Cross-ministerial Strategic Innovation Promotion Program

SIP Automated driving systems

— Mobility bringing everyone a smile —

July 13, 2017
Sub Program Director of SIP-adus
Yoichi SUGIMOTO

Outline of SIP

- **Intensive R&D program**
  - ✓ promote 5-years R&D (FY2014 - FY2018)
  - ✓ enhancing **cross-ministerial cooperation**

- **11 research themes**

  From societal issues such as Energy, Next-Generation Infrastructures and Local Resources, including R&D for AD

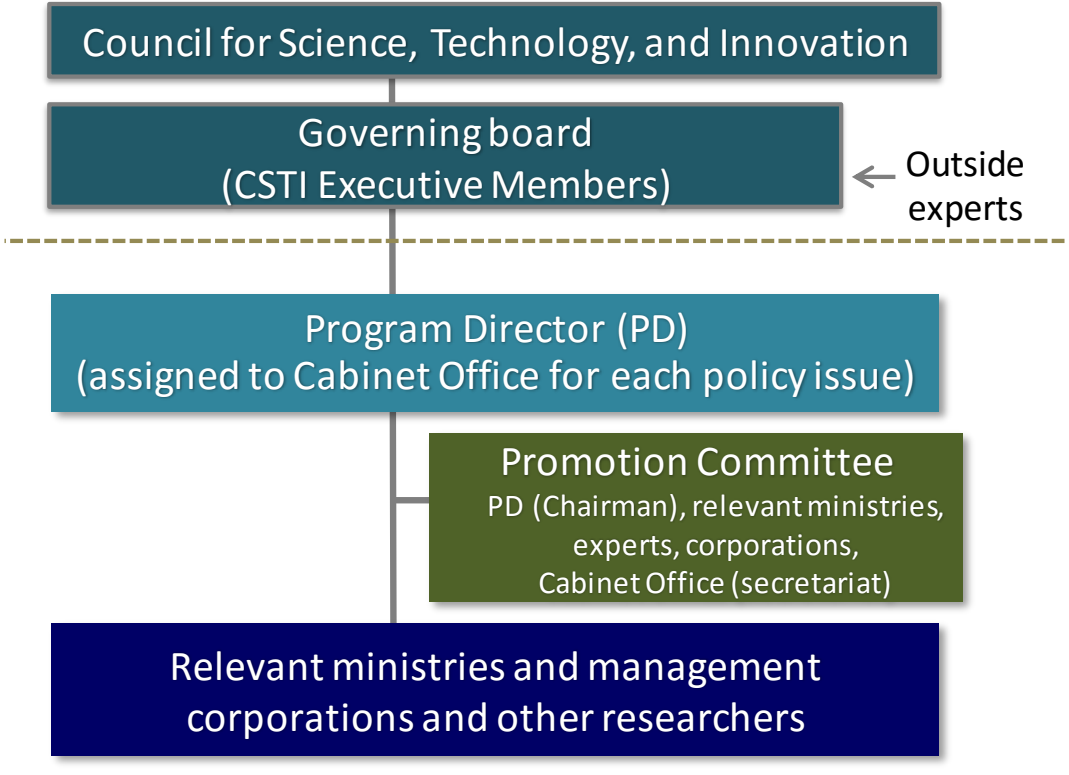
- **Leadership and total Budget**

  CSTI appointed Program Directors and allocates the budget for each research theme. *

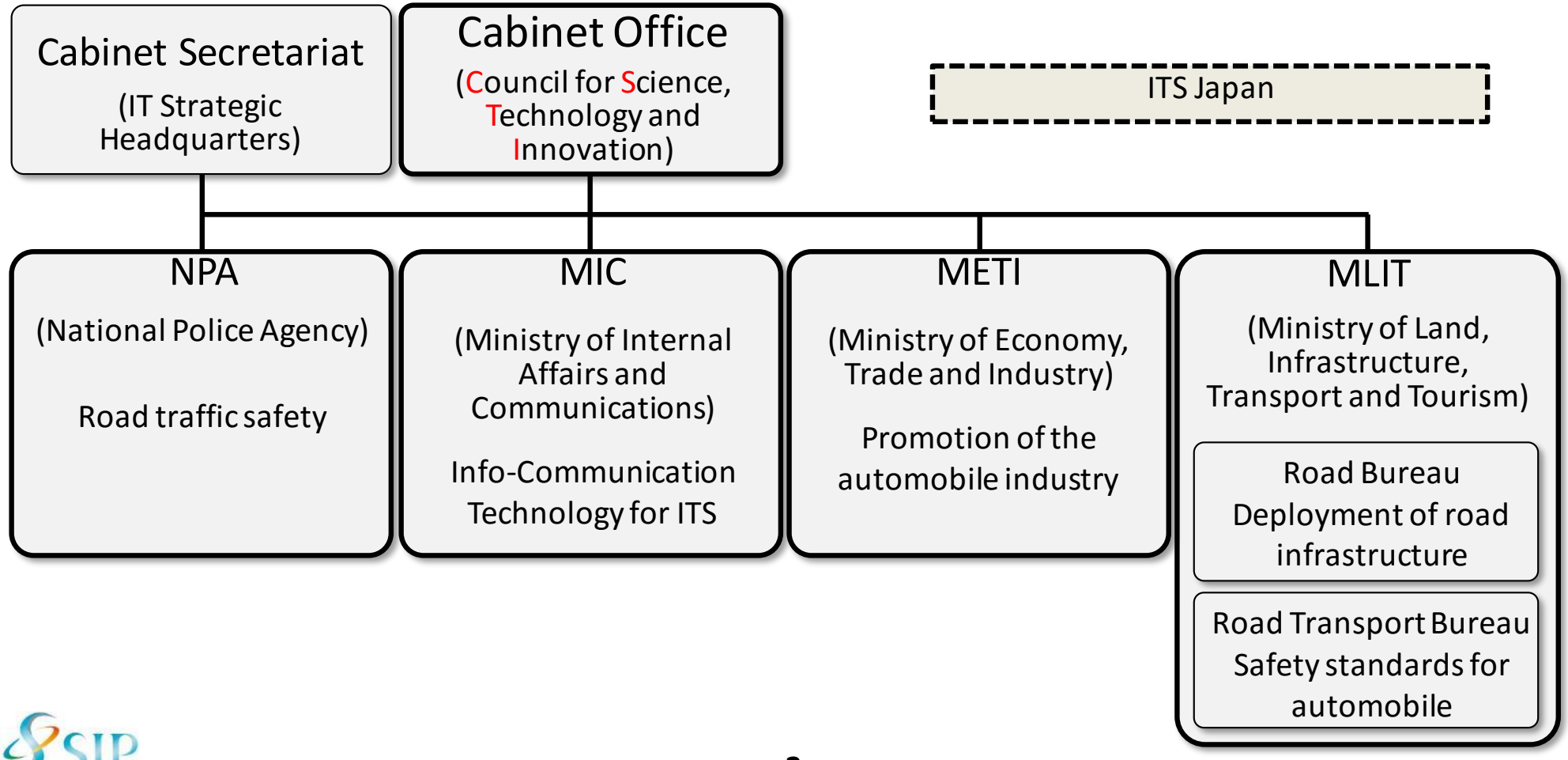
  * \50bil in total per year
  (65% for SIP 11 themes, 35% for medical R&D)

adus : Automated driving systems for universal service

SIP
Cross-ministerial Strategic Innovation Promotion Program

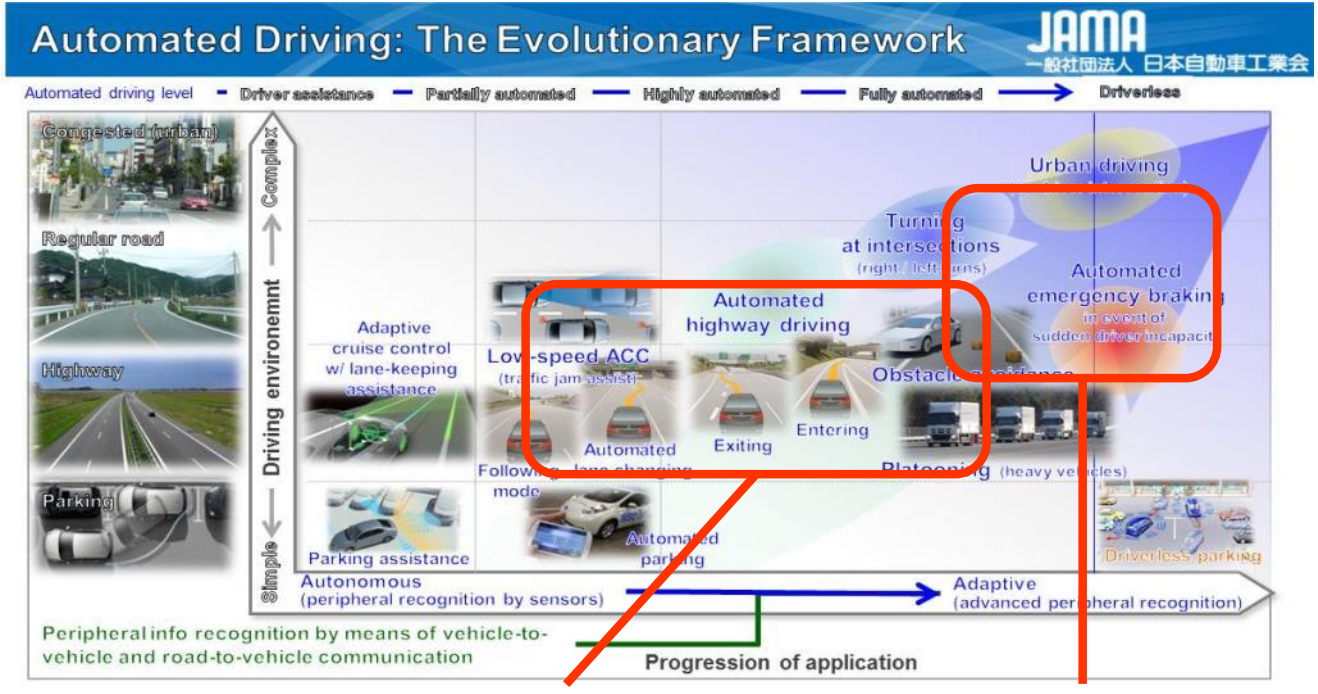


Promotion framework of Japanese Government



Goal & Exit Strategy

1. Ensuring safety and traffic jam reduction on the road
2. Realization and spread of Automated Driving System
3. Realization of advanced next generation public bus service for vulnerable people.



Realization of Level 2 on highway by 2020

Prioritization for next step Level 2 on regular road

Technologies for Automated driving systems

Vehicle

Recognition

Sensor, Map, ITS info.

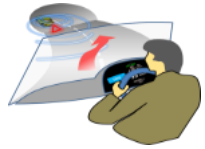
Judgment

Artificial intelligence

Operation

Actuator

HMI



HMI:
Human
Machine
Interface

Cooperation with Human

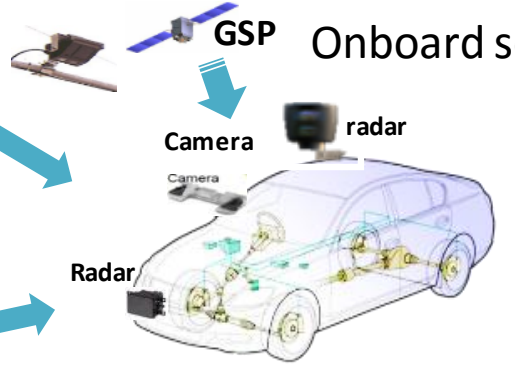
- A highly self-position estimation
- Neighboring environmental cognition

These are important for Automated Driving System

Dynamic Map

High-definition digital map

ITS Anticipative Information



In red ：Area of Cooperation
⇒ Main Area of SIP

Basic Tech. Security, Simulation, Database, etc.

SIP focus on the R&D in Cooperative area with Industry, Academia and Government

Dynamic map

Use Dynamic Map as an advanced traffic info. database for all vehicles, not only as a precise map for automated driving vehicle.

Dynamic Info.(< 1 sec)

ITS anticipative Info.
(V2V, V2P, traffic signal, etc.)

Semi-dynamic Info.(< 1 min)

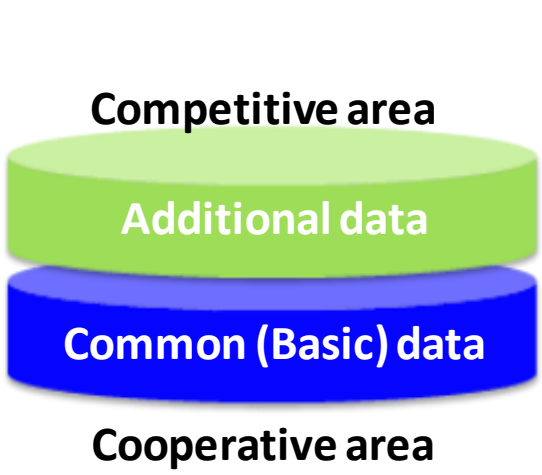
Accident, Congestion, Local weather etc.

Semi-static info.(< 1 hour)

Traffic control, Road construction, Weather forecast, etc.

Static Info.(< 1 month)

Road shape, Topological data, etc.



Dynamic Map Planning Co., Ltd. was established as a result of 2years SIP activity.

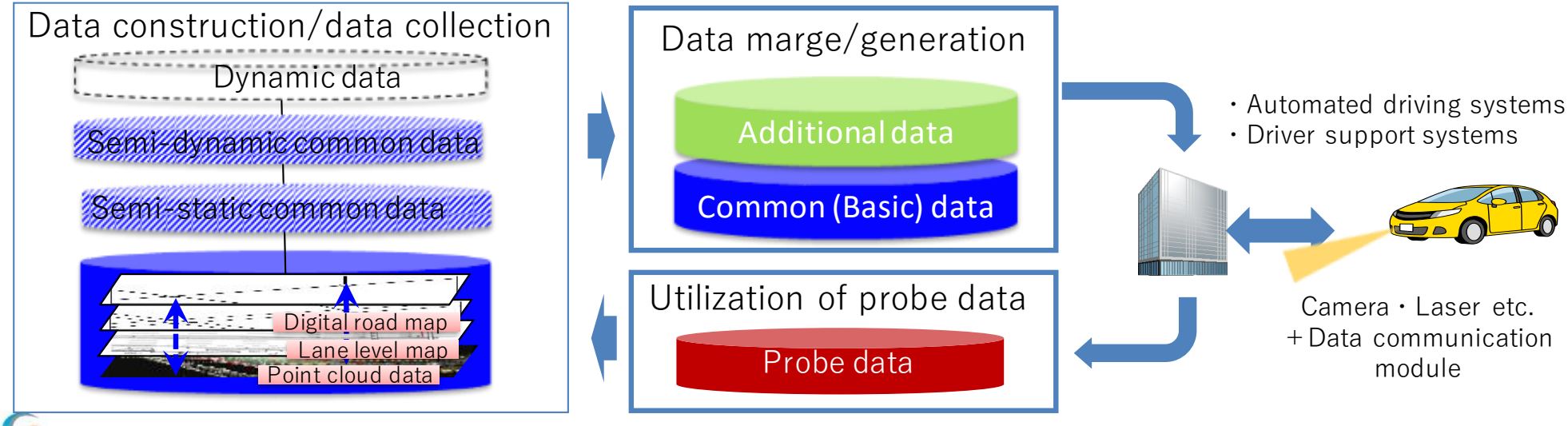
Establishment of Dynamic map database

Dynamic map

【Required condition】
- Freshness of data/Easiness of data updating
- Scalability
- Low cost
- Security　　etc.

- **Data commoditizing**
- **Utilization of probe data**

Public-Private Partnership



Dynamic Map Planning Co., Ltd

Collection | Generation | Processing | Use

Common 3D map data

3D Point cloud Picture etc.

Dynamic Map Cooperation Territory

Static information

Original competition territory

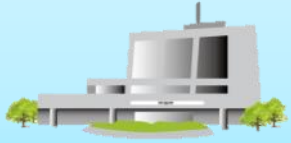
Competition territory

Cooperation territory

Competition territory

Common 3D Map data

Automotive



Public work

Expansion in sequence

Measurement outcome

Public Information

Various dynamic information

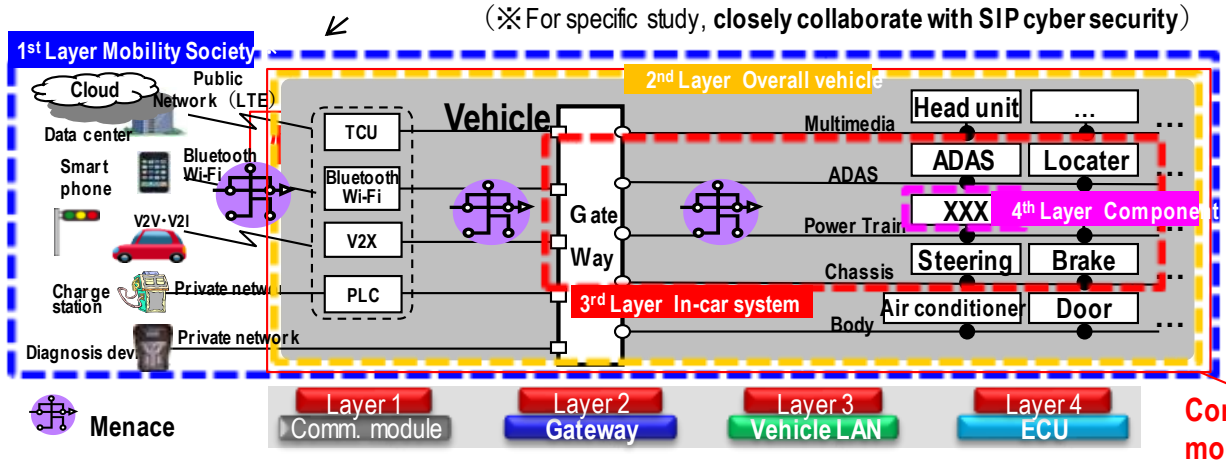
DMP cover area

Future cover area

(Material：Dynamic Map Planning Co. Ltd)

Cyber security

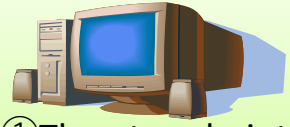
①Common Models of AD for Threat Analysis
②Validation/Evaluation Methods and Criteria
③Certificate Validation of V2X communication



①To establish threat analysis

①Common architecture model
①Use cases of AD (JAMA)
②Threat Info. (JPCERT/CC、Auto-ISAC)
②Evaluation (Attack) Info. (Auto-ISAC)

①User friendliness (JAMA)



①Threat analysis tool

①Comparison with current threat analysis (Jaspar)

②To establish Test protocols

②Countermeasure
②Level of Countermeasure

③To reduce V2X signature

Human Machine Interface

1) To investigate effects of system information on drivers' behavior.
2) To investigate effects of driver state on his/her behavior in transition.
3) To investigate effective ways to functionalize AV to be communicative

Driver state

- Cognitively distracted
- Physically distracted
- Low arousal
- Lack of SA
- Out of position

Controlled

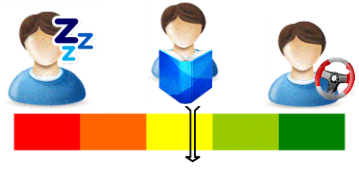
Readiness

- Head orientation and visual performance
- Heart rate and blood pressure
- Body temperature
- Skin conductance
- EEG
- Posture and body

Performance at the event

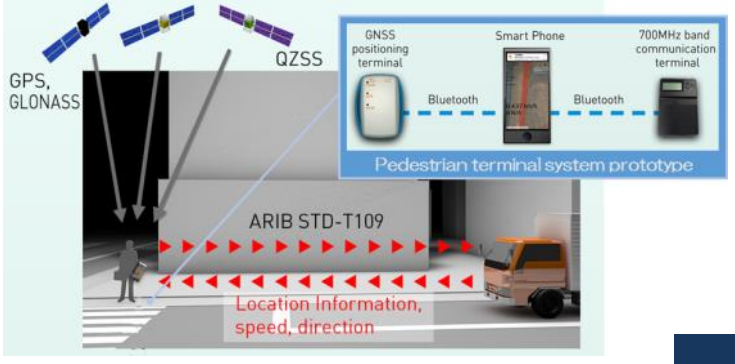
- Longitudinal and lateral control of the vehicle
- Minimum distance and minimum TTC to the hazard
- Time spent to regain control

Correlation



Pedestrian collision reduction

Vehicle-to-Pedestrian (V2P) Communication

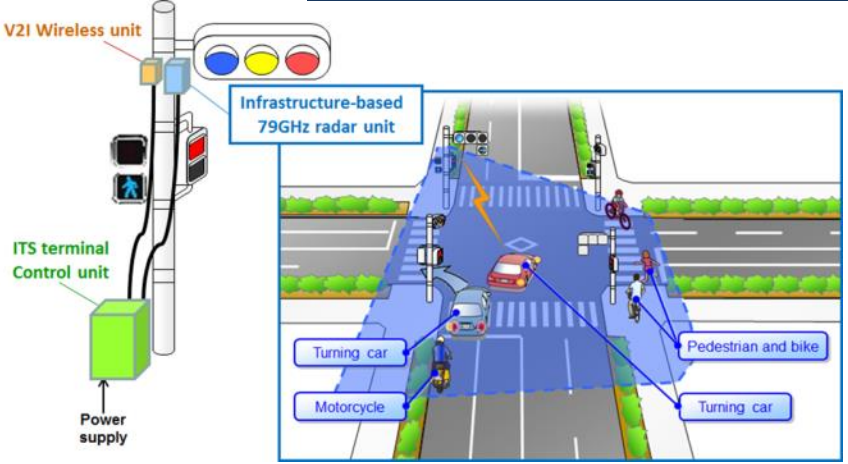


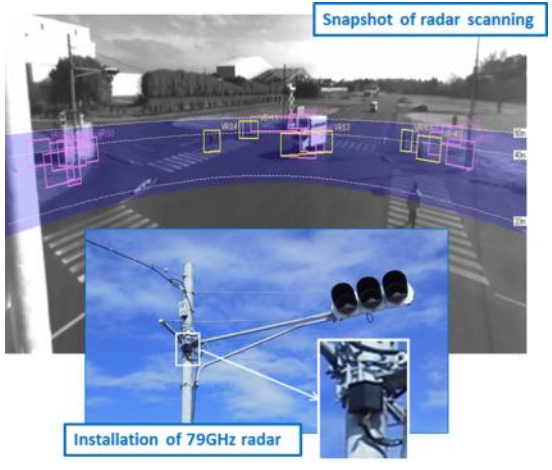
700MHz Direct Wireless Communication

- 700MHz band communication
- High-precision positioning
- Danger identification and pedestrian safety support

Infrastructure radar with V2I communication

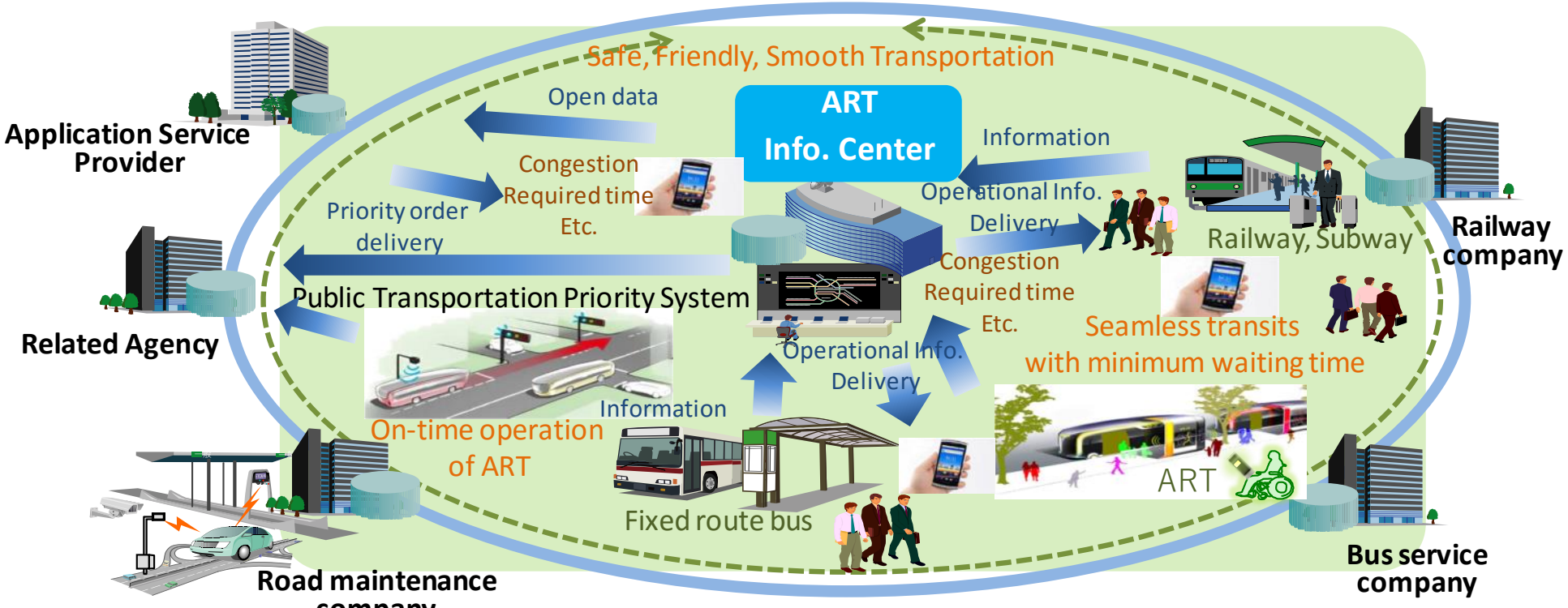
79GHz band radar from roadside of intersection





Next generation Transport

ART information center



Information Open Platform for ART related applications

Application Examples
* Congestion Prediction
* Dynamic Connection Guidance
* Remote Diagnostics

Field Operational Test (FOT)

≪Purpose≫

1. To activate the R&D
2. To prove each elemental technology
3. To enhance international cooperation and harmonization
4. To Build Social acceptance

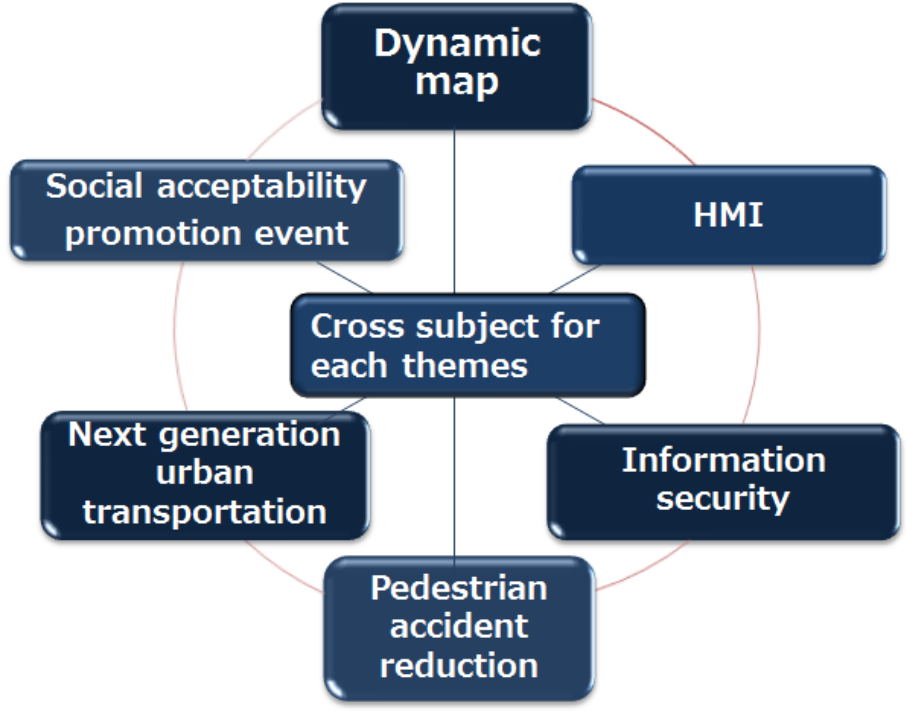
≪Participant≫

- OEM/Supplier
- University/Research organization
- Ministries, government officers
- **Foreign OEM/supplier**
- Journalist

≪Period≫

Autumn 2017 ～ beginning of 2019

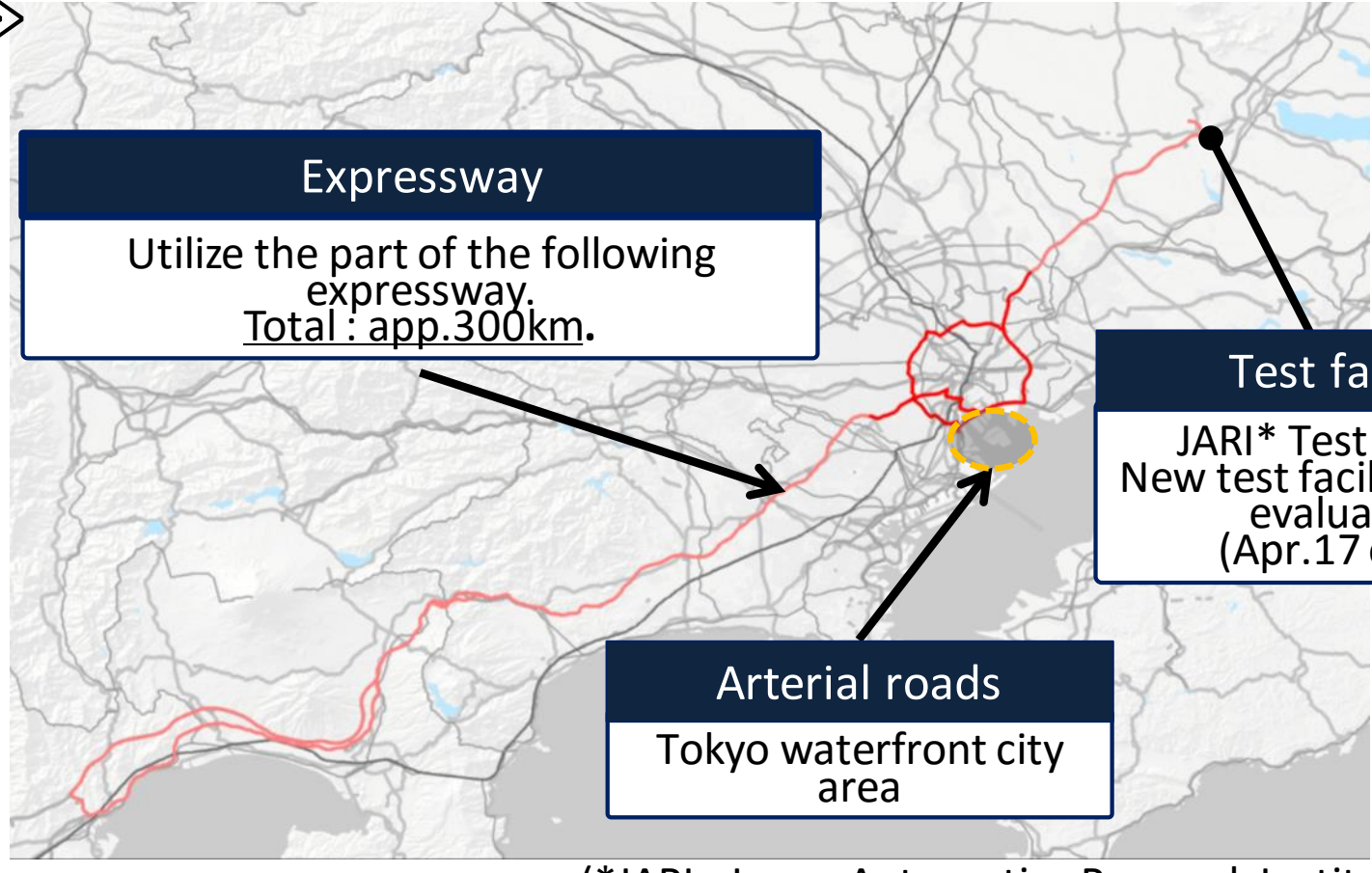
≪Main themes≫



SIP

Field Operational Test (FOT)

≪Test site≫

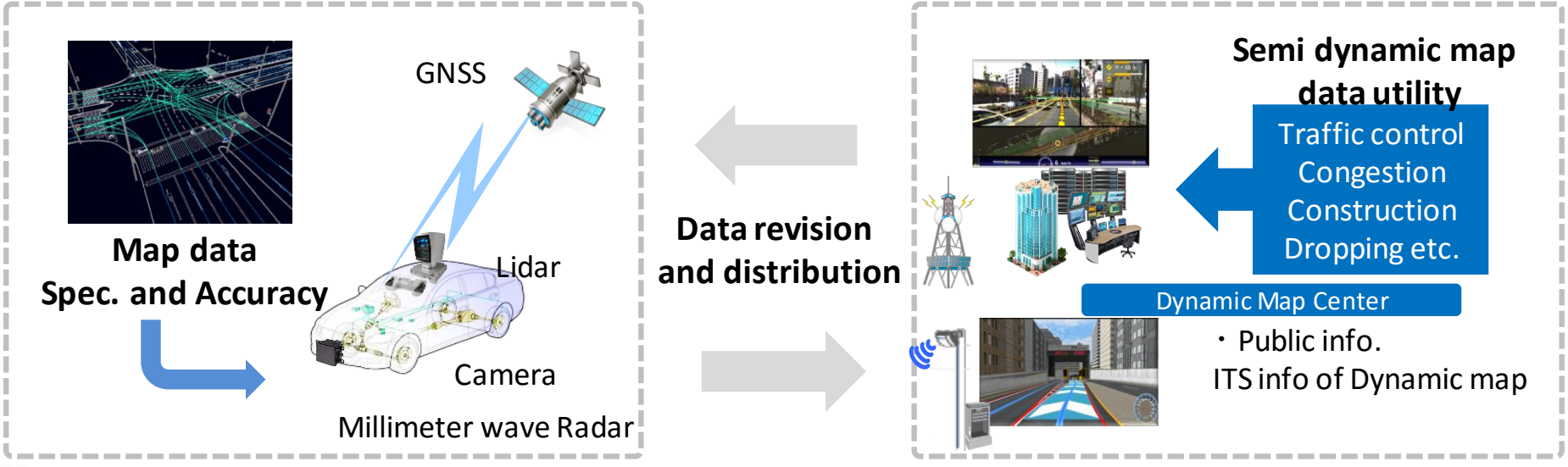


(*JARI : Japan Automotive Research Institute)

Field Operational Test (FOT)

Dynamic Map(Example)

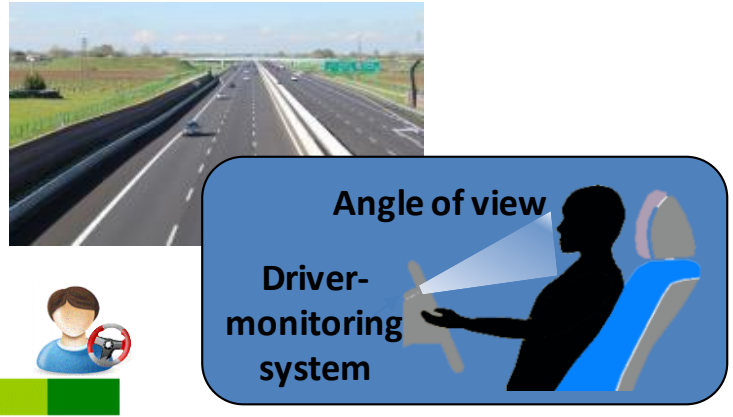
- ☐ To validate 3D high-resolution digital map data
- ☐ To validate data collection and distribution method
- ☐ To verify the utility of semi dynamic information
- ✓ The map data is provided by SIP-adus.



Field Operational Test (FOT)

HMI(Example)

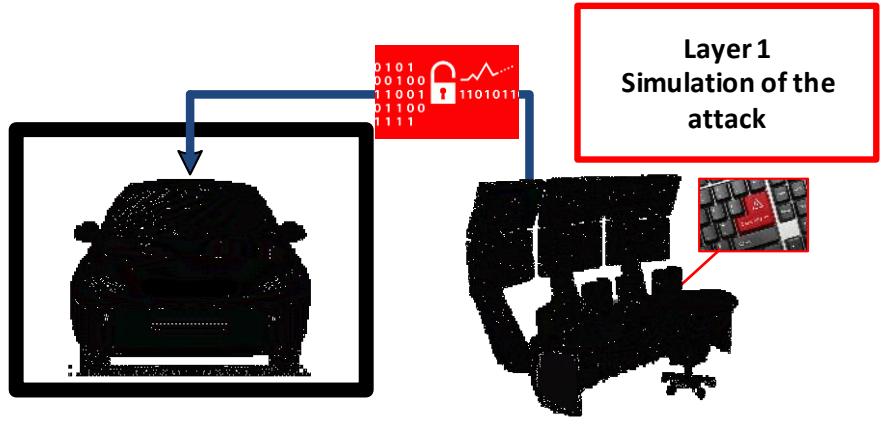
- To collect and analyze the driver state data
- To define driving readiness status and driver
- Verification of HMI methods and devices .



Cyber Security(Example)

- To Validate the evaluation method
- Inspect defense functions of ADV

Layer1: Communication of Out Car
Layer2: E/E Architecture
Layer3: In Car Bus Protocol
Layer4: ECU Software Structure



Automobile Society

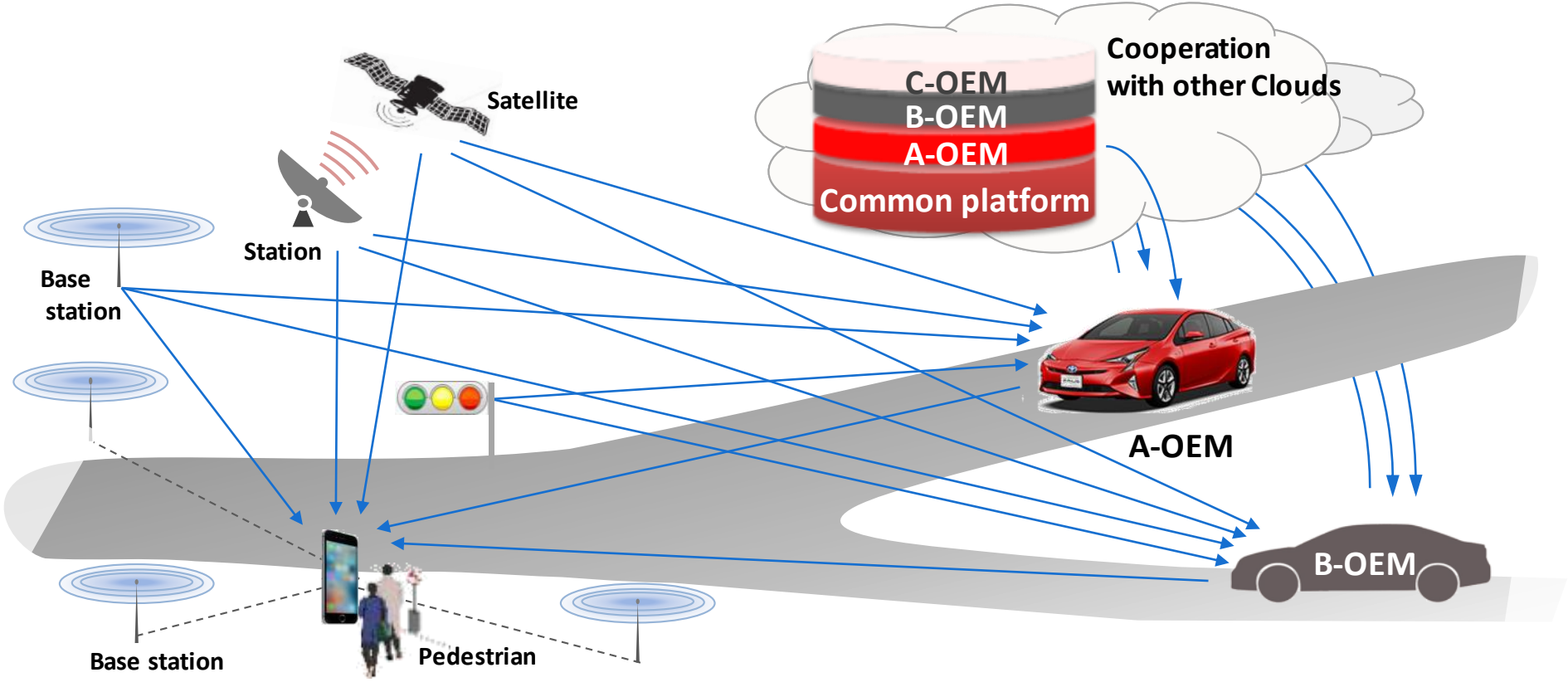
1886 BENZ Patent Motorwagen

（Toyota Automobile Museum）

1907 Piccadilly Circus, London

（Alpshima; sohske.cocolog-nifty.com）

Common Platform



A common base platform(map, rule etc.) is necessary for keeping safety and the social order.

⇒ **Promoting harmonization and standardization**

International Cooperation activities

■ Experts assigned in Focused areas

1. Dynamic Map
2. Connected Vehicle
3. Human Factors
4. Impact Assessment
5. Next Generation Transport
6. Security

EU ★ US ★ JAPAN ITS COOPERATION

ISO International Organization for Standardization

SIP-adus Workshop

SIP-adus Workshop 2016

Recognized as a specialized international conference on automated driving, participants from all over the world increased.
Sharing latest information, building friendship among experts, were highly evaluated by the participants.

- **Organizer** : Cross-Ministerial Strategic Innovation Promotion Program, Council for Science, Technology and Innovation, Cabinet Office, Government of Japan
- **Date** : November 15-17, 2016
- **Venue** : Tokyo International Exchange Center
  http://www.jasso.go.jp/tiec/index_e.html
- **Attendees** : 425 from 17 countries
- **Speakers** : 61 includes 34 speakers and moderators from overseas

Snapshot with speakers from overseas after Minister Tsuruho

Thank you for kind attention!