

Japanese Coordinated Approach for R&D of Automated Driving System

- **Cross-ministerial Strategic Innovation promotion Program (SIP)** -

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Cabinet Office, Japan



Contents

- 1. Overview of SIP-adus
(cooperative R&D for ADS in Japan)**
- 2. International Standardisation & Coordination**
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SIP (Cross-Ministerial Strategic Innovation Promotion Program)

➤ Intensive R&D program

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

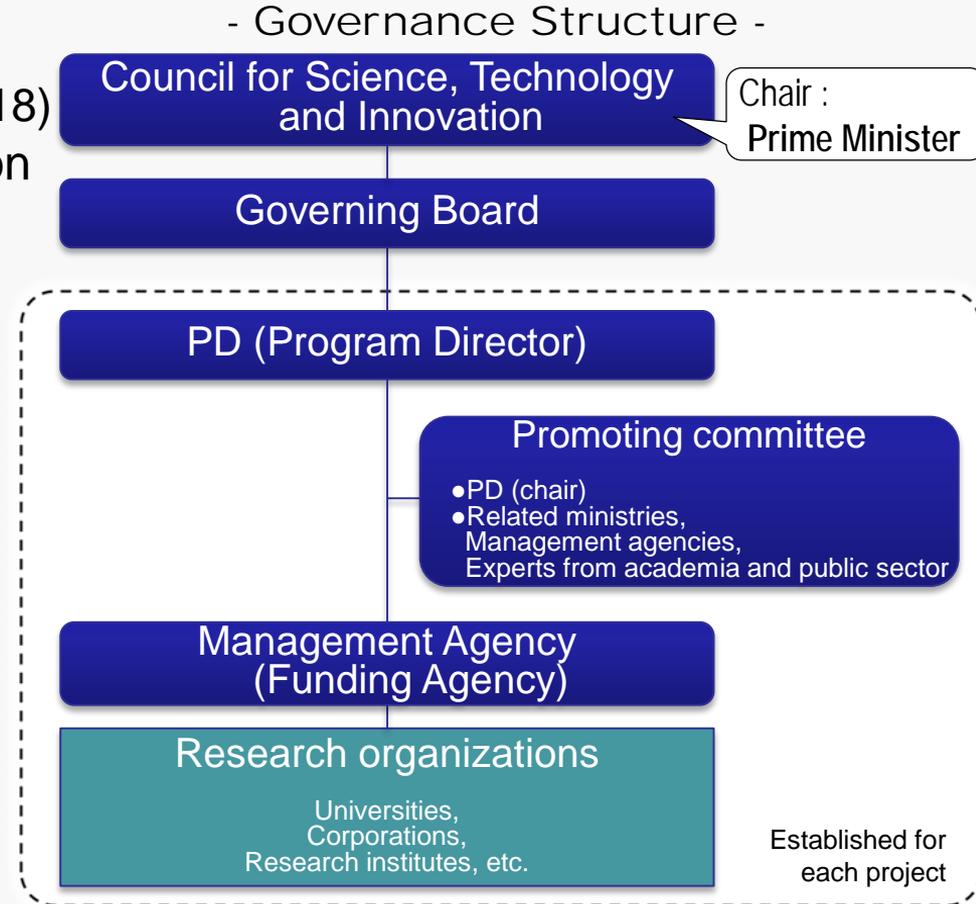
➤ 11 research themes

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 (PDs) and allocates the budget every year for each research theme. *

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



SIP (Cross-Ministerial Strategic Innovation Promotion Program)

Societal Issues	Themes	FY2016 budget
Energy	Innovative combustion technology	¥1.9bil
	Next-generation power electronics	¥2.4bil
	Innovative structural materials	¥3.8bil
	Energy carrier	¥3.5bil
	Next-generation ocean resources development technologies	¥4.7bil
Next-Generation Infrastructures	Automated Driving System	¥2.7bil
	Technologies for maintenance/upgrading/ management of infrastructures	¥3.2bil
	Reinforcement of resilient function for preventing and mitigating disasters	¥2.3bil
	Cyber-Security for Critical Infrastructure	¥2.6bil
Local Resources	Technologies for creating next-generation agriculture, forestry and fisheries	¥2.9bil
	Innovative design/manufacturing technologies	¥2.2bil

Automated Driving System

- ✓ **Incorporating AI, BD, IoT technologies into vehicle control system**
- ✓ **Connectivity through cellular network, satellite, V2X in mind**
- ✓ **Societal and Industrial impact to be considered**
- ✓ **Well-balanced combination of cooperative and competitive approaches in the development and deployment process**

Automated Driving System in SIP

SIP-adus

(*Innovation of Automated Driving for Universal Services*)

- ✓ Intensive R&D program supporting development of future advanced ADS
- ✓ Industry-academia-government collaboration
- ✓ Working with the Japan Automobile Manufacturers Association (JAMA) and going along with its vision for ADS
- ✓ Especially focusing on what we should cooperate with, including digital map, wireless communication, HMI, security

Budget for SIP-adus : JPY 2.7 Billion (FY2016)

Program Director



Seigo Kuzumaki

Chief Safety Technology
Officer Secretary,
Toyota Motor Corporation

Structure of SIP-adus

SIP-adus R&D activities are reviewed in the Promoting Committee. Currently, 3 Working Groups and 2 Task Forces have been established to cover wide variety of the topics.

SIP-adus Promoting Committee

FOT planning TF

System Implementation WG

Map structuring TF

- ◆ Dynamic map (precise 3D digital map with information changing over time)
- ◆ Micro and macro data analysis and simulation technology
- ◆ Prediction based on information from ITS
- ◆ Sensing capability enhancement
- ◆ Human Factors
- ◆ System security

International cooperation WG

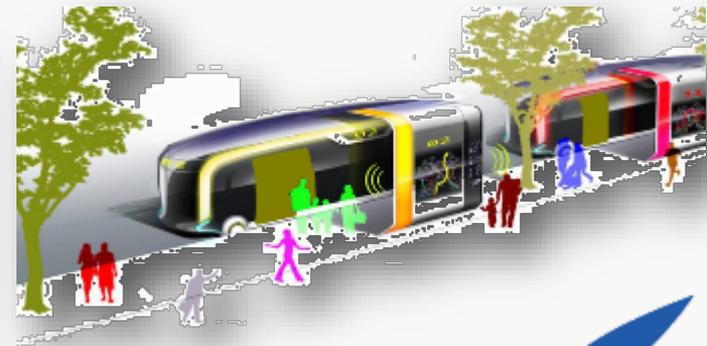
- ◆ Open research facility
- ◆ Social acceptance

Next Generation Urban Transportation WG

- ◆ Local traffic management enhancement
- ◆ Next-generation public road transport system

Goal & Exit Strategy of SIP-adus

1. Ensuring safety and traffic jam reduction on the road
2. Development and deployment of Automated Driving System
3. Realization of advanced next generation public bus service good for elderly and handicapped people.

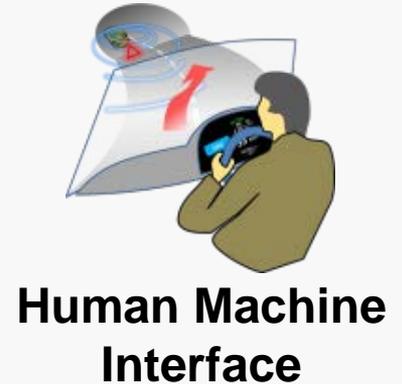
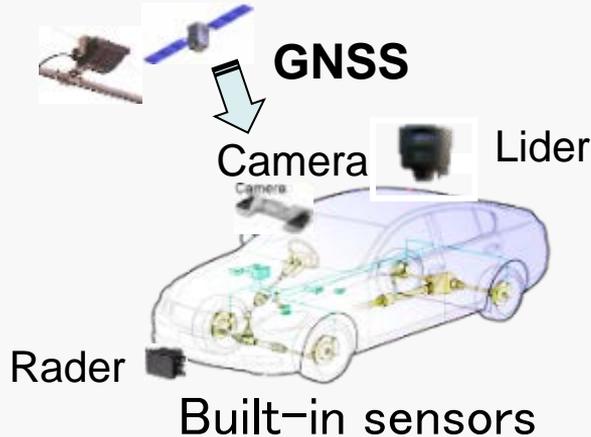
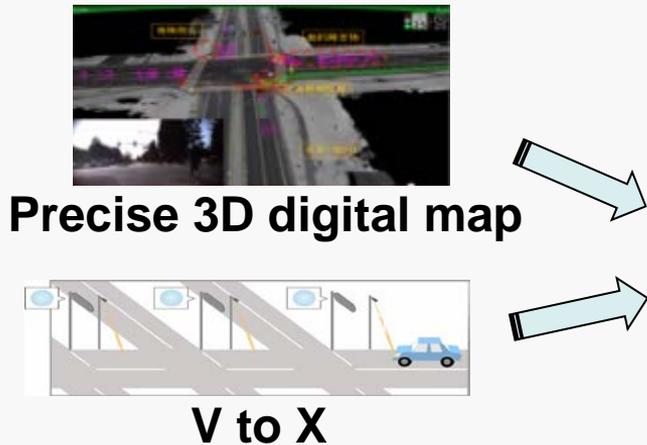


Technologies for Automated Driving

On-board Technologies



HMI



Platform

Security, Simulation, Shared database, etc.

Dynamic Map

Hierarchical structure of digital 'Map' layered by time frame

Time frame

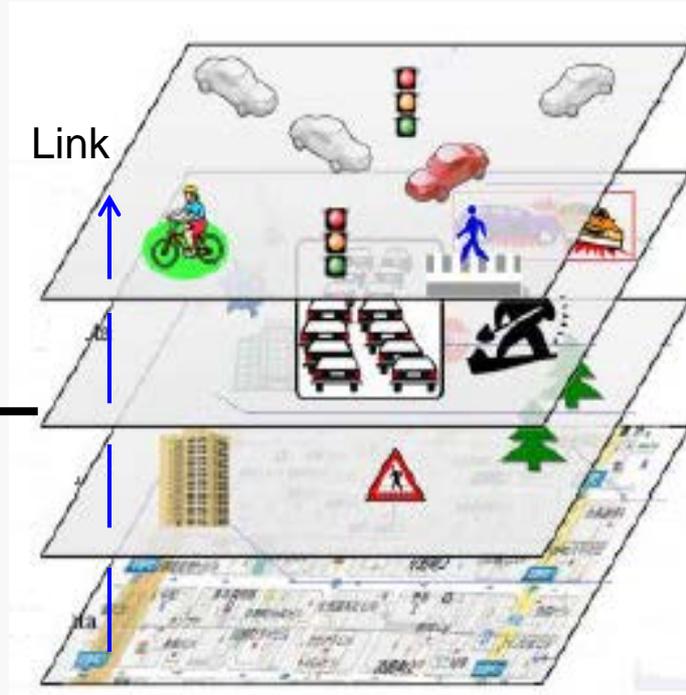
Dynamic (< 1 sec)

Semi-dynamic (< 1 min)

Semi-static (< 1 hour)

Static (< 1 day)

Linked layers



Information through V to X

Traffic Information

Planned and forecast information

Basic Map Database

Development of Operational Framework

Dynamic Map Planning 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 will be transformed to a business entity by 2017.

Survey and digital map providers

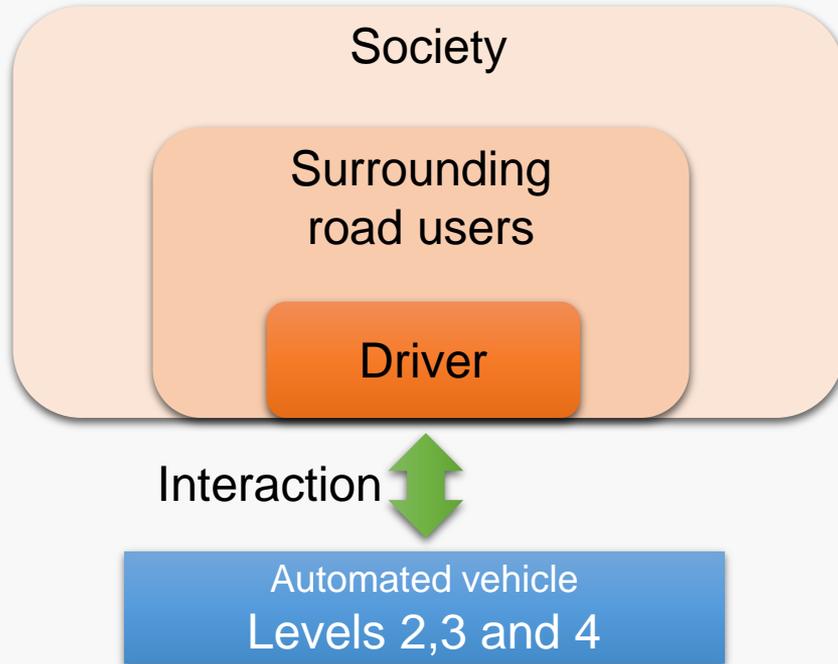
Mitsubishi Electric Corporation
ZENRIN CO., LTD.
PASCO CORPORATION
AISAN TECHNOLOGY Co., Ltd.
INCREMENT P CORPORATION
TOYOTA MAPMASTER INCORPORATED

Auto manufacturers

Isuzu Motors Limited
SUZUKI MOTOR CORPORATION
Toyota Motor Corporation
NISSAN MOTOR CO., LTD.
Hino Motors, Ltd.
Fuji Heavy Industries Ltd.
Honda Motor Co., Ltd.
Mazda Motor Corporation
Mitsubishi Motors Corporation

HMI (Human Machine Interface)

- Framework for extraction of human factor problems



- 3 phase for challenges and approaches toward Level 3, 4

- Vehicle - Driver
 - ✓ Understanding of system
 - ✓ Driver's state
- Vehicle & Surrounding road users
 - ✓ Communication between the Automated vehicle and its surrounding vehicle's drivers or pedestrians, etc..
- Vehicle & Society
 - ✓ Social acceptance
 - ✓ Liability, Licensing, etc..



International Standardisation & Coordination

- ✓ **Some technologies for ADS need to be addressed on the basis of the collaboration between stakeholders around the world.**
- ✓ **At this point, digital map and HMI are particularly considered to deserve international ‘standardisation’ in some form through coordination activities.**
- ✓ **Security and other topics also need continuous discussion and dialogue by taking various opportunities.**
- ✓ **We are looking for international cooperation.**

International Standardisation & Coordination

■ Leading Experts of SIP-adus



Ryota Shirato
Dynamic Map



Norifumi Ogawa
Connected Vehicles



Satoshi Kitazaki
Human Factors



Nobuyuki Uchida
Impact Assessment



Satoru Taniguchi
Security



Masayuki Kawamoto
Next Generation
Transport

➤ **ISO activities**

- > Dynamic Map ----- TC204 / WG3
- > HMI ----- TC22 / SC39 / WG8

➤ **Participation in the meeting of TRB, TRA, AVS, etc.**

➤ **Dialogue with relevant Forums, Consortia and Stakeholders**

➤ **Trilateral meeting**

SIP-adus Field Operation Test

Press Release <November 15, 2016>

Large-scale Field Operation Test (FOT) on public roads will start in around September 2017.

➤ Objectives of the FOT

1. Clarify technical and institutional issues with variety of OEMs

- Promote development of each technology such as Dynamic Map or HMI
- Investigate social system and legislation

2. Acquire new viewpoints through participation of various players from outside of the SIP-adus

3. Enhance International cooperation and harmonization through open participation to the overseas OEMs

4. Build Social acceptability by involving ordinary citizens and maximize effect

Outline of the SIP-adus FOT

Test sites

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

Expressway

some part of the following expressway

- JOBAN expressway
- Metropolitan expressway
- TOMEI expressway
- SHIN-TOMEI expressway

Total : app.300km.

Test facility

JARI* Test course
New test facility for
ADS evaluation
(Apr. 2017 open)

*JARI : Japan Automotive
Research Institute

Arterial roads

Tokyo waterfront area

Expected participants (open to both domestic and international)

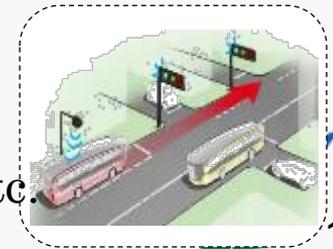
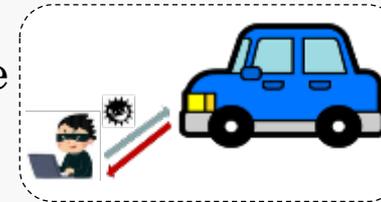
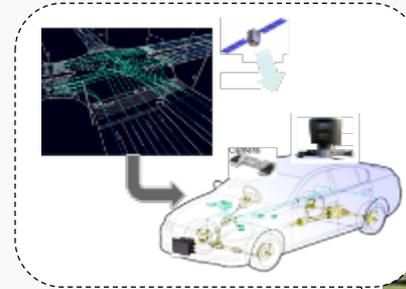
- ✓ Auto manufacturers and parts suppliers
- ✓ Universities, Research institutes, Government agencies, etc.

(There is a possibility of partial change.)

Outline of the SIP-adus FOT

Focus areas

- ✓ **Dynamic Map**
 - 3D high-resolution digital map validation
 - Validation of semi-dynamic information etc.
- ✓ **Human Machine Interface**
 - Measurement of a driver's condition under real-world
 - Study and validation of decision index of driver's condition etc.
- ✓ **Cyber Security**
 - Evaluation of simulated cyber attack from outside the vehicle by using test equipment etc.
- ✓ **Pedestrian Assistance**
 - Validation of a pedestrian mobile terminal (smartphone) etc.
- ✓ **Next Generation Public Transportation**
 - Validation of service level improvement for public transport etc.



SIP-adus FOT in Okinawa

Press Release <December 26, 2016>

FOT of Automated Driving Bus will be conducted in Okinawa from March 2017.

(now planning for subsequent FOTs)



Expected to be deployed as local community bus



Okinawa Island



Arterial roads

Around "Azama Sun-Sun Beach", Nanjo City, Okinawa prefecture



3rd SIP-adus Workshop 2016

- ◆ **Organizer** SIP-adus Promoting Committee
- ◆ **Date** November 15-17, 2016
- ◆ **Venue** Tokyo International Exchange Center
- ◆ **Program**



	Tuesday November 15	Wednesday November 16	Thursday November 17 (Breakout Workshop)
AM	Opening & Keynote Session	Special Session SIP-adus Report Session	Breakout Workshop-1
	Special Session Regional Activities and FOTs	Impact Assessment	
	SIP-adus Display		
PM	Dynamic Map	Next Generation Transport	Breakout Workshop-2
	Connected Vehicles		
	Security	Human Factors	Breakout Workshop Summary
	Preparation meeting for Breakout Workshop		Closing Session

Snapshot of SIP-adus Workshop 2016

■ Announcement of SIP-adus Large-Scale FOT in 2017

- Share Regional activities and FOTs from various areas



■ Report from SIP-adus R&D activities

- SIP-adus Report Session and Panels



■ Sharing latest information, discussing issues and actions for future on the six topics

- Dynamic Map, Connected Vehicles, Security, Impact Assessment, Next Generation Transport, Human Factors



For More Information...

Cabinet Office:

<http://www.cao.go.jp/index-e.html>

CSTI (Science and Technology Policy):

<http://www8.cao.go.jp/cstp/english/index.html>

SIP (Cross-Ministerial Strategic Innovation Promotion Program)

http://www8.cao.go.jp/cstp/panhu/sip_english/sip_en.html

SIP-adus (Workshop and other information):

<http://en.sip-adus.jp/>

Summary Report and all presentations of the workshop have been uploaded with permission from the speakers.

Thank you for your kind attention!

4th SIP-adus Workshop

Date : November 14-16, 2017

Venue : Tokyo International Exchange Center

Please join us!!

