Field Operation Tests in SIP-adus

SIP-adus: Cross-Ministerial Strategic Innovation Promotion Program
Innovation of Automated Driving for Universal Services

July 11, 2017

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President, ITS Japan
Chair, International Corporation WG, SIP-adus

Technologies for Automated Driving

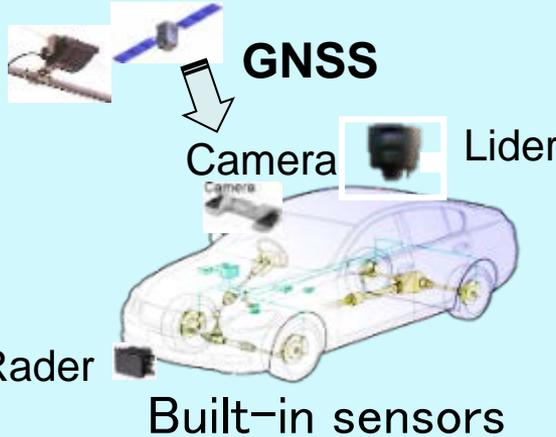## On-board Technologies

Perception

Decision

Operation
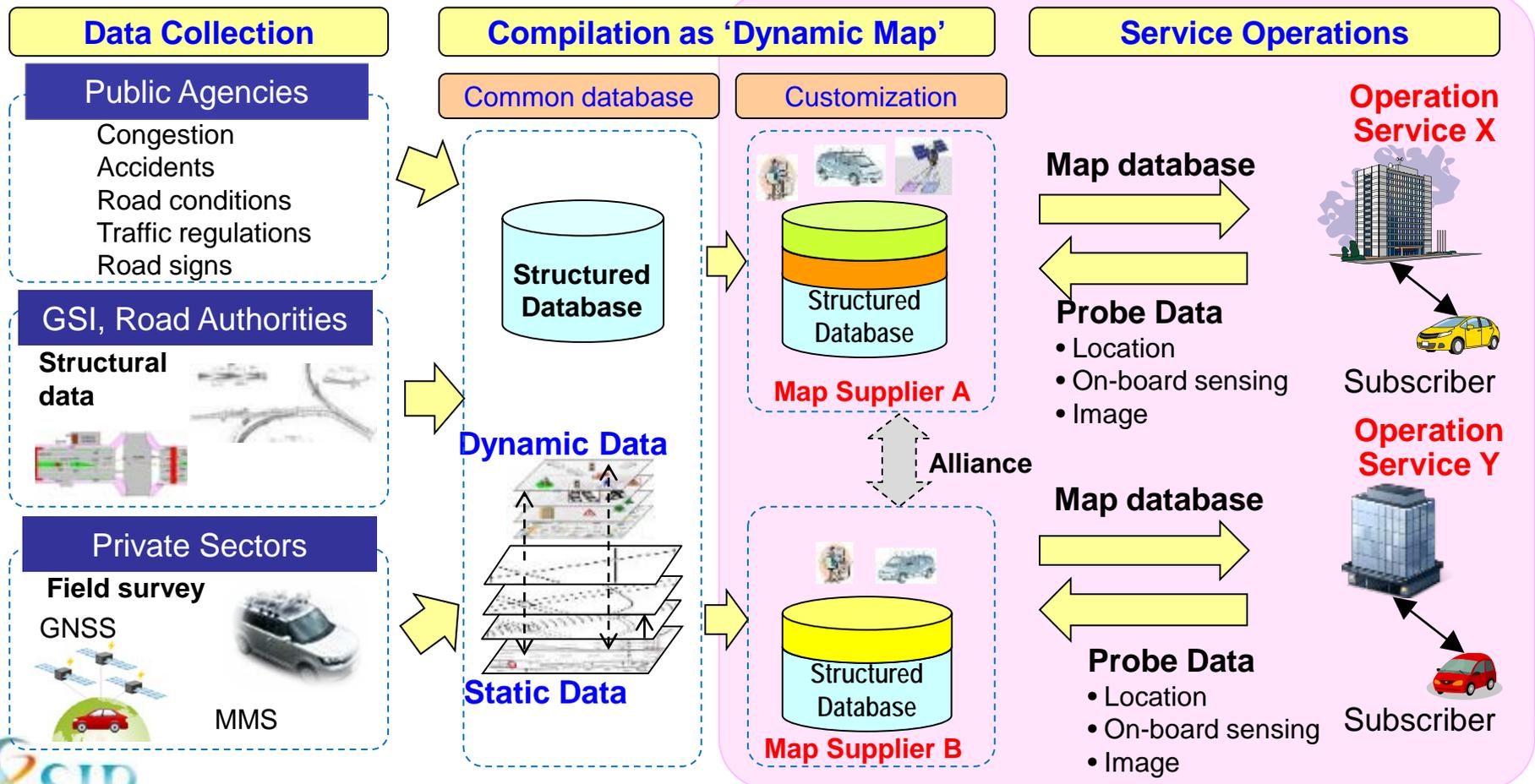
HMI

Coordination

Precise digital map

V to X

GNSS

Camera

Lider

Rader

Built-in sensors

Human Machine Interface

Platform

Security, Simulation, Shared database, etc.

Framework for Dynamic Map

Data Collection

Public Agencies
- Congestion
- Accidents
- Road conditions
- Traffic regulations
- Road signs

GSI, Road Authorities

Structural data

Private Sectors

Field survey

GNSS

MMS

Compilation as 'Dynamic Map'

Common database

Customization

Structured Database

Dynamic Data

Static Data

Structured Database

Map Supplier A

Structured Database

Map Supplier B

Alliance

Service Operations

Operation Service X

Map database

Probe Data
- Location
- On-board sensing
- Image

Subscriber

Operation Service Y

Map database

Probe Data
- Location
- On-board sensing
- Image

Subscriber

SIP

Development of Operational Framework

Dynamic Map Platform Co., Ltd.

Founded in June 2016 to establish technologies and business scheme to build and maintain the Dynamic Map for automated driving and other applications. The company has been transformed to a business entity as of June 13, 2017.
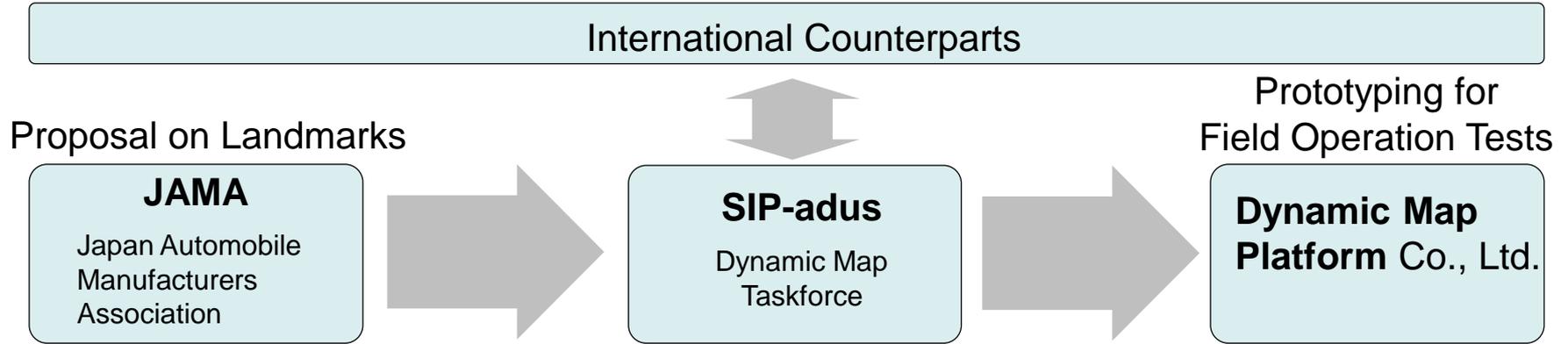
Survey and digital map providers

Mitsubishi Electric Corporation
Zenrin Co., Ltd.
Pasco Corporation
Aisan Technology Co., Ltd.
Increment P Corporation
Toyota Mapmaster Incorporated
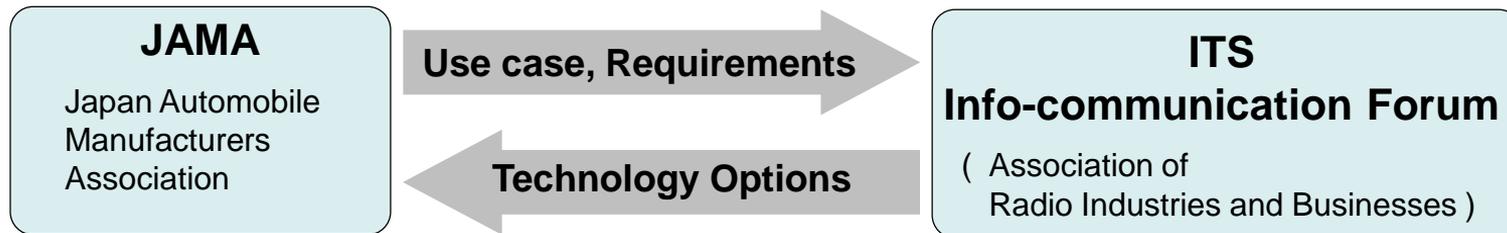
Auto manufacturers

Isuzu Motors Limited
Suzuki Motor Corporation
Subaru Corporation
Daihatsu Corporation
Toyota Motor Corporation
Nissan Motor Co., Ltd.
Hino Motors, Ltd.
Honda Motor Co., Ltd.
Mazda Motor Corporation
Mitsubishi Motors Corporation
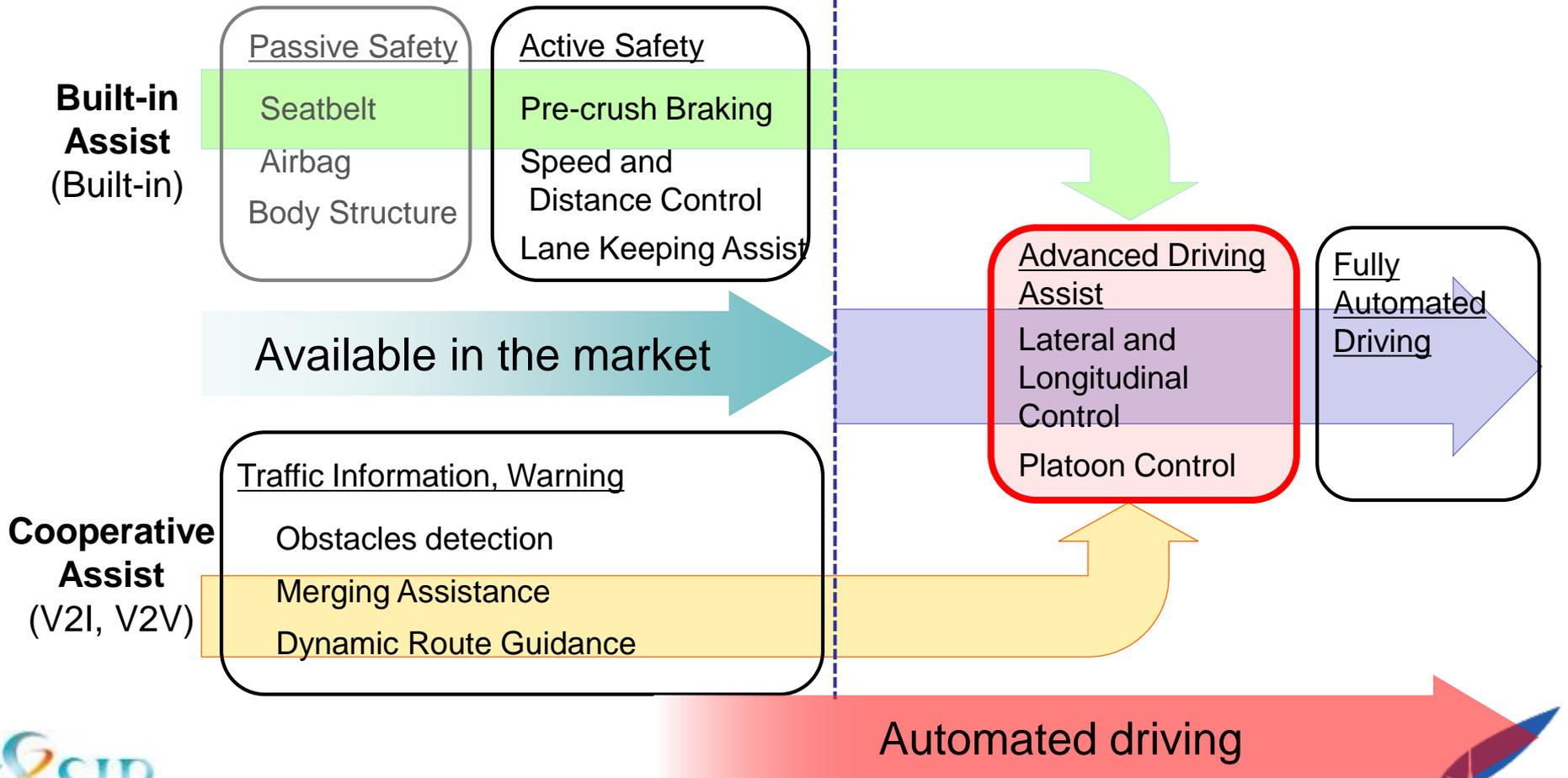
Cooperation across the sectors

Format and Contents of the Dynamic Map

International Counterparts

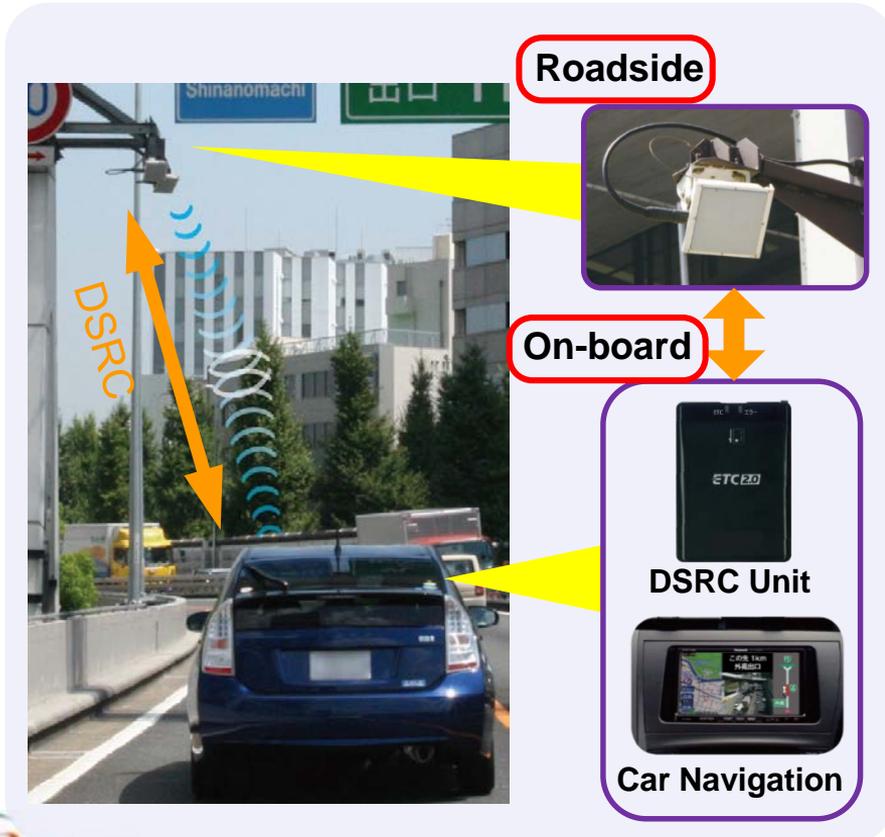Proposal on Landmarks

JAMA

Japan Automobile Manufacturers Association

SIP-adus

Dynamic Map Taskforce

Prototyping for Field Operation Tests

Dynamic Map Platform Co., Ltd.

Investigation of Communication Technologies

JAMA

Japan Automobile Manufacturers Association

Use case, Requirements

Technology Options

ITS Info-communication Forum

（ Association of Radio Industries and Businesses ）

Connected and Automated Systems

Built-in Assist
(Built-in)

Passive Safety
Seatbelt
Airbag
Body Structure

Active Safety
Pre-crush Braking
Speed and Distance Control
Lane Keeping Assist

Available in the market

Cooperative Assist
(V2I, V2V)

Traffic Information, Warning
Obstacles detection
Merging Assistance
Dynamic Route Guidance

Advanced Driving Assist
Lateral and Longitudinal Control
Platoon Control

Fully Automated Driving

Automated driving

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Electronic Toll Collection and Connected Services

Equipment

Roadside

On-board

DSRC

DSRC Unit

Car Navigation

Basic Services

Toll Collection

Safety Assistance

Traffic Information

Dynamic Route Guidance

Nationwide operation since 2011.

Traffic Signal Prediction Systems (TSPS)

Green Signal Timing Advisory

Timing of green light to move.

Red Signal Timing Advisory

Timing to decelerate to stop at red signal.

Speed Harmonization

Speed suggestion to pass intersections without stopping

Traffic Management Center

Roadside Beacon

Source: National Police Agency
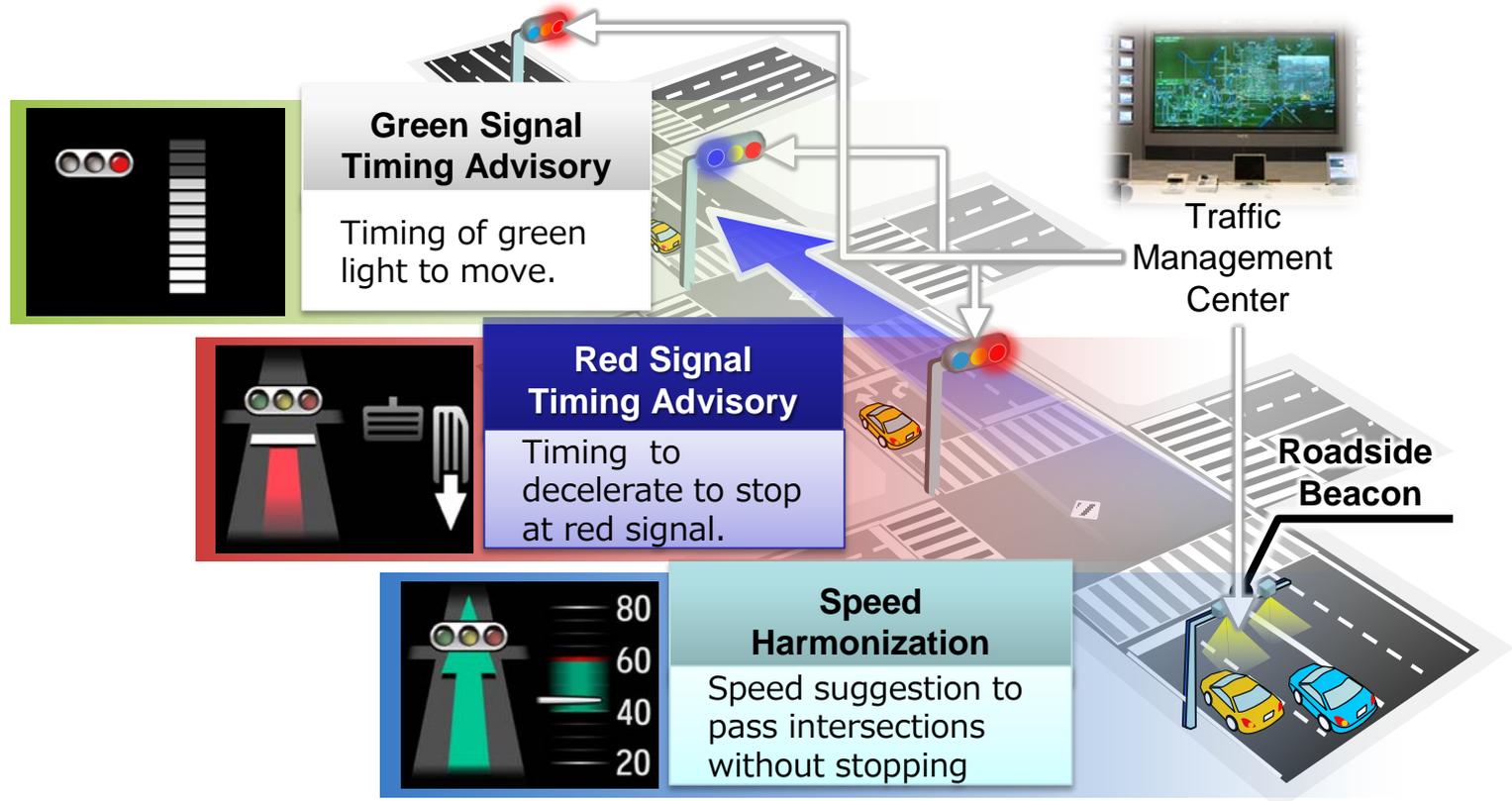
Right Turn Collision Warning

	Display	Sound	Situation
A		-	Clear
B		-	In coming vehicle/s detected
C		beep	Turning against in coming vehicle/s

Detection of shielded approaching cars

Messaging

Detection of pedestrians on the crosswalk

Source: National Police Agency

8
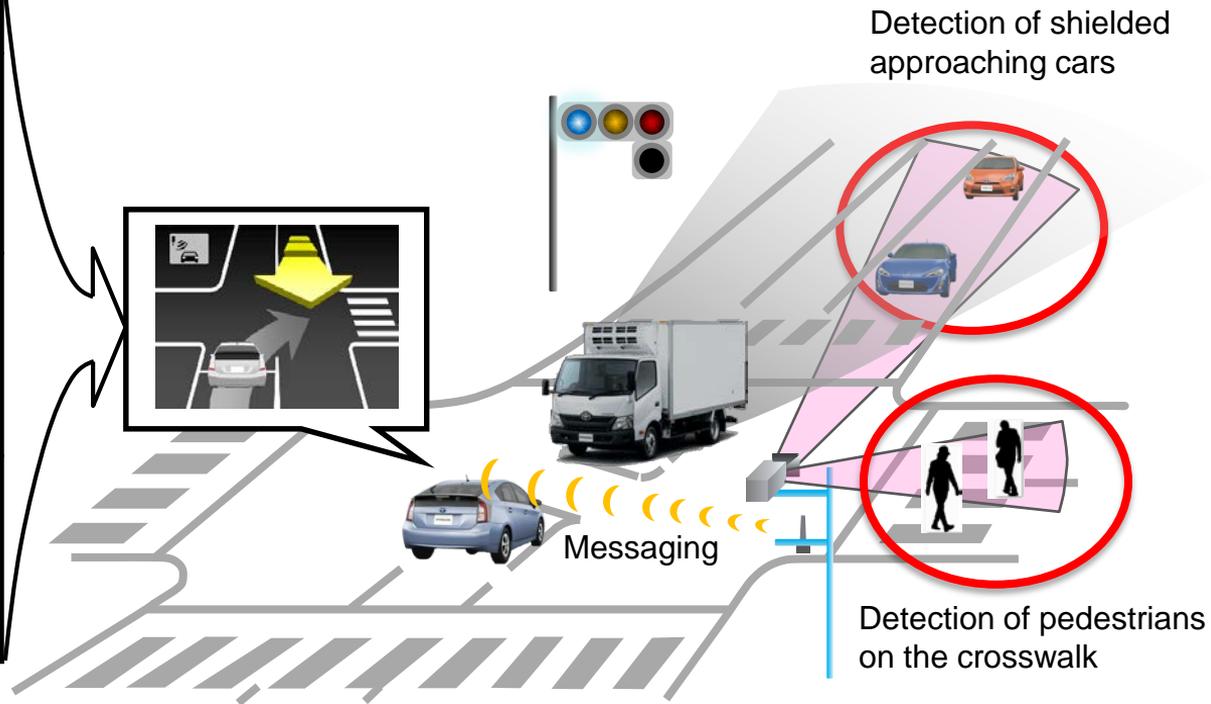
Dynamic Map:
- Surveys and Investigations for Prototyping and Evaluation Toward Construction of a Dynamic Map
- Surveying and investigation toward development of a common platform for dynamic maps
- Construction of the traffic regulation information management system for realization automated drive
- Investigation into the International Standardization of Dynamic Map and Overseas Trends
- Survey on utilization of satellite positioning information for realization of automated driving system
- Study and consideration to construct the "Dynamic Map Service Platform"

Connected Vehicles:
- Establishment of technology for providing traffic signal information towards the realization of automated driving
- Establishment of technology for providing vehicle/pedestrian detection information towards the realization of automated driving
- Creation of an internationally open research and development environment
- Development of V2V,V2I Communication Technology Toward the Automated Driving Systems
- Task II Development of Vehicle-to-pedestrian Communicatio+F1n Technology
- Development of Infrastructure Radar System Technology
- Next-Generation Intelligent Transport Systems (ITS) utilizing Information and Communication Technology (ICT)

Human Factors:
- Human Factors and HMI Research for Automated Driving

Impact Assessment:
- Study on analytical methodology to estimate the effect of automated driving technology on reduced number of traffic accident fatalities in order to achieve the government target
- Development and substantiation of simulation technology for estimation of traffic accident reduction detailed effects
- Development of an impact assessment method for Automated Driving System on CO_2emissions

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Next generation Transport:
- Studies of sensing technologies relating to an precision docking control in a next-generation urban transportation system
- Research on the speediness and the safety of the Advanced Rapid Transit
- Research and examination with public participation concerning congestion/ traffic jam predictions aiming for world standard accessibility
- Survey and Investigation of Reducing Boarding Times in Public Transport
- A research of the pedestrian support system common platform in a consideration of problems and solutions to realize automated driving systems
- Investigation about actuators and control for advanced rapid transit system in investigation and consideration about issues towards autonomous driving system
- Investigation and studies of various tasks to be solved for realization of an automated driving system and survey on the social adaptability of the system in Okinawa prefecture
- Development of the next-generation public transportation system
- Development of movement support system for people with mobility constraints
- Development functions required for ART information center

Cyber security:
- Prototyping and Evaluation of Server Functions and Map Update Procedure Toward Construction of a Dynamic Map

Other:
- Research and Study regarding the Promotion of International Cooperation Activities on an Automated Driving System
- Analysis of social and industrial aspects involved in the effort to develop more advanced automated driving systems and ensure their widespread use
- Development and evaluation of construction technology for driving pictures database
- Field Operational Tests toward Achieving Level 3/4 and Investigation toward Commercialization

Objectives of Field Operation Tests

<u>Verification of research results in 5 integrated themes</u>

- Dynamic Map
- Human Machine Interface (HMI)
- Cyber Security
- Pedestrian Accident Reduction
- Next Generation Transport

<u>International cooperation sharing the test fields and the data sets</u>

- International participants already signed up (OEMs, suppliers and research institutes)
- Concrete evidence acquired through the tests on the common grounds
- In-depth discussions on the specific research topics
- Identification of shared challenges and direction to overcome them

<u>Business model investigation</u>

Conditions: - Large scale field operation tests on public roads will start in 2017.
- Test facilities and operation management will be provided by the government.
- Dynamic Map data for the test sites will be provided for free and participants are required to use the data and to submit evaluation reports.
- Participants who test their vehicles are required to arrange all other resources by themselves.

Test sites - Expressways (relatively controlled environment)
- Arterial roads (with pedestrians and bicycles)
- Test facilities (separated from the general traffic)

Expected participants (both domestic and international)

- Auto manufacturers and parts suppliers
- Universities and research institutes
- Government agencies

General public and journalists will be invited to foster social acceptance through proper understanding of the technologies and implications.

Field Operation Test Sites

Expressway

300 km stretch in Tokyo Area
- Joban expressway
- Tokyo Metropolitan expressway
- Tomei expressway
- Shin-Tomei expressway

Test facility

Japan Automobile Research Institute

Arterial roads

Tokyo waterfront city area

<u>Guidelines for Public Road Testing of Automated Driving Systems</u>

May 2016, National Police Agency

Public road test of AD is available regardless of time and place as long as:

✓ the vehicle complies with the requirements of the Safety Regulation for Road Vehicles (including those specially approved by the Director of a District Transport Bureau),

✓ <u>The person who assumes the role of the driver is seated in the driver's seat, monitors the surrounding traffic as well as the vehicle's condition at all times, and operates the vehicle</u> in the event of an emergency as necessary in order to ensure safety and thus prevent damage to others, and

✓ The test vehicle is driven in compliance with the relevant laws including the Road Traffic Act

The guideline shows other notes including basic responsibilities of implementing entities, test driver's requirements etc.

Source: Plenary Session, ITS Asia-Pacific Forum 2017, National Police Agency

Regulatory Issues

Criteria for the permission for use of roads for public road testing of Driving Automation System with Remote Control Technology

June 2017, National Police Agency

- Only on the restricted area such as "the nearest station - home" (the last one mile)
- The vehicle automatically drives itself on most part.
- The remote driver monitors the driving all the time, and operates when necessary.

✓ The public road testing of Driving Automation System with Remote Control Technology (DAS-RCT) is regarded as the action which can be implemented with the permission for use of roads

✓ With this permission, implementing entity will be able to test DAS-RCT on public road in Japan (the driver has not to be inside the vehicle).

✓ Stating the case where one driver drives multiple vehicles, etc.

✓ Based on the international discussion at WP.1 (UNECE)

WP1-72 (April 2016)

The Group was of the opinion that there was no need for amendments to the 1949 and 1968 Conventions on Road Traffic for foreseeable types of experiments (i.e. "where there is a person who is ready, and able to take control of the experimental vehicle(s); this person may or may not be inside the vehicle").

Source: Plenary Session, ITS Asia-Pacific Forum 2017, National Police Agency

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15

4th SIP-adus Workshop
on Connected and Automated Driving Systems 2017
SIP-adus : Innovation of Automated Driving for Universal Services

Organizer:

Council for Science, Technology and Innovation, Cabinet Office, Government of Japan

Date:　**November 14-16, 2017**

Venue: Tokyo International Exchange Center

Topics:
1. Dynamic Map
2. Connected Vehicles
3. Human Factors
4. Impact Assessment
5. Next generation transport
6. Security

Special Information Session on SIP-adus

- Field Field Operation Tests starting 2017

- Achievement of SIP-adus activities

16