Japanese Coordinated Approach for R&D of Automated Driving System

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

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Cabinet Office, Japan

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1. Overview of SIP-adus
   (cooperative R&D for ADS in Japan)

2. International Standardisation & Coodination

3. Field Operation Tests from 2017

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

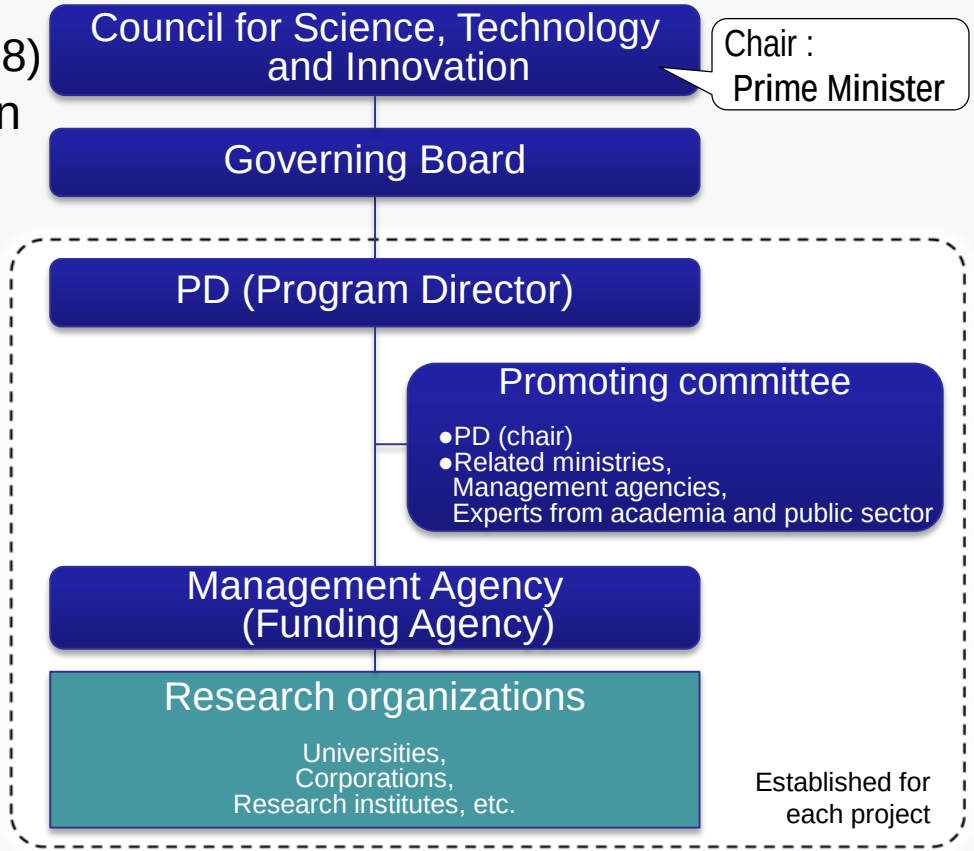
From societal issues such as Energy, Next-Generation Infrastructures and Local Resources, including R&D for AD

➢ 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)

- Governance Structure -



SIP (Cross-Ministerial Strategic Innovation Promotion Program)

Societal Issues	Themes
Energy	Innovative combustion technology
	Next-generation power electronics
	Innovative structural materials
	Energy carrier
	Next-generation ocean resources development technologies
Next-Generation Infrastructures	**Automated Driving System**
	Technologies for maintenance/upgrading/ management of infrastructures
	Reinforcement of resilient function for preventing and mitigating disasters
	Cyber-Security for Critical Infrastructure
Local Resources	Technologies for creating next-generation agriculture, forestry and fisheries
	Innovative design/manufacturing technologies

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

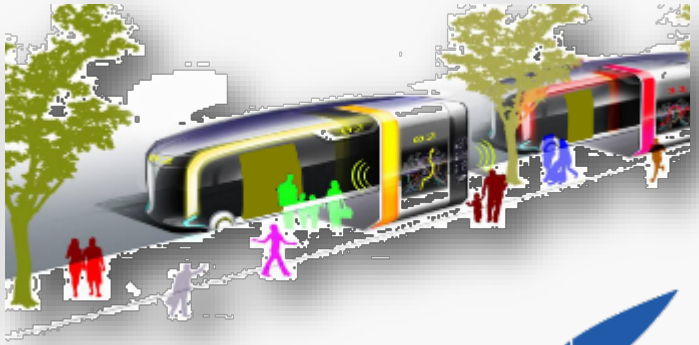
- ◆ Open research facility
- ◆ Social acceptance

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.



SIP Cross-ministerial Strategic Innovation Promotion Program

Technologies for Automated Driving

On-board Technologies

Perception

Decision

Operation

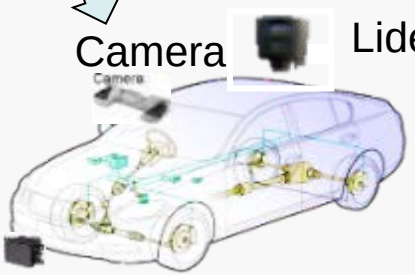
HMI

Coordination

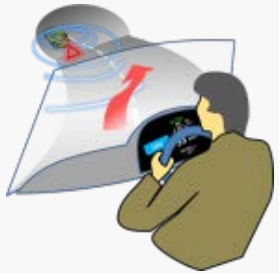
Precise 3D digital map

V to X

GNSS



Built-in sensors



Human Machine Interface

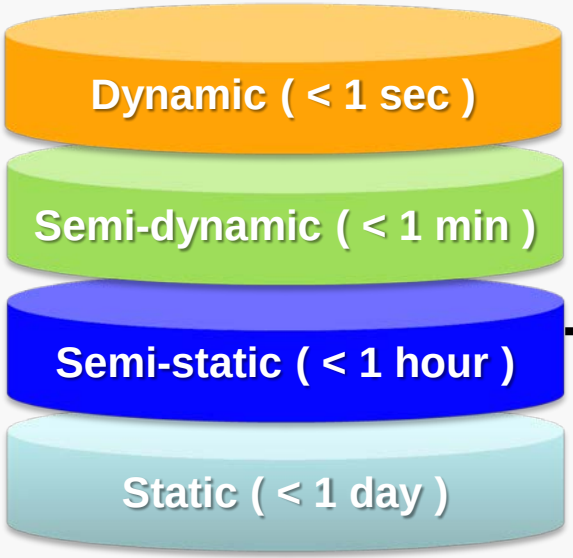
Platform

Security, Simulation, Shared database, etc.

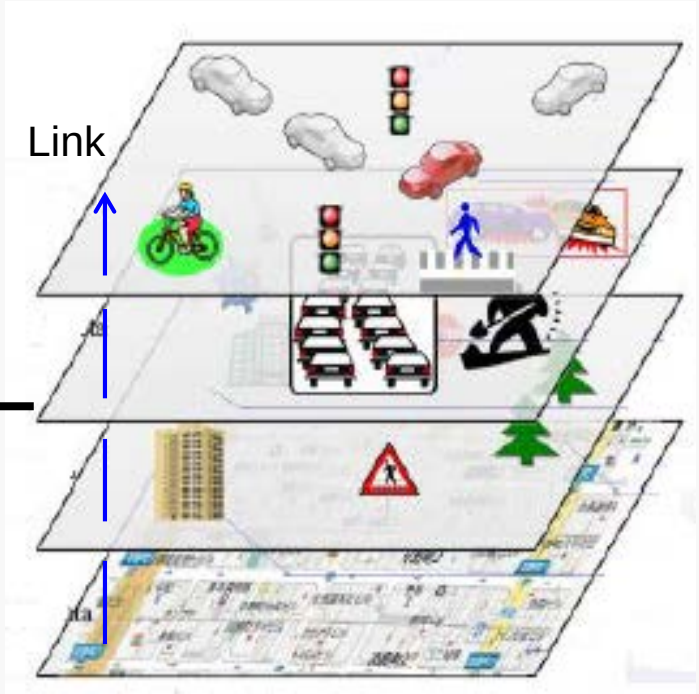
Dynamic Map

Hierarchical structure of digital ‘Map’ layered by time frame

Time frame



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

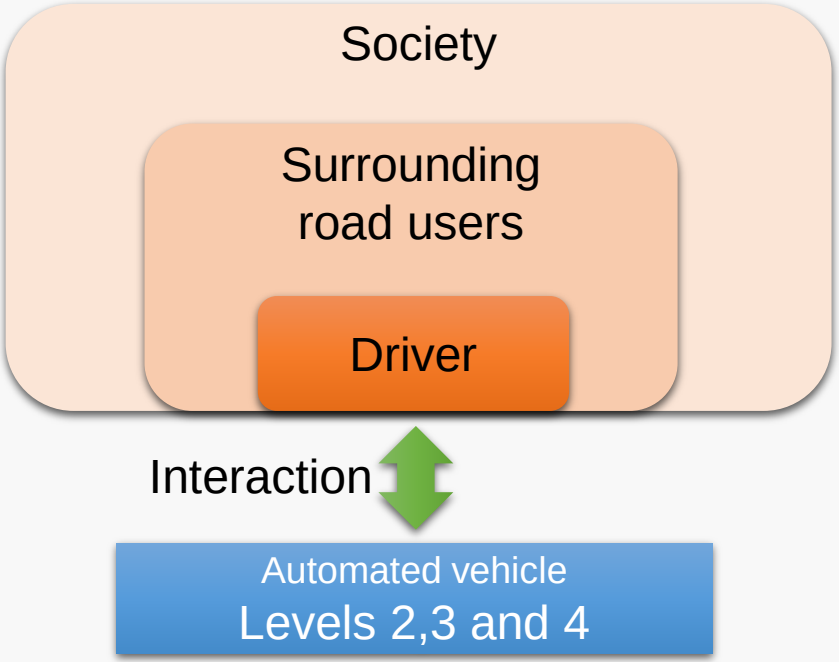
Mitsubishi Electric Corporation
ZENRIN CO., LTD.
PASCO CORPORATION
AISAN TECHNOLOGY Co., Ltd.
INCREMENT P CORPORATION
TOYOTA MAPMASTER INCORPORATED

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 & Coodination

■ Leading Experts at 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 Tests

Large-scale Field Operation Tests (FOTs) on public roads will start in 2017.

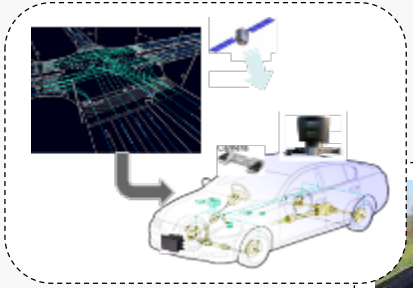
- Objectives of the FOTs

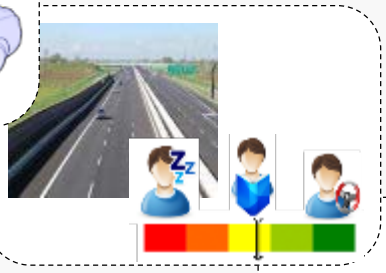
1. Clarify technical and institutional issues with variety of OEMs
   - Promote development of each technology such as Dynamic Map or HMI
   - Investigate social system and legislation
2. Acquire new viewpoints through participation of various players from outside of the SIP-adus
3. Enhance International cooperation and harmonization through open participation to the overseas OEMs
4. Build Social acceptability by involving ordinary citizens and maximize effect

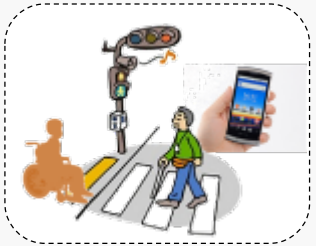
Outline of the SIP-adus FOTs

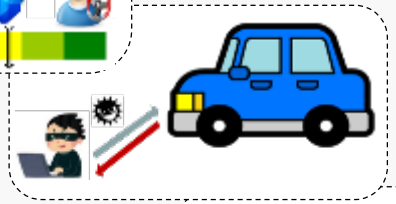
Focus areas

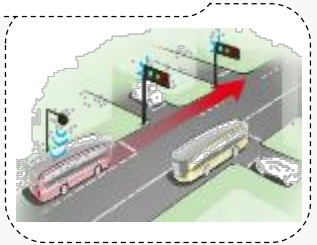
- ✓ Dynamic Map
- ✓ Human Machine Interface
- ✓ Cyber Security
- ✓ Pedestrian Assistance
- ✓ Next Generation Public Transportation











Test sites

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

Expected participants (open to both domestic and international)

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

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

More information about SIP-adus FOTs will be announced !!

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 on CAD):

http://en.sip-adus.jp/ *

*** All presentations of the workshop will be uploaded with permission from the speakers.**

Thank you for your kind attention!

3rd SIP-adus Workshop
on Connected and Automated Driving Systems 2016

Date : November 15-17, 2016
Venue : Tokyo

Please join us!!