Standardization of Intelligent Transport Systems

Standard Developing Activities of ISO/TC 204

2006

ITS規格化　自06-2

Logistics in Standardization

ISO/TC 204 Organization

TC 204, a technical committee for standardization for ITS within ISO, was set up in 1992 and went into operation the following year. In ISO, subcommittees (SC) are usually founded under technical committees (TC) and working groups (WG) under subcommittees. Regarding TC 204, working groups are directly under its jurisdiction. Among these working groups, some have been suspended or integrated during the ten years since the inception of TC 204, and there are now a total of 12 active working groups. Eight countries serve as lead countries of working groups, and Japan, the U.S. and Germany take charge of two working groups each.

ISO/TC 204 Organization

ISO/TC 204 Chairman

Secretariat:
TIA (Telecommunications Industry Association)

Liaison within ISO/IEC
TC 8
TC 22
TC 104
TC 154
TC 211
ISO/IEC/JTC 1
ISO/IEC/JTC 1/SC 31
TC 122-TC 104 JWG
IEC/TC 9

Liaison with organizations outside
ITU-R WP6M
ITU-R WP8A
CEN/TC 278
APEC
IEEE
OGC
UN/CEFACT/TBG 3
IrDA
ETSI/TG 37
WCO

Working Groups	Lead Country
WG 1 : Architecture	United Kingdom
WG 3 : ITS Database Technology	Japan
WG 4 : Automatic Vehicle Identification/ Automatic Equipment Identification	Norway
WG 5 : Electronic Fee Collection	Sweden
WG 7 : General Fleet Management and Commercial/Freight Operations	Canada
WG 8 : Public Transport and Emergency	United States
WG 9 : Integrated Transport Information, Management and Control	Australia
WG 10: Traveller Information Systems	Germany
WG 11: Route Guidance and Navigation Systems	Vacant
WG 14: Vehicle/Roadway Warning and Control Systems	Japan
WG 15: Dedicated Short-Range Communications	Germany
WG 16: Wide Area Communication	United States

Participating members (24 countries): Take part in conferences and play an active role in operations with a voting requirement

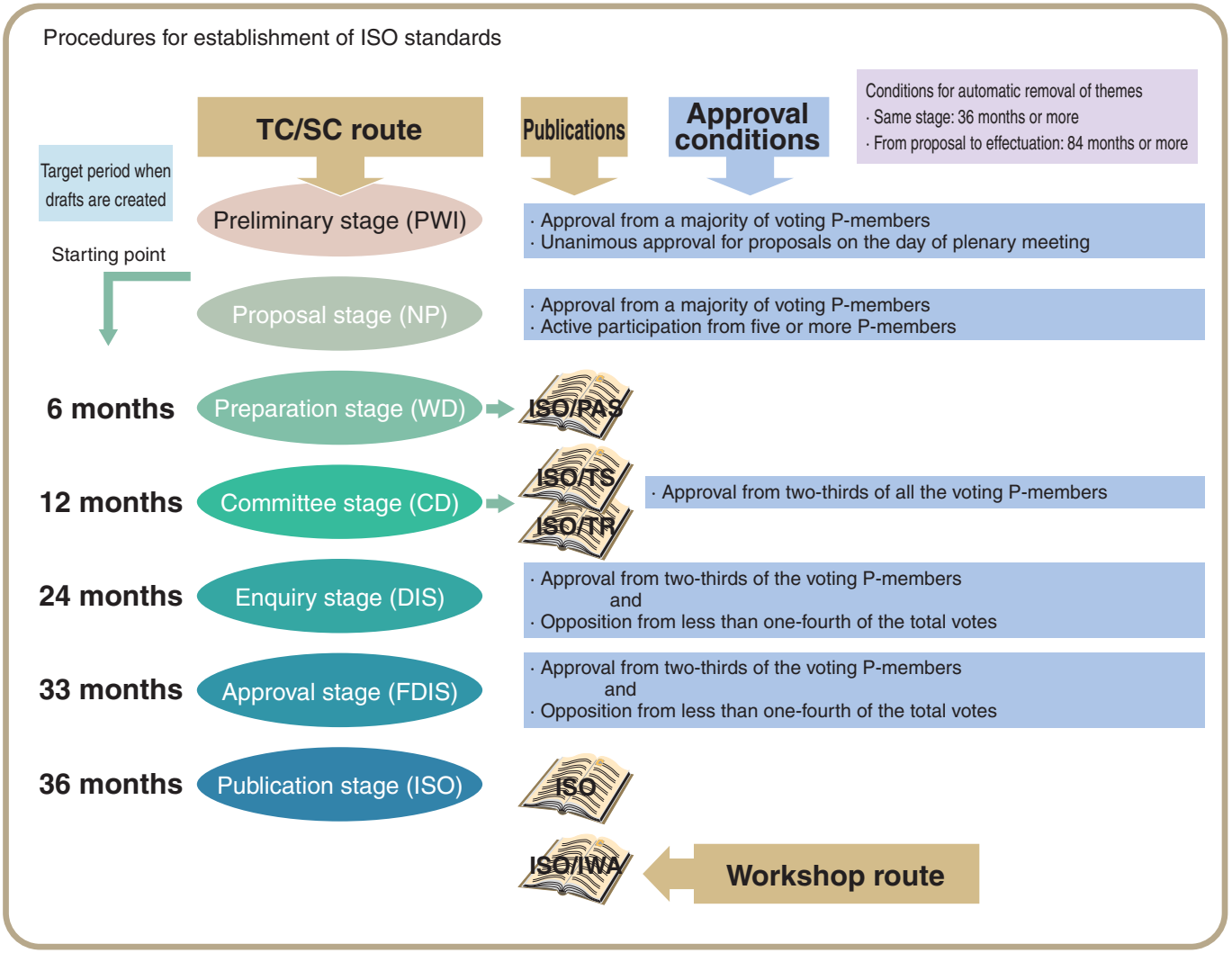
Australia, Austria, Belgium, Canada, China, Czech, France, Germany, Hungary, India, Israel, Italy, Japan, South Korea, Malaysia, Netherlands, Norway, Russia, South Africa, Spain, Sweden, Switzerland, United Kingdom, United States

Observing members (25 countries): Follow operations as an observer with the right to submit comments and take part in conferences

Brazil, Chile, Colombia, Croatia, Cuba, Denmark, Egypt, Finland, Greece, Indonesia, Iran, Ireland, New Zealand, Pakistan, Philippines, Poland, Romania, Singapore, Slovakia, Sri Lanka, Thailand, Trinidad and Tobago, Turkey, Uruguay, Serbia and Montenegro

Procedures for establishment of ISO standards

ISO/TC 204 has been carrying out numerous standardization activities related to ITS themes. These themes are discussed and voted on in accordance with the standardization establishment rules specified in the ISO/IEC Directives to enact standards.



Publications of ISO

ISO can publish ISO/PAS through WG agreement, and ISO/TS or ISO/TR through TC/SC agreement with a view to early public announcement of standard documents (TC/SC route on the map above). ISO/PAS is an interim specification at the stage prior to acceptance as an international standard. It does not meet the requirements of an international. ISO/TS is a semi-standard document that is expected to obtain agreement as an international standard. ISO/TR is a collection of technical data different from international standards. If an agreement is reached on technical documents through workshops designed to meet standardization needs in new technical fields or fields with no professionals, instead of a conventional TC/SC route, it can be published as a product of ISO (ISO/IWA). (Workshop route above)

Procedures for simplification of ISO standard establishment

Usually, ISO standards are established through six stages (NP through ISO) shown in the above figure. Some of the stages can be omitted by satisfying conditions specified in the ISO/IEC Directives. Approved at present are (1) NP voting to CD or DIS, (2) WD to DIS, (3) DIS to ISO (no FDIS), (4) external documents to DIS voting (Fast-track procedure), and (5) directly to FDIS.

WG 1: Architecture

ITS is a large-scale system with many application areas, and a large number of people have been involved in its development for a long time. Therefore, it is important to establish architecture to ensure interoperability, compatibility and expandability. WG 1 is preparing standards related to information and methods to be shared within the ITS sector—common use of terms, sharing of concepts, and unification of methods to describe documents and data.

List of WG 1 work items

	Standardization themes	ISO number	Content
1	Reference model architecture for the ITS sector	TS 14813	Specification of fundamental services, core architecture and descriptive requirements for architecture, to be referenced in the development of new architecture and comparison of different architectures
2	Requirements for an ITS/TICS central data registry and data dictionaries	ISO 14817	Definition of requirements for the framework, formats, and procedures used to define information and information exchanges within the ITS sector
3	Using XML in ITS standards, data registries and data dictionaries	DIS 24531	Stipulation of rules in using XML for ITS standards, data registries and data dictionaries
4	Using CORBA (common object request broker architecture) in ITS standards, data registries and data dictionaries	DTR 24532	Stipulation of rules in using CORBA for ITS standards, data registries and data dictionaries
5	Using UML in ITS standards	PWI	Stipulation of rules and guidance in using UML for ITS standards, data registries and data dictionaries
6	Using web services (machine-machine delivery) for ITS service delivery	NP 24097	Stipulation of guidance for use of web services designed to support collaboration among Internet-based systems
7	Procedure for developing ITS deployment plans utilizing ITS system architecture	PWI	Description of the procedure of developing ITS deployment plans utilizing ITS system architecture
8	User guide for harmonization of data concepts	PWI	Provision of guidance for data concepts related to registration to data registries
9	ITS use case pro forma template	PWI	Provision of a template to facilitate use case description
10	Business justification for ITS architecture	PWI	Provision of guidelines for evaluation of costs, benefits and risks associated with the implementation of ITS
11	Training requirements for ITS system architecture	PWI	Definition of requirements concerning training courses about ITS architecture
12	Procedures and format for ITS glossaries	PWI	Definition of requirements for on-line standard ITS glossaries that can be added to as necessary
13	Example high level business architecture -crash and emergency notification	DTR 25109	Indication of a standard description method for high-level ITS architecture using the emergency notification system (e-Call) as an example
14	Crash and emergency notification reference architecture	PWI	Indication of reference architecture for Crash and Emergency Notification systems

ITS reference model architecture (TS 14813)

System architecture is, in a sense, a conceptual design of a whole system. In establishing ITS, a large-scale and long-term system, system architecture is important to make all the people concerned share a picture of the whole system and to ensure interoperability, compatibility and expandability of the system. The ITS reference architecture has been established to serve as reference materials for architectural development in various countries and WGs in TC 204, and as a reference model for comparison of different architectures, such as the OSI layer model.

TS 14813 consists of six parts as follows. Each part is currently undergoing revision. Draft revisions for parts 1 and 6 are nearly finalized, and the revision of parts 2 and 5 has been started.

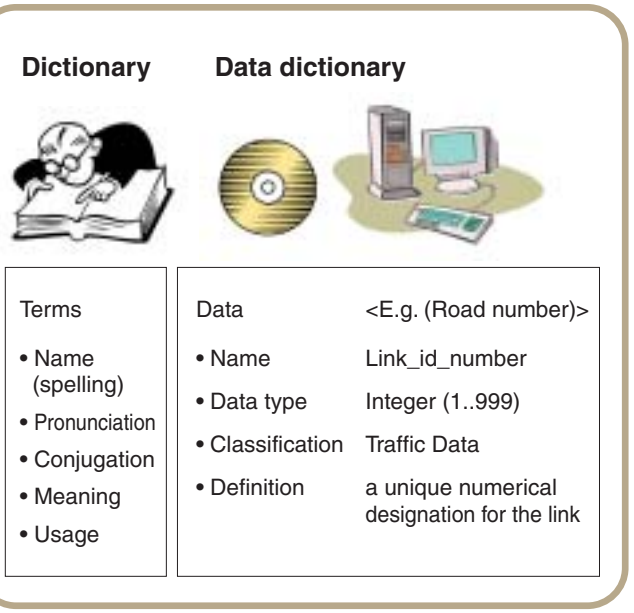
TS 14813

Part	Titles	Outline
1	Fundamental services	Definition of service classes (categories, groups)
2	Core reference architecture	Description of abstract object-oriented system architecture
3	Example elaboration	Description of a specific example of reference architecture with emphasis on traffic management
4	Reference model tutorial	Explanation of basic terms and modeling views in defining object-oriented architecture
5	Requirement for architecture description	Terms and forms to be used for documentation or reference of architecture
6	Data presentation in ASN.1	Description of ASN.1 to be used for normal syntax notation

Requirements for ITS central data registry and data dictionaries (ISO 14817)

It is extremely important that data with the same contents have the same name and that with different contents have different names, in terms of increased efficiency and reliability of system development through common use of data. But it is easier said than done. Data dictionaries are designed to manage definitions and expressions of data subject to common use. In the data dictionary prepared for each functional area, the mechanism that aims to register and manage interdisciplinary data used among various areas is called a data registry. In developing a new system, it is efficient to study the use of common data stored in the data registry.

ISO 14817 covers the items required to describe the contents of registered data (including names, definitions, data types and value ranges), the procedure for management of data features and quality, and operational systems. Additionally, the registered information is required to clarify the system architecture and data models upon which the information is based in order to identify its meaning as clearly as possible.



Use of CORBA, XML, UML and web services

TC 204 uses UML and ASN.1 as standard languages to describe information models and data contents subject to standardization. In recent system implementations, CORBA and XML have been increasingly used to send and receive data between subsystems. Furthermore, use of the web service consortium standard is increasing as the standard procedure for collaboration between web-based systems.

These languages have their own advantages and should be used in the right places, while rules for their appropriate use must be worked out in order to guarantee compatibility for the whole ITS. WG 1 is working to standardize the necessary rules and guidance when using each language in standard documents and data registries.

Procedure for developing ITS deployment plans utilizing ITS system architecture

Architecture describing a whole picture of ITS has been formulated in such leading countries and regions as Europe, Japan and the United States, followed by the establishment of similar architecture in Australia, China, South Korea and Taiwan. In the next phase, Europe, Japan and the United States prepared standard procedures for ITS deployment, such as selection of services to be implemented, development from logical architecture to physical architecture and sharing of roles among related entities, on the basis of system architecture.

This TR is designed to organize the knowledge obtained from these preceding activities, to create documents of standard procedure for developing regional ITS deployment plans utilizing system architecture, and thereby to contribute to activities of countries and regions planning to deploy ITS. This work item was approved as PWI at the TC 204 plenary meeting in October 2004, and studies are underway on drafts for the purpose of NP proposal.

New activities

Although they are part of the fundamental efforts for promoting the standardization and sharing of concepts, data definitions, and so on, the contents of 8-14 in the list of WG 1 work items are closer to daily practices, demonstrating the efforts of WG 1 to find new directions.

9-11 in the list of work items involves the preparation of guidelines for how to describe use cases (the first step in system development), how to evaluate architecture from a business perspective (including evaluation of effect, cost and risk), and for improving the ability to describe architecture, with the goal of achieving system architecture with high practical values.

The intention of 13-14 in the list of work items is to show an example of architecture closer to specific ITS services, and WG 16.5 is simultaneously furthering progress in standardizing specific specifications related to emergency notification systems. Highly abstract architecture and reference architecture consistent with the details of the preceding work are being developed.

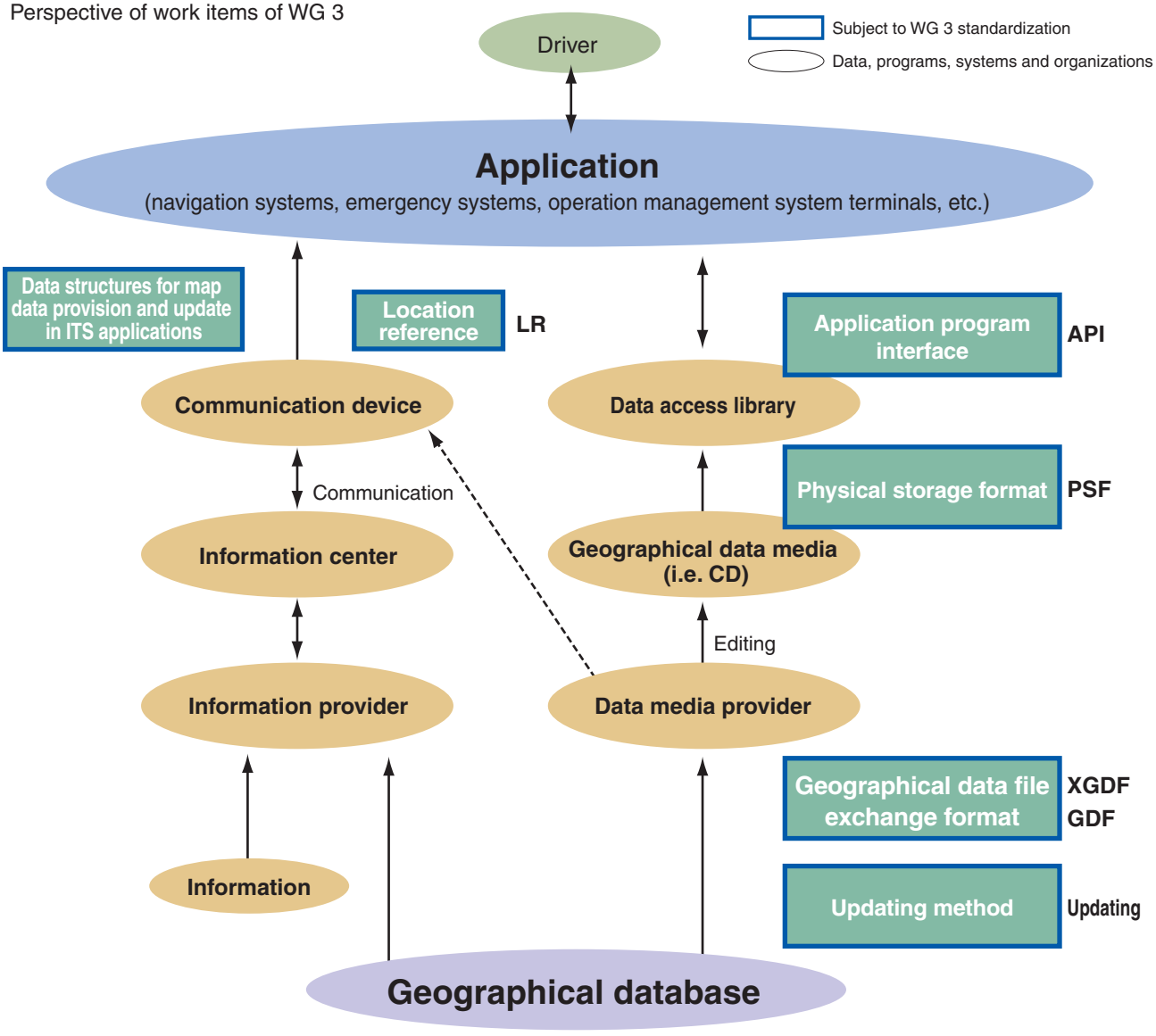
WG 3: ITS Database Technology

Many ITS services use geographical information. In particular, geographical information is of critical importance for the ever-growing field of car navigation services. In other services, geographical information is often necessary to give information and instructions. For this reason, WG 3 is studying standard plans for interfaces to exchange geographical information, considering various situations.

List of WG 3 work items

	Standardization themes	ISO numbers	Contents
1	Geographic data files (GDF) - overall data specification	ISO 14825	Standard for data exchange of geographical databases serving as the basis for geographical data used for navigation
2	Extended geographic data files (XGDF)	WD 22953	Extended updated version of geographical data files
3	Requirements and logical data model for PSF and API and; logical data organization for PSF used in ITS database technology	TS 20452	Standardization of data storage methods, such as CD-ROM used for navigation
4	Data structures for map data provision and update in ITS applications	PWI	Data structures to transmit map data
5	ITS - location referencing for geographic database	CD 17572	Standardization of location reference in case of information exchange between different applications and between geographical databases
6	Navigation system application programme interface (API)	PWI	Standardization of methods for access to data by application programs like navigation systems

Perspective of work items of WG 3



Geographic data files (ISO 14825) and extended geographic data files (WD 22953)

This is the standard for exchange of data from geographical databases serving as the basis for map data used for navigation.

As the file is not used directly for navigation, emphasis is placed on ease of editing—genre-by-genre compilation of data—rather than compactness and speed in comparison with physical storage. In other words, emphasis is given to the production side. Regarding XGDF, however, consideration will also be given to methods for providing information.

As for GDF, work was implemented in consideration of the Japan digital road map database standard and others, on the basis of CEN-GDF studied in Europe. Thanks to the preceding work for standardization by CEN, work proceeded relatively smoothly compared with other items, and GDF was announced as ISO 14825 in February 2004.

The entire volume of GDF is huge. As discussions went on, new ideas were proposed, requiring a lot of time to complete drafts. However, work went smoothly compared with other items. In the wake of the completion of the WG drafts, a proposal to begin studying the next standard was launched immediately, and a new PWI was approved at the TC 204 conference in November 2000. The purpose was to revise the current GDF and accommodate the latest developments in information exchange, such as the internet. The work entered the NP phase in August 2004 after compiling requests for improvement.

Discussions on XGDF got underway with themes on required performance and models. Japan for its part has made a proposal based on KIWI+, a new standard of Japan. KIWI+ has evolved from KIWI, which has been widely used in Japan and served as a basis for the proposed physical storage. After appropriate consultation with TC 211, which handles geographical information on a comprehensive basis, TC 211 decided to adopt UML for the concept model. The latest model has been circulated in TC 211.

Location referencing methods (CD 17572)

This is subject to methods for location referencing when information is exchanged between different applications and geographical databases. It is designed to find out location on a 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 options, pending the results of demonstration experiments in Europe and the United States. However, activities in this field were stalled for some time because the results were not readily available. During the stalemate, the need for standardization of general-purpose LR grew sharply as the information community moved rapidly toward standardization. Therefore, WG 3 decided to stop insisting only on the coordinate system and road descriptor, and to aim at establishment of a more comprehensive standard. In 2000, WG 3 launched discussions on drafts for two methods: Profile 1 (Pre-Coded Location Referencing: a method premised on regulation in a system, including a method using pre-coded location tables), and Profile 2 (Geographic Object Referencing: a method using coordinates (required) and descriptors (optional). Profile 1 has been completed, and CD comment has been finished. Full-scale discussions have just started on Profile 2 after receiving proposals from Europe. Coordination efforts for the details are being carried out in response to Japan's proposal for including a method that uses geometrical shapes with an emphasis on coordinate arrays.

Items where agreement was not reached for standardization

Discussions on drafts for Physical Storage (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.

As for NP 14826, NP has been proposed and approved to register agreements on standardization as official documents, and TS was approved in April 2005. A new PWI was approved for NP 17267 in October 2003, and NP voting is currently being prepared, and interface with priority given to applications is likely to be studied.

New proposals (Data structures for map data provision and update in ITS applications)

Under recent discussion are the updating of map data and the transmission of map data in some cases, if a need arises, in the navigation field. Japan proposed studying data structures to address these ideas, and PWI was approved at the TC 204 conference in October 2004. Currently, requests and the scope are being discussed, and a proposal for NP voting was scheduled for April 2006.

API: Application Program Interface
GDF: Geographic Data File
LR: Location Reference
PSF: Physical Storage Format
XGDF: Extended Geographic Data File
UML: Unified Modeling Language

KIWI+: Simple Topology & Special Temporal
- Open Database Schema

This is a familiar name of the public implementation-level database structure which handles time and space information uniformly with the implication-type phased description method. In this structure, the KIWI format proposed from ISO/TC 204/WG 3.2 with a view to use for car navigation and other applications is combined with the DiMSIS (time-space information system) data

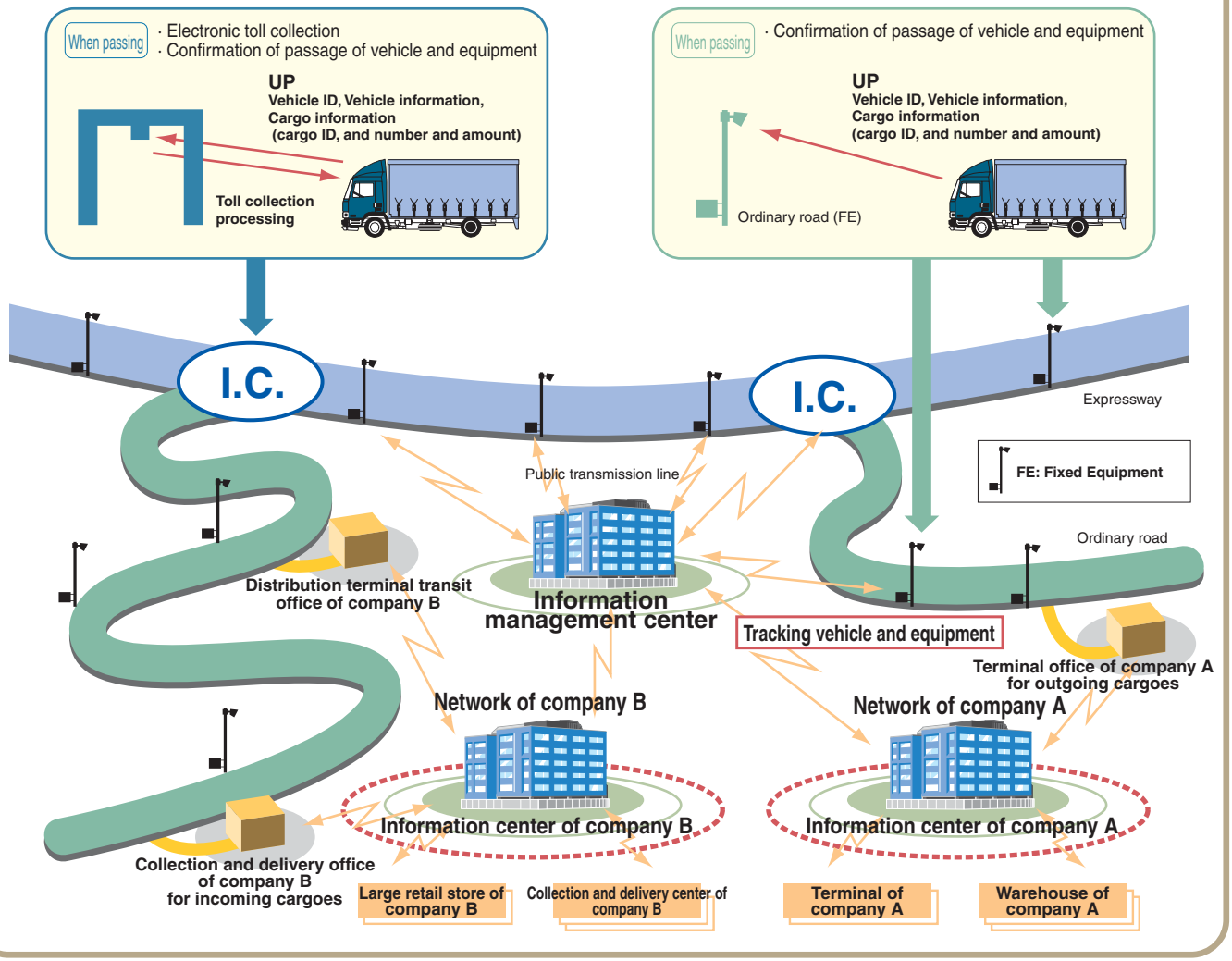
WG 4: Automatic Vehicle Identification/Automatic Equipment Identification

WG 4 is in charge of standardization of items necessary for interoperability between systems regarding AVI/AEI, an automatic identification system for vehicles and equipment through such simple media as tags. First, it discussed standardization themes on overland transportation like trucks, and then added an intermodal AVI/AEI system as a theme. Initially, WG 4 did not discuss standardization based on specific applications. In 2001, however, deliberations began on ERI (Electronic Registration Identification) standards as an AVI/AEI applied system designed for environment protection in the wake of a proposal from CEN. ISO designated this as an official discussion item. Completed in 2005 included the establishment of international standards for ISO numbers 14814, 14815 and 14816. ISO number 24535 is in the process of DIS voting.

List of WG 4 work items

	Standardization themes	ISO numbers	Contents
1	Automatic vehicle and equipment identification - reference architectures 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 structures	ISO 14816	Standardization of data compatibility of AVI/AEI system
4	Intermodal goods transport - architecture and terminology	TS 17261	Standardization of architecture of intermodal AVI/AEI system
5	Intermodal goods transport - numbering and data structures	TS 17262	Standardization of data structure of intermodal AVI/AEI system
6	Intermodal goods transport - system parameters	TS 17263	Standardization of classification of intermodal AVI/AEI system
7	Intermodal goods transport - interfaces	CD 17264	Standardization of interface specifications of intermodal AVI/AEI system
8	Electronic registration identification (ERI) for vehicles	CD 24534	Standardization of specifications for a system where roadside equipment reads vehicle data electronically registered in on-board equipment
9	Basic electronic registration identification (Basic ERI)	DIS 24535	Standardization of specifications for more simpler system

Scope of WG 4



Numbering and data structure for AVI/AEI system (ISO 14816)

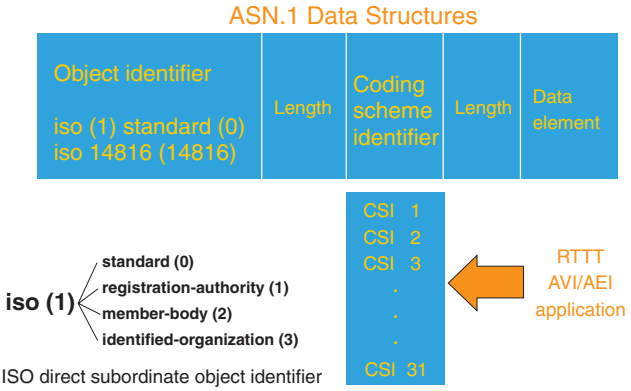
With the purpose of ensuring reciprocal compatibility of the system for automatic identification of moving vehicles and equipment, this standard defines the minimum data item requirements for AVI/AEI as well as the standard concerning the description method for this data. The minimum data is shown in Table 1. However, it is not anticipated that all of the minimum data items are to be transmitted. Instead, the system operator will select and use only the necessary items among these minimum data items. ASN.1, which was standardized on the basis of ISO numbers 8824 and 8825, is employed for the data description method. Table 2 shows the concepts of the ASN.1 data description structures. Employing this standard will give each country the expandability to use its exclusive data.

Table 1: AVI/AEI data items

Coding structure identifier number	TC 204 coding structure
0	Reserved for CEN/ISO
1	AVI/AEI for use in TC 204 applications
2	TC 204 manufacturer serial number
3	TC 204 validity limitation (time and place)
4	Licence plate
5	Vehicle (VIN) chassis number
6	Reserved for CEN/ISO
7	Freight container numbering
8	Tax authority code
9	Reserved for CEN/ISO
...	...
30	Reserved for CEN/ISO
31	Reserved for CEN/ISO (extension)

Note: The system operator can select or add the necessary CSI.

Table 2: Outline of ASN.1 data structures



Electronic Registration Identification (ERI)

Under ERI, roadside equipment communicates with on-board equipment for electronic vehicle identification. Two kinds of standards are being established: ERI for complex operation, and ERI for relatively simple identification. Originally, CEN made a proposal to ISO/TC/204/WG 4 for technical measures to Directive 2000/53/EC of the European Commission and to “end of life” (a management program from manufacture to disposal of vehicles for environment protection) of September 2000. In June 2003, the proposal was approved as an official work item at a plenary session of ISO/TC 204.

The scopes of ERI systems are (1) to give a unique identification number to each vehicle, (2) to make it possible to choose the performance of on-board equipment through ERI application systems, and (3) to guarantee minimum compatibility between on-board and roadside equipment. Discussions on standards have been divided into Basic ERI using simple RF tags and Fully ERI with an application layer including data codes and the like. As for Basic ERI, CD voting was passed in February 2005. As for Fully ERI, discussions have been almost completed on five parts, including a proposal from Japan. In establishing this standard, ERTICO began to conduct questionnaires on the operation of ERI systems in February 2003 under a request from the EC. The questionnaires were carried out to reflect the results in international standards, and the reports were published up to a fifth edition in 2004. Areas for possible applications of ERI systems are: (1) anti-theft vehicles, (2) access control, (3) road pricing, (4) vehicle registration, (5) vehicle tax management, (6) traffic flow control, (7) traffic rules and their observance, (8) environment protection from manufacturing to disposal of vehicles, and (9) hazardous material management.

Liaison activities of TC 204/WG 4

TC 204/WG 4 has a liaison relationship with ISO/IEC JTC 1 SC 31/WG 4 (Standardization for automatic identification and data acquisition technology/RFID) both internationally and domestically. TC 204/WG 4 is deliberating on specifications designed to maintain interoperability between AVI/AEI systems, and on system architecture, data structure and standards for international registration for data exchange regarding ERI systems as an application area of AVI. In the meantime, SC 31/WG 4 is discussing RF tags and standards for compatibility between RF tags and roadside equipment. In other words, the areas handled by TC 204 include applications using RF tags or roadside equipment corresponding to RF tags, which are defined by SC 31/WG 4, and TC 204/WG 4 is leading applications of AVI/AEI systems.

WG 5: Electronic Fee Collection

WG 5 is working on standardizing Electronic Fee Collection (EFC: term defined by TC 204) including ETC and other fee collections, to cover the entire field of charging and settlement of tolls for roads, fees for parking lots and ferries, and the like. Emphasis has been placed mainly on Electronic Toll Collection (ETC). Communication between vehicles and roadside equipment is implemented through DSRC (Dedicated Short Range Communication) or CN/GNSS (Cellular Network/Global Navigation Satellite Systems) using GNSS and cellular networks. In April 2004, the European Commission issued the "Directive on the interoperability of electronic road tolling systems in the Community". The directive recommends the adoption of the CN/GNSS system as the electronic road tolling system in Europe while it does not exclude the conventional DSRC system for coexistence.

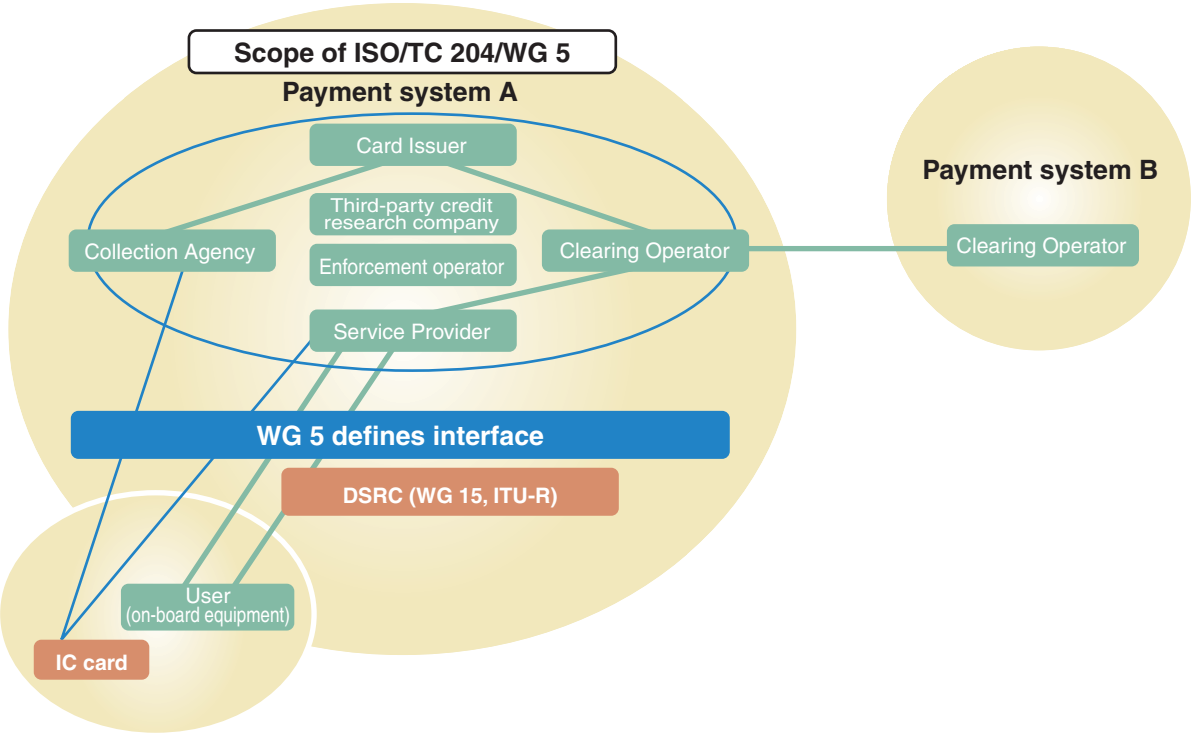
List of WG 5 work items

	Standardization themes	ISO numbers	Contents
1	Interface specification for clearing between operators	TS 14904	Prescription of interfaces for clearing between EFC operators with a pentagonal EFC concept model
2	EFC-application interface definition for dedicated short-range communication	ISO 14906	Prescription of data structures and commands, etc. to make sure interoperability of EFC applications using DSRC
3	EFC-test procedures for user and fixed equipment - Part 1	TS 14907-1	Prescription of procedures and conditions for tests of EFC-related equipment
4	EFC-test procedures for user and fixed equipment - Part 2	TS 14907-2	Prescription of conformance tests for On-Board equipment, conforming to EFC application interface definition (ISO 14906).
5	EFC- system architecture for vehicle related to transport services	TS 17573	Definition of reference architecture for the entire EFC system and prescription of frameworks of various EFC-related conditions
6	EFC-security services framework	TS 17574	Provision of a reference to ISO/IEC 15408 (IT security evaluation standard) and for EFC security establishment
7	Application interface definition for CN/GNSS based EFC	DTS 17575	Prescription of data structures and commands, etc. to insure interoperability of EFC applications using Cellular Networks and Global Navigation Satellite Systems (CN/GNSS)
8	Interface definition for on-board account using integrated circuit card	PWI	Specification of interfaces between roadside equipment and on-board equipment using IC cards that enable reading and writing of EFC information and account information on IC cards

Entire structure of EFC and scope of WG 5

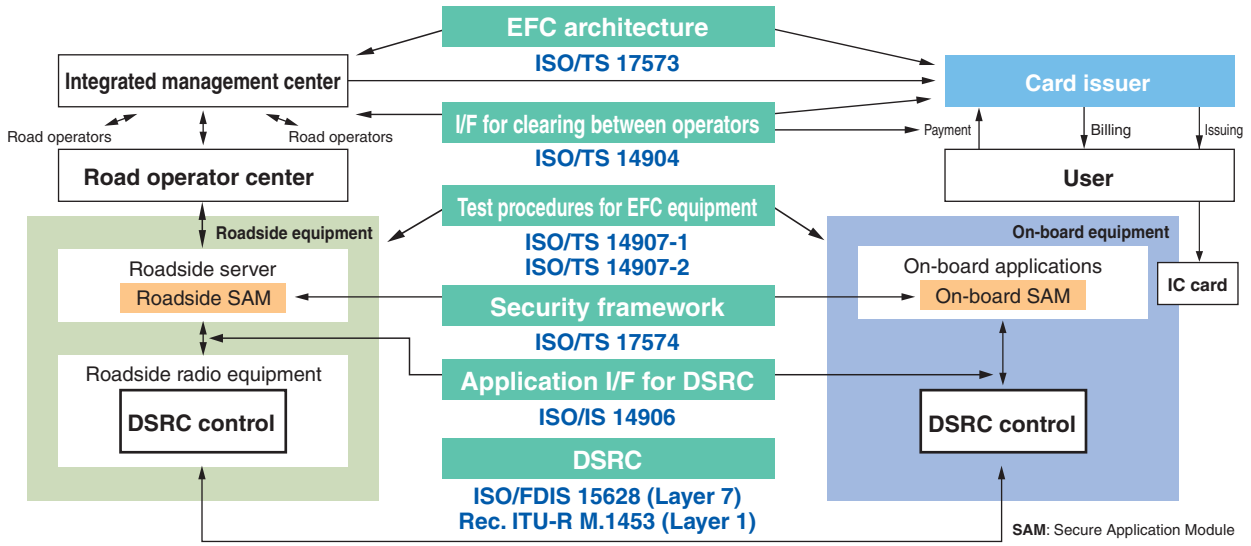
EFC-related entities include Card Issuers, Service Providers, Clearing Operators, and Collection Agents with the relationship shown in the figure below. WG 5 is working on standardization of the EFC application interface (data elements and command definition, etc.) both for DSRC and CN/GNSS, which are means of communication between Service Providers and Users, and of the test procedures and data security. ISO TC 204 WG 15 and ITU-R SG 8 are working on standardization of DSRC.

Entities involved in EFC and Scope of WG 5



Shown below is the ETC system configuration in Japan, and corresponding ISO standards and ITU recommendations.

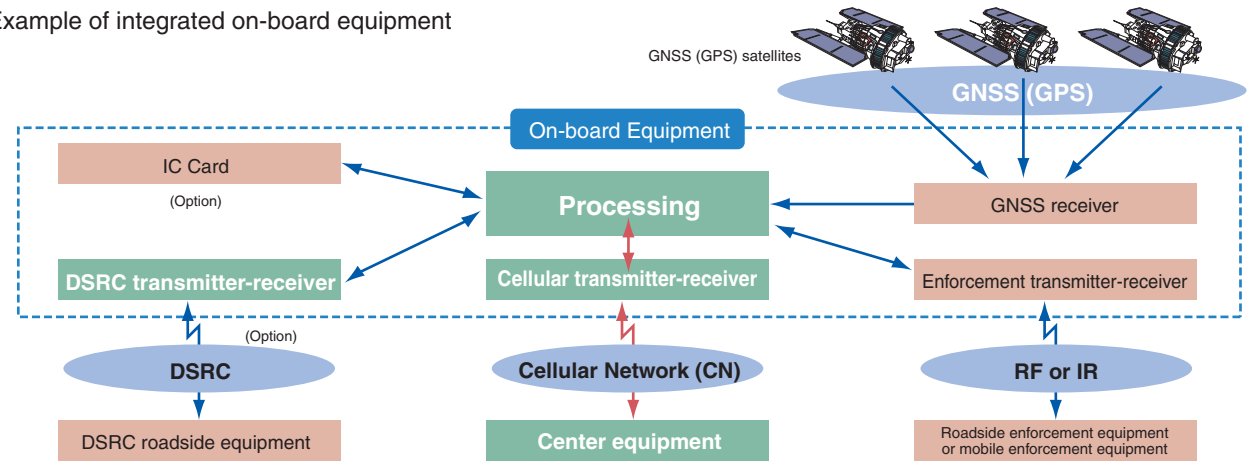
ETC system configuration in Japan and relationship with ISO standards, etc.



Application interface definition for CN/GNSS (ISO/DTS 17575)

The CN/GNSS based EFC was approved as a work item in 1997, and the initial draft preparation was completed in December 2004. The toll collection system for Heavy Goods Vehicle (HGV) in Germany, which went into operation on January 1, 2005, adopts this system. A built-in GNSS (GPS) receiver in on-board equipment monitors the coordinates of the current location continuously. The location is mapped through the geographical information stored in the on-board equipment and the fee to be collected is calculated using the location information and the toll information downloaded through a Cellular Network. Generally the fee is calculated within on-board equipment, and is recorded either on an IC card or at central equipment through the Cellular Network. For the fee calculation, a zone toll method for each passage through a virtual toll area or a distance-based toll method is used. The following figure is an example of on-board equipment integrating DSRC as an option to enable EFC interoperability throughout European countries.

Example of integrated on-board equipment



Interface definition for on-board account using integrated circuit card (PWI)

There are two major methods for EFC-related settlement. One is the center settlement method mainly employed in Europe and the United States, and the other is the IC-card based on-board equipment settlement system used in Japan, Korea and other parts of Asia. In this PWI draft, the application interface that enables roadside modules to access IC cards via DSRC and on-board equipment is modeled on the basis of Japanese ETC and Korean ETC methods.

WG 7: General Fleet Management and Commercial/Freight Operations

Initially, WG 6 (General Fleet Management) and WG 7 (Commercial/Freight) carried out work on standardization separately. In November 1999, WG 6 and WG 7 were integrated at a conference in Montreal into a new WG 7. At this conference, approval was also given to launch work on standardization for a new item related to the transportation of hazardous material. The new item was proposed by Canada at a preceding meeting in Amsterdam in June 1999.

List of WG 7 work items

	Standardization themes	ISO numbers	Contents
1	Data dictionary and message sets for electronic identification and monitoring of hazardous materials/dangerous goods transportation	FDIS 17687	Definition of data dictionary and message sets necessary for automatic identification and monitoring, which makes it possible to exchange information among vehicles, management centers, related organizations, carriers, and senders and receivers of cargoes, regarding hazardous material transport (WG 7.1)
2	Data dictionary and message set for tracking of freight and its intermodal transfer - road transport information exchanges	CD 24533	Definition of data dictionary and message sets necessary for monitoring functions that enables management of all processes in international air cargo transport. (WG 7.2)
3	Freight conveyance content identification and communication architecture-application profile	PWI	Definition of the cargo information transfer system architecture utilizing RFID that combines existing international standards that facilitate cargo management in international integrated transportation. (WG 7 or WG 7.3)

WG 7.1 Standardization of Data Dictionary and Message Sets for Electronic Identification and Monitoring of Hazardous Materials/Dangerous Goods Transportation

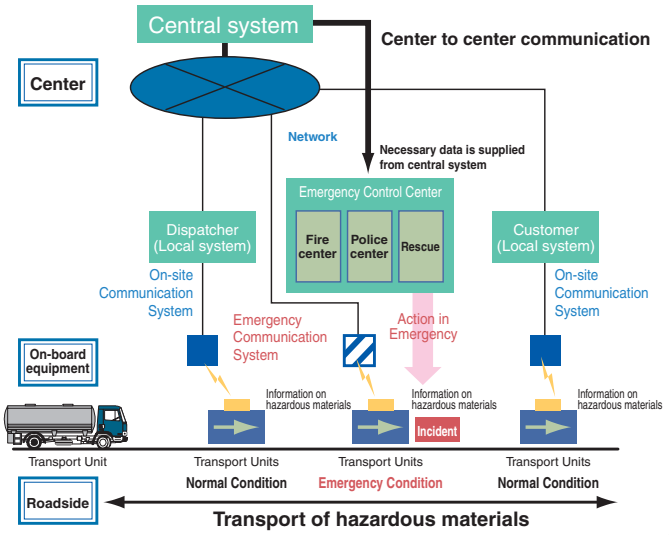
Subject to this standardization are the data dictionary and message sets for supporting exchange of information on hazardous materials, and automatic identification and monitoring. This standard can possibly be applied to various forms of communication media, such as DSRC and cellular phones.

Cited below are the effects of standardization.

1. Real-time information collection (identification of vehicles, information on hazardous materials)
2. Support for cooperation between operators and emergency responders (police, fire fighters, 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 standardization items are considered effective for one-stop services at borders.

Typical System Architecture D/G Transportation



WG 7.2 Standardization of Data Dictionary and Message Set to Facilitate the Movement of Freight and its Intermodal Transfer - Road Transport Information Exchanges

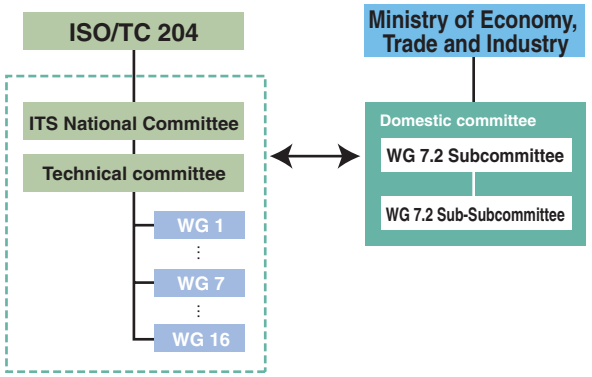
Subject to this standardization are the data dictionary and message sets to be exchanged between a shipper and several transport organizations in door-to-door transport. Specifically, it involves standardization of data elements used for electronic data interchange (EDI) and messages (clusters of data elements) necessary in supply chains.

Door-to-door transport requires international integrated transport involving trucks, railways, ships and airplanes. A different EDI is used for each transport organization. It will take a great deal of time and effort to unify data standards that differ according to each country and organization, and to introduce rules for standard information exchange. For the time being, standardization work is limited to air cargoes and study is being made on an Electronic Supply Chain Manifest (ESCM) to be exchanged among shippers, forwarders, truck carriers, airports and airlines, and on procedures for exchange of information. The study is also designed to realize visibility and traceability of door-to-door cargoes, while pursuing compatibility with existing rules for data exchange and information exchange systems.

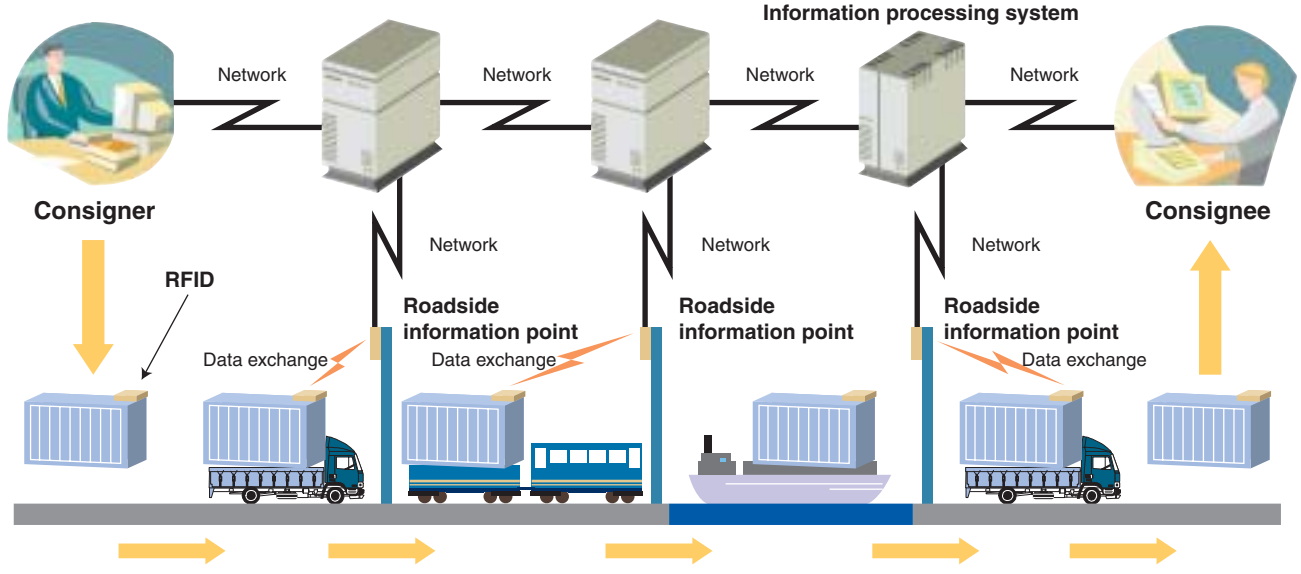
Developed so far have been four messages—registration of cargo data, changes in carriers, renewal of cargo data and completion of transport—and 62 data elements. At the Paris conference in April 2005, Japan also suggested the necessity of a system architecture utilizing RFID in order to facilitate the use of message sets (CD 24533) in the management of international integrated transportation. At the subsequent Portland conference in November 2005, Japan proposed standardization of the data transfer architecture for cargo and cargo transport information, and the proposal was approved as PWI. Proposals for RFID and architectures utilizing RFID are being studied by ISO TC 204 WG 4 (automatic vehicle identification/automatic equipment identification), ISO/IEC JTC1 SC31 (standardization concerning automatic identification and data acquisition technology) and ISO TC 122/104 JWG (joint working group for containers and packing) among others. This standardization is designed to utilize these existing standards, and to develop an RFID-based application profile enabling cargo management in international integrated transportation as an ISO standard. This international standard is considered as a way of dramatically improving the security and efficiency of international integrated transportation.

This standardization work has been promoted in cooperation with UN/CEFACT (UN/Center for Trade Facilitation and Electronic Business), WCO (World Customs Organization), IMO (International Maritime Organization), other technical committees of ISO (containers and packing), IATA (International Air Transport Association), and SMDC (User Group for Shipping Lines and Container Terminals).

Organization of domestic committees



Data exchange Intermodal Interface



WG 8: Public Transport and Emergency

WG 8 is working on standardization of information related to public transport. Public transport includes buses, trains, trams and emergency vehicles.
Specific standardization items include "Interoperable Fare Management System (IFMS)", which is being studied under the leadership of CEN, "Data Dictionary and Message Sets for Preemption and Prioritization Signal Systems for Emergency and Public Vehicles (PRESTO)" proposed by Japan, and "Standard Numbering System for Public Transport Stops" currently being studied under the leadership of Korea. The "Public Transport Communications Interface Protocol (TCIP)", for which a draft was prepared under US leadership, expired in the fall of 2005 due to lapsing of the specified period. However, the US is planning to submit the proposal for the second time.

List of WG 8 work items

	Standardization themes	ISO numbers	Contents
1	Data dictionary and message sets for pre-emption and prioritization signal systems for emergency and public transport vehicles (PRESTO)	CD 22951	Standardization of data dictionary and message sets for traffic signal pre-emption and prioritization for emergency and public transport vehicles
2	Public transport-interoperable fare management system-Part 1: architecture	DIS 24014-1	Definition of conceptual architecture to establish a public transport fare management system that accommodates multiple operators and services
3	Standard numbering system for public transport stops	PWI	Standardization of number assignment to public transportation system stations and stops

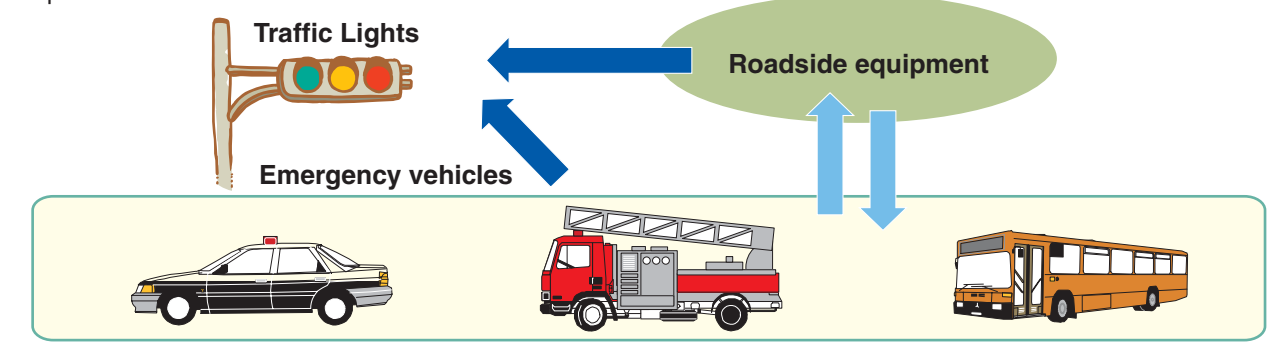
Importance of Public Transport

The reason why WG 8 has adopted public transport as an important standardization theme is that excessive dependence on automobiles for passenger and cargo transport is causing serious harm to our society and life, and damages sustainability. To reduce the dependence on automobiles, it is necessary to increase the density of cities and make cities compact, and then to change transport modes from automobiles to foot, bicycles and public transport. However, automobiles provide door-to-door transport and comfort, and direct costs borne by drivers is considered generally lower than that of public transport.
It is effective to enhance the attractiveness of public transport in order to promote a shift to public transport. Toward that end, information has an extremely important role to play. Progress in information technology has made it possible for people to get information on routes, transfers, operations, travel and fees of public transport before and during traveling, and to choose an optimum route. In order to dramatically enhance the attractiveness of public transport, it is of course necessary not only to apply advanced information technology but also to implement measures systematically and comprehensively, such as the removal of physical barriers during transfers, inexpensive and easy-to-understand fares as well as simple payment methods, and land use that gives priority to the convenience of users of public transport.

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

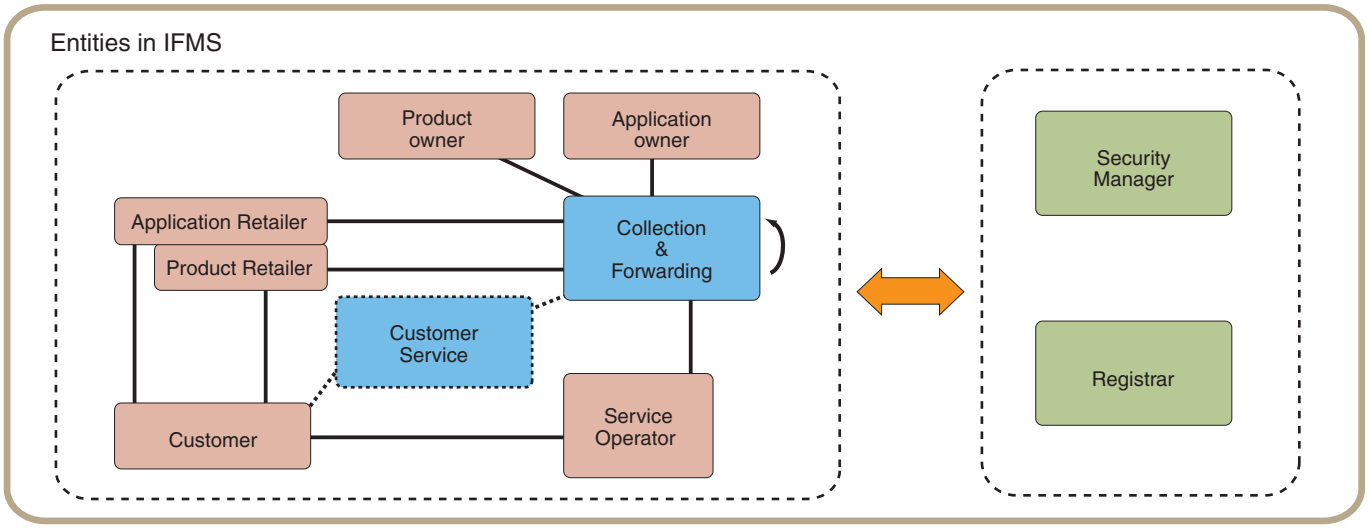
PRESTO is designed to exchange data efficiently for traffic signal preemption and prioritization so that such public transport vehicles as emergency vehicles, buses and trams can pass intersections preferentially over other vehicles. Data is in principle exchanged between vehicles and roadside equipment. The standardization scope includes data dictionaries and message sets in mobile communication fields—the same as for PTCIP mentioned below.
Specifically, traffic signals are controlled (longer green lights and shorter red lights) on the basis of information on the location of emergency vehicles, running speed, destination and the direction of travel at an intersection so that emergency vehicles can pass an intersection quickly. At the same time, passage of emergency vehicles is informed to other vehicles and pedestrians to prevent collision. Signal control is the work item subject to standardization for the time being.

Scope of standardization



Public Transport-Interoperable Fare Management System: IFMS (DIS 24014-1)

The Interoperable Fare Management System (IFMS) is a conceptual architecture for all related systems with a view to efficient operation and management of fare collection through IC cards in railways, buses and other public transport. In Europe, CEN/TC 278/WG 3 is leading the standardization of the system. In view of the social significance of IFMS, WG 8 decided to standardize IFMS in cooperation with CEN, and PWI proposal was approved in October 2003. Procedures for NP voting were also approved in October 2004, and approved as NP after NP voting in spring 2005.



Standard Numbering System for Public Transport Stops: SNSPTS (PWI)

Australia proposed the standardization for numbering of bus stops and railway stations. WG 8 worked on the item but suspended it later. The work was then resumed due to strong request from South Korea, which insisted that such a numbering system be introduced. At the Beijing conference in the fall of 2004, the PWI proposal was approved, and NP voting was carried out in October 2005. However, the NP proposal did not receive enough support to pass. The proposal will be revised and submitted for a second vote.

Public Transport Communications Interface Protocol: PTCIP

TCIP is designated as one area of the National Transportation Communications for ITS Protocol (NTCIP), a comprehensive communications specification used in the entire ITS system of the United States. It is designed for more efficient information exchange in the operation management of public transport vehicles, information services for passengers, and fee collection. As standardization themes, WG 8 has been studying the definition of terms common to public transport, operation planning, on-board systems, operation management centers, passenger information, incident management and spatial representation. However, the proposal expired due to lapsing of the specified period. The US is to study future actions (new proposal). The new proposal will focus on standardization of passenger information.

One of the problems over TCIP is harmonization with the Transmodel now under study at CEN/TC 278. The United Kingdom will play a leading role in harmonizing with the Transmodel.

Both domestic and international standards of the United States were formerly given the name “TCIP,” but international standards will be named “PTCIP” from now on.

Transmodel

This is a data description methodology used for information systems related to public transport in Europe. It is a conceptual model independent of implementation design and logical/physical levels, and is commonly used for different platforms to guarantee the interoperability of software resources between information systems and to establish highly secure and reliable systems. Data items handled include strategic planning, employee/operation management, passenger information, fee collection and operation statistics. Transmodel was proposed by France mainly in consideration of the needs of bus operators. It was registered as ENV 12896 (European preliminary standard) in 1997, and is now being studied by ECN/TC 278/WG 3 (public transport) SG 4 toward establishment as a European standard.

WG 9: Integrated Transport Information, Management and Control

Subject to study by WG 9 is standardization for traffic management (transport information and control, etc.). Specifically, it is working on the systematization of information and standardization of communication systems in order to exchange data efficiently between traffic management centers, centers and roadside modules, and between roadside modules themselves, and to provide information for outside organizations.

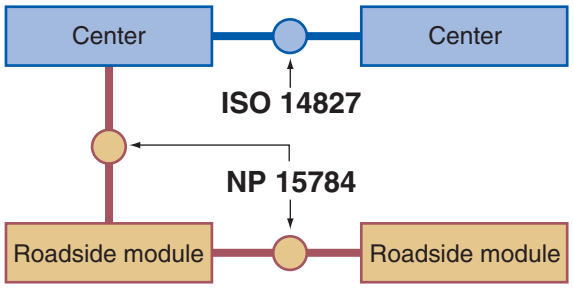
List of WG 9 work items

	Standardization themes	ISO numbers	Contents
1	Data interfaces between centres for transport information and control systems - Part 1: Message definition requirements	ISO 14827-1	Definition of message forms between centers for transport information and control systems
2	Data interfaces between centres for transport information and control systems - Part 2: DATEX-ANS	ISO 14827-2	Definition of communication protocol using DATEX-ANS between centers for transport information and control systems
3	Data exchange involving roadside module communication - Part 1: Framework and overview application profile	NP 15784-1	Principle of application profiles and framework for documentation regarding communication between TICS centers and roadside modules
4	Data exchange involving roadside module communication - Part 2: TMP	NP 15784-2	Application profile based on TMP (US communication standard) of communication between TICS centers and roadside modules
5	Data exchange involving roadside module communication - Part 3: DATEX	NP 15784-3	Application profile based on DATEX-ASN (ISO 14827) of communication between TICS centers and roadside modules
6	TICS - Integrated transport information, management and control - Data dictionary - Data dictionary	PWI	Data dictionaries in TICS traffic management area
7	TICS - Integrated transport information, management and control - Data dictionary - congestion monitor use case	PWI	Data model for congestion monitoring use case of TICS transport management area
8	Quality of input data for ITS systems	NP 21707	Definition of quality of input data for ITS

Activities

The scope (inter-centers, centers and roadside modules, inter-roadside modules) of standardization that WG 9 is working on is shown in the figure. Centers refer to transport management centers. Roadside modules refer to signal control devices, information boards and sensors installed on the roadside. One of the advantages for promoting standardization of information and communication between centers, and centers and roadside modules is inter-connectivity. It will be easy for module procurers to purchase modules from multi-venders, while it will be possible for module suppliers to reduce development burdens and risks.

Scope of standardization



Standardization for communication between centers (ISO 14827)

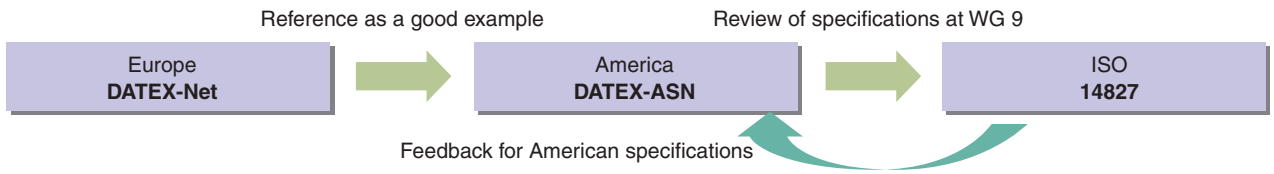
Inter-center communication means communication between transport management centers. Under this communication, information that a transport management center collects is exchanged with a neighboring center to make possible implementation of extensive transport management. WG 9 has stipulated definition forms of messages and protocol for exchange of messages when information is exchanged between centers.

Definition forms of messages refer to what should be described when a message is defined. For example, the name of a message, a text and a form (data type).

Designated as a procedure for information exchange is a protocol called DATEX-ASN. DATEX-ASN is a protocol developed in the United States for inter-center communication in the ITS domain. This protocol is based on DATEX-Net (a standard protocol for inter-center communication in Europe), which is considered to satisfy various requirements for inter-center communication in the ITS domain and adopts ASN.1 as a description language, which is the standard notation method in TC 204. Therefore, DATEX-ASN is compatible with international standards.

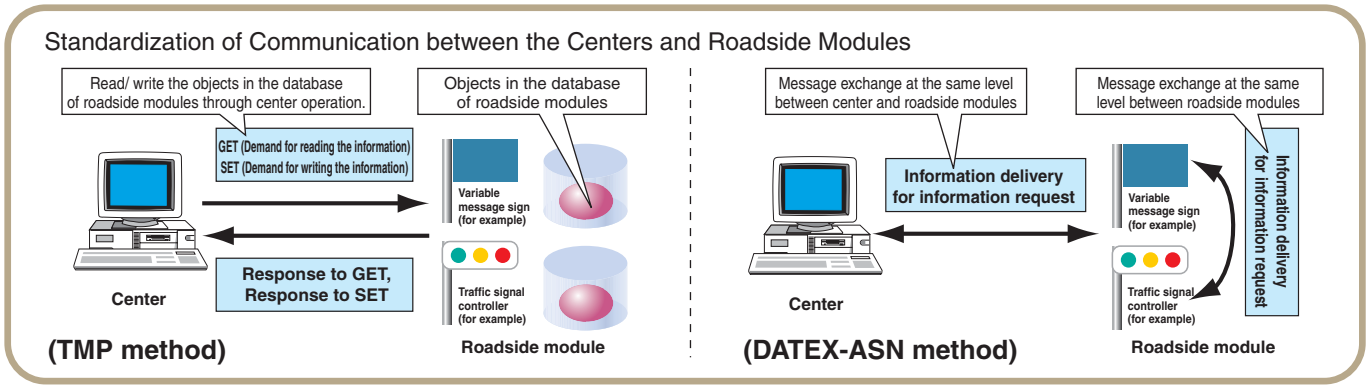
This proposal was approved through FDIS voting, and was established as an ISO standard (November 2005).

Standardization of inter-center communication



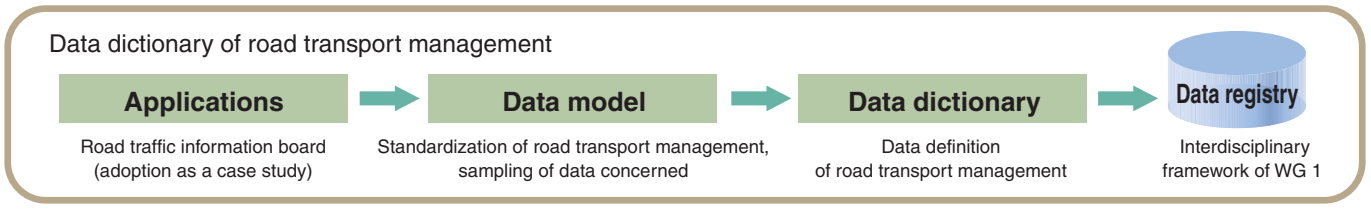
Standardization of communication between centers and roadside modules (NP 15784-1-3)

Communication between centers and roadside modules means exchange of information between central modules of a transport management center and modules installed on the roadside and between these roadside modules. WG 9 plans to prescribe this communication in the form of an application profile. This application profile designates a set of base standards regarding three upper layers of OSI to meet the requirements of communication between a center and roadside modules and prescribes how to use base standards. Designated under the initial version will be Transportation Management Protocols (TMP), a part of the National Transportation Communication for ITS Protocol (NTCIP). It is a communication standard for the ITS range in the United States, and DATEX-ASN of ISO 14827, an international standard for communication between transport management centers. How to use them will also be stipulated.



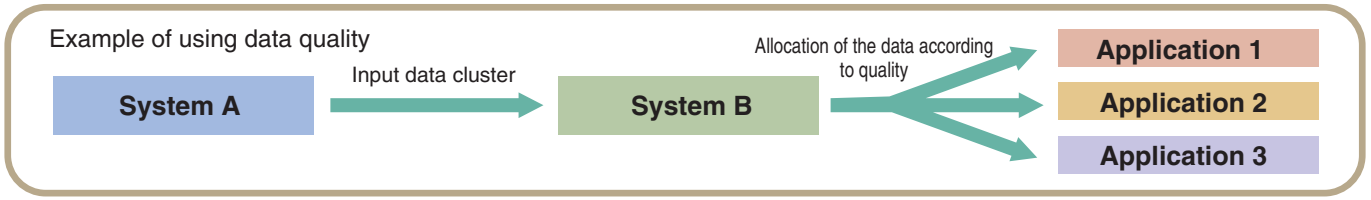
Data dictionary of road transport management (PWI)

A data dictionary compiles definitions of various data to be used in a specific area in a manner corresponding to a traditional dictionary. With this dictionary, experts trying to develop a new standard in a particular field and persons trying to establish applications in a particular field based on a standard can obtain standard and unambiguous understanding with regard to the meanings and forms of data.
The preparation of a data dictionary begins with clarification of applications and mutual relations of data used within such applications (data modeling).
Japan has prepared a data model/data dictionary for application of providing information for road transport information boards and thus, played a major role in this area. With the application of congestion data provision selected, a study is in progress on the need and possibility of preparation of a data dictionary as an international standard.



Quality of input data for ITS (NP 21707)

This standard specifies the format for defining the quality of quantitative data being exchanged between systems (including users) in a transport information application. In recent years, many users have wished to allocate obtained data to their own system. This is not possible unless the quality of the data is specified. The standard is intended to define the standard for 10 items, including accuracy, reliability and timeliness, regarding transport information. For this proposal, the United Kingdom is leading the efforts to revise the materials, and send the document for CD comment circulation, which officially should be performed by the TC 204 secretariat.



WG 10: Traveller Information Systems

Traveller 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 for drivers through various media, such as FM broadcasting, DSRC, cellular phones and digital broadcasting. Recently, much activity has been seen in integration of user services led by North America and Japan, and XML standardization of TPEG (Transport Protocol Export Group) led by Japan.

List of WG 10 work items

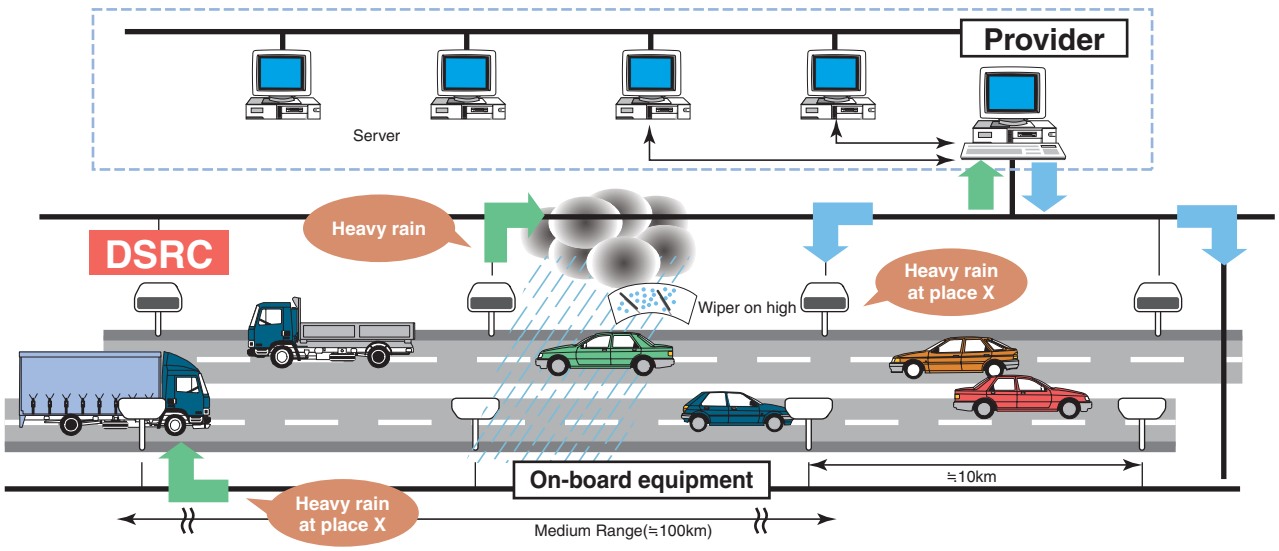
	Standardization themes	ISO numbers	Contents
1	TTI messages via traffic message coding	ISO 14819-1	Standardization of the RDS-TMC system adopted in Europe
		ISO 14819-2	Code definition of TTI messages
		ISO 14819-3	Location referencing method
		TR 14819-4	Coding protocol for RDS-TMC
		TR 14819-5	ALERT + location referencing method
		FDIS 14819-6	Regulation of conditional access
2	TTI messages via cellular phone networks	TR 14821	Standardization of various information supply services, such as emergency notification and breakdown support using cellular phone networks, route guidance, supply of transport information, operator services, transport information collection
3	Traffic and travel information—Medium-range pre-information via DSRC	CD 14822-1	Standardization of transport information supply through DSRC networks (downlink)
		CD 14822-2	Standardization of information gathering, such as local traffic conditions and emergency measures (uplink)
4	TTI messages via media-independent stationary dissemination systems	CD 14823	Standardization of pictogram data dictionary codes
5	User services integration for traffic and traveler message lists—Part 1~Part 5	WD 15074	Standardization of common message subsets to be used for services handled by WG 10
6	TTI over high data-rate broadcast digital bearers—Part 1~Part 5	TS 18234-1	Standardization of Transport Protocol Expert Group (TPEG) through digital broadcasting
		TS 18234-2	Explanation of terms and frame structure
		TS 18234-3	Services and network information
		TS 18234-4	Road transport message applications
	TTI via transport protocol experts group (TPEG) data streams—Part 6	TS 18234-5	Public transport information
		TS 18234-6	Location referencing
	TTI via transport protocol experts group (TPEG) extensible markup language (XML)	TS/CD 24530, PWI	XML-regulated next-generation TPEG

Note: TTI (traffic and traveller information), RDS-TMC (radio data system-traffic message channel)

Medium-Range Pre-Information (CD 14822)

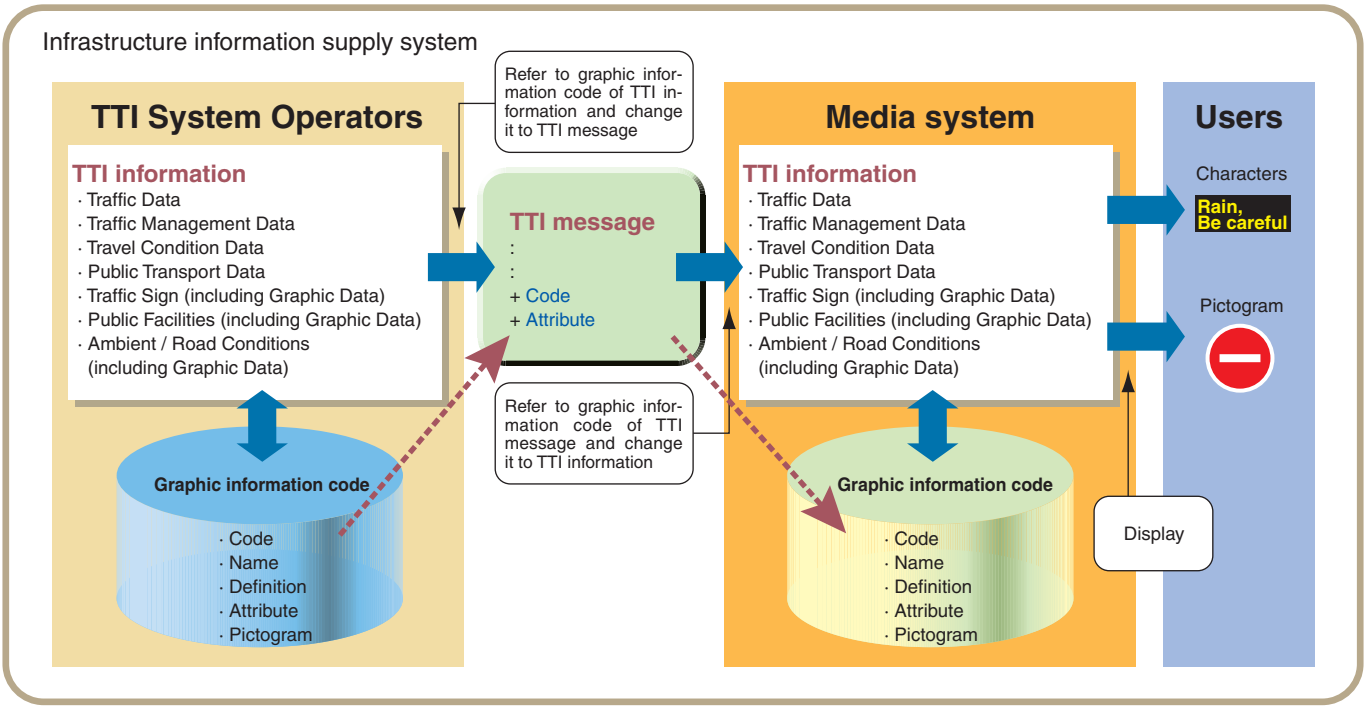
This work item is designed to study standardization of medium-range pre-information (MRPI) using DSRC. Standardization plans have been submitted on the basis of demonstration tests in Europe for downlink of information on rain and accidents from DSRC installed on expressways and for uplink of wiper operation information to DSRC. The Japanese working group suggested that the draft include a statement in the scope to the effect that Application Identification (AID) standardized in WG 15 is international standardization of the service equivalent to 8 (use of CEN standard DSCR), which was accepted.

Medium-range pre-information



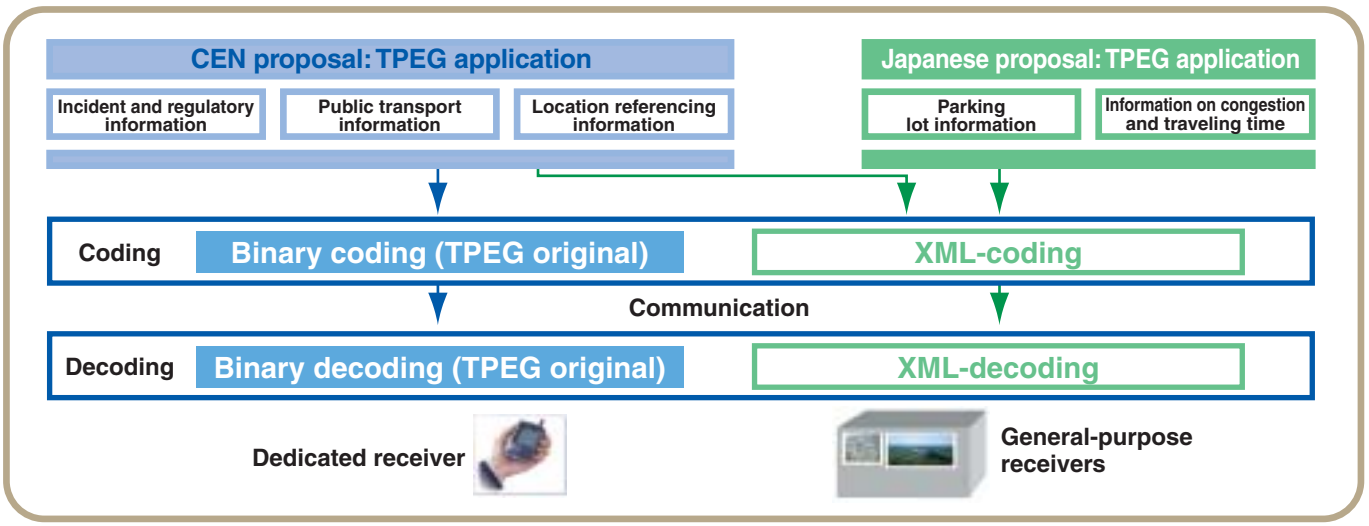
Infrastructure Information Supply System (CD 14823)

This work item involves the standardization of a graphic data dictionary (GDD) of pictograms including signs for road transport guidance and designs. This is intended to display pictograms corresponding to GDD codes on variable information boards and on-board equipment through transmission. As pictograms vary from country to country, only codes signified by the pictograms, not the actual pictograms or designs, are subject to standardization. Japan is taking the leadership by becoming a convener, and standardization work is in progress under the leadership of CEN.



TTI Messages Using Broadcasting-Type Digital Media (TS 18234, TS/CD/24530, PWI)

TPEG is a standardization plan regarding a transport information supply system using high-speed digital data broadcasting, which is proposed by CEN TC 278 WG 4 SWG 4.7 (hereinafter referred to as CEN). The next-generation TPEG business team submitted two standardization plans-for parking lot information, and for information on congestion and traveling time as TPEG applications-from ISO TC 204 WG 10. In September 2002, PWI was approved at a general meeting of ISO TC 204. Almost all the comment circulation of WD on parking lot information has been completed, and now the plan is waiting for TS voting. Discussions have been launched on information on congestion and traveling time, and Japan is promoting study mainly on link methods.



WG 11: Route Guidance and Navigation Systems

WG 11 is in charge of the standardization of route guidance and navigation systems. It has thus far worked on "navigation message sets," "centrally-determined route guidance" and "message set translators" under the standardization item related to message sets by navigation systems, and "on-board system architecture" under the standardization item linked to the architecture of on-board systems.

List of WG 11 work items

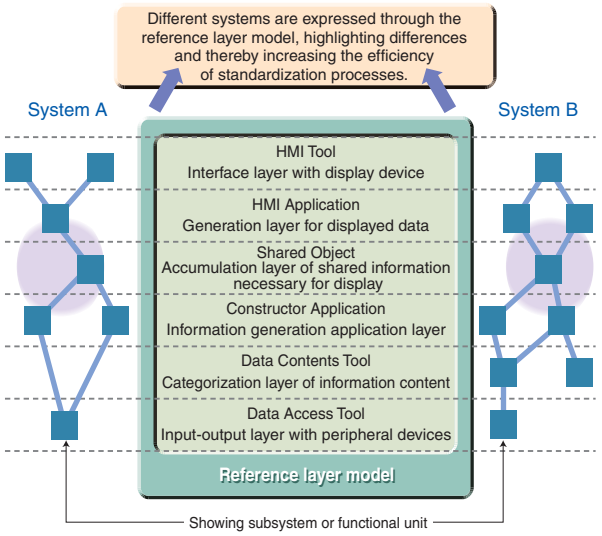
	Standardization themes	ISO numbers	Contents
1	In-vehicle navigation systems-communications message set requirements	ISO 15075	Prescription of necessary items for message sets to be handled by on-board navigation systems
2	Centrally-determined route guidance	TR 17384	Prescription of necessary items for interactive CDRG messages sets exchanged between a center and vehicles
3	On-board system architecture - a reference layer model	DPAS 16914	Prescription of reference layer model capable of describing hierarchically the structure of on-board information systems
4	ITS message set translator to ASN. 1 format definitions	PAS 17684	Simple notation of table forms regarding message sets and supply of conversion tools to ASN.1

On-Board System Architecture Reference Layer Model (DPAS 16914)

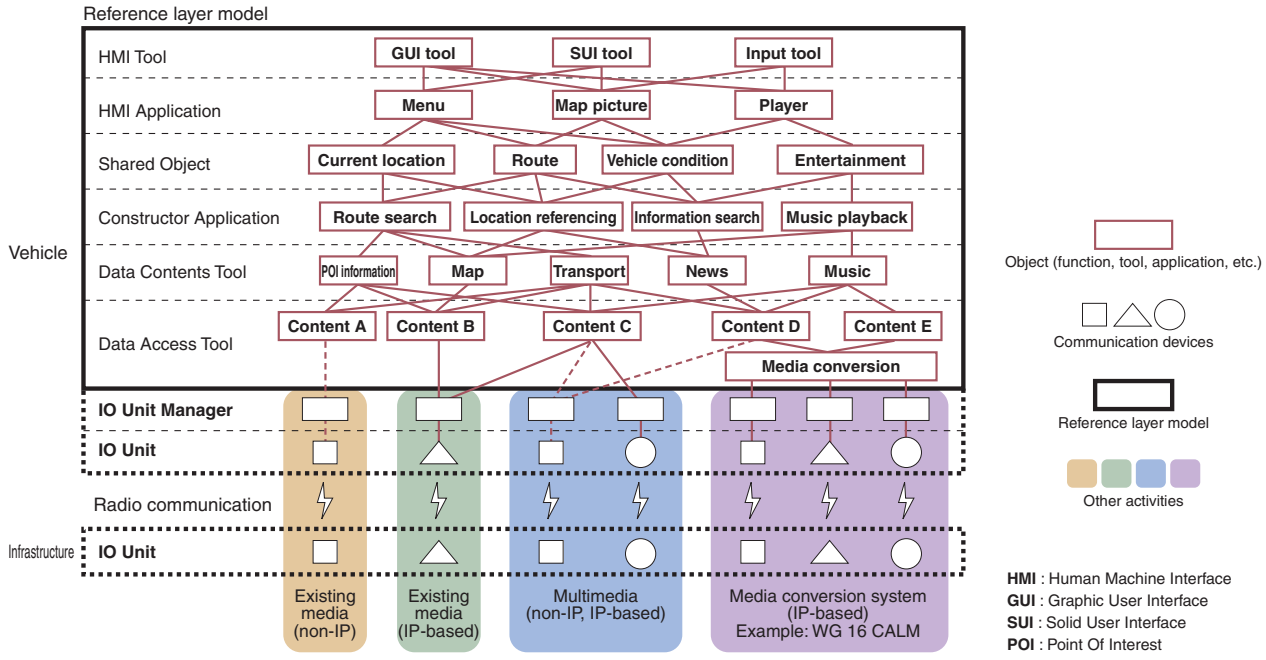
Underway is the standardization of a reference layer model in order to promote standardization work related to on-board systems.

The reference layer model is a standardized hierarchical model designed to express various on-board systems, such as navigation systems and next-generation on-board systems. It will make it possible to express models incorporating various restrictions on on-board systems—coordination between communication media for access to information sources, coordination between data obtained from information sources and structure of information accumulation to ensure responsiveness to users. Systems proposed individually are expressed after being applied to the reference layer model, highlighting differences in the contents of standardization for each system. This will result in smooth progress in standardization.

Reference layer model



Example of structure regarding on-board information system communication media



WG 14: Vehicle/Roadway Warning and Control Systems

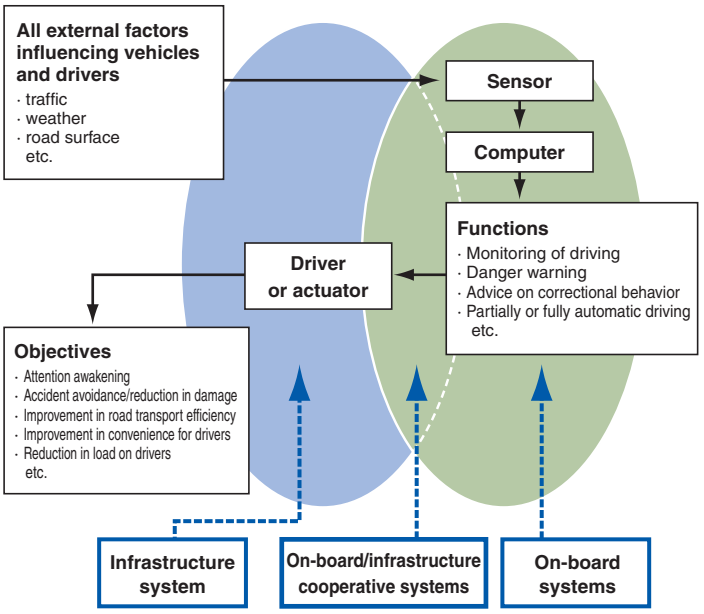
Activities of WG 14

"Driver support systems control" means control technology on vehicles directly linked to drivers, and forms a central part of ITS. The purpose of this area is to reduce driver workload, improve convenience, and arouse awareness of dangers, as well as to avoid accidents and decrease damage by the use of advanced technology. Examples of systems already on the market include adaptive cruise control (ACC) and forward vehicle collision warning.

Subject to standardization are contents regarding "vehicle/roadway warning and control systems" with a view to international uniformity of systems. Specifically, the work covers wide-ranging areas from vehicle control, sensing of and communication with external information and interface with drivers.

WG 14 is chaired by Japan. With its work going smoothly, WG 14 is widely recognized as one of the most active groups in ISO/TC 204 with a large number of participating countries.

Subject to standardization at WG 14



List of WG 14 work items

	Standardization themes	ISO numbers	Contents
1	Adaptive Cruise Control Systems (ACC)	ISO 15622	System to keep a certain distance with the vehicle running in front. Prescription of classification according to the existence of a clutch and an automatic brake, control strategy and characteristics of the driver's intervention.
2	Forward Vehicle Collision Warning Systems (FVCWS)	ISO 15623	System that prompts the driver to take an avoidance maneuver by activating a warning system whenever the vehicle in front is too close, to prevent rear-end collision. Specification of the detection range, detection performance and evaluation method for the vehicle in front.
3	Roadside Traffic Impediment Warning Systems (TIWS)	TS 15624	System that identifies obstacles in turns ahead of the vehicle through roadside sensors, and informs the driver using roadside message boards. To be established as TS without progressing to IS as the infrastructure depends on the unique situation in each country.
4	Maneuvering Aid for Low Speed Operation (MALSO)	ISO 17386	System to provide information on obstacles found at the rear end and at the corners of the vehicle when backing up and turning at low speed. Prescription of classification based on detection areas, system operation conditions and test methods.
5	Lane Departure Warning Systems (LDWS)	DIS 17361	System to warn a driver of an actual or possible departure from a lane due to carelessness, Prescription of definition of lane departure, conditions for warnings and test methods.
6	Lane Change Decision Aid Systems (LCDAS)	DIS 17387	System to provide information on a vehicle running in a blind spot or a vehicle approaching from behind when a driver tries to change lanes. Prescription of classification based on areas covered, conditions for warning and test methods.
7	Full Speed Range Adaptive Cruise Control Systems (FSRA)	NP 22179	System to expand following functions of ACC to stop control. Prescription of the definition of the vehicle running in front, how to restart, and operation limits of the system.
8	Low Speed Following Systems (LSF)	NP 22178	System unrelated to ACC and designed to place emphasis on following control of a low-speed vehicle on an expressway during congestion. In addition to common items with FSRA, studies of control methods for cases where the target has switched.
9	Rear-End Collision Mitigation Braking Systems (RECMS)	PWI	System that carries out an automatic emergency stop and reduces collision damage in the likelihood of a collision with an obstacle in front of the vehicle concerned. Studies of concepts, system requirements and test methods.
10	Extended Range Backing Aid Systems (ERBA)	NP 22840	System to provide information on obstacles at the rear end of the vehicle when backing up for a relatively long distance. Studies of the scope, obstacles concerned, detection areas and system operation conditions, in comparison with MALSO.
11	Intersection Signal Information and Violation Warning Systems (ISIVWS)	PWI	System based on roadside and vehicle cooperation that displays current traffic light information on on-board equipment and activates a warning system using on-board equipment when the driver is about to ignore a red light. Studies of the central features, such as basic functions, standardization items and information contents.

[Recent Activities]

Themes with draft discussions underway

With Japan serving as a leader, discussions on LDWS have been completed, and approved to establish the standard document. Smooth progress has been seen in discussions on LCDAS as Japan made a great contribution to test methods, and it is now in the voting stage of the DIS draft. As for FSRA and LSF, heated discussions are going on about the NP draft.

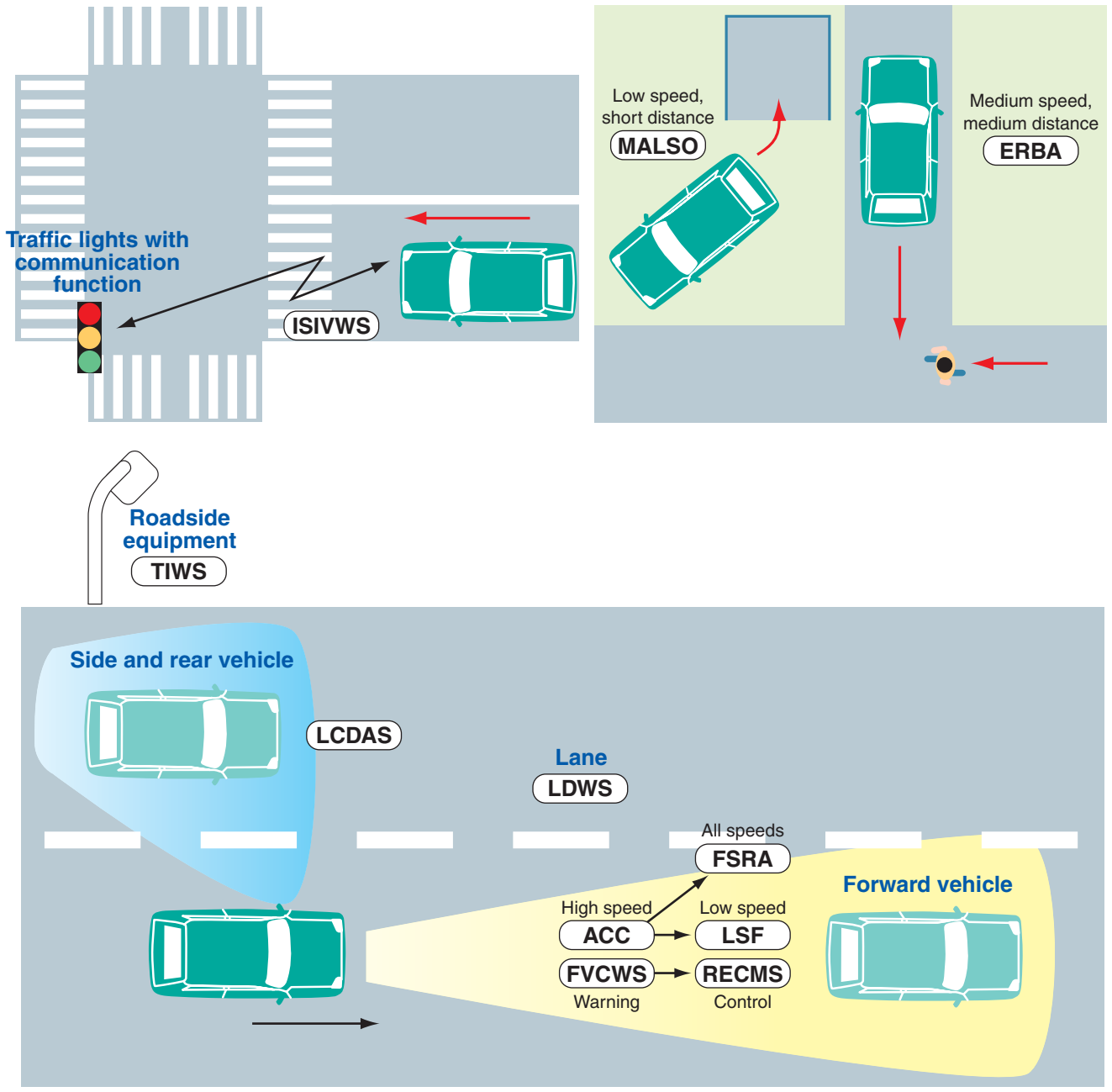
As for ERBA, the NP proposal was approved partly due to Japan's active proposals concerning the decision process for the draft contents and the test targets. RECMS was first commercialized in Japan, and work is underway using ASV for the preparation of commercialization guidelines. Comments are being actively submitted taking account of such trends.

WG14: Vehicle/ Roadway Warning and Control Systems

Themes with new PWI discussions underway

ISIVWS was approved as a new theme, and discussion has begun on a draft outline proposal. Since Japan is a leader in the research and development of infrastructure cooperative systems, it is proposed to start the discussion from such basic matters as standardization policies, scope and the like.

Correlation chart of each theme



[Future challenges]

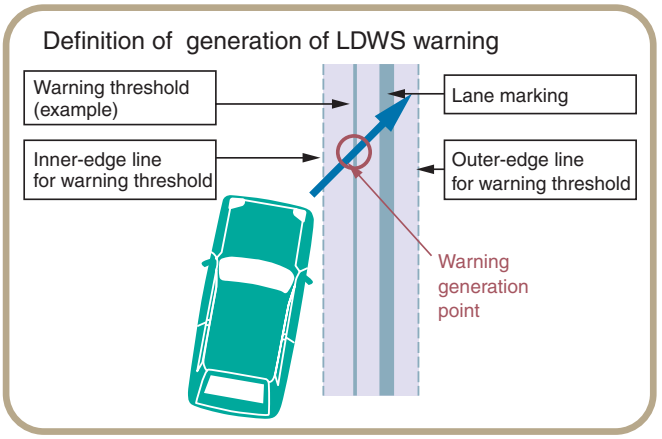
Standardization is designed to realize an effective and realistic system in draft form. Toward this end, experimental proof is essential, while it is necessary to carry out activities to gain consensus from each country through discussions.

The human machine interface (HMI) is very important to realize effective and safe driver support systems. Concerning standardization of HMI, liaison activities with TC 22/SC 13/WG 8 are being promoted more actively.

Introduction of major work items

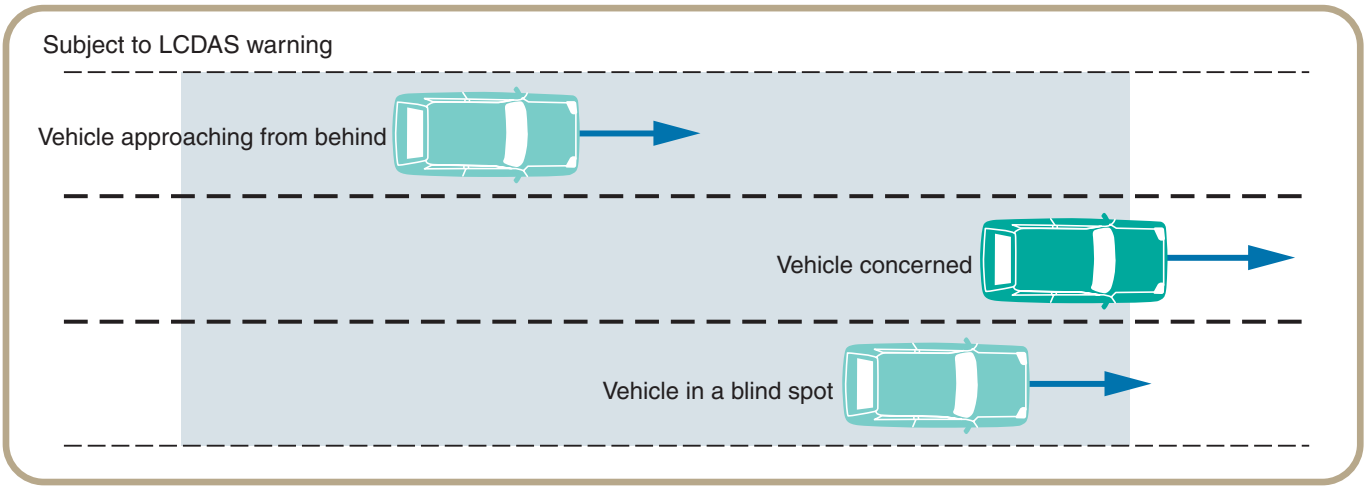
Lane Departure Warning Systems (LDWS)

LDWS is a system to warn the driver of lane departure or of its possibility in consideration of the lateral location of the vehicle concerned in a lane, as measured with a lane location detection sensor. Standardization work covers lane departure itself, not judgment of the possibility of a collision with vehicles running in an adjacent lane or the content of avoidance control. Japan serves as a leader in draft preparation, which is in the FDIS phase.



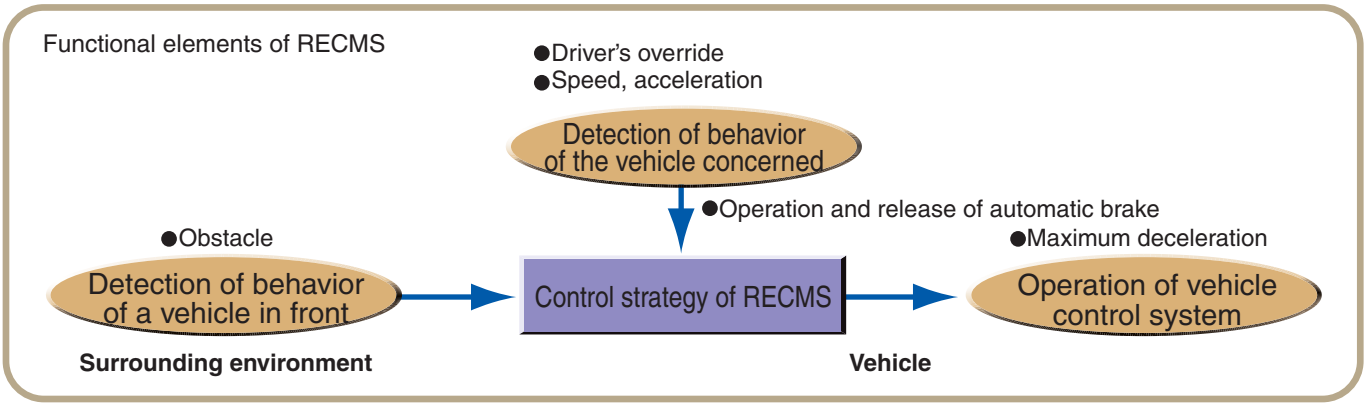
Lane Change Decision Aid Systems (LCDAS)

LDCAS is a system to give a warning of vehicles running in a blind spot or vehicles approaching from behind. Deliberations are going on regarding detailed warning conditions, such as the areas in which vehicles subject to warnings exist, approach speeds, and warning timings (in the case of a vehicle approaching from behind). This area has many new tasks, such as testing environment and standard targets. Japan proposes test methods and collects basic data.



Rear-End Collision Mitigation Braking Systems (RECMS)

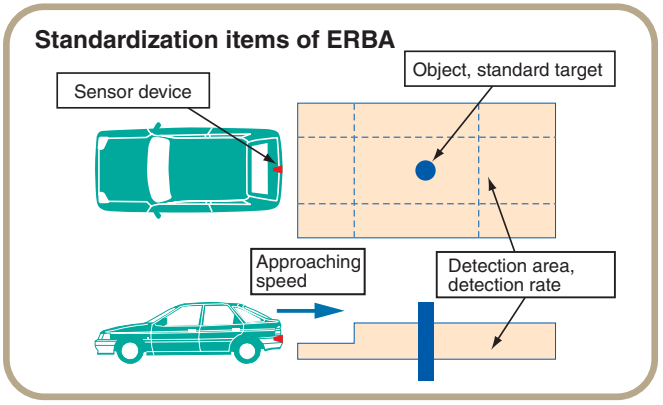
The conventional classification based on collision mitigation and avoidance was replaced by Type 1 (collision mitigation that minimizes interference between the driver's intention and the system action, as proposed by Japan) and Type 2 (collision mitigation that has an earlier automatic braking timing not guaranteeing collision avoidance, as proposed by the US). Type 1 and Type 2 are classified using TTC (time to collision) as the threshold for activation of automatic braking. Accordingly, the draft title was changed. RECMS is drawing great attention due to its direct effects on traffic safety, and accordingly early international standardization is anticipated. Comments will be submitted on the basis of domestic concepts and requirements in consideration of the actions of ASV, etc.



WG 14: Vehicle/Roadway Warning and Control Systems

Extended Range Backing Aid Systems (ERBA)

ERBA is designed to give a warning of obstacles at the rear end of the vehicle when it backs up for a relatively long distance. Japan will submit specific proposals on required specifications like detection range and rate, on test methods and standard targets on the basis of radar reflection data of various obstacles.

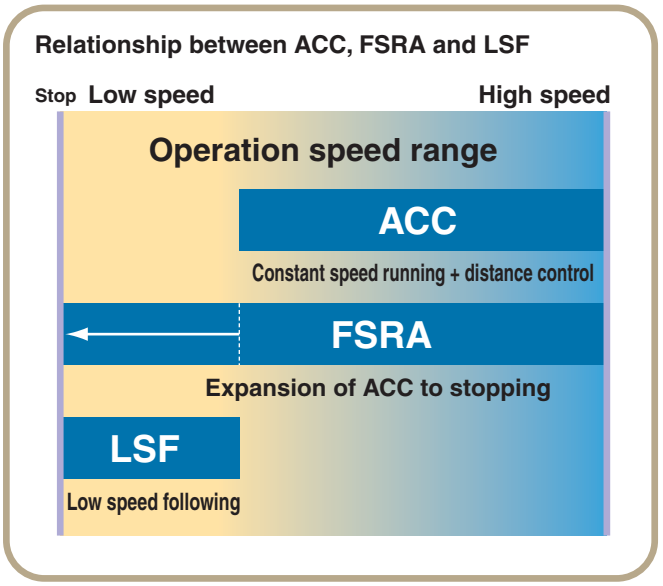


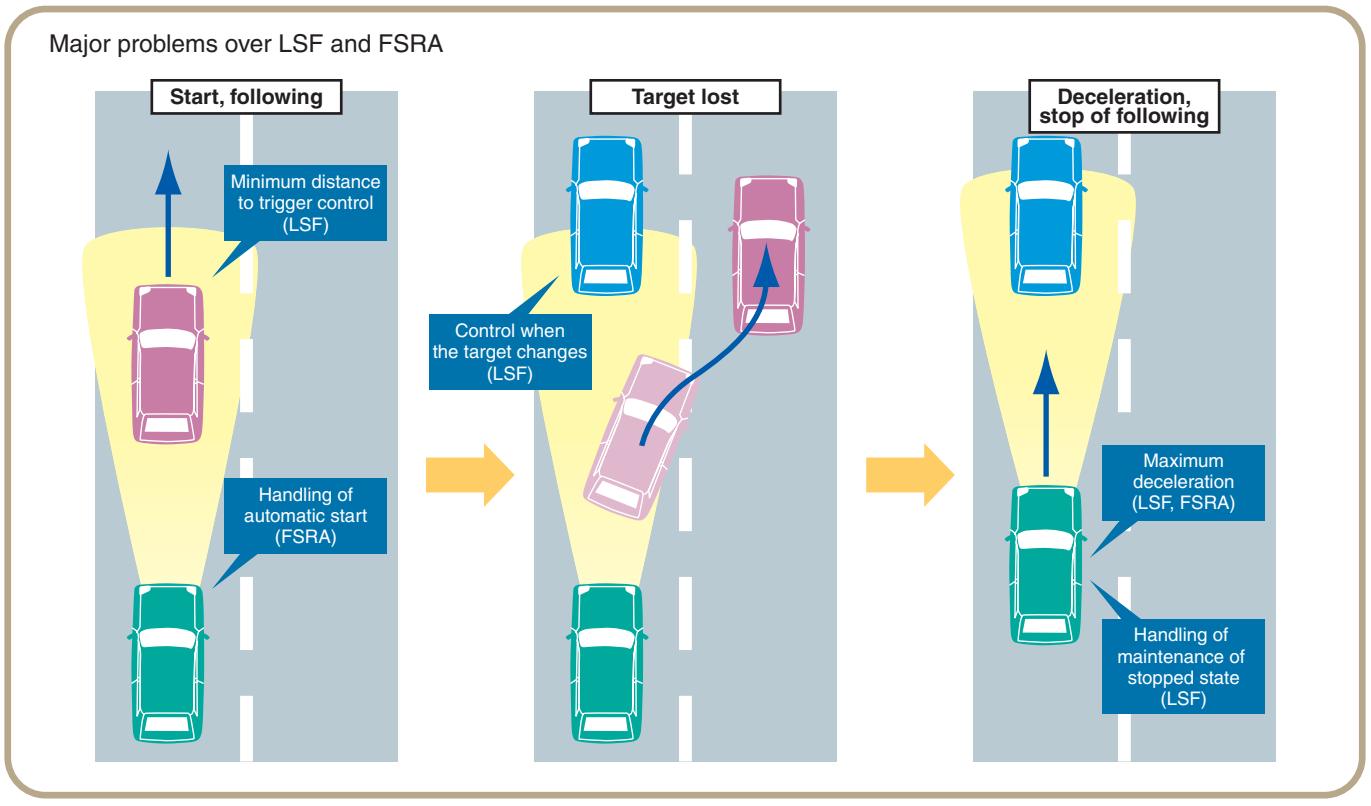
Low Speed Following Systems (LSF)

LSF is a system that allows the vehicle concerned to follow the vehicle in front in its lane, and it principally operates in congested conditions where there are repeated start-following-stop processes. It is designed to reduce driver workload. Japan suggested that this system is highly likely to be put on the market, and shift to NP was approved. Japan serves as a leader in draft preparation, and is promoting study of detail requirements.

Full Speed Range Adaptive Cruise Control Systems (FSRA)

FSRA is a system to extend the operation speed of ACC to the full speed range and keep a distance with the vehicle running in front. When the target vehicle stops, the vehicle concerned also comes to a stop. Japan will submit problems related to functional requirements necessary for expansion, while considering its transport situation.





WG 15: Dedicated Short Range Communications

WG 15 is working on the standardization of radio short range communications to be used for ITS applications. This is called Dedicated Short Range Communications (DSRC). The work area is limited to 'spot' type roadside-to-vehicle communications, and the seventh and second layers (LLC sub layers) in the Open Systems Interconnection (OSI) Seven-Layer Model are subject to standardization.
Standardization of the radio communication method equivalent to the Physical Layer has been handled by ITU-R, and recommendations on methods, including those of Japan and Europe, have been approved.

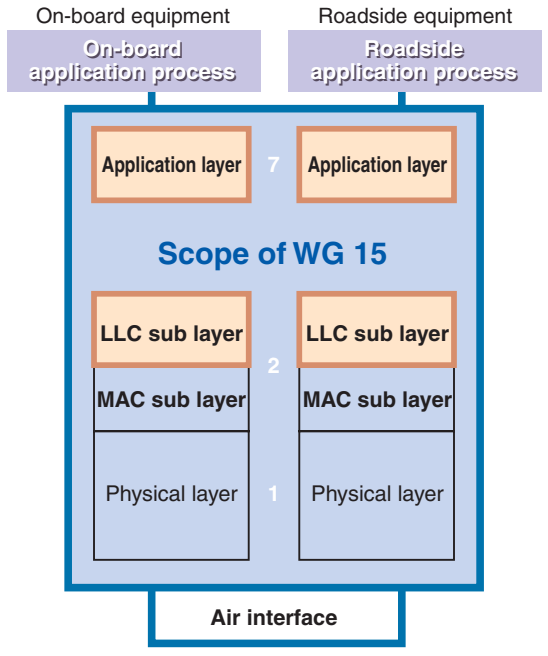
List of WG 15 work items

	Standardization themes	ISO numbers	Contents
1	Data link layer for dedicated short range communication - DSRC Layer 2	WD 15627	Interface for roadside-to-vehicle communications equivalent to communication protocol Layer 2 (suspended in a bid to include conditions for Data Link Layer in DSRC Layer 7 draft)
2	Application layer for dedicated short range communication - DSRC Layer 7	FDIS 15628	Interface for roadside-to-vehicle communications equivalent to communication protocol Layer 7 (including part of functions equivalent to Layers 3 - 6)

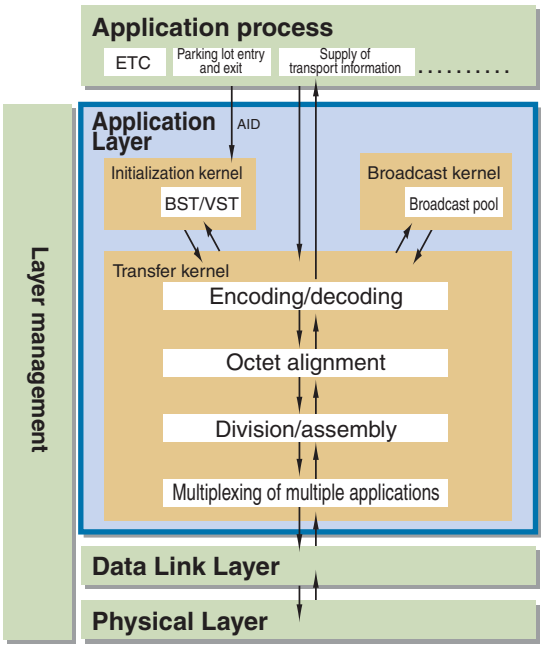
Progress in standardization of DSRC

In parallel with international standardization, progress has been made in standardization for DSRC in each country and region. In Europe, 5.8 GHz passive-system DSRC (CEN system) has been adopted as a European standard (EN), while 5.8 GHz active-system DSRC has been formulated in Japan. In North America, study is being made on 5.9 GHz standardization. Many countries are also studying the introduction of these types of DSRC, whereas Italy and South Korea have standardized their own DSRC. DSRC with Infrared systems is also available. As DSRC is a key technology for ITS, priority may be given to the situation of each country. In 2005, China prepared a draft based on employing Japan's DSRC.
DSRC protocol generally consists of the Physical Layer, the Data Link Layer and the Application Layer. In Japan, technical specifications on the Application Sub Layer (ASL) and basic application interface have been created as upper layers.

Scope of WG 15



DSRC Application Layer



DSRC Application Layer (FDIS 15628)

Under DSRC, Layers 3- 6 are usually omitted so that a vehicle running at a high speed can carry out direct communication with roadside equipment within a limited communication area. Functions necessary in these layers are included in the Application Layer. Various applications are available in DSRC, and an application identifier (AID) identifying applications is stipulated in the Application Layer. Roadside or on-board application processes designate this AID, and carry out communication with the other (on-board or roadside) application processes by way of the Application Layer and lower layers. Communication functions are performed mainly by transfer kernel. The functions include encoding and decoding of information, division and assembly of given frames and multiplexing of application information.
Japan prepared a working draft for this item and completed a draft for committee after incorporating requests from various regions and countries. In 2003, DIS voting was carried out and approved.

WG 16: Wide Area Communications

WG 16 Standardization themes

Six SWGs (16.0, 16.1, 16.2, 16.3, 16.4 and 16.5) are working on standardization at WG 16. Work items consist of CALM (Communications Air-Interface, Long and Medium Range) areas and probe areas.

List of WG 16 work items

	Standardization themes	ISO numbers	Contents	
1	TICS wide area communications - protocol management information	FDIS 15662	Message management information of ITS applications using wide area communication systems between a service center and a user terminal	
2	Wide area communications: CALM architecture	CD 21217	Architecture of Communications Air Interface, Long and Medium Range (CALM)	(SWG 16.0)
3	CALM-2G, CALM 3-G (2nd and 3rd generation cellular phones)	CD 21212 CD 21213	Application interfaces using 2nd and 3rd generation cellular phones for ITS	(SWG 16.1)
4	CALM-IR (infrared)	FDIS 21214	Application interface using infrared medium and wide area communication systems for ITS	(SWG 16.1)
5	CALM-M5 (5 GHz-band ITS communication)	CD 21215	Communication interface for ITS communication related to protocol 5 GHz band, Actual study by IEEE 802.11 Task Group	(SWG 16.1)
6	CALM-MM (millimeter wave)	NP 21216	Millimeter wave communication used for ITS	(SWG 16.1)
7	CALM-LL-SAP CALM Part 1 - medium service access point	CD 21218	Interface for each media to access the 3rd communication layer (IP layer)	(SWG 16.1)
8	CALM-MAIL (DSRC) CALM media adapted interface layer	PWI	DSRC adopting FDIS 15628 (DSRC-L7) including ARIB STD-T75 and T88 ASL (application sub layer) for CALM.	(SWG 16.1)
9	CALM-WBB general support, WiMax, existing systems	PWI	Requirements for wireless broadband and use of WiMAX and HC-SDMA	(SWG 16.1)
10	CALM interface manager	PWI	Function to control prevention of interference between different media	(SWG 16.1)
11	CALM networking protocol	CD 21210-1 CD 21210-2	Handover of medium and wide area communication, conditions for service access points (SAP), standards related to media selection function (cooperation with IEEE P 1609)	(SWG 16.2)
12	CALM-AM (application management)	NP 24101	Standards related to the installation of applications on ITS radio communication units	(SWG 16.4)
13	Configuration of vehicle probe data for wide area communications	CD 22837	Standards of information transmitted from a vehicle to an information processing center	(SWG 16.3)
14	Basic principles for personal data protection in probe vehicle information	PWI	Basic principle of protecting personal information in probe information services	(SWG 16.3)
15	Probe data reporting management	PWI	Control command for probe car	(SWG 16.3)
16	eCall eCall automatic crash notification	CD 24977 CD 24978	Emergency notification by cellular phone (eCall) and automatic emergency notification (ACN) by radio communication.	(SWG 16.5)

What is CALM?

CALM refers to long and medium range, high speed, air interface parameters and protocols for broadcast, point-point, vehicle-vehicle, and vehicle-point communications in the ITS sector.

- Supports ITS services and internet services
- Supports continuous communication during handover from one medium to another
- Covers differences between communication media and/or providers
- Realizes various communication modes
- Not influence on existing communication media
- Has an affinity for existing communication media

SWG 16.0: CALM architecture

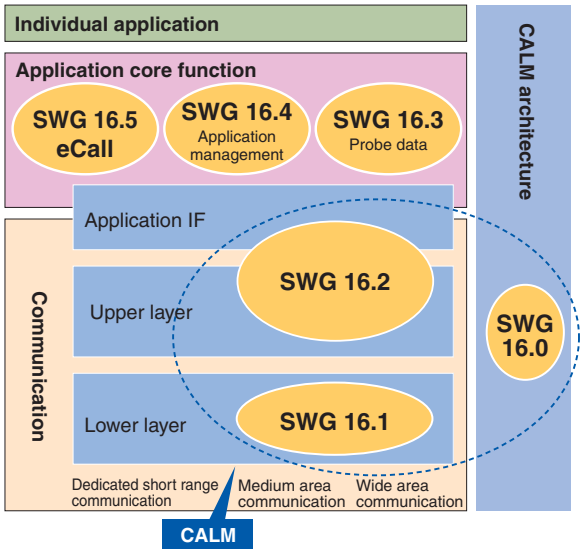
CALM architecture (CD 21217) was launched initially as internal work in CALM discussions in order to clarify each work item and term of CALM. As work items of CALM have increased, CALM architecture has become a new standardization work item. DIS is scheduled for August 2006.

General purpose: Capable of using applications and services (Web, etc.) on the Internet with IP protocol and direct access to the Internet

Continuous communication: Capable of using several media, such as cellular phones, infrared, 5 GHz band DSRC, and millimeter waves, and of handover among these media

Large capacity: Capable of several Mbps communication capacity depending on media (M5 may enable 3-27 Mbps capacity communication)

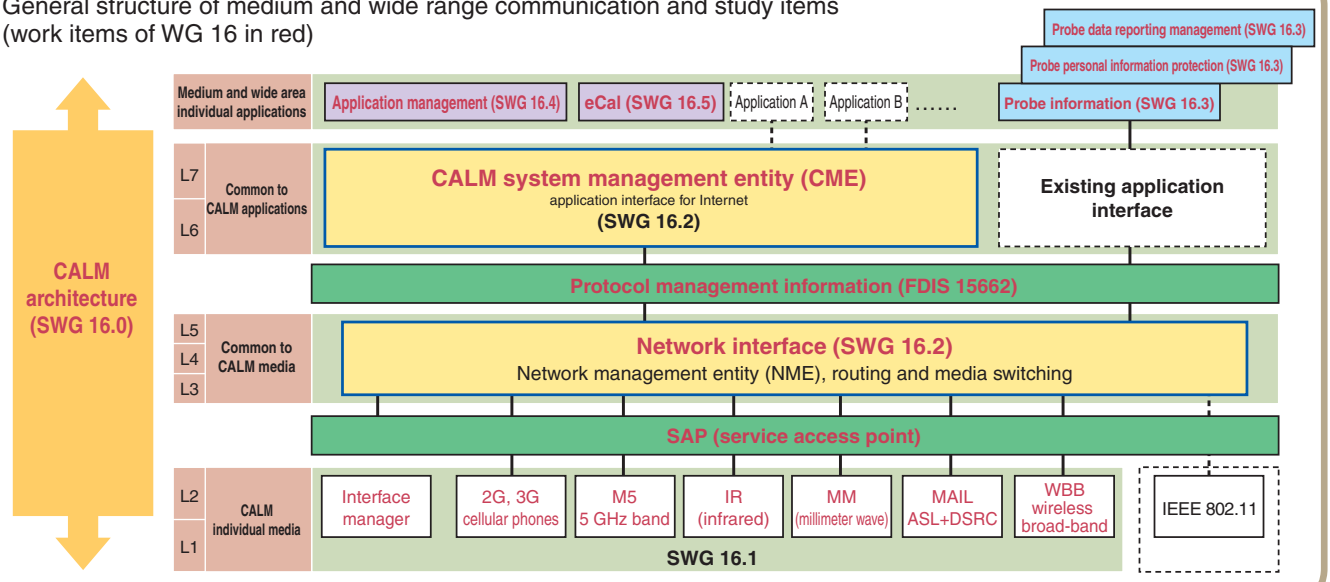
General framework and positioning of CALM architecture



General structure of CALM

CALM has an access interface SAP (service access point) between the 2nd layer and 3rd layer, making access to the Network layer (3rd layer) possible from various media such as cellular phones and millimeter waves. Under CALM architecture, media other than those not regulated at the moment are also capable of access to 3rd layer (network layer), a premise of CALM. Also scheduled for study is vehicle-vehicle communication under CALM.

General structure of medium and wide range communication and study items
(work items of WG 16 in red)



SWG 16.1: CALM media (lower layer)

Multiple media are capable of using CALM, and new media will be added, depending on future progress in technology or changes in demand.

CALM-M5 (CD 21215)

Among the presently possible CALM media, M5 using wireless LAN technology is expected to play a central role.

In November 2004, work of IEEE 802.11p was launched as an official task group of IEEE 802.11. Progress is being made in standardization for the US DSRC media and for the ISO-CALM media. After completion of IEEE 802.11p, the standard for CALM-M5 will be prepared by adding the functional parts to fit use with CALM.

CALM-IR (FDIS 21214)

A draft is being prepared under the leadership of Austria and Germany. In Germany, CALM-IR will be employed to enforce illegal use of systems using cellular network and GNSS for the charging of heavy vehicles. The document explicitly describes that the extant infrared beacon system in Japan is different from that defined in the CALM-IR.

CALM-MM (NP 21216)

In November 2002, an editor was selected from Japan at a WG 16 meeting. Having been approved through NP voting, the proposal is in the standardization stage, including studies of related system and studies of the characteristics of millimeter wave communication and applications.

CALM-2G, 3G (CD 21212, CD21213)

The media will be studied in cooperation with ITU-R and ETSI with a view to standardization of the interface to utilize 2nd and 3rd generation cellular phones in ITS.

CALM-interface manager (PWI)

Control will be performed to reduce mutual interference of multiple CALM media and to perform communications at the parameters in compliance with the regulations in each region. Currently, the details of the function are being discussed.

CALM-MAIL (PWI)

DSRC was developed as a medium for the 5 GHz band for ITS, and DSRC in the 5.8 GHz band is used in various countries and regions, including Japan with ARIB STD-T75. Standardization of the 7th layer (application layer) of DSRC has been worked out as FDIS 15628 in WG 15.

SWG 16.1 is standardizing the method of utilizing this DSRC as a CALM communication media while considering ARIB STD-T88 (ASL: Application Sub-Layer) as CALM-MAIL (Media Adapted Interface Layer). Its operation has already been verified as a dedicated communication for ITS, and DSRC can be applied to CALM with the goal of wider utilization of CALM.

NP voting for CALM-MAIL was approved at the TC 204 plenary meeting in Autumn 2005.

WG 16: Wide Area Communications

CALM-WBB (PWI)

Wireless broadband communication capable of quickly processing large amounts of data in IP bases has started to come under the spotlight. To utilize its performance and functions in ITS, a new PWI was approved at the TC 204 Paris plenary meeting in April 2005.

- CALM WBB – General Support
  General requirements for wireless broadband
- CALM WBB – WiMax
  Use of WiMAX (IEEE 802.16e)
- CALM WBB - Existing Systems
  Use of existing wireless broadband radio communication (iBurst, etc.)

In contrast with conventional mobile communication, wireless broadband communication achieves its functions and performance, including high speed, large capacity and constant connection, using the IP network.

Studies on the requirements for wireless broadband and which CALM applications can be enabled have just started. In parallel with these studies, concrete specifications, functions and performance of these two categories of communication means will be investigated. In addition, as in the cases of other individual CALM media, a joint study will be conducted with SWG 16.2 (Network Interface) on the SAP (service access points) to be incorporated into the CALM architecture. As frequency allocation for wireless broadband communications is expected to expand dramatically in Japan and other countries of the world, it is planned to swiftly improve CALM WBB as a new CALM media.

SWG 16.2: CALM Network (Upper Layer)

What is the standardization of CALM network (CD 21210)?

This standard will provide a function to realize a seamless communication environment (handover among the same medium and medium switching, etc.), which is a major concept of CALM.

In application development, a platform using the CALM environment will be provided regardless of expertise on communication media and networks. Consideration is given to Internet IPv6.

Three communication scenarios of CALM

[1] Scenario 1

Under this scenario, CALM is supposed to be used in areas that require high-speed processing, including safety-related applications, on the premise of one-on-one communication. No consideration is given to Internet access. Views will be compiled with reference to the study of IEEE P1609 and CALM-IR.

[2] Scenario 2

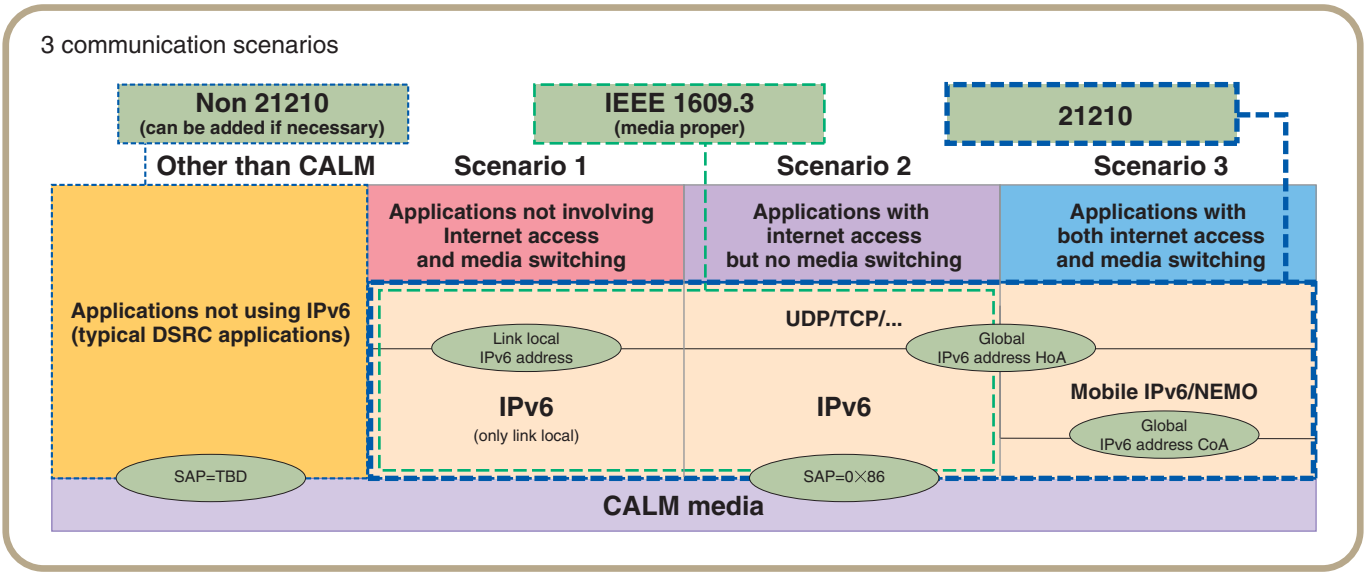
This scenario uses Internet access. No attention is paid to distribution of information by push technology to vehicles from the Internet and media switch. In case scenario 2 and 3 are available for equipment, it depends on stakeholders concerned (users, vendors and service providers) which will be used. Views will be complied on the basis of the study of IEEE P1609.

[3] Scenario 3

Complete Internet access will be possible , including media switch. Also available will be distribution of information by push technology from servers. Japan is playing a leading role in this standardization.

Media selection through CALM-CME

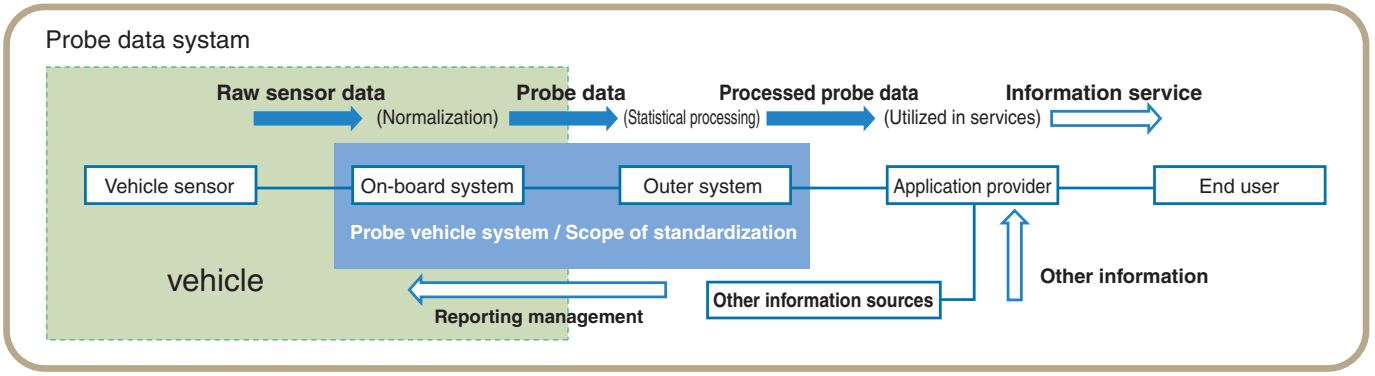
Study is being made as a standard for CME (CALM System Management Entity) regarding a function to select an appropriate media by comparing applications requirements for media with media condition and characteristics.



SWG 16.3: Probe data

What is standardization of probe data ?

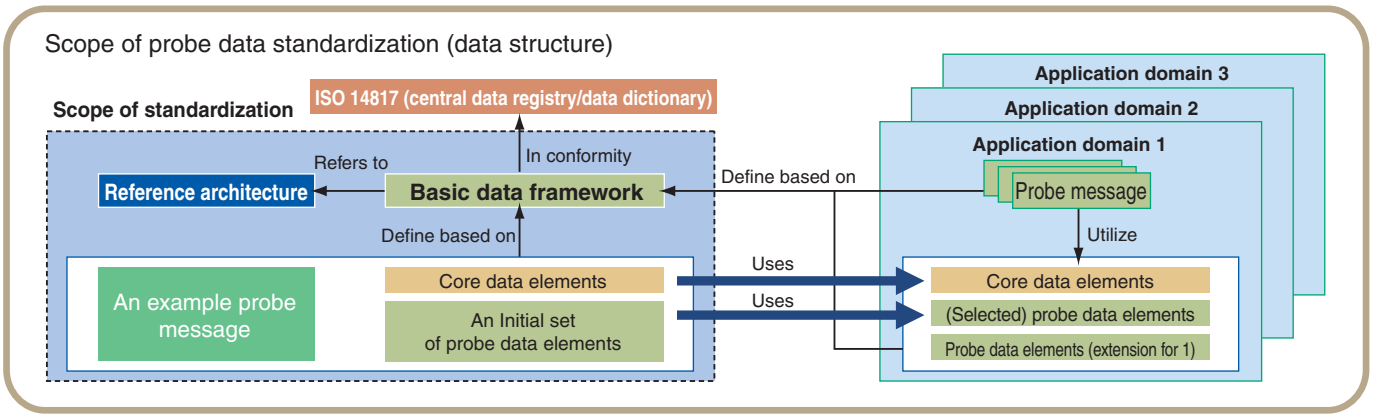
A system that consists of a group of vehicles that collect and transmit various types of data using medium and wide area radio communication, and center functions for statistical processing of the received data to acquire information concerning traffic, road and environment is called a “probe vehicle system.” Probe data is the data sent from on-board systems in the vehicle to the centers and other external systems. The speed and other basic data elements in the probe data are called “probe data elements,” and a compilation of multiple data elements is called a “probe message.” Probe messages always contains position and time stamps. This SWG is in charge of standardization of data dictionary for probe vehicle system and standardization of the instructions for the probe data reporting management that is sent from the center side to the group of vehicles when collecting probe data.



Configuration of vehicle probe data for wide area communications (CD22837)

For probe data, standardization of the following is in progress:

- Basic work frame: Specifies the methods of defining 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 position and time stamps included in all probe messages.
- Initial set of probe messages: Defines a group of typical probe messages.



Probe data reporting management (PWI)

Reporting management is a set of instructions regarding transmission of probe data to the group of vehicles, including the following:

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

By transmitting these instructions from the center side to the vehicle side, unnecessary transmission of data can be controlled, and detailed reports can be obtained on the desirable data in order to achieve effective data collection. The instructions are sent without identifying individual vehicles, and therefore the instructions can be sent to a group of vehicles in a specified region. Standardization of the report instruction message, which directs a reporting management, is being studied.

WG16: Wide Area Communications

Basic principles for personal data protection in probe vehicle information (PWI)

- In probe information services, the relationship between the usefulness of probe information and the handling of personal data is an extremely important problem for all the stakeholders concerned, such as probe data suppliers, probe vehicle information service providers and information users. Personal data cannot be handled too carefully.
- The following is considered 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.”
- Items being pursued are “preparation of guidelines to be followed by the stakeholders concerned” and “standardization of design guidelines necessary for its achievement” in addition to observance of laws concerning personal data protection, so that probe data suppliers can provide probe data without worry.
- It will be quite difficult to establish a uniform standard because legal systems on personal data protection differ from country to country. Therefore, priority will be given to consensus for the need for international standards and narrowing down of standardization items. “Identification of probe vehicle information services and limitation of services,” “Clarification of requirements for probe vehicle information systems” and “Concentration of priority items for wide use of probe vehicle information services.”

SWG 16.4: Application Management

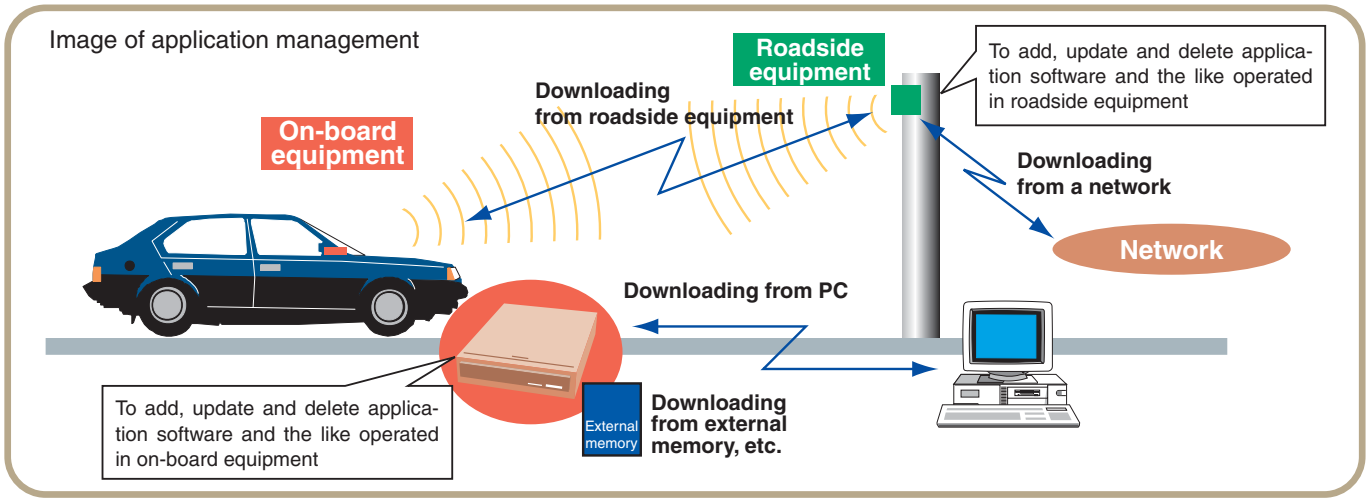
What is application management (NP 24101) ?

It is a scheme to download application software and the like from outside sources and realize new application services for equipment with ITS radio communication functions (roadside equipment and on-board equipment for ITS applications).

Objective and scope of standardization

The objective of standardization is to standardize how to realize installation of applications on equipment related to ITS radio communication. Subject to standardization are systems, structures and methods to add, update and delete applications.

Drafts are being prepared on the methods of managing applications, methods of adding, updating and deleting applications, security structures for application management, and the like.



Protocol Management Information (FDIS 15662)

Information items necessary when data is exchanged using wide area communication in ITS applications are described. The information is designated as meta-information (attribute information) of a message defined by each WG of TC 204, and serves as a check list designed to realize a system to process the message.

- Selection of communication systems (responsiveness, directivity, environment, service area, service times, band width, connection cost)
- Application identifier (message ID, message number, message transmission)
- Address (origin and destination)
- Priority (interrupt handling queue control)
- Security (mutual authentification, data authentification, concealing)
- Application execution (valid time, time stamp, target area)

As a result of DIS voting in October 2003, it was decided to be ISO standard on protocol management information.

SWG 16.5: eCall

At TC 204 Paris conference in April 2005, the following two standardization themes were proposed as PWI, and SWG 16.5: eCall (chair: United Kingdom) was established to deal with these standardization efforts.

- Emergency call using cellular network (CD 24977)
- Automatic crash notification using any available wireless media - data registry (CD 24978)

Both systems are designed to notify vehicle collision using position coordinates and related information and to notify the centralized professional call center management called PSAP (Public Service Answering Point) by radio communication. The former is a manual or automatic notification system covering the cellular phone network. It defines messages called Minimum Set Data (MSD) transmitted when a voice call is established, and uses these messages to provide position coordinates, times, vehicle information, communication parameters and other minimum data. On the other hand, the latter is an automatic system covering all available wireless data communication media. It provides specified position coordinates and related data (with no particular limitations on data length).

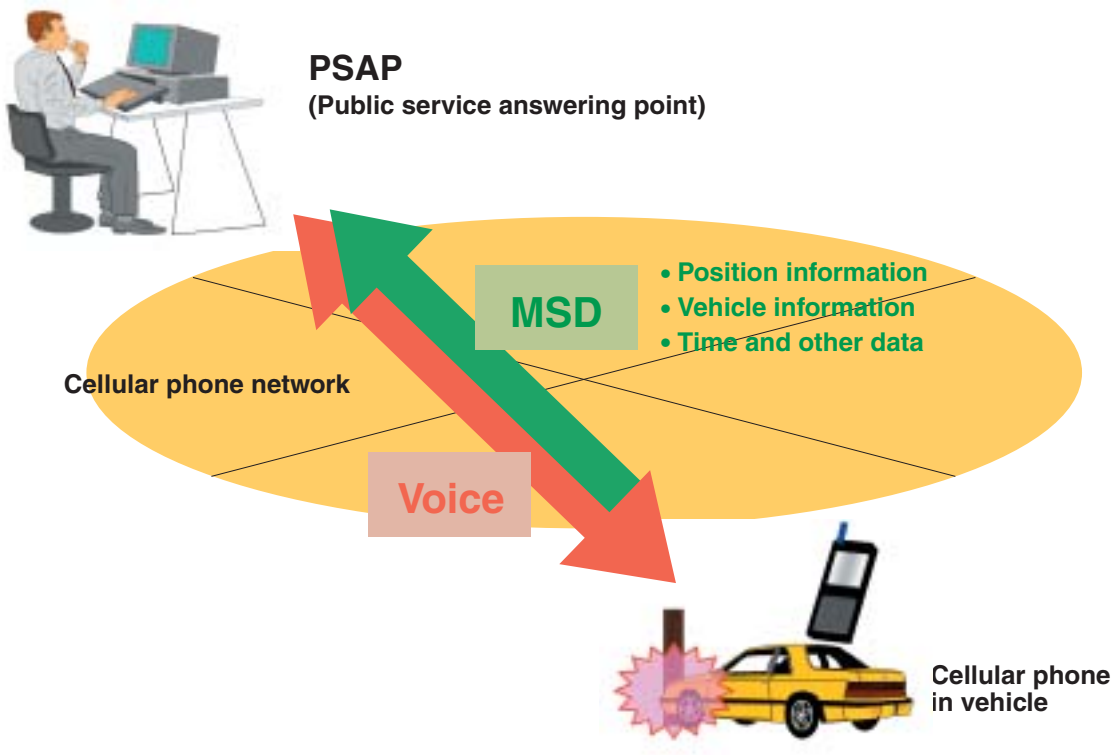
Standardization covers specification of the MSD data structure, message sets and protocols for 24977, as well as specification of management and operation methods including registration of emergency notification data and update rules for 24978.

After the Paris conference, both proposals became NP in September 2005, and subsequently approved for CD ballot at the Portland conference in November. As shown above, the chairperson is demonstrating leadership in carrying forward standardization efforts at a very fast pace. This may be because emergency notification for all cellular phones will contain additional position information from 2006 in Europe, and because eCall is positioned as one of the top priority items in the EC eSafety program.

The initial draft of 24977 dependent on the GSM format cellular phone standard. On the other hand, the CD draft that reflects Japan's suggestions can be used under the cellular phone standard of any country.

For standardization of these working items, participation of a wide range of specialists including cellular phone companies, car manufacturers, on-board equipment manufacturers and emergency notification service providers is requested.

Image of emergency call using cellular network



Introduction of related international standardization activities

ISO/TC 211 (Geographical information/Geomatics)

TC 211 is in charge of standardization of geographical information. This work aims to establish a structured set of standards for information concerning objects or phenomena that are directly or indirectly associated with a location relative to the earth. TC 211, established in 1994, is chaired by Norway. In Japan, the "Japan National Committee for ISO/TC 211" has been established in the Association of Precise Survey and Applied Technology. In many cases, TC 204 handles information related to location. In this sense, TC 211 is closely connected with TC 204.

Standardization activities by TC 211

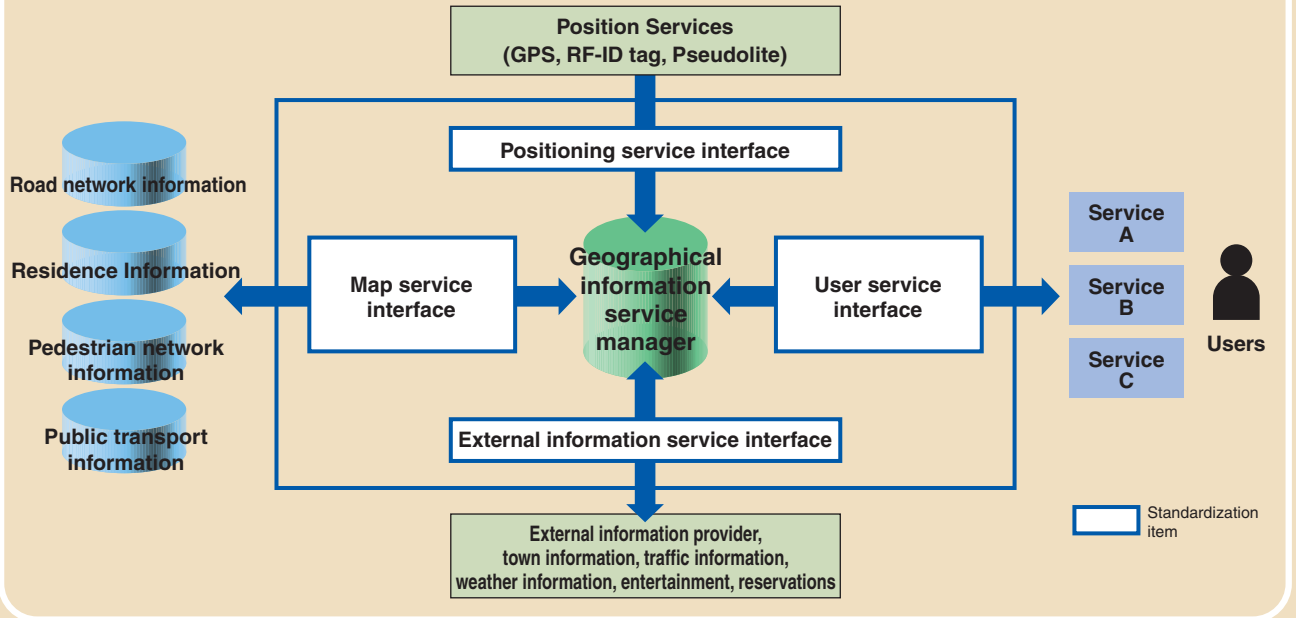
TC 211 has developed some 20 conceptual and systematic standards for the design of geographical information, quality, spatial referencing systems, meta-data, and services. At the finalization of these standards, TC 211 disbanded 4 out of 5 WGs, and established new 4 WGs in October 2001. At present, it is developing implementation-level standards and expanding existing standards. Specifically, it is working on the expansion of standards to geographical images, web services of geographic information and Location-Based Services (LBS). For detailed work items, please refer to the homepage of ISO/TC 211 (www.isotc211.org).

Since geographic information is one type of related information, TC 211 intends to employ usable standard "information technology" in the standardization process. From the early stage of establishment, TC 211 adopted UML and XML as standard notations.

Location-Based Services (LBS)

LBS refers to services combining map information, positioning services and external information concerning the location of moving objects. As an application area of geographical information, LBS is expected to become a larger market than GIS. Possible specific application areas are disaster management, rescue of victims and intelligent routing. "LBS-tracking and navigation" was issued as ISO 19133. Work is continuing with regard to standardization of "LBS-reference model", "LBS-multimodal routing and navigation" and "Schema for moving features".

Figure: LBS Interface schema and standardization items



Cooperation between TC 211 and TC 204

Since its inception, TC 211 has had liaison relations with TC 204. In 2004, a new cooperative agreement was concluded between TC 211 and TC 204 for even closer collaboration for LBS on the TC 211 side. Specifically, TC 211 and TC 204 have established a joint task force to share documents, ensure compatibility and jointly develop standards if a need arises. Another role of the joint task force is to promote coordination among standards using UML models.

Introduction of ITS standardization activities

ISO/IEC JTC 1 SC 31
(Standardization activities for technologies of automatic identification and data capture)

JTC 1 SC 31 is involved in standardizing AIDC (Automatic Identification and Data Capture).
AIDC is defined by ISO as "methods and technologies to identify 'objects' without human intervention", mainly utilized as means of automatic input for supply chain management (SCM). The standardization of SC 31 involves 5 working groups. WG 1 is working on standardizing 1st dimension and 2nd dimension symbols, WG 2 on methods of data storage to data carriers, WG 3 on conformance, and WG 4 on RFID, respectively.

Each working group is finalizing the development of standards. Focus is being shifted toward the future to WG 5 (Real Time Location System) which was newly established in 2004. RTLS is a system to identify the location of objects based on RFID technology. This system will be closely related to TC 204 since the link with GPS is considered. The product code system standard relating to all industries as proposed by Japan is in the final stage, and a new code system for product traceability is in the proposal stage.

Standardization of RFID

WG 4 which plays the role of standardizing has almost completed the scheduled task for developing standards (Fig. 1). The EPC Global tag, which Wal-Mart and the Department of Defense in the United States are planning to use, has been proposed as the new ISO/IEC 18000-6 Type C and is in the final stage. Currently, an additional provision to specify the interface between RFID and each sensor is being discussed as an amendment for each air interface.
A remaining challenge is problems regarding the product identification code system, i.e. the measures to construct a metacode system as represented by the EPC global code system, other RFID code systems, code systems for 1st dimension and 2nd dimension symbols, and the link with the EDI identifier. WG 2 is also deeply involved in this problem. In this situation, Japan has come forward to become the new convenor of WG 2, and is taking the leadership in this field. Also, the focus is shifting to the development of standards to solve problems arising in connection with use of the system, including the problem of tag disposal, the effect on medical equipment and the issue of privacy.

Fig. 1 Details of Standardization (WG 4 for RF Tag)

Title	P-No.
Radio Frequency Identification for Item Management-Air Interface Part 1 - Generic Parameters for Air Interface Communications for Globally Accepted Frequencies	ISO/IEC 18000-1
Part 2 - below 135 KHz	ISO/IEC 18000-2
Part 3 - 13.56 MHz	ISO/IEC 18000-3
Part 4 - 2.45 GHz	ISO/IEC 18000-4
Part 5 - 5.8 GHz	ISO/IEC 18000-5
Part 6 - 860-930 MHz	ISO/IEC 18000-6
Part 7 - 433 MHz	ISO/IEC 18000-7

ISO TC 104/TC 122 joint working group (SCM standards for RFID)

A supply chain is composed of diversified forms. Therefore, identification methods corresponding to each form and consistency in information between forms are both significant. (Fig. 2 and Fig. 3) As well as consistency in information, there is another problem regarding air interfaces between layers. For example, a case using the interface of ISO/IEC 18000-3 (13.56 MHz) for layer 0 with ISO/IEC 18000-6 for a collective unit, and on the contrary, a case where different interfaces are used in each layer. Thus, there are many themes to examine. America maintains the same interface (ISO/IEC 18000-6C) all through layer 0 to layer 3. In this case, a theme is methods for verifying demerits in this environment. However, the memory map for the tag has the same structure as ISO/IEC 18000-6C even if the air interface is different. This increases user convenience as the processing on the host side can be performed with the same software even if the air interface is different.

Fig. 2 Layers of Supply Chain Management (Transport Unit)

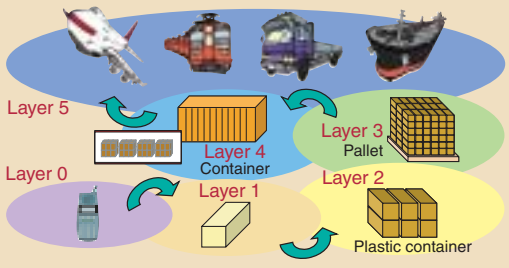
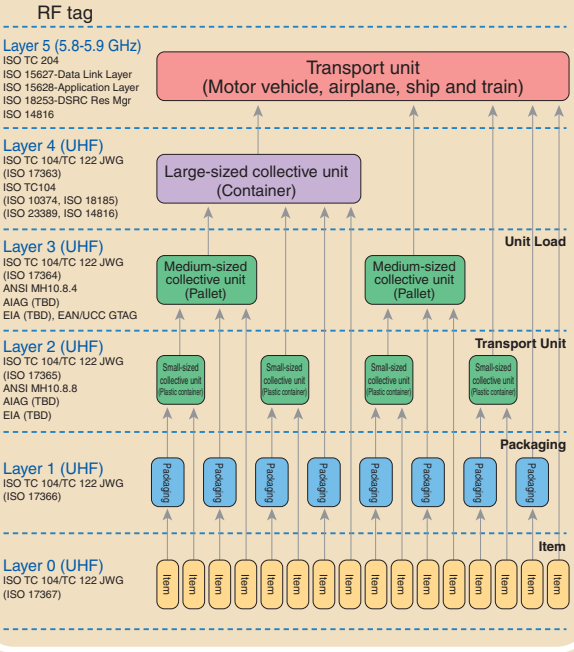


Fig. 3 Layers of Supply Chain Management



Introduction of ITS standardization activities

ITS-related Standardization in IEEE

As one of the standardization activities in IEEE (the Institute of Electrical and Electronic Engineers), the IEEE 802 Committee is involved in the standardization of technologies regarding LAN (Local Area Networks) and MAN (Metropolitan Area Networks). In ISO, technological standards prepared by the IEEE 802 Committee are often adopted as those in the area of LAN. Within the IEEE 802 Committee, working groups are involved in activities classified according to the targeted area, such as Ethernet standardization in 802.3WG. In the area of wireless systems, 6 WGs of 802. 11, 15, 16, 20, 21, 22 are presently involved in the activities for standardization.
Among these groups, 802.11 WG, which is promoting the standardization for wireless LAN technologies, has task groups classified according to the targeted area as shown in the table below. The IEEE 802.11b specifications prepared by TGb is well-known.

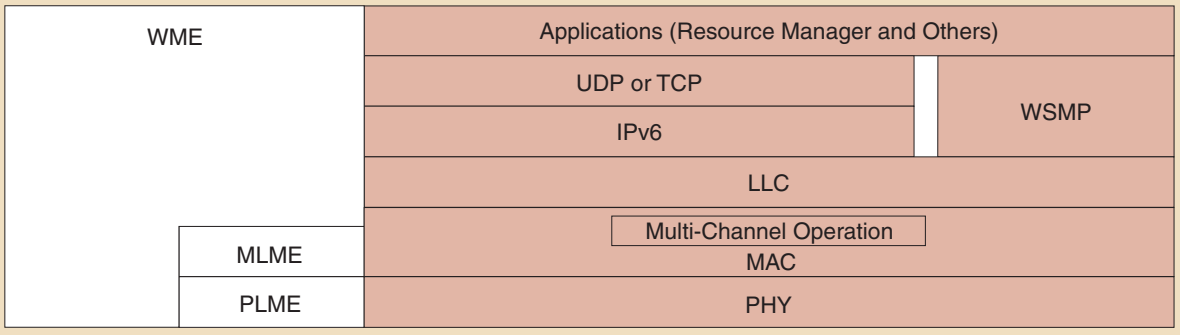
Task groups in 802.11 WG

Task groups	Scope of project	Status
TGa	Creation of specifications for physical layer in the 5 GHz band	Completed
TGb	Creation of specifications for physical layer in the 2.4 GHz band	Completed
TGe	Expansion of MAC specifications for QoS	Completed
TGf	Creation of specifications for communications between access points (AP)	Completed
TGg	Expanded specifications for 802. 11b, high-speed version in the 2.4 GHz band	Completed
TGh	Expanded specifications for 802. 11a (for European region)	Completed
TGi	Expansion of MAC specifications for security	Completed
TGj	Creation of specifications for the use of 4.9-5 GHz in Japan	Completed
TGk	Creation of specifications for the acquisition of wireless resource information	Active
TGm	Amendment of specifications such as 11a, 11b, etc.	Active
TGn	Creation of specifications for next-generation high-speed wireless LANs	Active
TGp	Creation of specifications for road-to-vehicle and vehicle-to-vehicle communications in the 5.9 GHz band, North America	Active
TGr	Expansion of MAC specifications for high-speed roaming	Active
TGs	Creation of specifications for communications to construct a network with mesh structure	Active
TGT	Specifications of test method for wireless LANs	Active
TGu	Creation of specifications for communications with networks other than wireless LANs	Active
TGv	Creation of specifications for managing wireless resource information	Active
TGw	Creation of specifications for protection of management frames	Active

A communication system applied to the 5.9 GHz band (5.85-5.925 GHz) allocated to ITS in North America is called WAVE (Wireless Access in Vehicular Environments). In this context, standardization activities for the physical layer and MAC layer were launched in November 2004 as TGp. In TGp, standardization is examined based on the ASTM (American Society for Testing and Materials) standard E2213-03.

In WAVE, applications which are unique to ITS such as safety are assumed, and standardization work for layers higher than the MAC layer is promoted in IEEE 1609 in coordination with each other to realize functions such as channel control, resource management, etc. At present, examination work is progressing toward the targeted communication architecture as shown below.

Archtecture of WAVE



WME: WAVE Management Entity
WSMP: WAVE Short Message Protocol

Introduction of ITS standardization activities

ITS-related standardization in ITU

What is ITU?

International standards regarding ITS are deliberated in ISO/TC 204. The International Telecommunications Union (ITU) prepares recommendations regarding ITS radio communications. ITU was established in Paris in 1865. After World War II, it was shifted to a specialized agency of the United Nations, and its headquarters was relocated to Geneva. The members of ITU number 189 countries and 642 organizations as of January 2006. ITU is the organization where governments from many countries and private organizations work together toward the development of telecommunication technologies and to coordinate with world communication networks and communication service operations.

In radiocommunications, this organization is involved in adopting international regulations and international treaties regarding terrestrial and space (satellites) frequency allocations and orbital position of geostationary satellites. Each country must establish relevant laws and regulations in accordance with the rules and treaties.

The organization involved in standardization of radiocommunication is the Radiocommunicaton Assemblies (RA) of the Radiocommunication Sector. Recommendations, i.e. communication standards, are prepared by the Radiocommunication Study Groups (SG), subordinate bodies of RA. Presently, radiocommunication study groups have several study sub groups and related committees. Of these, the group with the closest relation with ITS is SG 8 (Mobile, radiodetermination, amateur and related satellite services). SG 8 also has several working parties (WP) as subordinate groups. Among these parties, WP 8A (Land mobile service excluding IMT-2000; amateur and amateur-satellite service) is involved in standardization activities for ITS.

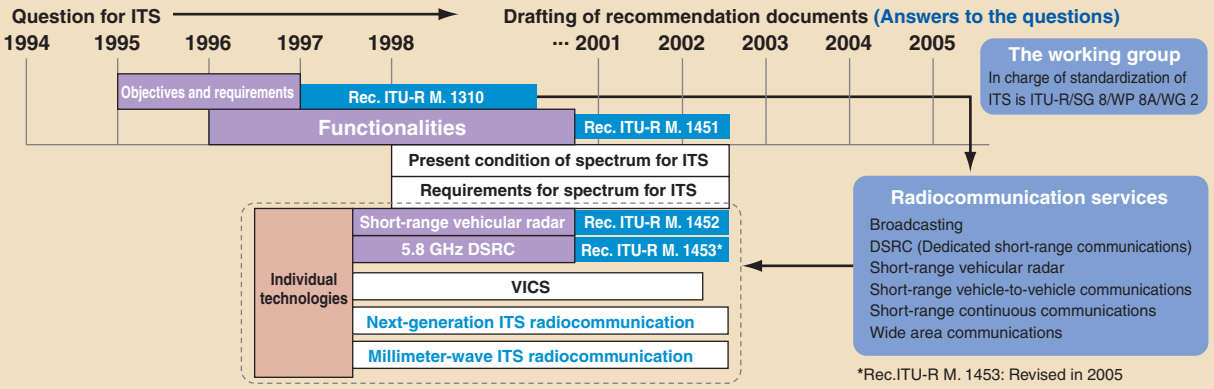
Standardization of ITS in ITU-R

Standardization of ITS in ITU-R was launched through the proposal of TICS (Transport Information and Control Systems: currently renamed as ITS) in 1994 as a study question. In 1995, the study question was officially adopted. The recommendation is positioned in ITU-R as the answer for the question. Intensive work has been done on the ITS study question since 1995. In 1997, “Objectives and Requirements” which describes requirements of radiocommunication in ITS was approved as a recommendation. This recommendation is a high-level document to describe the architecture of ITS radiocommunication in ITU-R. Based on this policy, three additional recommendations were drafted and approved: Functionalities, 60/76 GHz short-range radar, and 5.8 GHz dedicated short-range communications.

Among these recommendations, the 5.8 GHz dedicated short-range communications (DSRC) in Japan and European countries including Italy was approved. At that time, DSRC in Japan targeted ETC only. In 2002, the amendment of the recommendation was approved reflecting the new DSRC in Japan which was based on the ordinance of the Ministry of Internal Affairs and Communications in 2001. Additionally, a proposal was made to reflect the Application Sub Layer (ASL) established in Japan on the recommendation for 5.8 GHz dedicated short-range communications in 2004. This additional revision was approved in 2005. The next-generation ITS radiocommunication requested by ISO/TC 204, North America and Korea are being studied. Also under study are software radiocommunication and millimeter-waves for ITS newly proposed by Japan.

The history of preparing recommendations for ITS and the outline of recommendation documents already approved are shown below.

History of preparing recommendations for ITS



*Rec.ITU-R M. 1453: Revised in 2005

Outline of recommendation documents

Name of the document	Document number	Content
Objectives and Requirements	ITU-R M.1310	Document on architecture of ITS radiocommunication which provides the objectives and requirements of ITS
Functionalities	ITU-R M.1451	Positioning each function of ITS against specific communication services
Low power short-range vehicular radar equipment at 60 GHz and 76 GHz	ITU-R M.1452	Description of technical standards and parameters of low power collision-prevention radar at 60 GHz and 76 GHz
Dedicated Short Range Communications (DSRC) at 5.8 GHz	ITU-R M.1453	Recommendation for dedicated short-range communications in 5.8 GHz band comprising active method in Japan, passive method in Europe and high data-rate passive method in Italy; In 2002, the recommendation was revised according to promotion of high data rate of DSRC in Japan, and in 2005, it was revised additionally to reflect ASL in Japan.

Theme for Standardization List of working items for ISO/TC 204 and their stage of development (as of January 2006)

WG	ISO Number	Title	Developing stages						Publications
			PWI	NP	WD	CD	DIS	FDIS	
1	14813-1	Reference Model Architecture for the ITS Sector - Part 1: ITS Service Domains, Service Groups and Services					○		TS
1	14813-2	Reference Model Architecture for the ITS Sector - Part 2: Core ITS Reference Architecture							TS
1	14813-3	Reference Model Architecture for the ITS Sector - Part 3: Example Elaboration							TS
1	14813-4	Reference Model Architecture for the ITS Sector - Part 4: Reference Model Tutorial							TS
1	14813-5	Reference Model Architecture for the ITS Sector - Part 5: Requirements for Architecture Description in ITS Standards							TS
1	14813-6	Reference Model Architecture for the ITS Sector - Part 6: Data Presentation Using ASN.1				○			TS
1	24097	Using Web Services (machine-machine delivery) for ITS Service Delivery		○					
1	24531	Using XML in ITS Standards, Data Registries and Data Dictionaries					○		
1	24532	Using CORBA (Common Object Request Broker Architecture) in ITS Standards, Data Registries and Data Dictionaries							(TR)
1	25109	Example High Level Business Architecture - Crash and Emergency Notification				○			
1	-	Using UML in ITS Standards	○						
1	-	Procedure for Developing ITS Deployment Plans Utilizing ITS System Architecture	○						
1	-	User Guide for Harmonization of Data Concept	○						
1	-	ITS Use Case Pro Forma Template	○						
1	-	Business Justification for ITS Architecture	○						
1	-	Training Requirements for ITS System Architecture	○						
1	-	Procedures and Format for ITS Glossaries	○						
1	-	Crash and Emergency Notification Reference Architecture	○						
3	17572	ITS - Location Referencing for Geographic Database				○			(TS)
3	20452	Requirements and Logical Data Model for PSF and API and; Logical Data Organization for PSF used in ITS Database Technology				○			
3	22953	Extended Geographic Data Files (XGDF)			○				
3	-	Data Structures for Map Data Provision and Update in ITS Applications	○						
3	-	Navigation System Application Programme Interface (API)	○						
4	17261	RTTT - Intermodal Goods Transport - Reference Architectures and Terminology							TS
4	17262	RTTT - Intermodal Goods Transport - Numbering and Data Structures							TS
4	17263	RTTT - Intermodal Goods Transport - System Parameters							TS
4	17264	RTTT - Intermodal Goods Transport - Interfaces				○			
4	24534-1	AVI - ERI - Architecture				○			
4	24534-2	AVI - ERI - Operational Requirements				○			
4	24534-3	AVI - ERI - Vehicle Data				○			
4	24534-4	AVI - ERI - Secure Application Layer Using Asymmetric Techniques				○			
4	24534-5	AVI - ERI - Secure Application Layer Using Symmetric Techniques				○			
4	24535	AVI/AEI - Basic Electronic Registration Identification (Basic ERI)					○		
5	14904	RTTT - Electronic Fee Collection (EFC) - Interface Specification for Clearing between Operators							TS
5	14907-1	RTTT - Electronic Fee Collection (EFC) - Test Procedures for User and Fixed Equipment, Part 1: Description of Test Procedures							TS
5	14907-2	RTTT - Electronic Fee Collection (EFC) - Test Procedures for User and Fixed Equipment, Part 2: EFC Application Conformance Tests Specification							TS
5	17573	RTTT - Electronic Fee Collection (EFC) - System Architecture for Vehicle Related to Transport Services							TS
5	17574	RTTT - Electronic Fee Collection (EFC) - Guideline for EFC Security Protection Profiles							TS
5	17575	RTTT - Electronic Fee Collection (EFC) - Application Interface Definition for EFC based on Global Navigation Satellite Systems and Cellular Networks (GNSS/CN)				○			
5	-	Interface Definition for On-board Account Using Integrated Circuit Card	○						
7	17687	Data Dictionary and Message Sets for Electronic Identification and Monitoring of Hazardous Materials/Dangerous Goods Transportation						○	
7	24533	Data Dictionary and Message Set for Tracking of Freight and its Intermodal Transfer - Road Transport Information Exchanges				○			
7	-	Freight Conveyance Content Identification and Communication Architecture-Application Profile	○						
8	22951	Data Dictionary and Message Sets for Preemption and Prioritization Signal Systems for Emergency and Public Transport Vehicles (PRESTO)				○			
8	24014-1	Public Transport-Interoperable Fare Management System - Part 1: Architecture					○		
8	-	Transport Information and Control Systems - Standard Numbering System for Public Transport Stops (Reballot after Revision of Scope)	○						
9	15784-1	Data Exchange involving Roadside Module Communication - Part 1: Framework and Overview Application Profile		○					
9	15784-2	Data Exchange involving Roadside Module Communication - Part 2: TMP		○					
9	15784-3	Data Exchange involving Roadside Module Communication - Part 3: DATEX		○					
9	21707	Quality of Input Data for ITS Systems		○					
9	-	TICS - Integrated Transport Information, Management and Control - Data Dictionary - Data Dictionary	○						
9	-	TICS - Integrated Transport Information, Management and Control - Data Dictionary - Congestion monitor Use Case	○						

Note) Refer to P40 for ISO/TC 204 International Standards established and published so far.

WG	ISO Number	Title	Developing stages						Publications
			PWI	NP	WD	CD	DIS	FDIS	
10	14819-4	TTI Messages via Traffic Message Coding - Part 4: Coding Protocol for RDS-TMC using ALERT-C with ALERT+							(TR)
10	14819-5	TTI Messages via Traffic Message Coding - Part 5: Location Referencing for ALERT+							(TR)
10	14819-6	TTI Messages via Traffic Message Coding - Part 6: Encryption and Conditional Access for the Radio Data System - Traffic Message Channel ALERT C Coding						○	
10	14822-1	Traffic and Travel Information - Medium Range Pre-Information via DSRC - General Specification - Part 1: Downlink				○			(TS)
10	14822-2	Traffic and Travel Information - Medium Range Pre-Information via DSRC - General Specification - Part 2: Uplink				○			
10	14823	TTI Messages via Media-Independent Stationary Dissemination Systems				○			
10	15074	User Services Integration for Traffic and Traveler Message Lists			○				
10	18234-1～5	TTI over High Data-rate Broadcast Digital Bearers - Part1～Part5				○			
10	18234-6	TTI via Transport Protocol Experts Group (TPEG) Data Streams - Part 6: Location Referencing for Applications (TPEG-Loc-3.0/001)				○			
10	24530-1	TTI via Transport Protocol Experts Group (TPEG) Extensible Markup Language (XML) Part 1: Introduction, Common Data Types and tpegML				○			(TS)
10	24530-2	TTI via Transport Protocol Experts Group (TPEG) Extensible Markup Language (XML) Part 2: tpeg-locML				○			(TS)
10	24530-3	TTI via Transport Protocol Experts Group (TPEG) Extensible Markup Language (XML) Part 3: tpeg-rtmML				○			(TS)
10	24530-4	TTI via Transport Protocol Experts Group (TPEG) Extensible Markup Language (XML) Part 4: tpeg-ptiML				○			(TS)
10	24530-5	TTI via Transport Protocol Experts Group (TPEG) Extensible Markup Language (XML) Part 5: tpeg-pkiML				○			
10	-	TTI via Transport Protocol Experts Group (TPEG) Extensible Markup Language (XML) Part 6: tpeg-cttML	○						
11	16914	On Board System Architecture - A Reference Layer Model							(PAS)
11	17384	Centrally Determined Route Guidence							(TR)
11	17684	ITS Message Set Translator to ASN.1 Formal Definitions							PAS
14	15624	Roadside Traffic Impediment Warning Systems							TS
14	17361	Lane Departure Warning Systems					○		
14	17387	Lane Change Decision Aid Systems (LCDAS)					○		
14	22178	Low Speed Following (LSF) Systems		○					
14	22179	Full Speed Range Adaptive Cruise Control (FSRA) Systems		○					
14	22840	Extended Range Backing Aid Systems (ERBA)		○					
14	-	RECMS (Rear-End Collision Mitigation Braking Systems)	○						
14	-	ISIVWS (Intersection Signal Information and Violation Warning Systems)	○						
15	15627	Data Link Layer for Dedicated Short Range Communication - DSRC Layer 2			○				
15	15628	Application Layer for Dedicated Short Range Communication - DSRC Layer 7						○	
16	15662	TICS Wide Area Communication - Protocol Management Information						○	
16	21210-1	CALM Networking Protocol - Part1				○			
16	21210-2	CALM Networking Protocol - Part2				○			
16	21212	CALM 2G Cellular				○			
16	21213	CALM 3G Cellular				○			
16	21214	CALM IR						○	
16	21215	CALM M5				○			
16	21216	CALM MM		○					
16	21217	Wide Area Communications: CALM Architecture				○			
16	21218-1	CALM Part1: Medium Service Access Points				○			
16	22837	Configuration of Vehicle Probe Data for Wide Area Communication				○			
16	24101	CALM Application Management		○					
16	24977	Emergency Call using Cellular Networks				○			
16	24978	Automatic Crash Notification using any available wireless media				○			
16	-	CALM WBB - General Support	○						
16	-	CALM WBB - WiMAX	○						
16	-	CALM WBB - Existing Systems	○						
16	-	Basic Principles for Personal Data Protection in Probe Vehicle Information	○						
16	-	CALM Interface Manager	○						
16	-	CALM Media Adapted Interface Layer (MAIL)	○						
16	-	Probe Data Reporting Management	○						

Note) 1) The number of work items totals 82. 2) Publications in parentheses are being prepared for printing.

ISO/TC 204 International Standards established

ISO international standards issued so far (as of January 2006)

WG 1	ISO 14817	Requirements for an ITS/TICS central Data Registry and ITS/TICS Data Dictionaries (December 2002)
Stipulation of a system to register and manage, as a common dictionary, definitions of standard data used widely among ITS systems. In future, this standard is expected to be helpful in ensuring reciprocal operability and achieving more efficient development.		

WG 3	ISO 14825	Geographic Data Files (GDF) (February 2004)
Standard for data exchange of geographical database used for navigation systems. If they are expressed in the format of this standard, map data prepared all over the world can be distributed as data for navigation systems among map vendors.		

WG 4	ISO 14814	Reference architectures and terminology for automatic vehicle and equipment identification (January 2006)
Reference architectures and terminology for automatic vehicle and equipment identification		

WG 4	ISO 14815	Automatic vehicle and equipment identification - System specifications (July 2005)
Definition of the standard for the passing speeds of applicable vehicles and equipment, and definition of provisions on the distance between pieces of land equipment in automatic vehicle and equipment identification systems in order to ensure consistency between the ordering and order receiving parties and to facilitate reciprocal operations.		

WG 4	ISO 14816	Automatic vehicle and equipment identification - Numbering and data structures (November 2005)
Specification of data structures for IDs of vehicles communicating with the roadside, vehicle information, and equipment information (equipment ID, quantity) in automatic vehicle and equipment identification systems to maintain reciprocal operability.		

WG 5	ISO 14906	Electronic fee collection-Application interface definition for dedicated short-range communication (September 2004)
Regulation of EFC application interfaces under the DSRC method. This standard has been adopted for ETC on-board equipment and roadside equipment in Japan and many European countries.		

WG 9	ISO 14827-1	Data interfaces between centres for transport information and control systems - Part 1: Message definition requirements (November 2005)
Specification of the format of traffic information (messages) when being exchanged between traffic flow management centers, and specification of the procedure (protocol) for exchanging messages in order to ensure reciprocal operability.		

WG 9	ISO 14827-2	Data interfaces between centres for transport information and control systems - Part 2: DATEX-ASN (November 2005)
Establishment of a common international standard for the US, Europe and Japan by specifying the DATEX-ASN protocol as the procedure for exchanging information between traffic flow management centers.		

WG 10	ISO 14819-1	TTI messages via traffic message coding-Part 1: coding protocol for Radio Data System (June 2003)
Stipulation of introduction of the RDS-TMC (message coding of traveler information through FM broadcasting) system. It is possible for drivers to receive transport information in their native tongue with use of a virtual language even when they pass a border.		

WG 10	ISO 14819-2	TTI messages via traffic message coding-Part 2: Event and information codes for Radio Data System (June 2003)
Compilation of traveler information messages used for the RDS-TMC system. Stipulation of how to codify event information. A central standard in the 14819 series, it has made great contribution to ensuring interoperability of message exchange between different systems.		

WG 10	ISO 14819-3	TTI messages via traffic message coding-Part 3: Location referencing for Alert-C (March 2004)
Specification of the method of coding location referencing information, including road names, street names, urban areas, and the like, for the traveler information to be used in the RDS-TMC system. This standard contributes to ensuring reciprocal operability along with ISO 14819-1 and ISO 14819-2.		

WG 11	ISO 15075	In-vehicle navigation systems-Communications message set requirements (December 2003)
Stipulation of necessary items for a message set handled by an on-board navigation system. Prepared on the basis of existing standards in Japan and North America, it has specifications applicable to the route guidance system.		

WG 14	ISO 15622	Adaptive Cruise Control Systems (ACC) (October 2002)
Stipulation of the minimum and recommended headway time and automatic brake performance on the basis of transport surveys in Japan, the range of detection of a vehicle running in front in view of man's response time. Prescription of evaluation and standards in detail for performance of actual systems in various driving environments.		

WG 14	ISO 15623	Forward Vehicle Collision Warning Systems (FVCWS) (October 2002)
Stipulation of system performance after the study on scope of detection of a vehicle in front, in view of human's response time and warning issue accuracy on the basis of the draft prepared by Japan. Wrong warnings are reflected in evaluation and standards in various driving environments. Detailed description of items regarding human interface, such as display of warnings.		

WG 14	ISO 17386	Manoeuvring Aids for Low Speed Operation (MALSO) (July 2004)
Research was made into system performance evaluation tests and test subjects used to reflect back sonar and other equipment now being put on the market in Japan in the initial standard draft.		

ISO international standards to be issued soon (as of January 2006)

WG 14	DIS 17361	Lane Departure Warning Systems (LDWS)
LDWS is the standard for a system that generates warnings whenever the position of the applicable vehicle has deviated or is likely to deviate from its lateral position within the lane as measured by sensors.		

WG 15	FDIS 15628	Application layer for dedicated short range communication - DSRC Layer 7
Specification of the 7th layer of DSRC. Japan edited the draft standard, which conforms to the Japanese DSRC standard specifying the 7th layer (ARIB STD-T75). This standard has been adopted for ETC on-board equipment and roadside equipment in Japan and many European countries.		

WG 16	FDIS 15662	TICS wide area communications - Protocol management information
Standardization of checklists concerning messages of ITS applications in medium and wide area radio communication between service centers and the user's terminal.		

WG 16	FDIS 21214	CALM - IR
Specification of the application interface and protocol when infrared radiation is used in CALM.		

Web sites related to ITS

Representing organizations for ITS in countries and cities

ITS America	www.itsa.org/	ITS Munich	www.its-munich.de/
ITS Australia	www.its-australia.com.au/	ITS Netherlands (Connekt)	www.connekt.nl/
ITSC (China)	www.itsc.com.cn/	ITS Norway	www.its-norway.no/
ITS Canada	www.itscanada.ca/	ITS Spain	www.itsespana.com/
ITS Chile	www.itschile.cl/	ITS Singapore	www.itssingapore.org.sg/
ITS Czech Republic	www.its-cz.cz/	ITS South Africa	www.sasits.com/
ITS Finland	www.its-finland.fi/	ITS Sweden	www.its-sweden.com/
ITS France	www.itsfrance.net/	ITS Taiwan	www.its-taiwan.org.tw/
ITS Hong Kong	www.its-hk.org/	ITS United Kingdom	www.its-uk.org.uk/
ITS India	www.itsindia.org/	ITS Japan	www.its-jp.org/
TTS Italy	www.ttsitalia.it/	REAM (REAM Malaysia)	www.ream.org.my/
ITS Korea	www.itskorea.or.kr/		

Organizations involved in standardization of ITS

AASHTO (America)	www.aashto.org/	ISO	www.iso.ch/
ANSI (America)	www.ansi.org/	ITE	www.ite.org/
APEC	www.apecsec.org.sg/	ITS Standards (America)	www.its-standards.net/
ASECAP	www.asecap.com/	ITU	www.itu.int/
ASTM (America)	www.astm.org/	JTC1	www.jtc1.org/
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