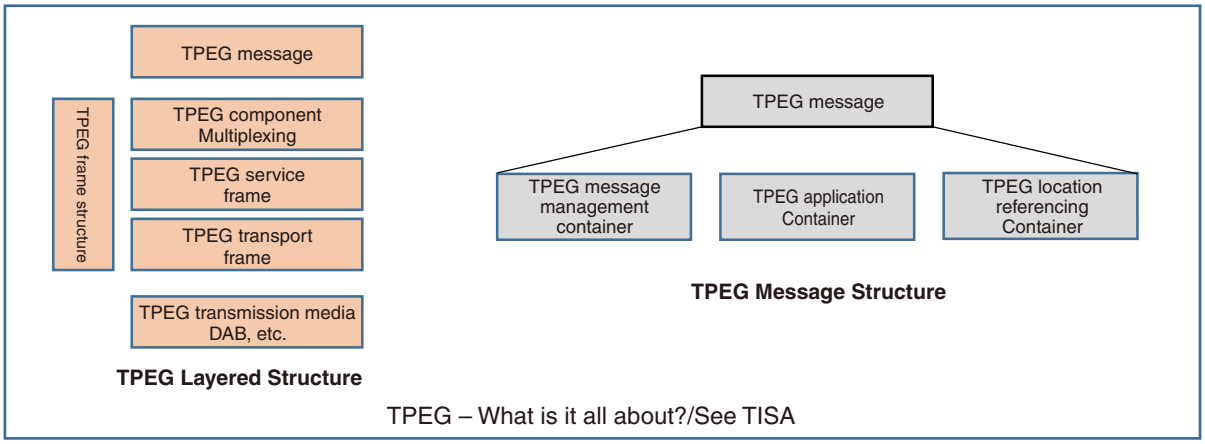
TPEG is a proposal to standardize a method of providing traffic information using high-speed digital data broadcasting.

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

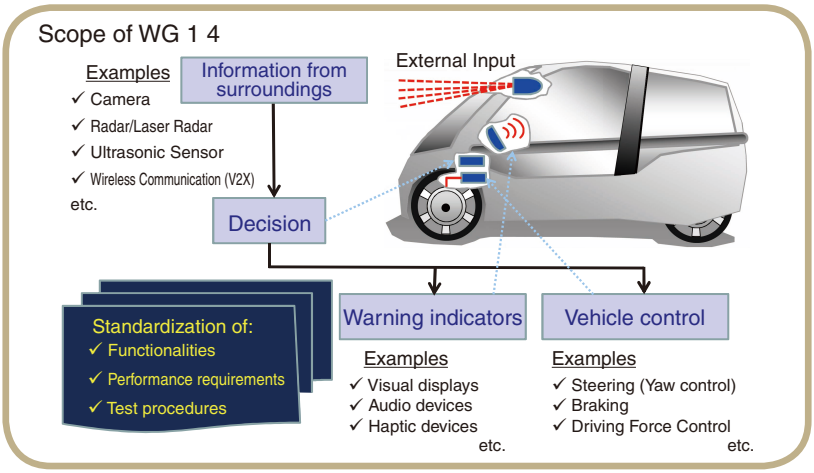
		Standardization themes	ISO Number	Content
	1	Adaptive Cruise Control systems -- Performance requirements and test procedures	ISO 15622	System for maintaining a certain distance from the vehicle ahead Specification of classification according to the existence of a clutch or active braking, control strategy, and driver intervention characteristics Currently in revision to include ISO22179 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)	FDIS 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	CD 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 systems (PAPS) -- Performance requirements and test procedures	AWI 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 from outside the car in Type 2.
	21	Emergency electronic brake light systems (EEBL) -- Performance requirements and test procedures	AWI 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 (PALS)	NP 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 (PADS) -- Performance requirements and test procedures	AWI 21717	The system automatticly controls the vehicle in longitudinal and lateral directions within the lane. Requirements for free-hand driving are expected to be included.
	24	Bicyclist detection and collision mitigation systems (BDCMS)	NP 22078	System that automatically applies emergency braking to mitigate collision damage if there is a risk of colliding with a bicyclist ahead Operational concepts, performance requirements, and evaluation procedures are specified
★	25	Traffic incident notification systems (TINS) -- System requirements	PWI 22084	System that detects dangerous incidents on the road ahead and provides information to drivers, systems and road traffic operators.
	26	Low-speed automated driving systems for limited operational design domain (LSAD) -- Performance requirements, system requirements and performance test procedures	PWI 22737	System that, in the limited operational design domain, automatically operates vehicles driving at low speed under supervision from in-vehicle or remote locations.
	27	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 the SAE issued standard.

★ 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 16 international standards, and has 13 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



FDIS 19237 Pedestrian Detection and Damage Mitigation Systems (PDCMS)

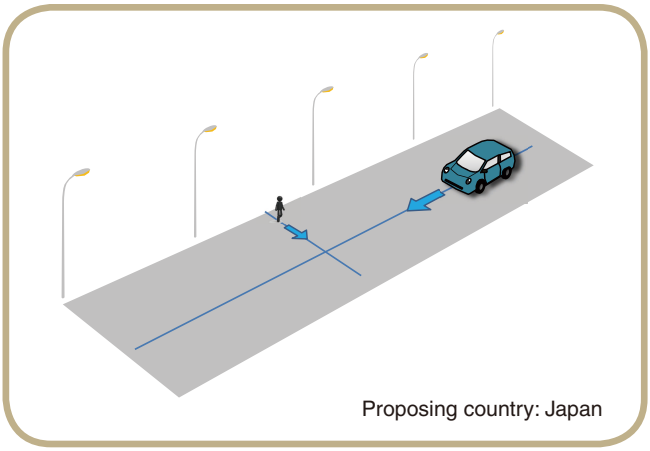
This standard defines a system to minimize collision damage by activating an automatic brake mechanism if collision with the pedestrian is unavoidable.

Countries are increasingly anticipating that similar types of systems will reduce the number of pedestrian fatalities resulting from auto accidents.

TC 204/WG 14 standardizing functional requirements and performance test method, and TC 22/SC 33/WG 16 standardizing specifications of targets used in the performance test[*1], have been working collaboratively on their tasks.

Those standards are planned to be issued as ISO standards in 2017.

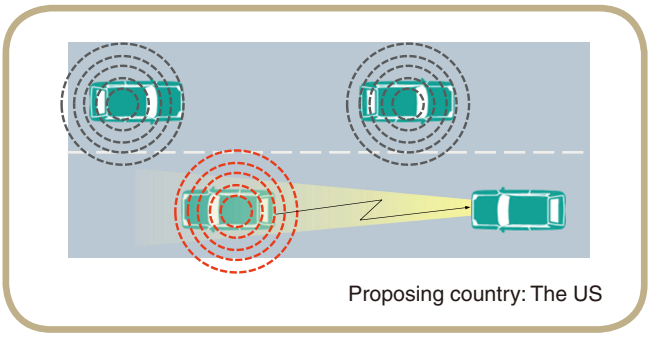
*1 ISO DIS 19206-2 Road vehicles - Test devices for target vehicles, vulnerable road users and other objects, for assessment of active safety functions - Part 2: Requirements for pedestrian targets



DIS 20035 Cooperative Adapted Cruise Control (CACC)

This standard defines systems that shorten response time by adding vehicle-to-vehicle communication data and aim for a shorter following distance and faster convergence of target values than the standard Adaptive Cruise Control systems that rely on onboard radar or other devices.

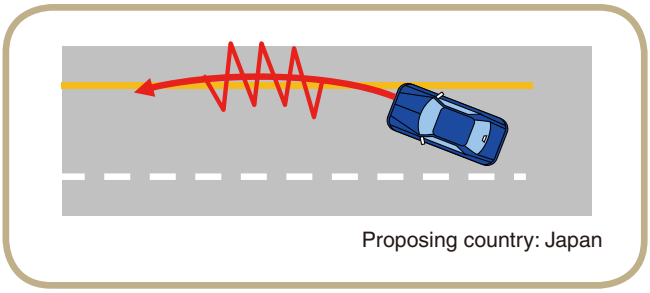
It includes communication between multiple vehicles as well as instructions from the roadside such as recommended speed information. Country-specific factors such as different communication methods are being considered, aiming at publication of an international standard in 2018.



CD 19638 Road Boundary Departure Prevention Systems (RBDPS)

This standard defines a system that uses onboard sensors to detect road boundaries and controls steering and braking to prevent road departure accidents.

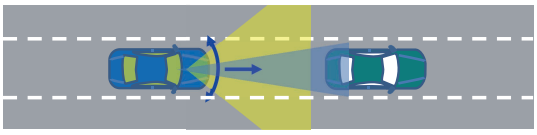
The standard, comprised of the safety driving assistance system avoiding accidents and/or mitigating the damage, also clarifies the difference from ISO 11270 (Lane Keeping Assistance System, LKAS) that is already published, and aims at its early publication as the international standard.



WD 21717 Partially Automated In-lane Driving Systems (PADS)

This standard defines a system that detects lane markings and the preceding vehicle via onboard sensors and other devices to carry out partially automated driving within the lane.

Control of acceleration and deceleration in the longitudinal forward/backward direction complies with DIS 15622 (ACC; under revision) including restarting form stationary state. Even during selfdriving, the driver is required to monitor the surroundings in the same manner as employed during manual driving. The system must have measures for monitoring the driver's level of alertness.



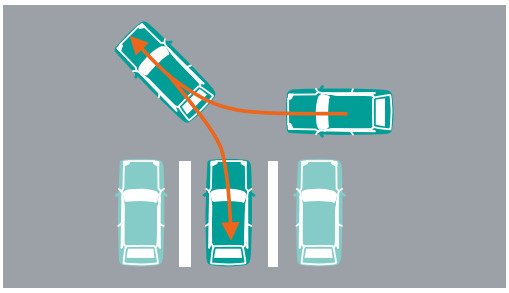
Proposing country: Germany

AWI 20901 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.

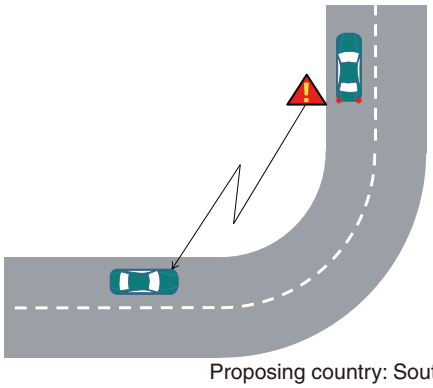


Proposing country: Japan and Germany

AWI 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.

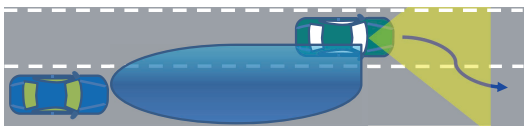


Proposing country: South Korea

NP 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.

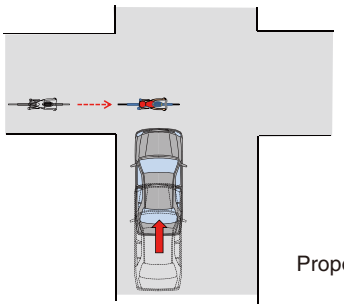


Proposing country: Japan

NP 22078 Bicyclist detection and damage mitigation systems (BDCMS)

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

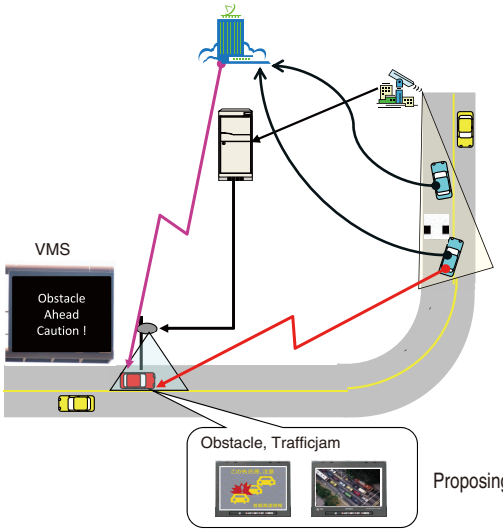
The moving speed of the object to be detected is faster than that of a pedestrian, so the minimum performance requirements need to be stricter. As with FDIS 19237 (PDCMS: Pedestrian Detection and Damage Mitigation Systems), TC 22/SC 33/WG 16 is developing specifications for the test target a dummy. Both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



Proposing country: The US

PWI 22084 Traffic Incident Notification System (TINS)

This standard defines a system in which vehicles the road infrastructure detect dangerous incidents in the path of the vehicle, and this information is transmitted to drivers (not limited to humans: also includes driver assistance and autonomous systems) and road traffic operators. Whereas TS 15624 (TIWS: Roadside Traffic Impediment Warning Systems) aims at generating an alarm to signal an incident that is about to occur, this standard is intended to classify types of incidents the timing at which the driver should react, and to support the driver by enabling him or her to easily perform appropriate handling in the situation.



Proposing country: Japan

PWI 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.

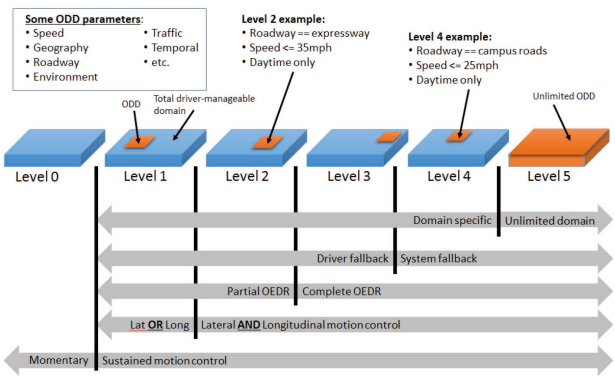
Proposing country: The UK

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 standard by revising a standard with the same title (SAE J3016) issued by SAE in September 2016 with approval of SAE PSDO (co-developer 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 standard as PAS (public available specifications).



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 WG16 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	DIS 16461	Readjustment of anonymity requirements and evaluation criteria in probe data systems
★	31	Service architecture of probe vehicle systems	CD 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

★ 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 TC204 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.

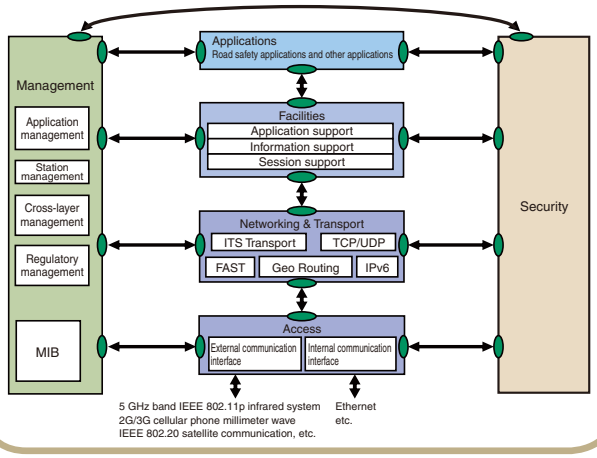
ITS stations in CALM systems feature various communications formats. The architecture standard divides them into 16 communications classes, depending on whether or not 1) multihop communications are used, 2) IPv6 or a non-IP protocol is used for the network layer, 3) handover is conducted, and 4) there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

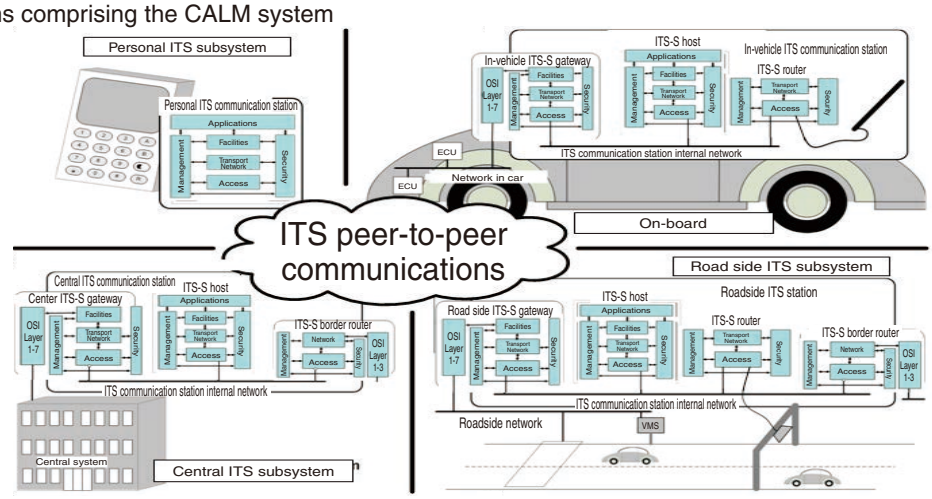
CALM ITS Station Management (ISO 24102)

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.

ITS station architecture



ITS subsystems comprising the CALM system



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 (CALM Access Technology Support). Changes to the ASN.1 descriptions were added, and a revised edition was issued.

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.

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 will be published soon.

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 IEEE802.16e/ IEEE802.16g(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 IEEE802.20 (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 (WD 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.

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.

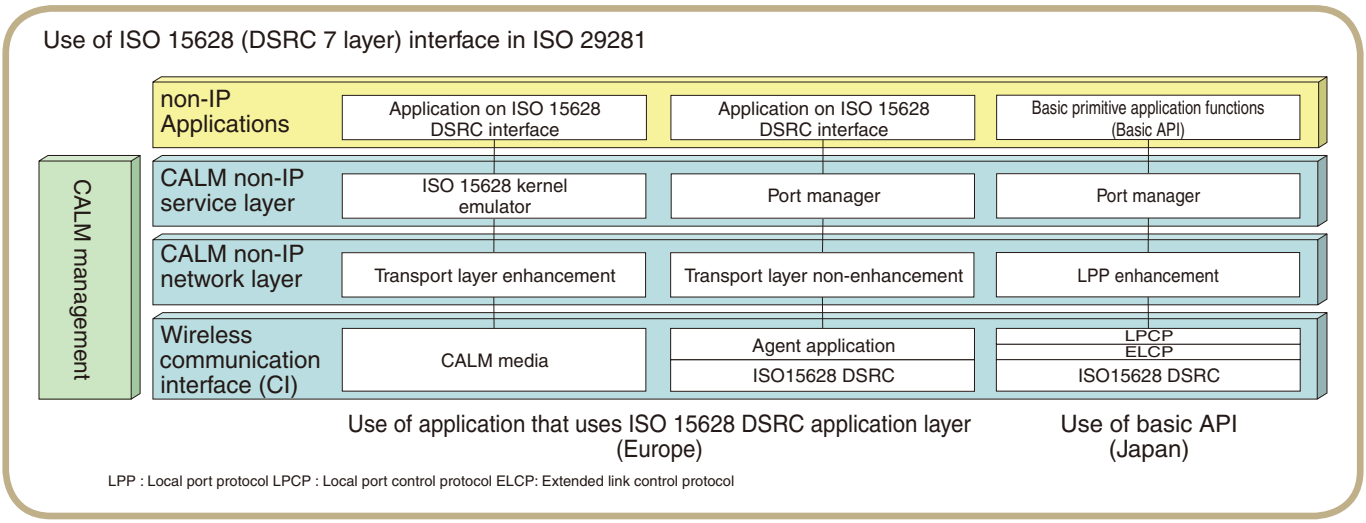
CALM non-IP networking (ISO 29281)

CALM non-IP (ISO 29281)

The CALM FAST sub-system 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 ITUR, 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 method) 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.

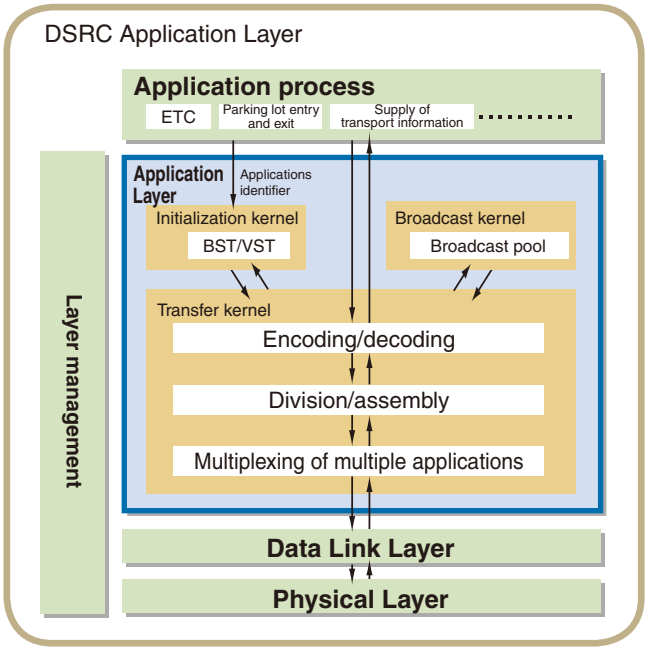
In Japan, the ASL (Application Sub Layer) standards and basic application interface technical specifications have been positioned above the 7th layer.

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.

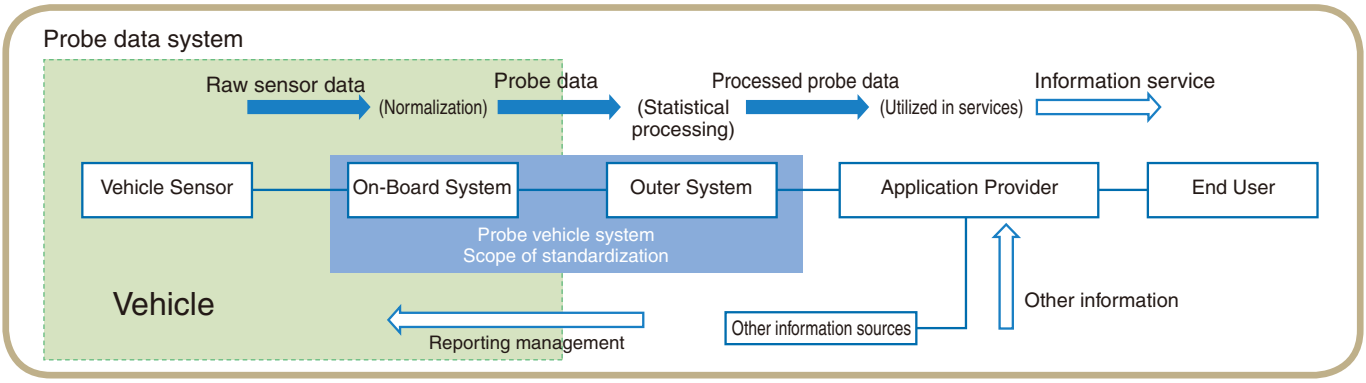


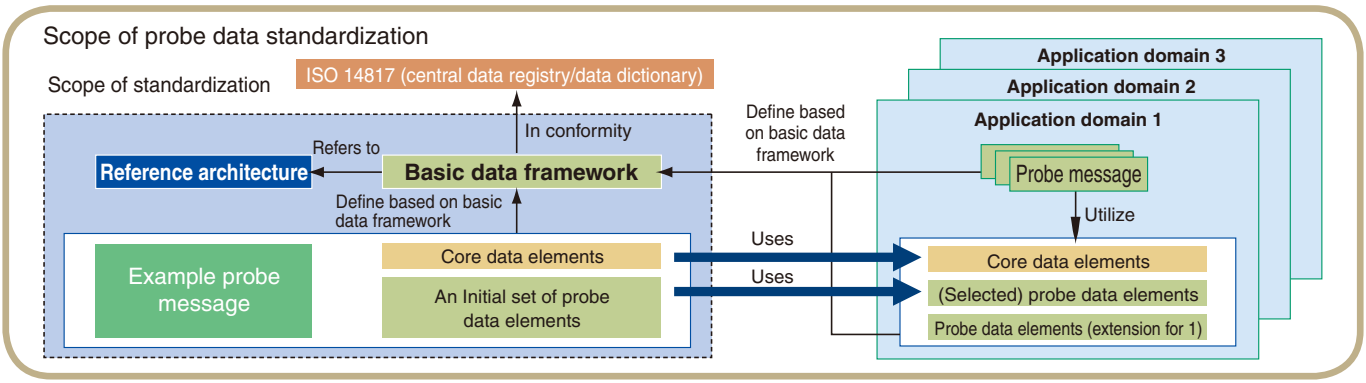
Probe Data

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 (DIS 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 will be studied. It is soon to be published.

Probe services architecture (CD 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 n 2013 and is currently under development.

Application Management

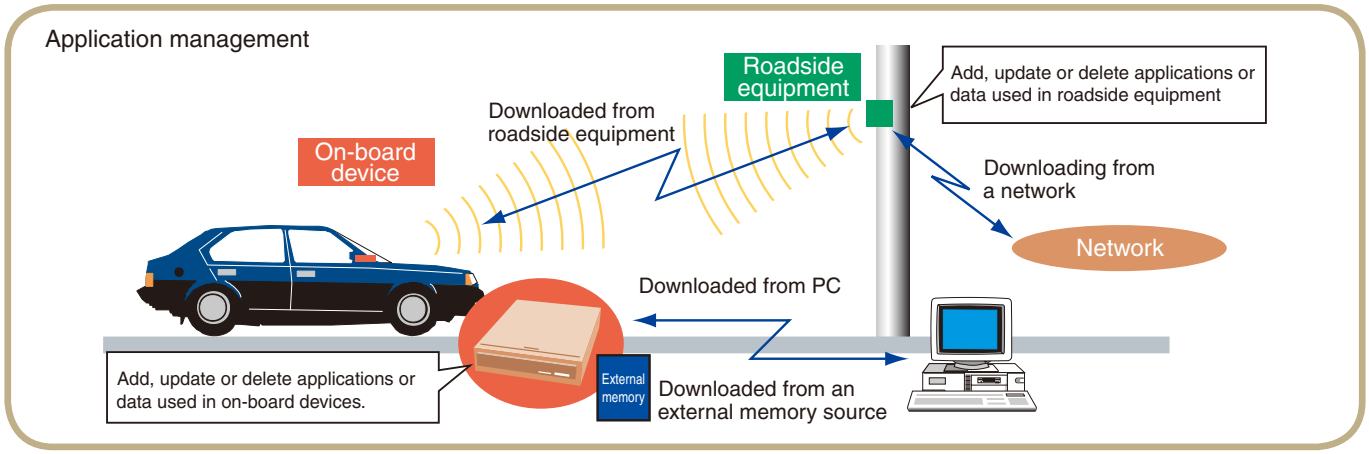
Application management (ISO 24101-1)

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

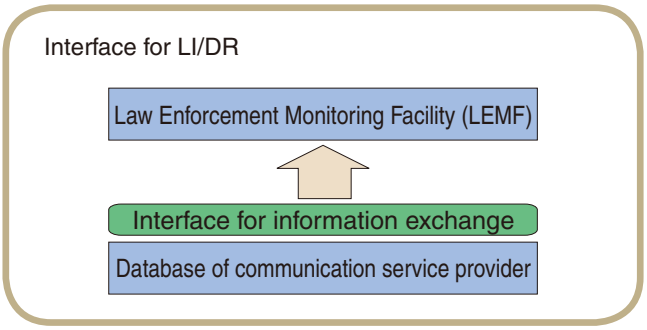
In the wake of the Great East Japan earthquake, this SWG launched a study on securing emergency communications in the event of a disaster, particularly in terms of road traffic. Chaired by Japan, this item worked on possible basic requirements with the close examination of use cases. Disaster recovery 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 (24978)

The title of item 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.

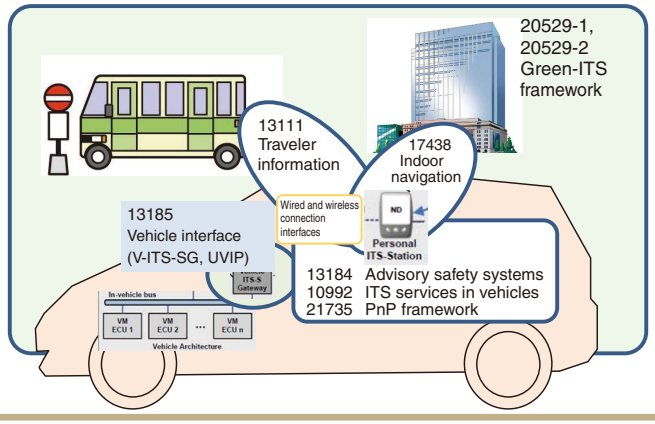
List of WG17 work items

	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	NP 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	DIS 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	DIS 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	NP 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	CD 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	PWI 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	PWI 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	PWI 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	PWI 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)*.

* V-ITS-SG: Information gateway of vehicles that comply with ITS Station architecture proposed by WG17

Overview of standardization proposals under discussion by WG 17

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

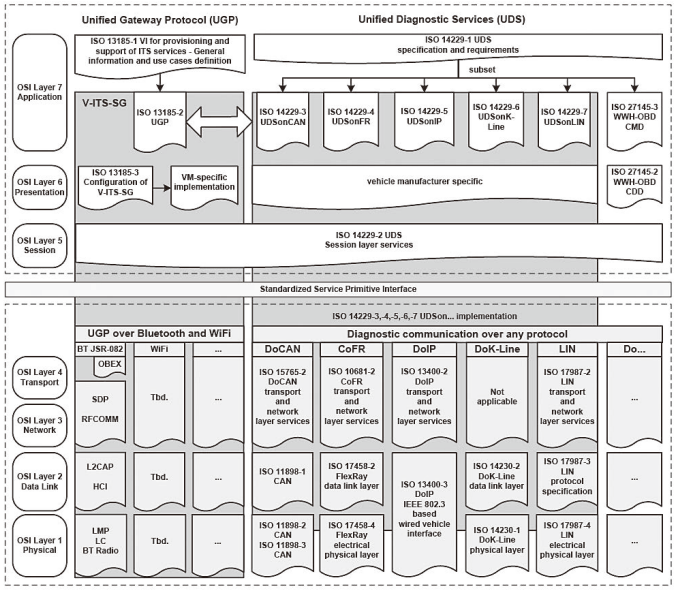


Vehicle Interface for the Provisioning and Support of ITS Services (13185-1 to 4)

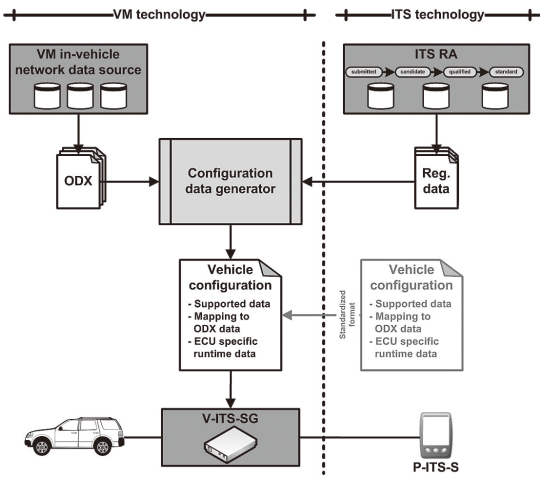
This is a standardization proposal for gateways to allow applications in nomadic devices to use vehicle information. Discussion on this item was conducted in collaboration with TC22/SC3/WG1 (Road vehicles/Electrical devices/Serial data communications, current TC22/SC31) that is in charge of standardization 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 TC22. 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 TC22 and TC204, 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 (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.

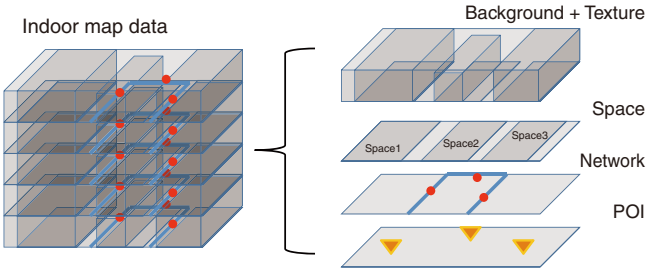


Diagram of indoor map

*POI: Point of Interest

Guidance protocol via personal ITS station for advisory safety systems (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 WG18 work items

	Standardization themes	ISO Number	Contents
1	Classification and management of ITS applications in a global context	TS/DIS 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	TS/DIS 18750	Stipulations for defining Local Dynamic Map (LDM) concepts
5	Roles and responsibilities in the context of co-operative ITS architecture(s)	TS/DIS 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 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	NP/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	Conformance test specifications for CEN ISO TS 17426	PWI TS 21189	Stipulations concerning validation of test suites based on TS17426
11	Using V2I and I2V communications for applications related to signalized intersections	TS 19091	Definition of V2I/I2V messages and related data structures and data elements for applications related to signalized intersections
12	Representative probe data use cases and related gaps in existing probe data standards	PWI 20025	Reports (TRs) that collate use cases concerning messages for probe data and its management, and which also highlight deficiencies in existing standards
13	Dictionary of in-vehicle information (IVI) data structures	TS 19321	Stipulations concerning data structure dictionaries for applications providing in-vehicle information
14	Test architecture	TS 20026	Stipulations concerning the architecture of validation test suites for cooperative systems
15	Guidelines on the use of C-ITS standards for hybrid communications	AWI TR 21186	Guidelines for using mixed multiple communication media with cooperative ITS
16	ITS-station security services for secure session establishment and authentication	AWI TS 21177	Stipulations concerning required items for secure connections between in-vehicle ITS communication station and vehicle information systems
	Data dictionary of vehicle-based information for C-ITS applications	AWI TS 21184	
	Communication profiles for secure connection between an ITS-station and a vehicle	AWI TS 21185	
17	Guidelines on the use of C-ITS standards for hybrid communications	AWI TS 21186	Stipulations concerning the architecture of validation test suites for cooperative systems
18	Conformance test specifications for CEN ISO TS 17426 -- Protocol implementation conformance statements (PICS) pro forma	PWI TS 21189	Stipulations concerning validation of test suites based on TS17426

Background behind the establishment of WG 18

In October 2009, Mandate M/453 on the standardization of cooperative ITS was ordered 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 SWG1 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 conference 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 WG18.

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 (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 (18750) examines definitions of completed concepts based on the above TR, and was published as TS in 2015. International standardization (IS) is planned to be approved in 2017.

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 (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 (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 (17425) and Contextual Speeds (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" (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 conference, 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 (21177) and "Communication profile for secure connection between ITS stations and vehicles" (21185) are standards for ensuring security of communication between vehicles and ITS stations, and "Vehicle information data dictionary for cooperative ITS application" (21185) is a standard 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 (21186) is a standard for centrally handling location, speed and time information as a function of the ITS station facility layer. Discussion of the standard was launched at the October 2015 Potsdam conference.

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 new WG 17 was created within CEN/TC 278 in April. The first meeting was held in November 2016, followed by the second meeting in May 2017. Standardization work was then started. Prior to this, the Urban ITS project team PT1701 meeting was held in Brussels at 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 PT1701, in which items that should be standardized were proposed. This report will be published from CEN as TR (Technical Report). Currently CEN/TC 278/WG 17 includes the following three 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

Each PT also plans to include an electronic legal information provisioning application, "Electronic regulations", in anticipation of universal autonomous transportation. Every PT is working on standardization with the aim of formulating toolkits that will enable the government to realize Smart cities. The third meeting in Milan was held delete is planned in September 2017, followed by the fourth meeting in Paris in December 2017.

List of CEN/TC 278 working groups

CEN/TC 278 Working Group	Working Group	Lead Country	Corresponding TC 204 Working Group
WG1	Electronic Fee Collection(EFC)	Sweden	WG5
WG2	Freight, Logistics and Commercial Vehicle Operations	United Kingdom	WG7
WG3	Public Transport	France	WG8
WG4	Traffic and Traveler Information	United Kingdom	WG10
WG5	Traffic Control Systems	United Kingdom	WG9
WG7	ITS Spatial Data	Germany	WG3
WG8	Road Traffic Data	Netherlands	
WG9	Dedicated Short-Range Communications (DSRC)	Germany	WG16
WG10	Human-Machine Interfacing	Germany	(TC 22/SC 13/WG 8)
WG12	Automatic Vehicle and Equipment Identification (AVI/AEI)	Norway	WG4
WG13	Architecture and Terminology	United Kingdom	WG1
WG14	Recovery of Stolen Vehicles	France	
WG15	eSafety / eCall	United Kingdom	
WG16	Cooperative ITS	Germany	WG18
WG17	Urban ITS	Norway	

Why is Urban ITS needed now?

1. Issues that cities currently face

Seventy percent of the global population lives at close quarters in cities. Various problems encountered in current cities have negative effects on their citizens' standard of living. These are, typically, growing traffic jams 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 jams 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) http://isotc.iso.org/livelink/livelink?func=ll&objId=4230458&objAct ion=browse&sort=subtype

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.

●TC 22 (Road Vehicles) Overview

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 843 TC 22-published international standards as of June 2017, and 238 draft standards are currently under development.

Scope and structure of TC 22

ISO/TC22

Chair: France
P member: 29 countries
O member: 44 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
SC32	Electrical and electronic components/systems	Japan
SC33	Vehicle dynamics and chassis components	Germany
SC34	Powertrain	US
SC35	Lighting and visibility	Italy
SC36	Safety and impact tests	US
SC37	Electrically propelled vehicles	Germany
SC38	Motorcycles and mopeds	Japan
SC39	Ergonomics	US
SC40	Commercial vehicles, buses and trailers	Italy
SC41	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.

Based on this memorandum, TC 22/SC 33/WG 16 (Active safety test equipment) is developing pedestrian dummy standards, and TC 204/WG 14 is developing standards for performance requirements and test methods for pedestrian collision mitigation systems. Both WGs are conducting their tasks successfully. On the other hand, a tug-of-war persists between both TCs for automated driving-related standardization. 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.

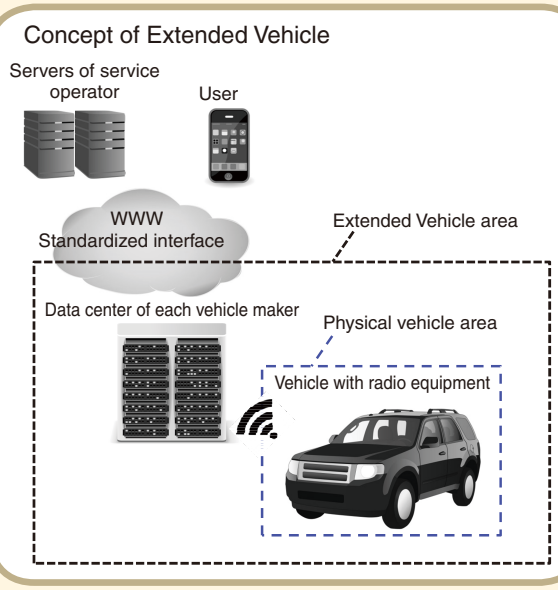
●SC 31 Extended Vehicle Overview

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. As a result of discussions between representatives from TC 22/SC 3 (current SC 31) responsible for standardization of in-vehicle electronic equipment and from TC 204 WG 17, the conclusion was reached that cooperative discussion was required. At the ISO TC22/SC 3 plenary meeting in June 2013, they agreed to the creation of a Joint Working Group (TC 22/SC 3/JWG 2). To foster progress in the discussion, 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. The proposal was approved, after which TC 22/SC 31/WG 6 Extended Vehicle (ExVe)/ Remote Diagnostic Support was created separately from the Joint Working Group. Standardization is currently under discussion.

Lately, with services for road vehicles cooperating with external systems becoming available, standardization of communication between vehicles and external systems is needed for reason of gaining access to vehicle data and of information security for invehicle electronic controlled equipment. New service creation using vehicle data is likely to spread in the future. Over the medium- to long-term, it is possible that various 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. In standardization of ExVe, the risk to information security due to direct access to vehicles is minimized, with the provisioning of vehicle data required for external services being targeted.

Concept of Extended Vehicle



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

Of the items currently in progress under WG 3, PWI 20531 and PWI 20532 were proposed to NP ballot. PWI 20531 and PWI 20532 correspond to AEBS and LKAS test methods respectively. They are required to harmonize with different test methods in each country.

Standardization of dummy target of the rear of the vehicle and pedestrian dummy targets are in progress under WG 16 were DIS was approved in February 2017, and planned to be registered as IS later in 2017. Standardization is under active discussion for items for other dummy targets.

In Japan, the vehicle dynamics committee is responsible for SC 33. The active safety subcommittee under the vehicle dynamics committee is responsible for WG 3 and WG 16. Both are actively participating in the above-mentioned standardization. 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 domestic subcommittees corresponding to TC 204/WG 14 to enable Japan to lead this technology field.

WG3	Standardization themes	ISO Number	Content
1	Test method to evaluate the performance of autonomous braking systems	PWI 20531	Standardizing AEBS test methods
2	Test method to evaluate the performance of lane-keeping assistance systems	PWI 20532	Standardizing LKAS test methods
3	Test method for combined lateral and longitudinal control	PWI 20533	-
WG16	**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 object monitoring and control for active safety and automated/autonomous vehicle testing -- Part 1: Communication protocols and interfaces	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.

●SC 39 (Ergonomics)/WG 8 (Traffic Information and Control System of Human Machine Interface) Program Overview

WG 8 is working on standardization of specifications and design/evaluation methods of the human-machine interface (hereinafter HMI) for in-vehicle information equipment. It is focused primarily on promoting the development of "HMI for autonomous driving," "Measurement/analysis methods of driver viewing behavior," "Terminology definition in naturalistic driving studies," and "Calibration tasks in driving performance and destruction evaluation."

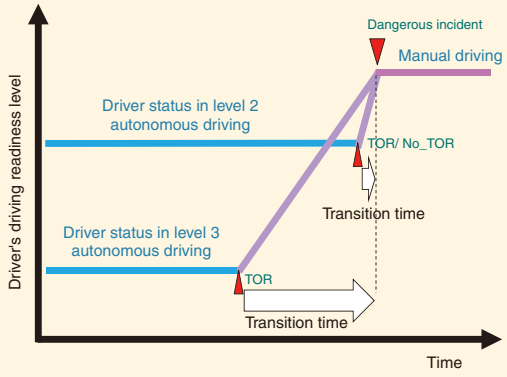
Assuming automated driving level 2 and level 3, since the driver can never be irrelevant to driving even if he or she is employing automated driving, companies and laboratories are competitively developing highly convenient HMI while maintaining safety. Thus, to contribute to research and development at those companies and laboratories, WG 8 is working on the definition of various kinds of terminology in the field of operations that describe driver status during autonomous driving, or is relevant to measuring driver performance when the authority of driving is transferred to the human driver. The following shows the Japan-proposed concept for stepwise transfer of authority. The work on terminology definition is co-chaired by Japan and the United States.

Currently TR (Technical Reports) on terminology definitions are created. In the future, it will be valuable to standardize the unified evaluation of driver performance when authority is transferred, and to allow results from R&D at companies and laboratories to be compared. In fact, at the current stage, it is technologically not easy to define a unified specific evaluation method. Thus Japan insists that what should be done is to establish policies useful for thinking about evaluation methods or performing experiments at companies and laboratories.

In Japan, study of three important issues facing HMI for automated driving is in progress under the SIP-adus project promoted by the Cabinet Office. Two of these are related to (1) Method of measuring the driver's readiness for driving and (2) Method of measuring the degree of the driver's understanding of system functionality. These are truly useful for formulating policies on evaluation methods that can be standardized by ISO. Then, as a domestic program, we are closely working with SIP to bring the outcome of SIP to ISO.

We believe that it will now be necessary to deliver the outcomes of studies at SIP actively and fairly, and to make efforts to gain other countries' understanding to be able to tie our views to ISO.

Diagram of authority transfer at Levels 2 and 3

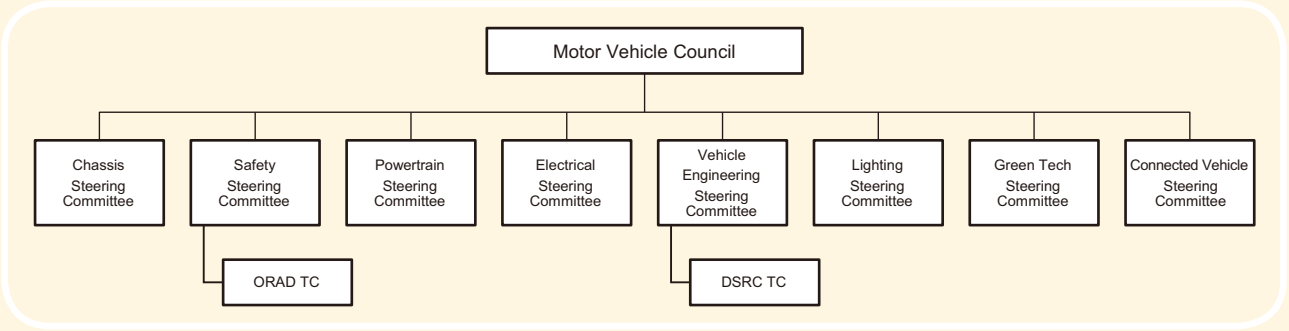


Source: Excerpted from a concept diagram in the SIP automated driving system HMI task force outcome report (April 2016)

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". A wireless power supply method for electric vehicles, etc., is one of the fields the groups are considering for future development.

SAE J3016 Overview

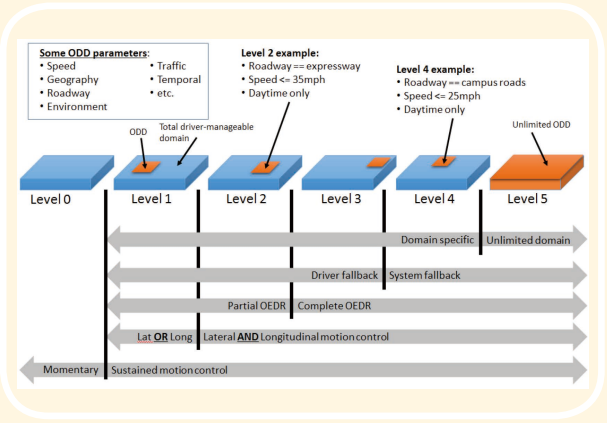
SAE J3016: Since the publication of its first edition (12 pages in total) in January 2014, "Taxonomy and Definitions for Terms Related to Driving Automation Systems for On-Road Motor Vehicles" it has been widely referenced as a key document defining levels of driving automation.

In response to subsequent progress in discussion, a revised edition (30 pages total) was published in September 2016 as a major revision with significantly improved content.

The SAE standard document consists of three steps: Information Report, Recommended Practice, and Standard. Whereas the first edition of J3016 was positioned as Information Report, the revised edition in 2016 is positioned as Recommended Practice, one step higher than the previous edition. In addition, to promote its widespread distribution, the revised edition is distributed free.

As shown in fig 2, automated driving is segmented into six steps: level 0 to level 5. Levels 3 to 5, where the system basically plays the role of monitoring the driving environment, are referred to as automated driving systems.

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.

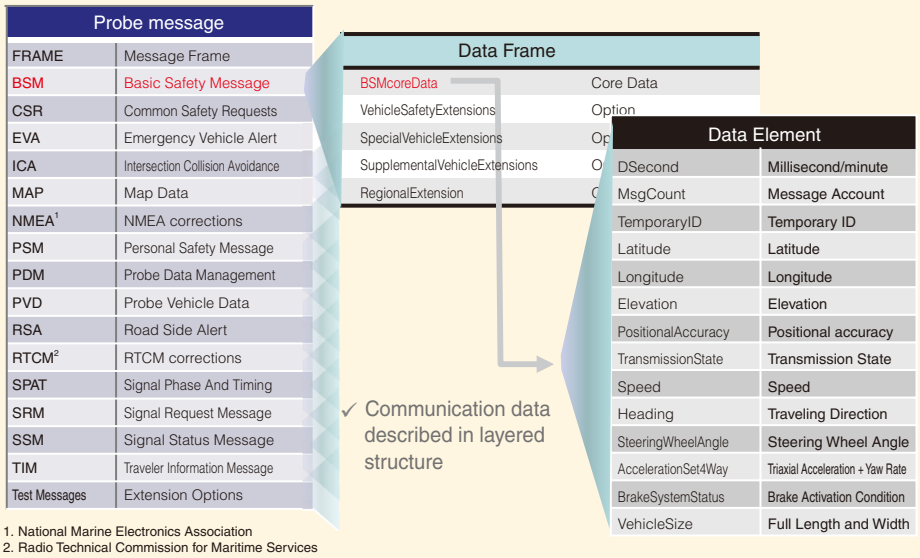
In the proposed legislation notice of FMVSS (Federal Motor Vehicle Safety Standards) No. 150 published from NHTSA in December 2016, the functionality of BSM (Basic Safety Message) transmission/reception in vehicle-to-vehicle communications for small vehicles is proposed as the legal requirement, and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

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

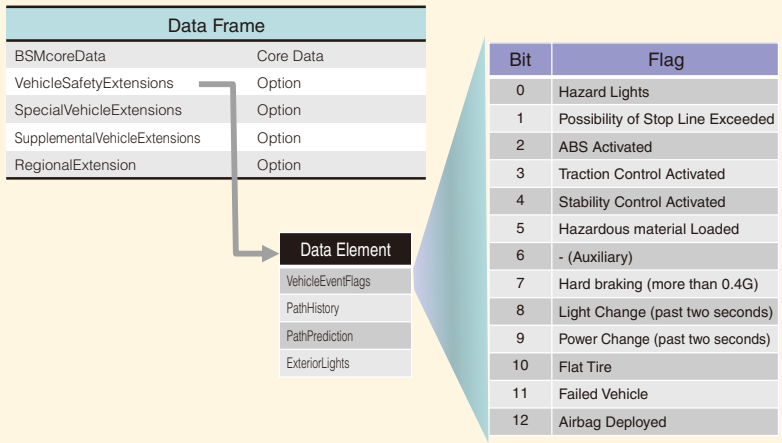
J2945/0 DSRC Common Performance Requirements
- /1 On-Board System Requirements for V2V Safety Communications
- /2 DSRC Requirements for V2V Safety Awareness
- /4 DSRC Messages for Traveler Information and Basic Information Delivery
- /6 Performance Requirements for Cooperative Adaptive Cruise Control 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.

Structure of SAE J2735 DSRC (Dedicated Short-Range Communications) message dictionary



1. National Marine Electronics Association
2. Radio Technical Commission for Maritime Services



ITS-related standardization in ITU

◆What is ITU?

ITS international standardization is under discussion in TC 204, 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 July 2016. 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.

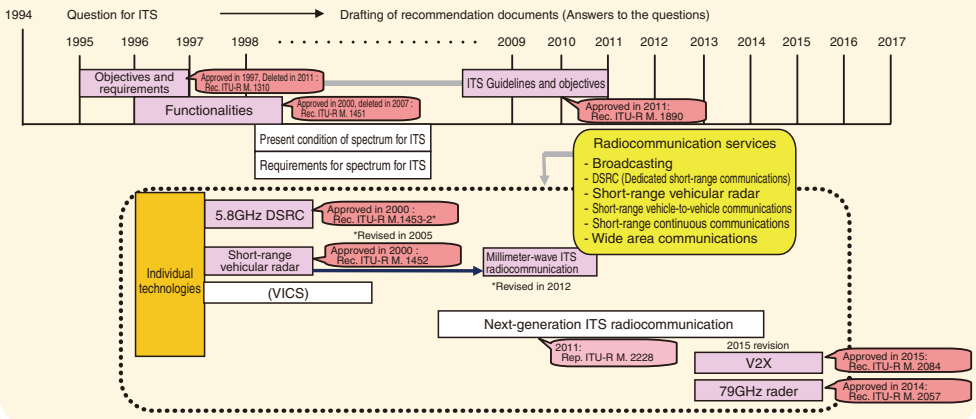
Further, through Japan-led efforts, the Land Mobile Handbook Volume 4 (Intelligent Transport Systems) was published in 2007. It contains all the international trends in ITS radio communications.

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.

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. Currently, the groups concerned are discussing the handling of these items in preparation for the conference 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)
ITS㊀Guidelines 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, FGFITCAR II and FGCarCom, which discussed voice calls from vehicles, and FGDriver 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 SG 12.

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
SG 12 (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 application)	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.
SG 17 (Security)	In charge of security of the info-communication network. Discussing standardization of security guideline in ITS communications.

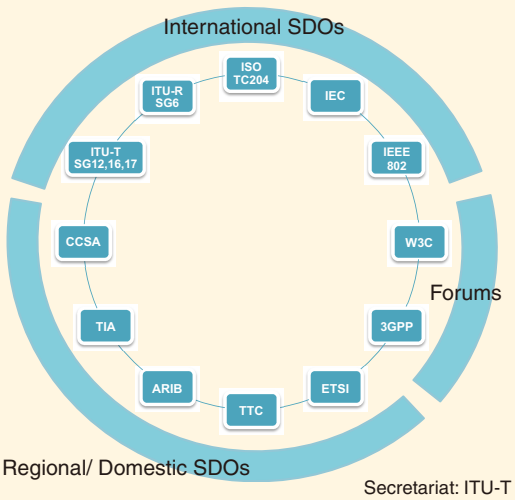
Outline of recommendation documents

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.
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 SG 16 in August 2011, 19 CITS meetings have been held as of March 2017, 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 leading 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	Standardizations for 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	Standardizations for Wireless Personal Area Network (WPAN)	Deals with technologies for wireless communication within a room (Several to several tens meters)
802.16	Standardizations for Wireless Metropolitan Area Network (WMAN)	Deals with technologies for wireless communication within a region like a city (Several to several ten kms)
802.20	Standardizations for Mobile Broadband Wireless Access (MBWA)	Deals with broadband IP wireless communication in high speed mobile environments such as vehicles
802.21	Standardizations for handover between heterogeneous networks	Deals with technologies to continue communication by switching across different kind of networks
802.22	Standardizations for 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 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 Rule making (ANPRM) and started procedures to systematize the installation of IEEE802.11p-based vehicle-to-vehicle communication devices in new compact vehicles. Draft rules were released as NPRM and opened for public comment in December 2016. The rules governing NPRM are 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.

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 IEEE802.11a)
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 method	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 technology 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 Project 1609

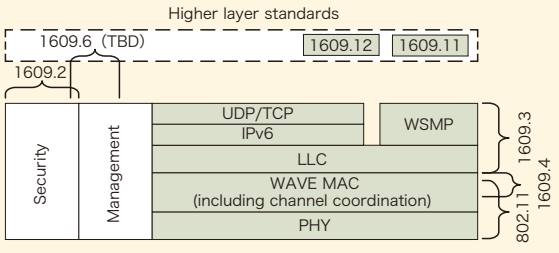
The ITS communication system in the US is referred to as WAVE (Wireless Access in Vehicular Environments). While WAVE communication media will use the above-mentioned IEEE 802.11p, the other parts are likely to use the IEEE 1609 standards prepared in IEEE project 1609.

Standards 1609.0 to 1609.4, 1609.11, and 1609.12 have been completed and issued, but some parts are being revised. 1609.1 is being newly developed as 1609.6.

Table 3 Standardization Items in IEEE 1609

1609.0	WAVE Architecture
1609.1	Remote Management Services (abandoned)
1609.2	Security Services for Application and Management Messages
1609.3	Networking Services
1609.4	Multi-Channel Operations
1609.5	Communication Manager
1609.6	Remote Management Services
1609.11	Over-the-Air Data Exchange Protocol for ITS
1609.12	Provider Service Identifier (PSID) Allocations

Overall WAVE architecture



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 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

WG1	Application requirements and services
WG2	Architecture and cross-layer items
WG3	Networking and Transport
WG4	Communication media and media-related items
WG5	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 in-vehicle 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. In 2016, a large event was held in Livorno, a harbor city in Italy. The effectiveness of the following standards was verified in the event. These define technologies that mitigate the interference between CEN DSRC (5795 to 5815 MHz) and ETSI ITS G5 (5855 to 5925 MHz) used for fee and toll collection.

- ETSI TS 102 792: Mitigation techniques to prevent interference between European CEN Dedicated Short-Range Communication (CEN DSRC) equipment and Intelligent Transport Systems (ITS) operating in the 5 GHz frequency range

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

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)

TC 204 List of Work Items as of June 2017

WG	ISO Number	Title	Stage						Published
			PWI	NP	WD	CD	DIS	FDIS	
1	TR 12859:2009	System architecture -- Privacy aspects in ITS standards and systems							○
1	NP 13189	Business Case Template for ITS Projects		○					
1	ISO 14813-1 :2015	Reference model architecture(s) for the ITS sector -- Part 1: ITS service domains, service groups and services							○
1	ISO 14813-5 :2010	Reference model architecture(s) for the ITS sector -- Part 5: Requirements for architecture description in ITS standards							○
1	DIS 14813-5	Reference model architecture(s) for the ITS sector -- Part 5: Requirements for architecture description in ITS standards					○		
1	ISO 14813-6 :2009	Reference model architecture(s) for the ITS sector -- Part 6: Data presentation in ASN.1							○
1	DIS 14813-6	Reference model architecture(s) for the ITS sector -- Part 6: Data presentation in ASN.1					○		
1	PWI 14813-7	Reference model architecture(s) for the ITS sector -- Part 7: ITS standards framework	○						
1	ISO 14817-1 :2015	ITS central data dictionaries -- Part 1: Requirements for ITS data definitions							○
1	ISO 14817-2 :2015	ITS central data dictionaries -- Part 2: Governance of the Central ITS Data Concept Registry							○
1	FDIS 14817-3	ITS data dictionaries -- Part 3: Object identifier assignments for ITS data concepts						○	
1	NP 17419-2	Identifiers -- Part 2: Management and operation of registries		○					
1	TR 17452:2007	Using UML for defining and documenting ITS/TICS interfaces							○
1	TR 17465-1 :2014	Cooperative ITS -- Part 1: Terms and definitions							○
1	TR 17465-2 :2015	Cooperative ITS -- Part 2: Guidelines for standards documents							○
1	TR 17465-3 :2015	Cooperative ITS -- Part 3: Release procedures for standards documents							○
1	ISO 24097-1 :2009	Using web services (machine-machine delivery) for ITS service delivery -- Part 1: Realization of interoperable web services							○
1	ISO 24097-1	Using web services (machine-machine delivery) for ITS service delivery -- Part 1: Realization of interoperable web services							○
1	TR 24097-2 :2015	Using web services (machine-machine delivery) for ITS service delivery -- Part 2: Elaboration of interoperable web services' interfaces							○
1	DTR 24097-3	Using web services (machine-machine delivery) for ITS service delivery -- Part 3: Quality of service				○			
1	TR 24098:2007	System architecture, taxonomy and terminology -- Procedures for developing ITS deployment plans utilizing ITS system architecture							○
1	TR 24529:2008	Systems architecture -- Use of unified modelling language (UML) in ITS International Standards and deliverables							○
1	ISO 24531:2013	System architecture, taxonomy and terminology -- Using XML in ITS standards, data registries and data dictionaries							○
1	NP 24531-2	System architecture, taxonomy and terminology -- Part 2: Using ASN.1 in ITS standards, data registries and data dictionaries		○					
1	TR 24532:2006	Systems architecture, taxonomy and terminology -- Using CORBA (Common Object Request Broker Architecture) in ITS standards, data registries and data dictionaries							○
1	TR 25100:2012	Systems architecture -- Harmonization of ITS data concepts							○
1	TR 25102:2008	System architecture -- 'Use Case' pro-forma template							○
1	TR 25104:2008	System architecture, taxonomy, terminology and data modelling -- Training requirements for ITS architecture							○
1	TR 26999:2012	Systems architecture -- Use of process-oriented methodology in ITS International Standards and other deliverables							○
1	TR 28682:2008	Joint APEC-ISO study of progress to develop and deploy ITS standards							○
3	ISO 14296 :2016	Extension of map database specifications for applications of cooperative ITS							○
3	ISO 14825 :2011	Geographic Data Files (GDF) -- GDF5.0							○
3	ISO 17267 :2009	Navigation systems -- Application programming interface (API)							○
3	ISO 17572-1:2015	Location referencing for geographic databases -- Part 1: General requirements and conceptual model							○
3	ISO 17572-2 :2015	Location referencing for geographic databases -- Part 2: Pre-coded location references (pre-coded profile)							○
3	DIS 17572-2	Location referencing for geographic databases -- Part 2: Pre-coded location references (pre-coded profile)					○		
3	ISO 17572-3 :2015	Location referencing for geographic databases -- Part 3: Dynamic location references (dynamic profile)							○

WG	ISO Number	Title	Stage						Published
			PWI	NP	WD	CD	DIS	FDIS	
3	AWI 17572-4	Location referencing for geographic databases -- Part 4: Lane-level location referencing			○				
3	CD 19297-1	Shareable geospatial databases for ITS applications -- Part 1: Framework				○			
3	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							○
3	CD 20524-1	Geographic Data Files (GDF) -- GDF5.1 -- Part 1: Application independent map data shared between multiple sources				○			
3	AWI 20524-2	Geographic Data Files (GDF) GDF5.1 -- Part 2: Map data used in automated driving systems, Cooperative ITS, and multi-modal transport			○				
3	PRF TR 21718	Spatio-temporal data dictionary for cooperative ITS and automated driving systems				○			
3	PWI 22726	Dynamic events and map database specifications for applications of automated driving systems, cooperative ITS, and advanced road/traffic management systems	○						
4	ISO 14814 :2006	Automatic vehicle and equipment identification -- Reference architecture and terminology							○
4	ISO 14815 :2005	Automatic vehicle and equipment identification -- System specifications							○
4	ISO 14816 :2005	Automatic vehicle and equipment identification -- Numbering and data structure							○
4	ISO 14816:2005/ DAmd 1	Automatic vehicle and equipment identification -- Numbering and data structure -- Amendment 1				○			
4	ISO 17261:2012	Automatic vehicle and equipment identification -- Intermodal goods transport architecture and terminology							
4	ISO 17262 :2012	Automatic vehicle and equipment identification -- Numbering and data structures							
4	ISO 17262:2012/ DAmd 1	Automatic vehicle and equipment identification -- Numbering and data structures -- Amendment 1							
4	ISO 17262:2012/ Cor 1:2013	Automatic vehicle and equipment identification -- Numbering and data structures -- Technical Corrigendum 1							
4	ISO 17263 :2012	Automatic vehicle and equipment identification -- System parameters							
4	ISO 17263:2012/ Cor 1:2013	Automatic vehicle and equipment identification -- System parameters -- Technical Corrigendum 1							
4	ISO 17264:2009/ DAmd 1	Automatic vehicle and equipment identification -- Interfaces -- Amendment 1							
4	ISO 17264 :2009	Automatic vehicle and equipment identification -- Interfaces							
4	ISO 24534- 1:2010	Automatic vehicle and equipment identification -- Electronic registration identification (ERI) for vehicles -- Part 1: Architecture							
4	ISO 24534-2 :2010	Automatic vehicle and equipment identification -- Electronic registration identification (ERI) for vehicles -- Part 2: Operational requirements							
4	ISO 24534-3 :2016	Automatic vehicle and equipment identification -- Electronic registration identification (ERI) for vehicles -- Part 3: Vehicle data							
4	ISO 24534-4 :2010	Automatic vehicle and equipment identification -- Electronic registration identification (ERI) for vehicles -- Part 4: Secure communications using asymmetrical techniques							
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							
4	ISO 24534-5 :2011	Automatic vehicle and equipment identification -- Electronic Registration Identification (ERI) for vehicles -- Part 5: Secure communications using symmetrical techniques							○
4	ISO 24534-5 :2011/DAmd 1	Automatic vehicle and equipment identification -- Electronic Registration Identification (ERI) for vehicles -- Part 5: Secure communications using symmetrical techniques -- Amendment 1				○			
4	ISO 24535 :2007	Automatic vehicle identification -- Basic electronic registration identification (Basic ERI)							○
5	ISO 12813 :2015	Electronic fee collection -- Compliance check communication for autonomous systems							○
5	ISO 12813:2015/ Amd 1:2017	Electronic fee collection -- Compliance check communication for autonomous systems -- Amendment 1							○
5	ISO 12855 :2015	Electronic fee collection -- Information exchange between service provision and toll charging							○
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							○
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							○
5	ISO 13141 :2015	Electronic fee collection -- Localisation augmentation communication for autonomous systems							○
5	ISO 13141:2015/ Amd 1:2017	Electronic fee collection -- Localisation augmentation communication for autonomous systems -- Amendment 1							○
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							○
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							○
5	TS 14904:2002	Electronic fee collection (EFC) -- Interface specification for clearing between operators							○
5	ISO 14906 :2011	Electronic fee collection -- Application interface definition for dedicated short-range communication							○

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			PWI	NP	WD	CD	DIS	FDIS	
5	ISO 14906:2011/ Cor 1:2013	Electronic fee collection -- Application interface definition for dedicated short-range communication -- Technical Corrigendum 1							○
5	ISO 14906:2011/ Amd 1:2015	Electronic fee collection -- Application interface definition for dedicated short-range communication -- Amendment 1							○
5	DIS 14906	Electronic fee collection -- Application interface definition for dedicated short-range communication					○		
5	TS 14907-1 :2015	Electronic fee collection -- Test procedures for user and fixed equipment -- Part 1: Description of test procedures							○
5	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							○
5	TS 16401-1 :2012	Electronic fee collection -- Evaluation of equipment for conformity to TS 17575-2 -- Part 1: Test suite structure and test purposes							○
5	PRF TR 16401-1	Electronic fee collection -- Evaluation of equipment for conformity to TS 17575-2 -- Part 1: Test suite structure and test purposes				○			
5	TS 16401-2 :2012	Electronic fee collection -- Evaluation of equipment for conformity to TS 17575-2 -- Part 2: Abstract test suite							○
5	PRF TR 16401-2	Electronic fee collection -- Evaluation of equipment for conformity to TS 17575-2 -- Part 2: Abstract test suite				○			
5	TS 16407-1 :2011	Electronic fee collection -- Evaluation of equipment for conformity to TS 17575-1 -- Part 1: Test suite structure and test purposes							○
5	PRF 16407-1	Electronic fee collection -- Evaluation of equipment for conformity to TS 17575-1 -- Part 1: Test suite structure and test purposes						○	
5	TS 16407-2 :2012	Electronic fee collection -- Evaluation of equipment for conformity to TS 17575-1 -- Part 2: Abstract test suite							○
5	DIS 16407-2	Electronic fee collection -- Evaluation of equipment for conformity to ISO 17575-1 -- Part 2: Abstract test suite					○		
5	TS 16410-1 :2011	Electronic fee collection -- Evaluation of equipment for conformity to TS 17575-3 -- Part 1: Test suite structure and test purposes							○
5	TS 16410-2 :2012	Electronic fee collection -- Evaluation of equipment for conformity to TS 17575-3 -- Part 2: Abstract test suite							○
5	PRF 16410-1	Electronic fee collection -- Evaluation of equipment for conformity to ISO 17575-3 -- Part 1: Test suite structure and test purposes						○	
5	DIS 16410-2	Electronic fee collection -- Evaluation of equipment for conformity to ISO 17575-3 -- Part 2: Abstract test suite					○		
5	TS 16785:2014	Electronic Fee Collection (EFC) -- Interface definition between DSRC-OBE and external in-vehicle devices							○
5	TS 17444-1 :2012	Electronic fee collection -- Charging performance -- Part 1: Metrics							○
5	PRF TS 17444-1	Electronic fee collection -- Charging performance -- Part 1: Metrics						○	
5	TS 17444-2 :2013	Electronic fee collection -- Charging performance - Part 2: Examination Framework							○
5	PRF TS 17444-2	Electronic fee collection -- Charging performance -- Part 2: Examination framework						○	
5	ISO 17573 :2010	Electronic fee collection -- Systems architecture for vehicle-related tolling							○
5	CD 17573	Electronic fee collection -- Systems architecture for vehicle-related tolling				○			
5	TS 17574:2017	Electronic fee collection -- Guidelines for security protection profiles							○
5	ISO 17575-1:2016	Electronic fee collection -- Application interface definition for autonomous systems -- Part 1: Charging							○
5	ISO 17575-2 :2016	Electronic fee collection -- Application interface definition for autonomous systems -- Part 2: Communication and connection to the lower layers							○
5	ISO 17575-3 :2016	Electronic fee collection -- Application interface definition for autonomous systems -- Part 3: Context data							○
5	TS 19299:2015	Electronic fee collection -- Security framework							○
5	TR 19639:2015	Electronic fee collection -- Investigation of EFC standards for common payment schemes for multi-modal transport services							○
5	CD TR 21190	Electronic fee collection -- Investigation of charging policies and technologies for future standardization				○			
5	NP TS 21192	Electronic fee collection -- Support for traffic management		○					
5	NP TS 21193	Electronic fee collection -- Requirements for EFC application interfaces on common media		○					
5	DTS 21719-1	Electronic fee collection -- Personalization of on-board equipment -- Part 1: Framework				○			
5	DTS 21719-2	Electronic fee collection -- Personalization of on-board equipment -- Part 2: Using dedicated short-range communication				○			
5	PWI TS 21719-3	Electronic fee collection -- Personalization of on-board equipment -- Part 3: Using bluetooth	○						
5	PRF 25110	Electronic fee collection -- Interface definition for on-board account using integrated circuit card (ICC)						○	
5	TS 25110:2013	Electronic fee collection -- Interface definition for on-board account using integrated circuit card (ICC)							○
7	ISO 15638-1:2012	Framework for collaborative Telematics Applications for Regulated commercial freight Vehicles (TARV) -- Part 1: Framework and architecture							○
7	ISO 15638-2 :2013	Framework for collaborative Telematics Applications for Regulated commercial freight Vehicles (TARV) -- Part 2: Common platform parameters using CALM							○

WG	ISO Number	Title	Stage						Published
			PWI	NP	WD	CD	DIS	FDIS	
7	ISO 15638-3 :2013	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							○
7	CD 15638-4	Framework for cooperative telematics applications for regulated commercial freight vehicles (TARV) -- Part 4: System security requirements				○			
7	ISO 15638-5 :2013	Framework for collaborative Telematics Applications for Regulated commercial freight Vehicles (TARV) -- Part 5: Generic vehicle information							○
7	ISO 15638-6 :2014	Framework for collaborative Telematics Applications for Regulated commercial freight Vehicles (TARV) -- Part 6: Regulated applications							○
7	ISO 15638-7 :2013	Framework for collaborative Telematics Applications for Regulated commercial freight Vehicles (TARV) -- Part 7: Other applications							○
7	ISO 15638-8 :2014	Framework for cooperative telematics applications for regulated vehicles (TARV) -- Part 8: Vehicle access management							○
7	TS 15638-9 :2013	Framework for collaborative Telematics Applications for Regulated commercial freight Vehicles (TARV) -- Part 9: Remote electronic tachograph monitoring (RTM)							○
7	DIS 15638-9	Framework for cooperative telematics applications for regulated commercial freight vehicles (TARV) -- Part 9: Remote electronic tachograph monitoring (RTM)					○		
7	ISO 15638-10 :2017	Framework for cooperative telematics applications for regulated commercial freight vehicles (TARV) -- Part 10: Emergency messaging system/eCall							○
7	ISO 15638-11 :2014	Framework for cooperative telematics applications for regulated vehicles (TARV) -- Part 11: Driver work records							○
7	ISO 15638-12 :2014	Framework for cooperative telematics applications for regulated vehicles (TARV) -- Part 12: Vehicle mass monitoring							○
7	TS 15638-13 :2015	Framework for cooperative telematics applications for regulated commercial freight vehicles (TARV) -- Part 13: "Mass" information for jurisdictional control and enforcement							○
7	ISO 15638-14 :2014	Framework for cooperative telematics applications for regulated vehicles (TARV) -- Part 14: Vehicle access control							○
7	ISO 15638-15 :2014	Framework for cooperative telematics applications for regulated vehicles (TARV) -- Part 15: Vehicle location monitoring							○
7	ISO 15638-16 :2014	Framework for cooperative telematics applications for regulated vehicles (TARV) -- Part 16: Vehicle speed monitoring							○
7	ISO 15638-17 :2014	Framework for cooperative telematics applications for regulated vehicles (TARV) -- Part 17: Consignment and location monitoring							○
7	ISO 15638-18 :2017	Framework for cooperative telematics applications for regulated commercial freight vehicles (TARV) -- Part 18: ADR (Dangerous Goods)							○
7	TS 15638-19 :2013	Framework for collaborative Telematics Applications for Regulated commercial freight Vehicles (TARV) -- Part 19: Vehicle parking facilities (VPF)							○
7	AWI 15638-20	Framework for cooperative telematics applications for regulated commercial freight vehicles (TARV) -- Part 20: Weigh in motion (WIM)			○				
7	DIS 15638-21	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					○		
7	NP 15638-22	Framework for cooperative telematics applications for regulated vehicles (TARV) -- Part 22: Freight vehicle stability monitoring		○					
7	TS 17187:2013	Electronic information exchange to facilitate the movement of freight and its intermodal transfer -- Governance rules to sustain electronic information exchange methods							○
7	ISO 17687 :2007	General fleet management and commercial freight operations -- Data dictionary and message sets for electronic identification and monitoring of hazardous materials/dangerous goods transportation							○
7	ISO 18495-1:2016	Commercial freight -- Automotive visibility in the distribution supply chain -- Part 1: Architecture and data definitions							○
7	TS 24533:2012	Electronic information exchange to facilitate the movement of freight and its intermodal transfer -- Road transport information exchange methodology							○
7	NP 24533	Electronic information exchange to facilitate the movement of freight and its intermodal transfer -- Road transport information exchanges for supply chain time-sensitive delivery (road - air freight - road)		○					
7	ISO 26683-1:2013	Freight land conveyance content identification and communication -- Part 1: Context, architecture and referenced standards							○
7	ISO 26683-2:2013	Freight land conveyance content identification and communication -- Part 2: Application interface profiles							○
7	AWI 26683-3	Freight land conveyance content identification and communication -- Part 3: Monitoring cargo condition information during transport			○				
8	TR 14806: 2013	Public transport requirements for the use of payment applications for fare media							○
8	ISO 17185-1:2014	Public transport user information -- Part 1: Standards framework for public information systems							○
8	TR 17185-2 :2015	Public transport user information -- Part 2: Public transport data and interface standards catalogue and cross references							○
8	TR 17185-3 :2015	Public transport user information -- Part 3: Use cases for journey planning systems and their interoperation							○
8	NP 17185-4	Public transport user information -- Part 4: Use cases for mobility journey planning systems and their inter-operation		○					
8	NP 17185-5	Part 5: Governance of mandatory public transport standards		○					
8	NP 17185-6	Part 6: Modelling stops and network topology		○					
8	NP 17185-7	Part 7: Conformance test of interoperable fare management system (ISO 24014-1)		○					

WG	ISO Number	Title	Stage						Published
			PWI	NP	WD	CD	DIS	FDIS	
8	NP 17185-8	Part 8: Framework message architecture		○					
8	TR 19083-1 :2016	Emergency evacuation and disaster response and recovery -- Part 1: Framework and concept of operation							○
8	NP 19083-3	Public transport -- Emergency evacuation and disaster response and recovery -- Part 3: Use cases		○					
8	TR 20526	Account-based ticketing state of the art report							○
8	AWI TR 20527	Interoperability between IFM systems and NFC mobile devices			○				
8	PWI 20528	Standard identifier formats for public transport media	○						
8	PWI 20989	Public transport -- Conformance testing for fare management systems	○						
8	PWI 21344	Public transport - Emergency services E-Call device for emergency on connected vehicles using ITS station	○						
8	PWI 21345	Charging infrastructure for public transport electric bus for Bus Rapid Transit (BRT) applications	○						
8	AWI TR 21724-1	Common transport service account systems -- Part 1: Framework and use cases	○						
8	PWI 21733	Public transport -- Synchronization of terminology and role models	○						
8	PWI 21734	Public transport -- Performance testing for connectivity and safety functions of automated driving bus	○						
8	NP 22047	Bike-share data exchange		○					
8	ISO 22951:2009	Data dictionary and message sets for preemption and prioritization signal systems for emergency and public transport vehicles (PRESTO)							○
8	ISO 24014-1:2015	Public transport -- Interoperable fare management system -- Part 1: Architecture							○
8	NP 24014-1	Public transport -- Interoperable fare management system -- Part 1: Architecture		○					
8	TR 24014-2 :2013	Public transport -- Interoperable fare management system -- Part 2: Business practices							○
8	TR 24014-3 :2013	Public transport -- Interoperable fare management system -- Part 3: Complementary concepts to Part 1 for multi-application media							○
9	ISO 10711: 2012	Interface Protocol and Message Set Definition between Traffic Signal Controllers and Detectors							○
9	ISO 14827-1:2005	Data interfaces between centres for transport information and control systems -- Part 1: Message definition requirements							○
9	ISO 14827-2 :2005	Data interfaces between centres for transport information and control systems -- Part 2: DATEX-ASN							○
9	DIS 14827-3	Data interfaces between centres for transport information and control systems -- Part 3: Data interfaces between centres for Intelligent Transport Sytems (ITS) using XML					○		
9	ISO 15784-1:2008	Data exchange involving roadside modules communication -- Part 1: General principles and documentation framework of application profiles							○
9	ISO 15784-2 :2015	Data exchange involving roadside modules communication -- Part 2: Centre to field device communications using SNMP							○
9	ISO 15784-3 :2008	Data exchange involving roadside modules communication -- Part 3: Application profile-data exchange (AP-DATEX)							○
9	TR 16786:2015	The use of simulation models for evaluation of traffic management systems -- Input parameters and reporting template for simulation of traffic signal control systems							○
9	CD 19082	Definition of data elements and data frames between roadside units and signal controllers for cooperative signal control				○			
9	NP TS 19468	Data interfaces between centres for transport information and control systems -- Platform independent model specifications for data exchange protocols for transport information and control systems		○					
9	PWI 20684-1	Roadside modules SNMP data interface -- Part 1: Overview	○						
9	NP 20684-2	Roadside modules SNMP data interface -- Part 2: Generalized field devices -- basic management		○					
9	AWI 20684-10	Roadside modules SNMP data interface -- Part 10: Variable message signs			○				
9	TR 21707:2008	Integrated transport information, management and control -- Data quality in ITS systems							○
9	PWI 22741-1	Roadside modules AP-DATEX data interface -- Part 1: Overview	○						
9	PWI 22741-2	Roadside modules AP-DATEX data interface -- Part 2: Generalized field devices - basic management	○						
9	PWI 22741-10	Roadside modules AP-DATEX data interface -- Part 10: Variable message signs	○						
10	ISO 14819-1:2013	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							○
10	ISO 14819-2 :2013	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							○
10	ISO 14819-3 :2013	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							○
10	ISO 14819-6 :2006	TTI messages via traffic message coding -- Part 6: Encryption and conditional access for the Radio Data System -- Traffic Message Channel ALERT C coding							○
10	ISO 14823 :2017	Graphic data dictionary							○

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			PWI	NP	WD	CD	DIS	FDIS	
10	AWI TR 14823-2	Graphic data dictionary -- Part 2: Examples			○				
10	TS 18234-1 :2013	Traffic and travel information via transport protocol experts group, generation 1 (TPEG1) binary data format -- Part 1: Introduction, numbering and versions (TPEG1-INV)							○
10	TS 18234-2 :2013	Traffic and travel information via transport protocol experts group, generation 1 (TPEG1) binary data format -- Part 2: Syntax, semantics and framing structure (TPEG1-SSF)							○
10	TS 18234-3 :2013	Traffic and travel information via transport protocol experts group, generation 1 (TPEG1) binary data format -- Part 3: Service and network information (TPEG1-SNI)							○
10	TS 18234-4 :2006	TTI via Transport Protocol Expert Group (TPEG) data-streams -- Part 4: Road Traffic Message (RTM) application							○
10	TS 18234-5 :2006	TTI via Transport Protocol Expert Group (TPEG) data-streams -- Part 5: Public Transport Information (PTI) application							○
10	TS 18234-6 :2006	TTI via Transport Protocol Expert Group (TPEG) data-streams -- Part 6: Location referencing applications							○
10	TS 18234-7 :2013	Traffic and travel information via transport protocol experts group, generation 1 (TPEG1) binary data format -- Part 7: Parking information (TPEG1-PKI)							○
10	TS 18234-8 :2012	Traffic and travel information via transport protocol experts group, generation 1 (TPEG1) binary data format -- Part 8: Congestion and Travel Time application (TPEG1-CTT)							○
10	TS 18234-9 :2013	Traffic and travel information via transport protocol experts group, generation 1 (TPEG1) binary data format -- Part 9: Traffic event compact (TPEG1-TEC)							○
10	TS 18234-10 :2013	Traffic and travel information via transport protocol experts group, generation 1 (TPEG1) binary data format -- Part 10: Conditional access information (TPEG1-CAI)							○
10	TS 18234-11 :2013	Traffic and Travel Information (TTI) via transport protocol experts group, generation 1 (TPEG1) binary data format -- Part 11: Location Referencing Container (TPEG1-LRC)							○
10	TS 21219-1 :2016	Traffic and travel information (TTI) via transport protocol experts group, generation 2 (TPEG2) -- Part 1: Introduction, numbering and versions (TPEG2-INV)							○
10	TS 21219-2 :2014	Traffic and travel information (TTI) via transport protocol experts group, generation 2 (TPEG2) -- Part 2: UML modelling rules							○
10	TS 21219-3 :2015	Traffic and travel information (TTI) via transport protocol experts group, generation 2 (TPEG2) -- Part 3: UML to binary conversion rules							○
10	TS 21219-4 :2015	Traffic and travel information (TTI) via transport protocol experts group, generation 2 (TPEG2) -- Part 4: UML to XML conversion rules							○
10	TS 21219-5 :2015	Traffic and travel information (TTI) via transport protocol experts group, generation 2 (TPEG2) -- Part 5: Service framework (TPEG2-SFW)							○
10	TS 21219-6 :2015	Traffic and travel information(TTI) via transport protocol experts group, generation 2 (TPEG2) -- Part 6: Message management container (TPEG2-MMC)							○
10	TS 21219-7 :2017	Traffic and travel information (TTI) via transport protocol experts group, generation 2 (TPEG2) -- Part 7: Location referencing container (TPEG2-LRC)							○
10	TS 21219-9 :2016	Traffic and travel information (TTI) via transport protocol experts group, generation 2 (TPEG2) -- Part 9: Service and network information (TPEG2-SNI)							○
10	TS 21219-10 :2016	Traffic and travel information (TTI) via transport protocol experts group, generation 2 (TPEG2) -- Part 10: Conditional access information (TPEG2-CAI)							○
10	TS 21219-14 :2016	Traffic and travel information (TTI) via transport protocol experts group, generation 2 (TPEG2) -- Part 14: Parking information application (TPEG2-PKI)							○
10	TS 21219-15 :2016	Traffic and travel information (TTI) via transport protocol experts group, generation 2 (TPEG2) -- Part 15: Traffic event compact (TPEG2-TEC)							○
10	TS 21219-16 :2016	Traffic and travel information via transport protocol exports group, generation 2 (TPEG2) -- Part 16: Fuel price information and availability (TPEG2-FPI)							○
10	TS 21219-18 :2015	Traffic and travel information (TTI) via transport protocol experts group, generation 2 (TPEG2) -- Part 18: Traffic flow and prediction application (TPEG2-TFP)							○
10	TS 21219-19 :2016	Traffic and travel information (TTI) via transport protocol experts group, generation 2 (TPEG2) -- Part 19: Weather information (TPEG2-WEA)							○
10	NP TS 21219-20	Traffic and travel information (TTI) via transport protocol expert group, generation 2 (TPEG2) -- Part 20: Extended TMC location referencing (TPEG2-ETL)		○					
10	PRF TS 21219-21	Traffic and travel information via transport protocol experts group, generation 2 (TPEG2) -- Part 21: Geographic location referencing (TPEG-GLR)						○	
10	TS 21219-22 :2017	Traffic and travel information (TTI) via transport protocol experts group, generation 2 (TPEG2) -- Part 22: OpenLR location referencing (TPEG2-OLR)							○
10	TS 21219-23 :2016	Traffic and travel information (TTI) via transport protocol experts group, generation 2 (TPEG2) -- Part 23: Roads and multimodal routes (TPEG2-RMR)							○
10	TS 21219-24 :2017	Traffic and travel information (TTI) via transport protocol experts group, generation 2 (TPEG2) -- Part 24: Light encryption (TPEG2-LTE)							○
10	TS 21219-25 :2017	Traffic and travel information (TTI) via transport protocol experts group, generation 2 (TPEG2) -- Part 25: Electromobility charging infrastructure (TPEG2-EMI)							○
10	NP TS 21219-26	Traffic and travel information via transport protocol experts group, generation 2 (TPEG2) -- Part 26: Vigilance location information (TPEG2-VLI)		○					
10	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							○
10	TS 24530-2 :2006	Traffic and Travel Information (TTI) -- TTI via Transport Protocol Experts Group (TPEG) Extensible Markup Language (XML) -- Part 2: tpeg-locML							○
10	TS 24530-3 :2006	Traffic and Travel Information (TTI) -- TTI via Transport Protocol Experts Group (TPEG) Extensible Markup Language (XML) -- Part 3: tpeg-rtmML							○
10	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	ISO Number	Title	Stage						Published
			PWI	NP	WD	CD	DIS	FDIS	
11	ISO 15075 :2003	In-vehicle navigation systems -- Communications message set requirements							○
11	TR 17384:2008	Interactive centrally determined route guidance (CDRG) -- Air interface message set, contents and format							○
11	ISO 24099 :2011	Navigation data delivery structures and protocols							○
14	ISO 11067 :2015	Curve speed warning systems (CSWS) -- Performance requirements and test procedures							○
14	ISO 11270 :2014	Lane keeping assistance systems (LKAS) -- Performance requirements and test procedures							○
14	ISO 15622 :2010	Adaptive Cruise Control systems -- Performance requirements and test procedures							○
14	DIS 15622	Adaptive cruise control systems -- Performance requirements and test procedures					○		
14	ISO 15623 :2013	Forward vehicle collision warning systems -- Performance requirements and test procedures							○
14	TS 15624 :2001	Transport information and control systems -- Traffic Impediment Warning Systems (TIWS) -- System requirements							○
14	ISO 16787 :2016	Assisted Parking System (APS) -- Performance requirements and test procedures							○
14	DIS 16787	Assisted Parking System (APS) -- Performance requirements and test procedures					○		
14	ISO 17361 :2017	Lane departure warning systems -- Performance requirements and test procedures							○
14	ISO 17386 :2010	Manoeuvring Aids for Low Speed Operation (MALSO) -- Performance requirements and test procedures							○
14	ISO 17387 :2008	Lane change decision aid systems (LCDAS) -- Performance requirements and test procedures							○
14	ISO 18682 :2016	External hazard detection and notification systems -- Basic requirements							
14	DIS 19237	Pedestrian detection and collision mitigation systems (PDCMS) -- Performance requirements and test procedures							
14	CD 19638	Road Boundary Departure Prevention Systems (RBDPS) -- Performance requirements and test procedures							
14	CD 20035	Cooperative adaptive cruise control (CACC) -- Operation, performance and verification requirements							
14	TR 20545	Report on standardisation for vehicle automated driving systems (RoVAS)/Beyond driver assistance systems							○
14	AWI 20900	Partially automated parking systems (PAPS) -- Performance requirements and test procedures		○					
14	AWI 20901	Emergency electronic brake light systems (EEBL) -- Performance requirements and test procedures		○					
14	PWI 21202	Partially Automated Lane Change Systems (PALS) -- Functional / operational requirements and test procedures	○						
14	AWI 21717	Partially automated in-lane driving systems (PADS) -- Performance requirements and test procedures			○				
14	PWI 22078	Bicyclist detection and collision mitigation systems (BDCMS) -- Performance requirements and test procedures	○						
14	PWI 22084	Traffic incident notification systems (TINS) -- System requirements	○						
14	ISO 22178 :2009	Low speed following (LSF) systems -- Performance requirements and test procedures							○
14	ISO 22179 :2009	Full speed range adaptive cruise control (FSRA) systems -- Performance requirements and test procedures							○
14	NP PAS 22736	Taxonomy and definitions for terms related to driving automation systems for on-road motor vehicles		○					
14	PWI 22737	Low-speed automated driving systems for limited operational design domain (LSAD) -- Performance requirements, system requirements and performance test procedures	○						
14	ISO 22839 :2013	Forward vehicle collision mitigation systems -- Operation, performance, and verification requirements							○
14	ISO 22840 :2010	Devices to aid reverse manoeuvres -- Extended-range backing aid systems (ERBA)							○
14	ISO 26684 :2015	Cooperative intersection signal information and violation warning systems (CIWS) -- Performance requirements and test procedures							○
16	TR 11766:2010	Communications access for land mobiles (CALM) -- Security considerations for lawful interception							○
16	TR 11769:2010	Communications access for land mobiles (CALM) -- Data retention for law enforcement							○
16	ISO 13183 :2012	Communications access for land mobiles (CALM) -- Using broadcast communications							○
16	ISO 15628 :2013	Dedicated short range communication (DSRC) -- DSRC application layer							○
16	ISO 15662 :2006	Wide area communication -- Protocol management information							○
16	TS 16460:2016	Communications access for land mobiles (CALM) -- Communication protocol messages for global usage							○
16	DIS 16461	Criteria for privacy and integrity protection in probe vehicle information systems					○		
16	PWI 16788	Communications access for land mobiles (CALM) -- IPv6 Networking Security	○						
16	ISO 17515-1:2015	Communications access for land mobiles (CALM) -- Evolved Universal Terrestrial Radio Access Network (E-UTRAN) -- Part 1: General usage							○
16	AWI 17515-2	Communications access for land mobiles (CALM) -- Evolved-universal terrestrial radio access network (E-UTRAN) -- Part 2: Device to device communications (D2D)			○				
16	AWI 17515-3	Communications access for land mobiles (CALM) Evolved-universal terrestrial radio access network (E-UTRAN) -- Part 3: LTE-V2X			○				

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

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

WG	ISO Number	Title	Stage						Published
			PWI	NP	WD	CD	DIS	FDIS	
17	ISO 17438-1:2016	Indoor navigation for personal and vehicle ITS station -- Part 1: General information and use case definition							○
17	NP 17438-2	Indoor navigation for personal and vehicle ITS stations -- Part 2: TBD		○					
17	NP 17438-3	Indoor navigation for personal and vehicle ITS stations -- Part 3: TBD		○					
17	AWI 17438-4	Indoor navigation for personal and vehicle ITS stations -- Part 4: Requirements and specification for interface between Personal/Vehicle and Central ITS stations			○				
17	CD TR 18561-1	The use of personal ITS station for green transport information and management -- Part 1: General information and use cases definition				○			
17	PRF TR 20529-1	Framework for green ITS (G-ITS) standards -- Part 1: General information and use cases definition						○	
17	NP 20529-2	Framework for green ITS (G-ITS) standards -- Part 2: Integrated mobile service application and specification		○					
17	AWI 20530	Information for emergency service support via personal ITS station -- General requirements and technical definition			○				
17	NP TR 21735	Framework architecture for plug & play (PnP) functionality in vehicles utilizing nomadic devices		○					
17	NP TR 22085-1	Nomadic device service platform for micro mobility -- Part 1: General information and use cases definition		○					
17	PWI 22086-1	Network based precise positioning infrastructure for land transportation -- Part 1: General information and use cases description	○						
17	PWI 22087	Exchanging driving experience information collected by nomadic devices	○						
18	DIS 17419	Cooperative systems -- Globally unique identification					○		
18	TS 17419:2014	Cooperative systems -- Classification and management of ITS applications in a global context							○
18	DIS 17423	Cooperative systems -- Application requirements and objectives					○		
18	TS 17423:2014	Cooperative systems -- ITS application requirements and objectives for selection of communication profiles							○
18	TR 17424:2015	Cooperative systems -- State of the art of Local Dynamic Maps concepts							○
18	TS 17425:2016	Cooperative systems -- Data exchange specification for in-vehicle presentation of external road and traffic related data							○
18	TS 17426:2016	Cooperative systems -- Contextual speeds							○
18	TS 17427:2014	Cooperative systems -- Roles and responsibilities in the context of cooperative ITS based on architecture(s) for cooperative systems							○
18	DIS 17427-1	Cooperative ITS -- Part 1: Roles and responsibilities in the context of co-operative ITS architecture(s)					○		
18	TR 17427-2 :2015	Cooperative ITS -- Part 2: Framework overview							○
18	TR 17427-3 :2015	Cooperative ITS -- Part 3: Concept of operations (ConOps) for 'core' systems							○
18	TR 17427-4 :2015	Cooperative ITS -- Part 4: Minimum system requirements and behaviour for core systems							○
18	CD TR 17427-5	Cooperative ITS -- Part 5: Common approaches to security				○			
18	TR 17427-6 :2015	Cooperative ITS -- Part 6: 'Core system' risk assessment methodology							○
18	TR 17427-7 :2015	Cooperative ITS -- Part 7: Privacy aspects							○
18	TR 17427-8 :2015	Cooperative ITS -- Part 8: Liability aspects							○
18	TR 17427-9 :2015	Cooperative ITS -- Part 9: Compliance and enforcement aspects							○
18	TR 17427-10 :2015	Cooperative ITS -- Part 10: Driver distraction and information display							○
18	CD TR 17427-12	Cooperative ITS -- Part 12: Release processes				○			
18	CD TR 17427-13	Cooperative ITS -- Part 13: Use case test cases			○				
18	CD TR 17427-14	Cooperative ITS -- Part 14: Maintenance requirements and processes			○				
18	NP 17429	Cooperative ITS -- ITS station facilities for the transfer of information between ITS stations		○					
18	TS 17429:2017	Cooperative ITS -- ITS station facilities for the transfer of information between ITS stations							○
18	TS 18750:2015	Cooperative systems -- Definition of a global concept for Local Dynamic Maps							○
18	DIS 18750	Co-operative ITS -- Local dynamic map					○		

WG	ISO Number	Title	Stage						Published
			PWI	NP	WD	CD	DIS	FDIS	
18	NP TS 19091	Cooperative ITS -- Using V2I and I2V communications for applications related to signalized intersections		○					
18	TS 19091:2017	Cooperative ITS -- Using V2I and I2V communications for applications related to signalized intersections							○
18	TS 19321:2015	Cooperative ITS -- Dictionary of in-vehicle information (IVI) data structures							○
18	PWI 20025	Cooperative ITS -- Representative probe data use cases and related gaps in existing probe data standards	○						
18	TS 20026:2017	Cooperative ITS -- Test architecture							○
18	AWI TS 21176	Cooperative ITS -- Position, velocity and time functionality in the ITS station			○				
18	AWI TS 21177	Secure vehicle interface -- ITS-station security services for secure session establishment and authentication			○				
18	AWI TS 21184	Secure vehicle interface -- Data dictionary of vehicle-based information for C-ITS applications			○				
18	AWI TS 21185	Secure vehicle interface -- Communication profiles for secure connection between an ITS-station and a vehicle			○				
18	AWI TR 21186	Cooperative ITS -- Guidelines on the use of C-ITS standards for hybrid communications			○				
18	PWI TS 21189	Cooperative ITS -- Conformance test specifications for CEN ISO TS 17426 -- Protocol implementation conformance statements (PICS) pro forma	○						

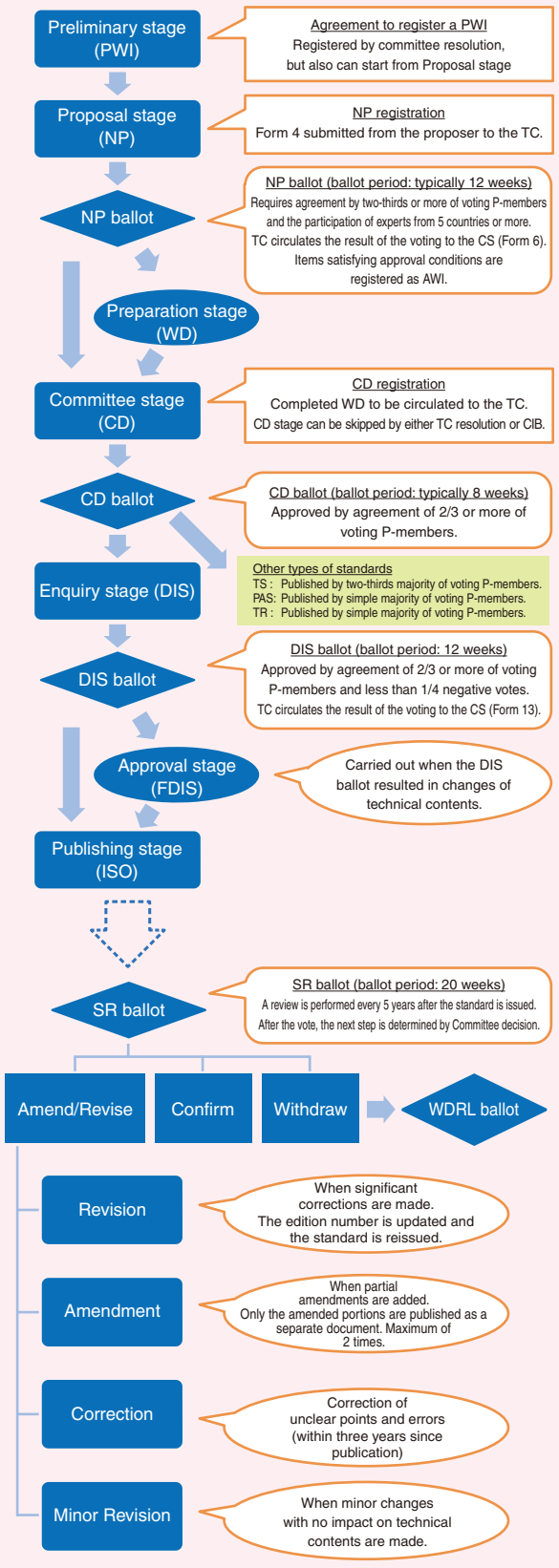
Venues of TC 204 Plenary Meetings

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

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/IEC Directives.



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
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.

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 (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	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	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
FHWA (America)	www.fhwa.dot.gov	INEA	inea.ec.europa.eu
IEC	www.iec.ch	TIA (America)	www.tiaonline.org
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		

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