

# 13<sup>th</sup> Japan ITS Promotion Forum



## Connected Vehicles

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# INDEX

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- 1. SIP System Implementation WG  
Summary of Activities in 1st Phase**
- 2. SIP System Implementation WG  
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**SIP System  
Implementation WG  
Summary of Activities in  
1st Phase**

# 1. SIP System Implementation WG Summary of Activities in 1st Phase

## ◆ Projects for connected vehicles

	FY2014	FY2015	FY2016	FY2017	FY2018
V2V	Development of vehicle-to-vehicle communication and vehicle-to-infrastructure communication technologies required for automated driving systems			Investigation and study on the message sets and protocol of automated driving support communication	
V2I					
	Investigation and research on advancement of driver support by utilizing traffic signal information				
V2P	Development of vehicle-to-pedestrian communication technology				
V2N					Utilization of vehicle probe information
V2X					Preparation to provide dynamic information



# 1. SIP System Implementation WG

## Summary of Activities in 1st Phase

- ◆ Development of vehicle-to-vehicle communication and vehicle-to-infrastructure communication technologies required for automated driving systems

### Aim

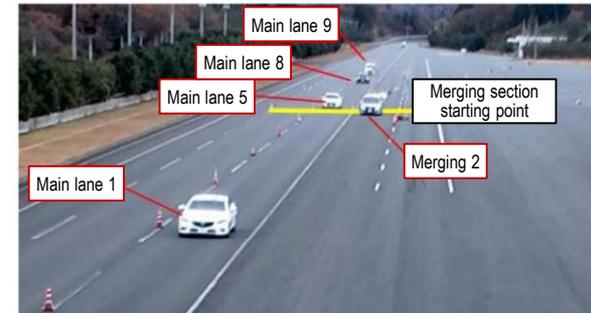
To clarify the performance of existing ITS wireless communication (700 MHz band) for applications to automated driving

- Mutual communication by V2V, V2I for merging scenario on expressway
- Impact of communication interference in exchanging vehicle position information at intersections, etc.



### Results

- It is necessary to modify the protocol, but mutual communication is possible when merging on expressways.
- It was found that packet collision occurs at intersections when the number of vehicles increases but that its impact on the exchange of vehicle position information is small.



# 1. SIP System Implementation WG

## Summary of Activities in 1st Phase

- ◆ Investigation and research on advancement of driver support by utilizing traffic signal information

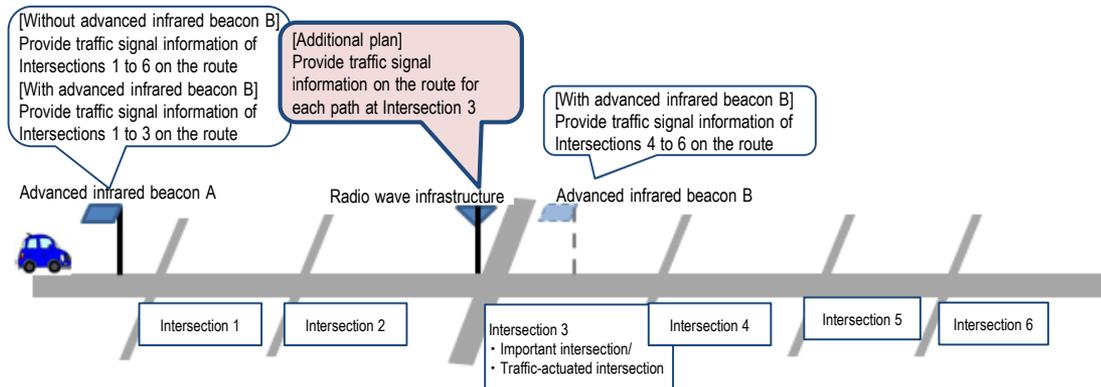
### Aim

To provide traffic signal information to automated driving vehicles at intersections

- Improve accuracy by utilizing ITS radio communication in addition to infrared beacons
- Adding radio communication provides extensive and real-time signal information

### Result

- The FOT on public roads verified the improvement in accuracy by providing traffic signal information.



# 1. SIP System Implementation WG Summary of Activities in 1st Phase

## ◆ Development of vehicle-to-pedestrian communication technology

### Aim

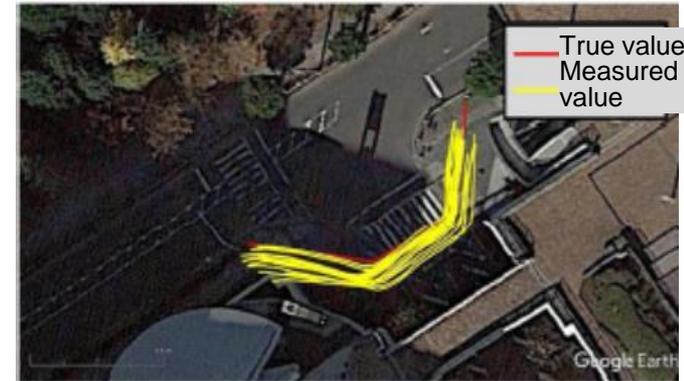
To reduce pedestrian accidents

- Pedestrian's mobile device notifies pedestrian presence information to vehicles
- Notifies approaching vehicle information to pedestrians

Improvement of pedestrian position precision by GPS/GNSS/dead reckoning/multipath rejection, and risk determination technology

### Results

- The pedestrian mobile device for FOT was developed.
- The pedestrian position precision was checked in Odaiba (1.6 m to 5.9 m).
- Risk determination technology was developed.



# 1. SIP System Implementation WG Summary of Activities in 1st Phase

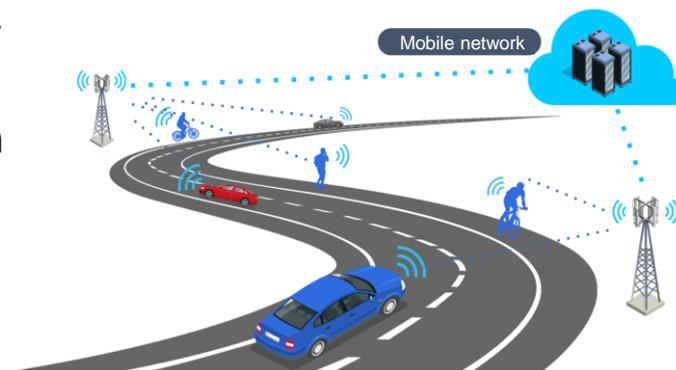
## ◆ Utilization of vehicle probe information

### Aims

- To collect semi-dynamic, semi-static information in real time and a wide area
- To obtain traffic flow information at lane level

### Results

- Construction of server for collecting probe car information
- Traffic status of each lane on the Metropolitan Expressway

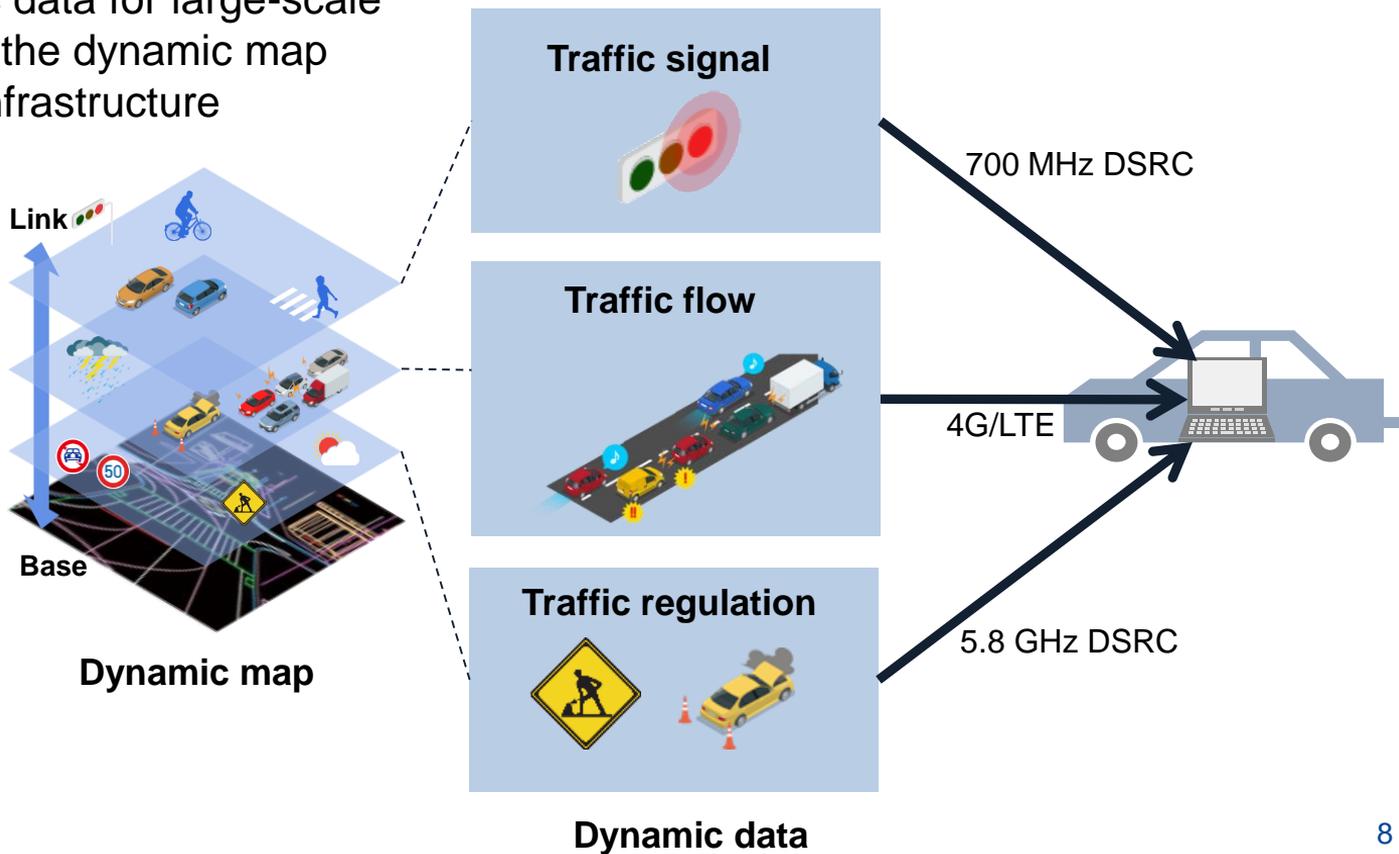


# 1. SIP System Implementation WG

## Summary of Activities in 1st Phase

### ◆ Preparation to provide dynamic information

- Distribution of dynamic data for large-scale FOTs and linkage with the dynamic map
- Utilization of existing infrastructure



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## **SIP System Implementation WG Activity Plan for 2nd Phase**

## 2. SIP System Implementation WG Activity Plan for 2nd Phase



### ◆ Improvement of the FOT environment: FOT in the Tokyo waterfront area

#### 1. To support for merging on expressway by V2I

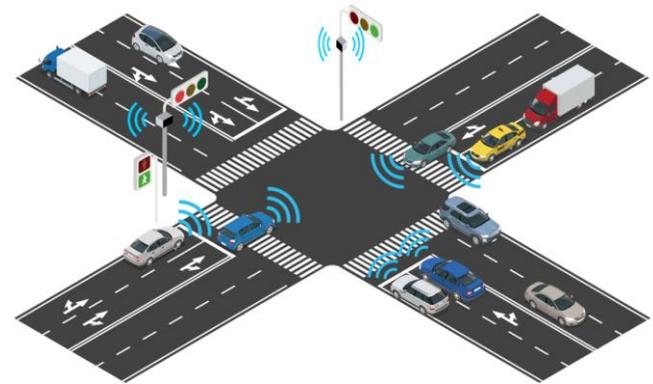
- The necessary information for merging on the main lane is acquired by the road side sensor and sent to the merging vehicle
- Providing information on ETC gate operation status



Airport West IC

#### 2. To support passing through intersection by signal information provision

- Signal color status, phase timing, etc. are provided by communication



Tokyo International Airport (Haneda Airport) area  
Odaiba area

## 2. SIP System Implementation WG Activity Plan for 2nd Phase

- ◆ JAMA is planning FOTs and demonstrations at Olympics and Paralympics in 2020

### Tokyo Waterfront City area



Demonstration of automated driving buses/Levels 2 to 4 on ordinary roads

### Expressway area



Demonstration of automated driving on expressways

### Haneda area



Demonstration of Level 4 automated driving on ordinary roads

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**Overseas  
Developments  
EU  
USA**



### 3. Overseas Developments: EU

#### ◆ Status of introduction of DSRC (ITS-G5)

- C-ITS platform Phase II Final report 2017
- FOTs using C-ROADS are underway in respective countries.
- In 2019, Volkswagen announced mass production of vehicles with DSRC-based V2X capabilities.
- In January 2019, the European Commission adopted the **delegated acts**.
- Public comments were solicited by February 8.
- There were pros and cons (Germany: approved, Finland: opposed).
- When will the European Parliament approve these acts?

# 3. Overseas Developments: EU

## ◆ Overview of the delegated acts

### 1) Concept of C-ITS services

- Safety driver support information of Day 1 and Day 1,5 services such as road construction information, weather information, and emergency braking information on which FOTs are underway using C-ROADS.
- The C-ITS stations (on-board units and roadside units) can be interconnected.
- A hybrid approach using **mature technology** (ITS-G5 + mobile communication) is used for the communication protocol.

### 2) Compliance with laws and regulations

- Equipment manufacturers must comply with the requirements. The authorities must conduct market surveillance and check compliance.

### 3) Security

- Registration with the C-ITS Security Credential Management System (CCMS)
- The European Commission plays a key role in CCMS and fulfills the functions until a permanent management organization is established.

### 4) Privacy and data protection

- It is necessary to comply with the preceding General Data Protection Regulation (GDPR) of the EU.

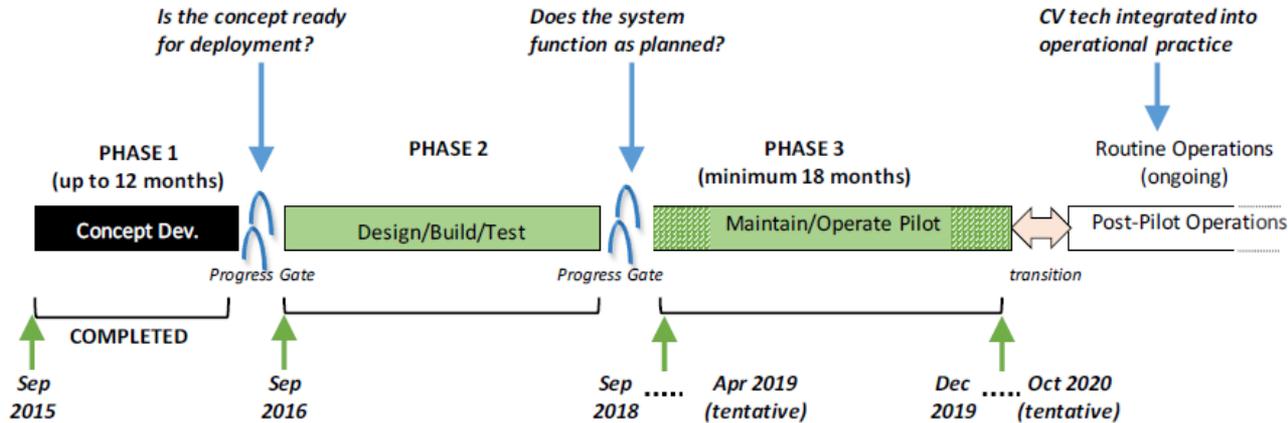
### 5) Review

- New services and mature compatible C-ITS technologies will be included if they are developed in the future.

# 3. Overseas Developments: USA

## ◆ Progress of CV Pilots

- The Phase 3 operation FOT is somewhat behind schedule.
- This may be due to delays in installing on-board units and roadside units.
- Various issues in data gathering were reported.



# 3. Overseas Developments: USA

## ◆ Other developments

### ■ Deployment of DSRC roadside units for FOTs

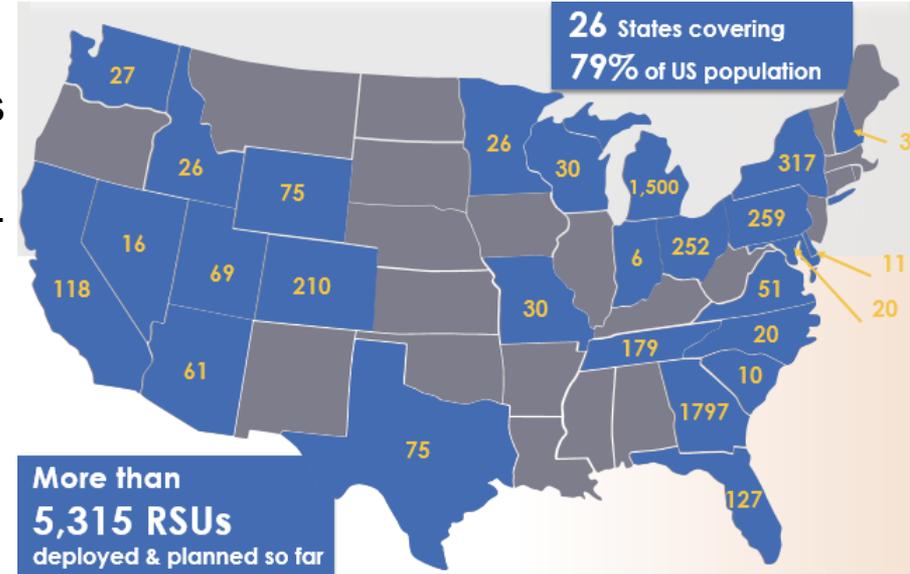
- In addition to the project by the U.S. DOT, FOTs are actively being conducted by the DOT of respective states.
- The V2X Functional and Performance Test Report was issued by the 5GAA.

### ■ Public comments were solicited for V2X communication in December 2018.

(by February 25)

Examples:

- Which V2X technologies will become available, and when?
- Is it possible to avoid interference on the same frequency?
- Is interconnection possible between different communication protocols and between generations?



Deployment of DSRC roadside units

**Thank you**

