Cross-ministerial Strategic Innovation Promotion Program

Cross-ministerial Strategic Innovation Promotion Program (SIP) Phase 2 - Automated Driving (Expansion of Systems and Services)/ Study of Overseas Trends, etc., in Preparation for International Collaboration Regarding Roadway Traffic Environmental Data

FY2019 Report

Overview

Mitsubishi Research Institute

March 2020

Background and objectives

Background

The Cross-ministerial Strategic Innovation Promotion Program (SIP) Phase Two - Automated Driving (Expansion of Systems and Services) being conducted by the Cabinet Office is working to create systems for exploiting roadway traffic environmental data, such as dynamic information in dynamic maps, with the aim of practically implementing advanced automated driving and achieving Society5.0. In order to promote international standardization related to roadway traffic environmental data, it is essential to consider project strategies that are harmonized with global efforts through coordination with overseas organizations (such as the Open AutoDrive Forum (OADF)) that promote the industry standardization of high-accuracy 3D map information and roadway traffic environmental data.

Objectives

This study investigated domestic and overseas standardization trends related to roadway traffic environmental data, ways to share information with related parties in Japan, and international standardization strategies, with the objective of harmonizing the results of measures related to the creation of systems for exploiting SIP Phase 2 automated driving roadway traffic environmental data with overseas standards organizations and reflecting them appropriately in international standards.

Study items

This study was performed over the course of two years, 2019 and 2020, and consisted of the following study items.

Table. Study items

Item	Overview
1. Study and analysis of domestic and foreign roadway traffic environmental data services, standards, etc.	We collected information regarding the state of handling of roadway traffic environmental data, both inside Japan and overseas, and trends in the formulation of standards, both de facto and de jure. We then analyzed and organized the contents of standards, etc. • Names of standards • Scopes of standards/roadway traffic environmental data targeted by standards • Formulating organizations and levels of standards (international standards, regional stan dards, industry standards)
2. Operation of council for deliberation on the formulation of international standardization strategies for roadway traffic environmental data in Japan and organization and summarization of council meeting results	We created and held roadway traffic environmental data standardization strategy deliberation council meetings, attended by various parties involved with roadway traffic environmental data in Japan, with the aim of achieving consensus between Japanese parties involved with international standardization strategies for roadway traffic environmental data in Japan. • Information sharing regarding domestic and overseas standardization trends • Proposal of approach for international standardization strategies • Organization and summarization of deliberation results

1. Study and analysis of domestic and foreign roadway traffic environmental data services, standards, etc.

1-1. Overview of study

Our objective was to **collect basic information to be used in the deliberation of approaches to take in roadway traffic environmental data international standardization strategies** in Japan. We collected information regarding the state of handling of roadway traffic environmental data, both inside Japan and overseas, and trends in the formulation of standards, both de facto and de jure. We then analyzed and organized the contents of standards, etc.

(1) Information collection and organization

- We identified standards concerning information necessary for vehicle driving (information regarding other vehicles, pedestrian information, information regarding traffic signals, traffic congestion information, traffic restriction information, information regarding fallen objects and obstacles, weather information, parking area information, etc.) through a review of the literature based on publicly disclosed information, for use in roadway traffic environmental data-related standards.

  * We placed greater emphasis on roadway traffic environmental data itself and methods for using it, and excluded from the study scope standards regarding the methods used to transmit it.

- We organized the roadway traffic environmental data-related standards that we discovered in the form of lists and individual sheets containing the names of standards, scope of standards/roadway traffic environmental data targeted by the standards, the organizations that formulated them and the levels of the standards (international standards, regional standards, industry standards).
- We performed a detail study of roadway traffic environmental information planned for verification during SIP Phase 2. This study was carried out from the following three perspectives: (1) The status of standard formulation for each roadway traffic environmental information, (2) Standardized items, and (3) Items to be dealt with in the future in preparation for automated driving, etc.

1-1. Overview of study

(2) Analysis related to standardization trends, etc.

- Based on the lists and individual sheets prepared in (1), we organized and summarized the scopes of existing standards and the contents of those standards, using diagrams and tables, to be used as basic materials when deliberating the formulation of roadway traffic environmental data international standardization strategies in Japan.
- Our study confirmed that existing standards contained standards that apply to the delivery of roadway traffic environmental data for traffic information (traveler information), traffic signal information, cooperative ITS, etc.
  With regard to the expressive accuracy of information (e.g.: provision of lane-level information), there were standards that were still being considered or which left room for further consideration, so we will continue to assess trends in the states of standardization measures by related organizations.
- In the future, based on the implementation of the FOTs in the Tokyo Waterfront area, we plan to focus on individual themes and organize information regarding the relationships between existing standards, the need for new standards, the usage potential of FOTs results, etc.

1-2. Information collection and organization: Identification of roadway traffic environmental data-related standards [1/4]

No.	Formulating body	Number	Name	Region
1	ISO/TC204WG8	22951	Data dictionary and message sets for preemption and prioritization signal systems for emergency and public transport vehicles (PRESTO)	Global
2	ISO/TC204WG9	14827-1	Transport information and control systems -- Data interfaces between centres for transport information and control systems -- Part 1: Message definition requirements	Global
3	ISO/TC204WG9	14827-2	Transport information and control systems -- Data interfaces between centres for transport information and control systems -- Part 2: DATEX-ASN	Global
4	ISO/TC204WG9	14827-3	Transport information and control systems -- Data interfaces between centres for transport information and control systems -- Part 3: Data interfaces between centres for intelligent transport systems (ITS) using XML (Profile A)	Global
5	ISO/TC204WG9	15784-1	Intelligent transport systems (ITS) -- Data exchange involving roadside modules communication -- Part 1: General principles and documentation framework of application profiles	Global
6	ISO/TC204WG9	15784-2	Intelligent transport systems (ITS) -- Data exchange involving roadside modules communication -- Part 2: Centre to field device communications using SNMP	Global
7	ISO/TC204WG9	15784-3	Intelligent transport systems (ITS) -- Data exchange involving roadside modules communication -- Part 3: Application profile-data exchange (AP-DATEX)	Global
8	ISO/TC204WG9	10711	Intelligent Transport Systems -- Interface Protocol and Message Set Definition between Traffic Signal Controllers and Detectors	Global
9	ISO/TC204WG9	19082	Intelligent transport systems -- Definition of data elements and data frames between roadside modules and signal controllers for cooperative signal control	Global
10	ISO/TC204WG10	14819-2	Intelligent transport systems -- Traffic and travel information messages via traffic message coding -- Part 2: Event and information codes for Radio Data System -- Traffic Message Channel (RDS-TMC) using ALERT-C	Global
11	ISO/TC204WG10	18234-5	Traffic and Travel Information (TTI) -- TTI via Transport Protocol Expert Group (TPEG) data-streams -- Part 5: Public Transport Information (PTI) application	Global
12	ISO/TC204WG10	18234-7	Intelligent transport systems -- Traffic and travel information via transport protocol experts group, generation 1 (TPEG1) binary data format -- Part 7: Parking information (TPEG1-PKI)	Global

1-2. Information collection and organization: Identification of roadway traffic environmental data-related standards [2/4]

No.	Formulating body	Number	Name	Region
13	ISO/TC204WG10	18234-8	Intelligent transport systems -- Traffic and travel information via transport protocol experts group, generation 1 (TPEG1) binary data format -- Part 8: Congestion and Travel Time application (TPEG1-CTT)	Global
14	ISO/TC204WG10	18234-9	Intelligent transport systems -- Traffic and travel information via transport protocol experts group, generation 1 (TPEG1) binary data format -- Part 9: Traffic event compact (TPEG1-TEC)	Global
15	ISO/TC204WG10	24530-3	Traffic and Travel Information (TTI) -- TTI via Transport Protocol Experts Group (TPEG) Extensible Markup Language (XML) -- Part 3: tpeg-rtmML	Global
16	ISO/TC204WG10	24530-4	Traffic and Travel Information (TTI) -- TTI via Transport Protocol Experts Group (TPEG) Extensible Markup Language (XML) -- Part 4: tpeg-ptiML	Global
17	ISO/TC204WG10	21219-14	Intelligent transport systems -- Traffic and travel information (TTI) via transport protocol experts group, generation 2 (TPEG2) -- Part 14: Parking information application (TPEG2-PKI)	Global
18	ISO/TC204WG10	21219-15	Intelligent transport systems -- Traffic and travel information (TTI) via transport protocol experts group, generation 2 (TPEG2) -- Part 15: Traffic event compact (TPEG2-TEC)	Global
19	ISO/TC204WG10	21219-16	Intelligent transport systems -- Traffic and travel information via transport protocol exports group, generation 2 (TPEG2) -- Part 16: Fuel price information and availability (TPEG2-FPI)	Global
20	ISO/TC204WG10	21219-18	Intelligent transport systems - Traffic and travel information (TTI) via transport protocol experts group, generation 2 (TPEG2) -- Part 18: Traffic flow and prediction application (TPEG2-TFP)	Global
21	ISO/TC204WG10	21219-19	Intelligent transport systems -- Traffic and travel information (TTI) via transport protocol experts group, generation 2 (TPEG2) -- Part 19: Weather information (TPEG2-WEA)	Global
22	ISO/TC204WG10	21219-25	Intelligent transport systems -- Traffic and travel information (TTI) via transport protocol experts group, generation 2 (TPEG2) -- Part 25: Electromobility charging infrastructure (TPEG2-EMI)	Global
23	ISO/TC204WG14	20035	Intelligent transport systems — Cooperative adaptive cruise control systems (CACC) — Performance requirements and test procedures	Global
24	ISO/TC204WG14	26684	Intelligent transport systems (ITS) — Cooperative intersection signal information and violation warning systems (CIWS) — Performance requirements and test procedures	Global
25	ISO/TC204WG14	20901	Intelligent transport systems -- Emergency electronic brake light systems (EEBL) -- Performance requirements and test procedures	Global

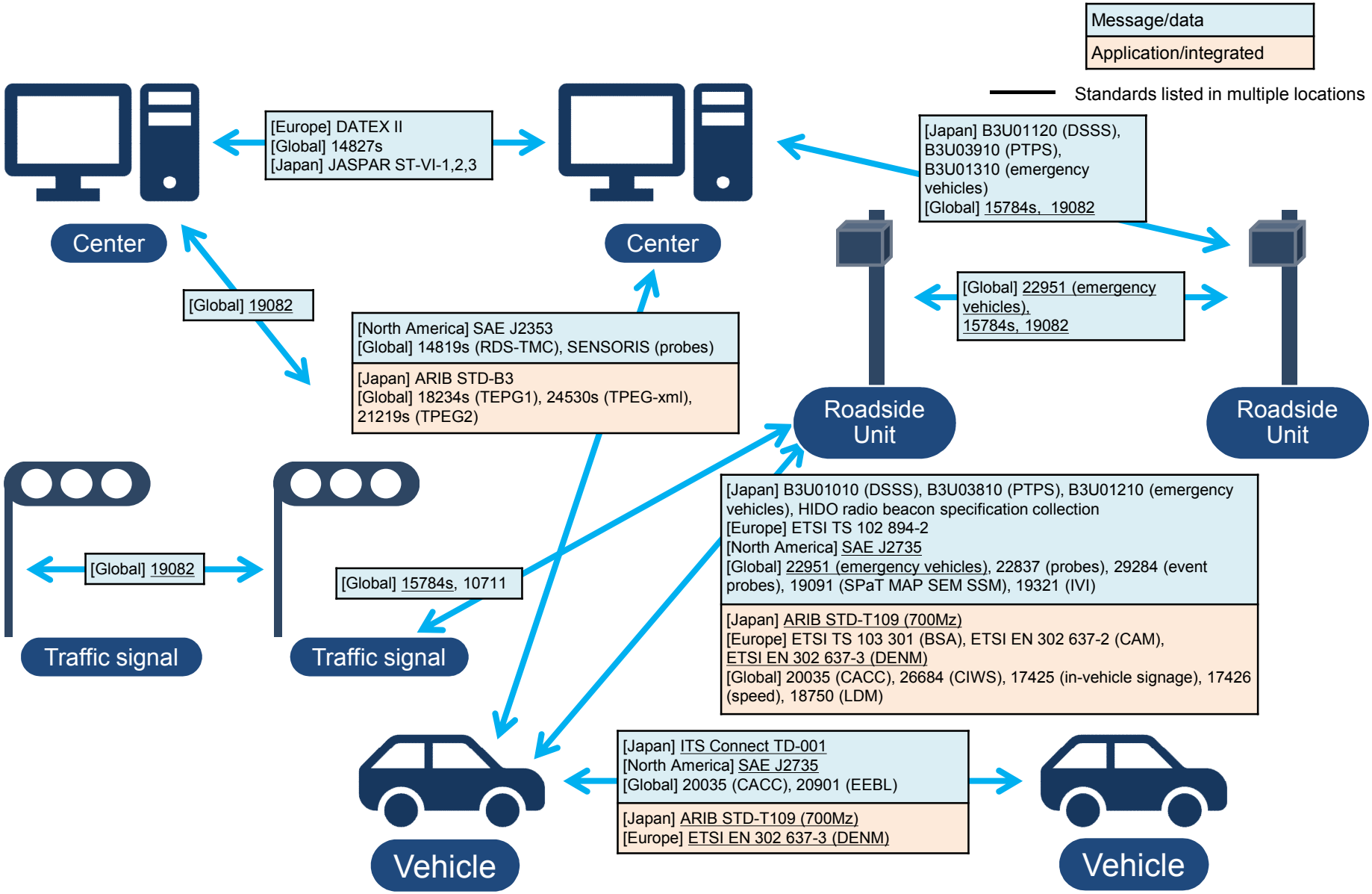
1-2. Information collection and organization: Identification of roadway traffic environmental data-related standards [3/4]

No.	Formulating body	Number	Name	Region
26	ISO/TC204WG16	22837	Vehicle probe data for wide area communications	Global
27	ISO/TC204WG16	29284	Intelligent transport systems -- Event-based probe vehicle data	Global
28	ISO/TC204WG18	19091	Intelligent transport systems -- Cooperative ITS -- Using V2I and I2V communications for applications related to signalized intersections	Global
29	ISO/TC204WG18	19321	Intelligent transport systems -- Cooperative ITS -- Dictionary of in-vehicle information (IVI) data structures	Global
30	ISO/TC204WG18	17425	Intelligent transport systems -- Cooperative systems -- Data exchange specification for in-vehicle presentation of external road and traffic related data	Global
31	ISO/TC204WG18	17426	Intelligent transport systems -- Cooperative systems -- Contextual speeds	Global
32	ISO/TC204WG18	18750	Intelligent transport systems -- Co-operative ITS -- Local dynamic map	Global
33	CEN/TC278	16157-1	Intelligent transport systems - DATEX II data exchange specifications for traffic management and information - Part 1: Context and framework	Europe
34	CEN/TC278	16157-2	Intelligent transport systems - DATEX II data exchange specifications for traffic management and information - Part 2: Location referencing	Europe
35	CEN/TC278	16157-3	Intelligent transport systems - DATEX II data exchange specifications for traffic management and information - Part 3: Situation Publication	Europe
36	CEN/TC278	16157-4	Intelligent transport systems - DATEX II data exchange specifications for traffic management and information - Part 4: Variable Message Sign (VMS) Publications	Europe
37	CEN/TC278	16157-5	Intelligent transport systems - DATEX II data exchange specifications for traffic management and information - Part 5: Measured and elaborated data publications	Europe
38	CEN/TC278	16157-6	Intelligent transport systems - DATEX II data exchange specifications for traffic management and information - Part 6: Parking Publications	Europe
39	CEN/TC278	16157-7	Intelligent transport systems - DATEX II data exchange specifications for traffic management and information - Part 7: Common data elements	Europe
40	ETSI	TS 103 301 V1.1.1(2016-11)	Intelligent Transport Systems (ITS); Vehicular Communications; Basic Set of Applications; Facilities layer protocols and communication requirements for infrastructure services	Europe

1-2. Information collection and organization: Identification of roadway traffic environmental data-related standards [4/4]

No.	Formulating body	Number	Name	Region
41	ETSI	ETSI EN 302 637-2 V1.4.0 (2018-08)	Intelligent Transport Systems (ITS); Vehicular Communications; Basic Set of Applications; Part 2: Specification of Cooperative Awareness Basic Service	Europe
42	ETSI	ETSI EN 302 637-3 V1.3.0 (2018-08)	Intelligent Transport Systems (ITS); Vehicular Communications; Basic Set of Applications; Part 3: Specifications of Decentralized Environmental Notification Basic Service	Europe
43	ETSI	ETSI TS 102 894-2 V1.3.1 (2018-08)	Intelligent Transport Systems (ITS); Users and applications requirements; Part 2: Applications and facilities layer common data dictionary	Europe
46	SENSORIS	-	Vehicle Sensor Data Cloud Ingestion Interface Specification (v2.0.2)	Industry (Europe)
44	SAE	J2735	Dedicated Short Range Communications (DSRC) Message Set Dictionary™	North America
45	SAE	J2353	Data Dictionary for Advanced Traveler Information Systems (Atis)	North America
47	UTMS Society	B3U01010	ITS Wireless Roadside Device DSSS Road-to-Vehicle Communication Application Standard	Japan
48	UTMS Society	B3U01120	ITS Wireless Roadside Device DSSS DATEX-ASN Message Standard	Japan
49	UTMS Society	B3U03810	ITS Wireless Roadside Device PTPS Road-to-Vehicle Communication Application Standard	Japan
50	UTMS Society	B3U03910	ITS Wireless Roadside Device PTPS DATEX-ASN Message Standard	Japan
51	UTMS Society	B3U01210	ITS Wireless Roadside Device Emergency Vehicle Approach Information Relay Road-to-Vehicle Communication Application Standard	Japan
52	UTMS Society	B3U01310	ITS Wireless Roadside Device Emergency Vehicle Approach Information Relay DATEX-ASN Message Standard	Japan
53	Association of Radio Industries and Businesses	ARIB STD-B3	ARIB Standard for Operation of the FM Multiplex Broadcasting System	Japan
54	Association of Radio Industries and Businesses	ARIB STD-T109	700 MHz Band Intelligent Transport Systems	Japan
55	ITS Info-communications Forum	ITSFORUM RC-013 1.0	700MHz BAND INTELLIGENT TRANSPORT SYSTEMS - Experimental Guideline for Vehicle-to-Vehicle Communication Messages ITSFORUM RC-013 1.0	Japan
56	JASPAR	ST-VI-1	Dynamic Vehicle Information Sharing API Specifications Ver.1.0	Japan
57	JASPAR	ST-VI-2	Dynamic Vehicle Information Sharing Concept Specifications Ver.1.0	Japan
58	JASPAR	ST-VI-3	Common Vehicle Information and Data Set SpecificationsVer.1.0	Japan

1-3. Analysis related to standardization trends, etc.: Relationships between traffic environmental data-related standards



1-3. Analysis related to standardization trends, etc.: Relationships between roadway traffic environmental data-related standards

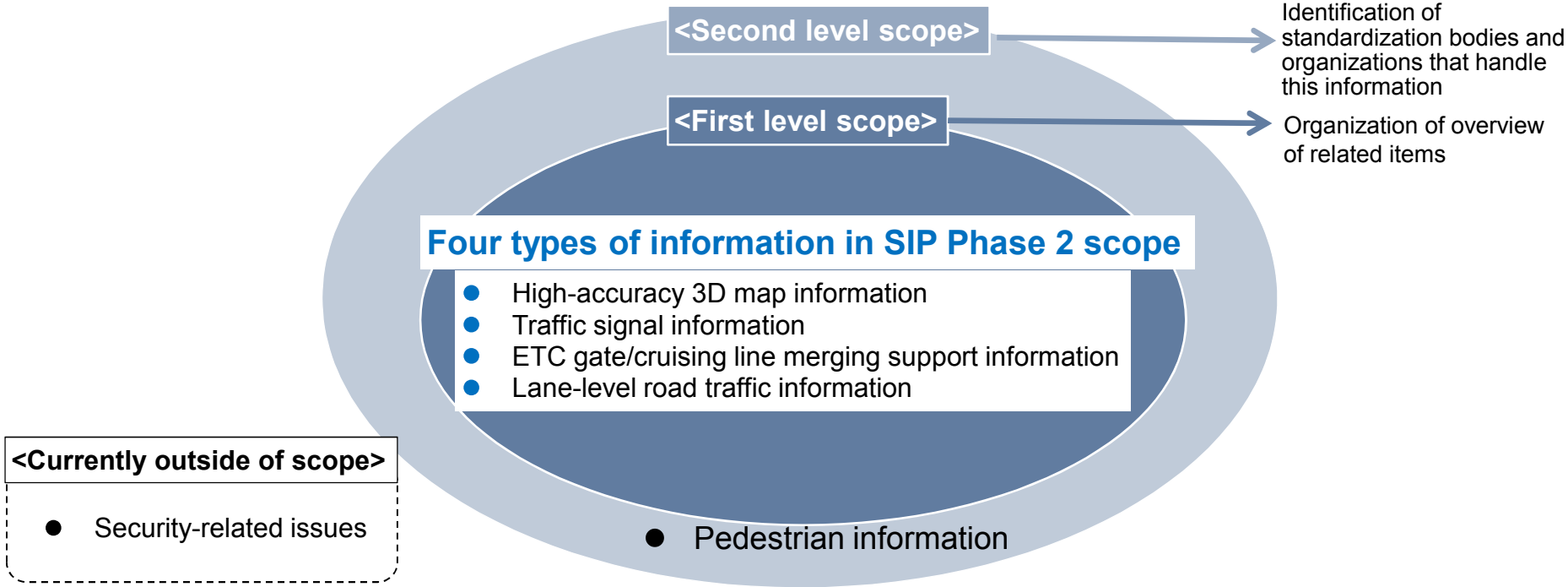
- "Message/data" indicates standards that apply to message and/or data items, formats, data sets, and/or message sets.
- "Application/integrated" indicates standards that apply to services that use messages/data, standards that apply to methods of using messages/data, and standards that collectively apply to both messages/data and applications.
- Underlined standards are standards covering multiple areas (such as center-infrastructure and infrastructure-infrastructure, etc.).

Scope	Japan		Europe		North America		Global * Numbers are listed alone for ISO standards * Series standards are denoted by an "s" following the number	
	Message/data	Application/integrated	Message/data	Application/integrated	Message/data	Application/integrated	Message/data	Application/integrated
Center-center	• ST-VI-1,2,3		• DATEX II				• 14827s	
Center-traffic signal							• 19082	
Center-roadside unit	• B3U01120 • B3U03910 • B3U01310						• 15784s • 19082	
Center-vehicle		• ARIB STD-B3			• SAE J2353		• 14819s • SENSORIS	• 18234s • 24530s • 21219s
Traffic signal-traffic signal							• 19082	
Traffic signal-roadside unit							• 15784s • 10711	
Roadside unit-roadside unit							• 22951 • 15784s • 19082	
Roadside unit-vehicle	• B3U01010 • B3U03810 • B3U01210 • Radio beacon 5.8GHz specification collection	• ARIB STD-T109	• ETSI TS 102 894-2	• ETSI TS 103 301 • ETSI EN 302 637-2 • ETSI EN 302 637-3	• SAE J2735		• 22951 • 22837 • 29284 • 19091 • 19321 • 25114	• 20035 • 26684 • 20901 • 17425 • 17426 • 18750
Vehicle-vehicle	• ITS Connect TD-001	• ARIB STD-T109			• SAE J2735			• 20035 • 20901

1-3. Analysis related to standardization trends, etc.: Detailed study

Based on the deliberations in the roadway traffic environmental data standardization strategy deliberation council meetings, we conducted a detailed study and divided the scope of standardization strategy into **two levels**.

- The first level scope consists of information organization and deliberation regarding the four types of information that are the focus of SIP Phase 2.
- The second level scope extends to include information which is not the scope of SIP Phase 2 FOTs, but which is discussed in other countries as roadway traffic environmental data use cases. (E.g.: Provision of information to pedestrians, etc.)



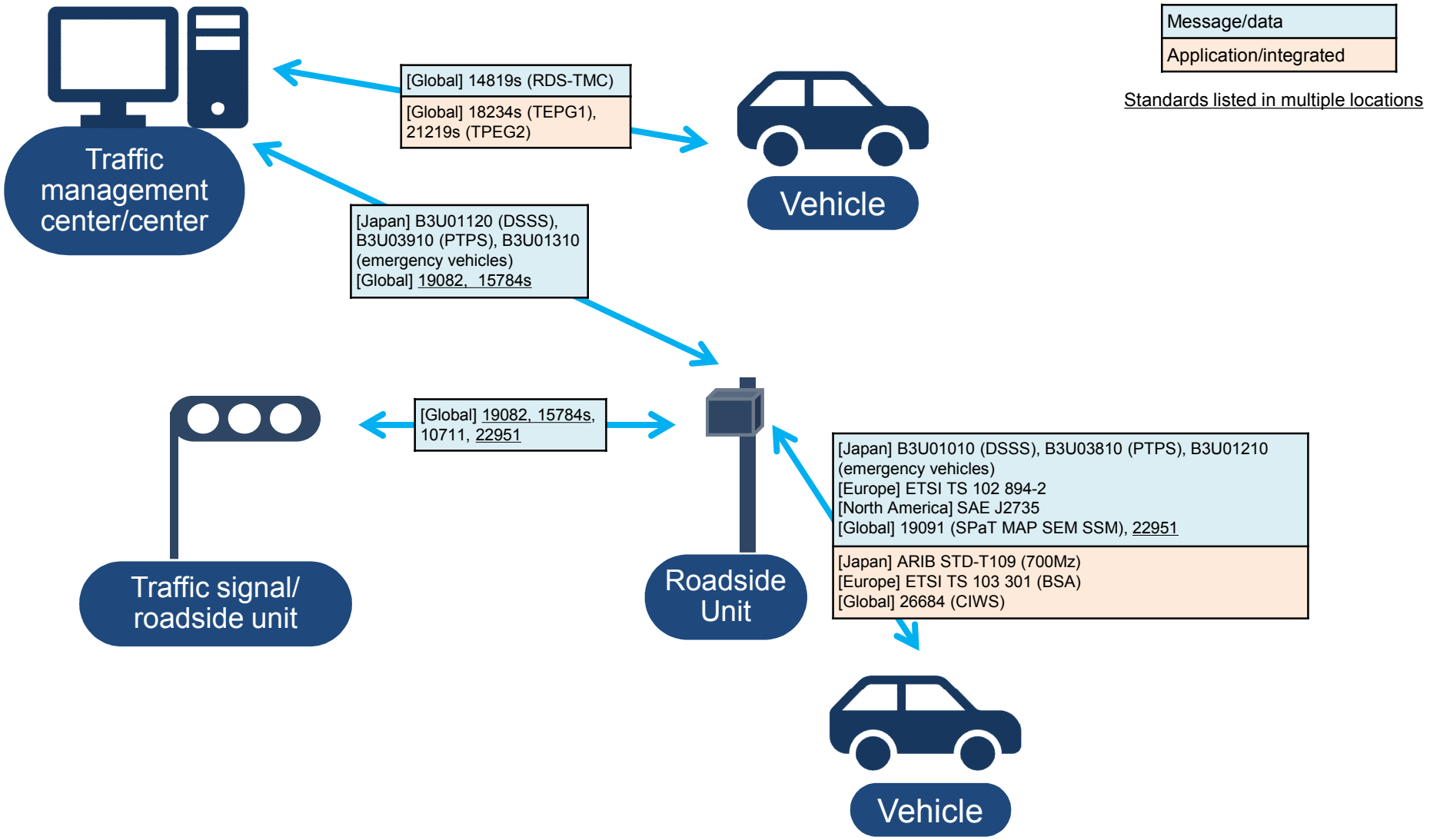
1-3. Analysis related to standardization trends, etc.: Detailed study

Standards listed in multiple locations

Scope	Traffic signal information	Road traffic information
Center-center	(N/A)	[Europe] DATEX II
Center-traffic signal	(N/A)	(N/A)
Center-roadside unit	[Japan] B3U01120 (DSSS), B3U03910 (PTPS), B3U01310 (emergency vehicles) [Global] 19082, 15784s	(N/A)
Center-vehicle	[Global] 14819s (RDS-TMC) [Global] 18234s (TEPG1), 21219s (TPEG2)	[Global] 14819s (RDS-TMC) [Japan] ARIB STD-B3 [Global] 18234s (TEPG1), 21219s (TPEG2)
Traffic signal-traffic signal	(N/A)	(N/A)
Traffic signal-roadside unit	[Global] 19082, 15784s, 10711, 22951	(N/A)
Roadside unit-roadside unit	(N/A)	[Global] 22951 (emergency vehicles)
Roadside unit-vehicle	[Japan] B3U01010 (DSSS), B3U03810 (PTPS), B3U01210 (emergency vehicles) [Europe] ETSI TS 102 894-2 [North America] SAE J2735 [Global] 19091 (SPaT MAP SEM SSM), 22951 [Japan] ARIB STD-T109 (700Mz) [Europe] ETSI TS 103 301 (BSA) [Global] 26684 (CIWS)	[Japan] HIDO radio beacon specification collection [Europe] ETSI TS 102 894-2, DATEX II [North America] SAE J2735 [Global] 22951 (emergency vehicles) [Japan] ARIB STD-T109 (700Mz)
Vehicle-vehicle	(N/A)	(N/A)

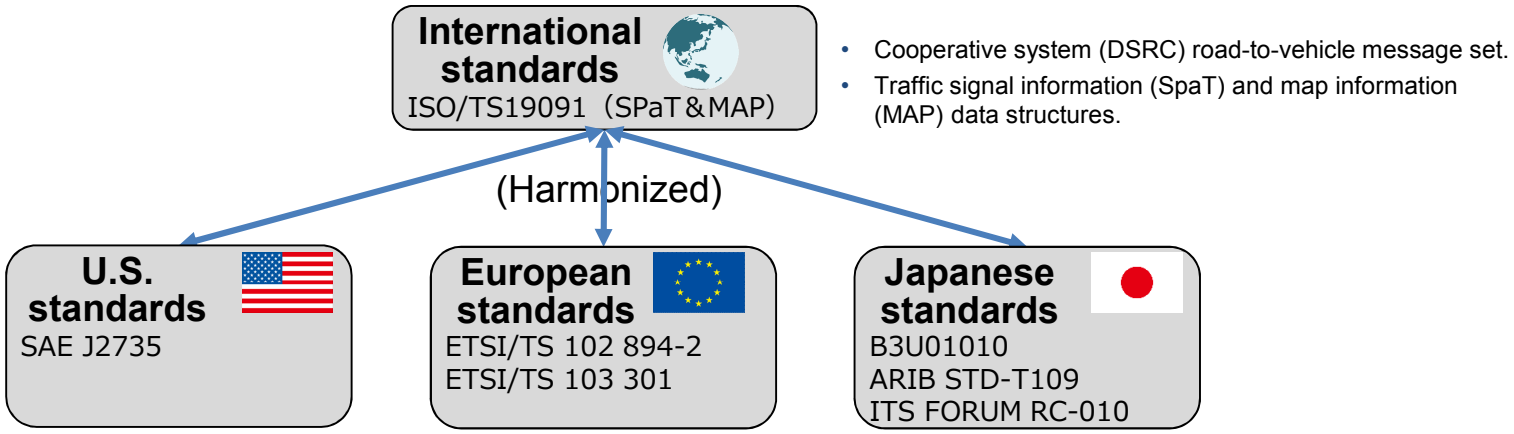
* There are no corresponding du jure standards for merging information and gate information, so they have been omitted.

1-3. Analysis related to standardization trends, etc.:
(1) Relationships between traffic signal information-related standards



1-3. Analysis related to standardization trends, etc.:
(1) Trends in traffic signal information-related standardization

Status of organization of international standards and national standards



- Cooperative system (DSRC) road-to-vehicle message set.
- Traffic signal information (SpaT) and map information (MAP) data structures.

Correspondence to SIP measures

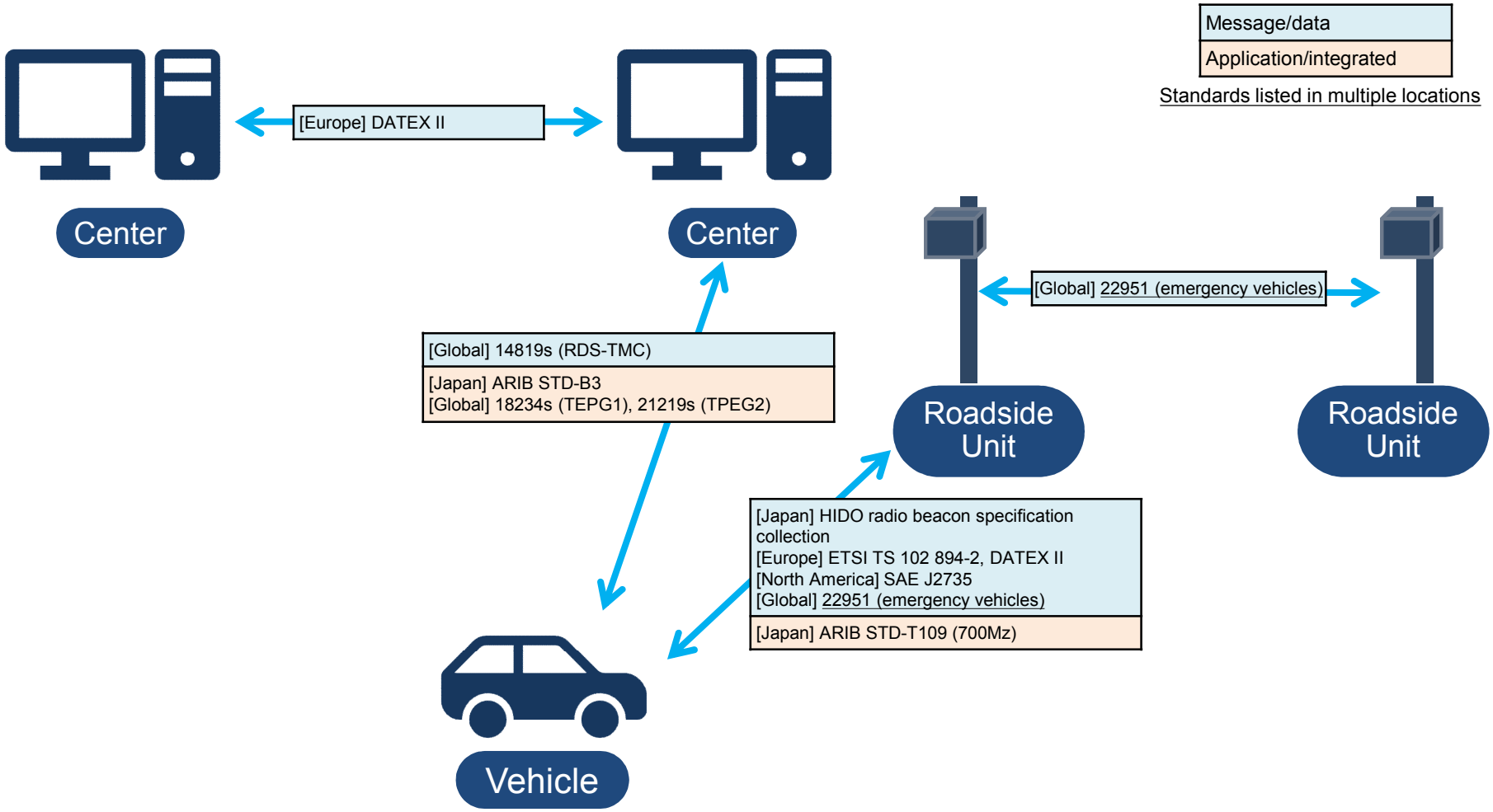
- In the Tokyo Waterfront City FOTs, vehicles have tables linking intersection IDs on dynamic map and intersection IDs on SPaT.

Standardization approach

- The contents of SIP measures are conformant with existing standards.

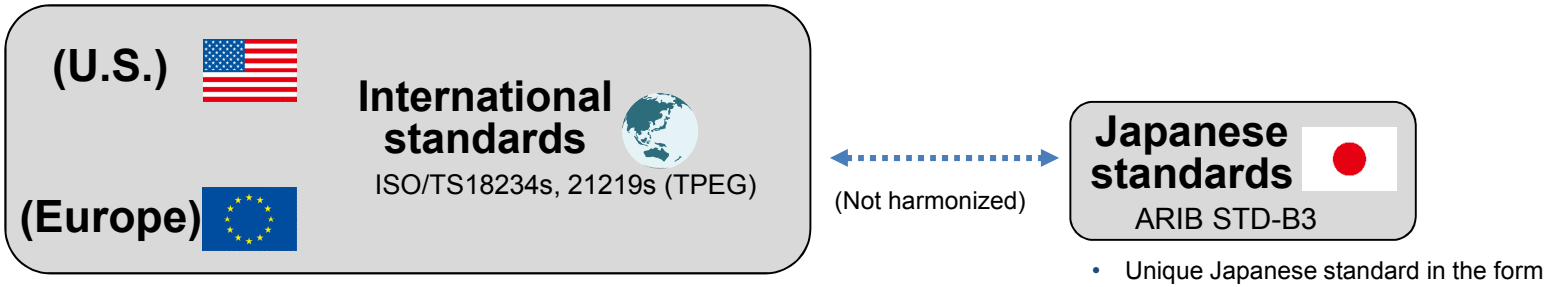
1-3. Analysis related to standardization trends, etc.:
(2) Relationships between road traffic information-related standards

- We primarily organized standards involving traffic congestion information as road traffic information.
- We did not include standards regarding probe information.



1-3. Analysis related to standardization trends, etc.:
(2) Trends in lane-specific road traffic information-related standardization

Status of organization of international standards and national standards



- Unique Japanese standard in the form of VICS specifications.

Correspondence to SIP measures

- There are plans to conduct FOTs regarding the provision of lane-specific road traffic information.
- Location referencing methods that use CRPs (common reference points) are used to express locations.

Approach to future standardization

- Some information, such as information regarding fallen objects or lane closure, can be expressed through the location in a lane in which they occur, but there are some types of information, such as travelling speed and traffic congestion information, for which there are no systems of lane-specific expression. Further discussion regarding standardization is essential.

2. Operation of council for deliberation on the formulation of international standardization strategies for roadway traffic environmental data in Japan and organization and summarization of council meeting results

2. Operation of council for deliberation on the formulation of international standardization strategies for traffic environmental data in Japan and organization and summarization of council meeting results

We established a roadway traffic environmental Data Standardization Strategy Deliberation Council with the aims of **sharing information regarding foreign and domestic roadway traffic environmental data standardization trends with related parties in Japan** and **debating, coordinating, and collaborating regarding the direction of roadway traffic environmental data international standardization strategies in Japan**.

(1) Establishment of a deliberation council

- A deliberation council was established in October 2019, composed of SIP participants, the Japan Automobile Manufacturers Association, ISO/TC204 experts, and map makers.

(2) Holding of deliberation council meetings

- Deliberation council meetings have been held once every three months, based on the status of meetings by related standardization organizations, etc.

Table Deliberation council meetings

Session	Date	Agenda
1st meeting	Thursday, October 3, 2019	• Explain the purpose of council meetings • Confirm the policies of studies of existing standards related to roadway traffic environmental data • Align understanding of the scope of the council's deliberations
2nd meeting	Thursday, December 12, 2019	• Share information regarding overviews of the deliberations of the ADASIS workshops and SIP-adus Workshops • Explain the contents of traffic signal information distribution performed in the FOTs in the Tokyo Waterfront area and how it relates to existing standards • Discuss traffic signal information standardization strategies
3rd meeting	Thursday, March 19, 2020 * Postponed	• Share information regarding the merging support-related activities of the FOTs in the Tokyo Waterfront area and related standards, etc. • Discuss merging support information standardization strategies