SIP Cross-ministerial Strategic Innovation Promotion Program

under CAO
(Cabinet Office)

Cross-Ministerial **S**trategic **I**nnovation **P**romotion Program
Innovation of **A**utomated **D**riving for **U**niversal **S**ervices

SIP-adus and ART*;
why ART, How Advanced?

Takashi OGUCHI

Professor
Advanced Mobility Research Center (ITS center),
Institute of Industrial Sciences,
the University of Tokyo

*Advanced Rapid Transit (**ART**)

SIP (Cross-Ministerial Strategic Innovation Promotion Program)

- **Intensive R&D program**
  - promote 5-years R&D (FY2014-2018)
  - enhancing cross-ministerial cooperation

- **11 research themes**

  From societal issues such as Energy, Next-Generation Infrastructures and Local Resources, including R&D for Automated Driving
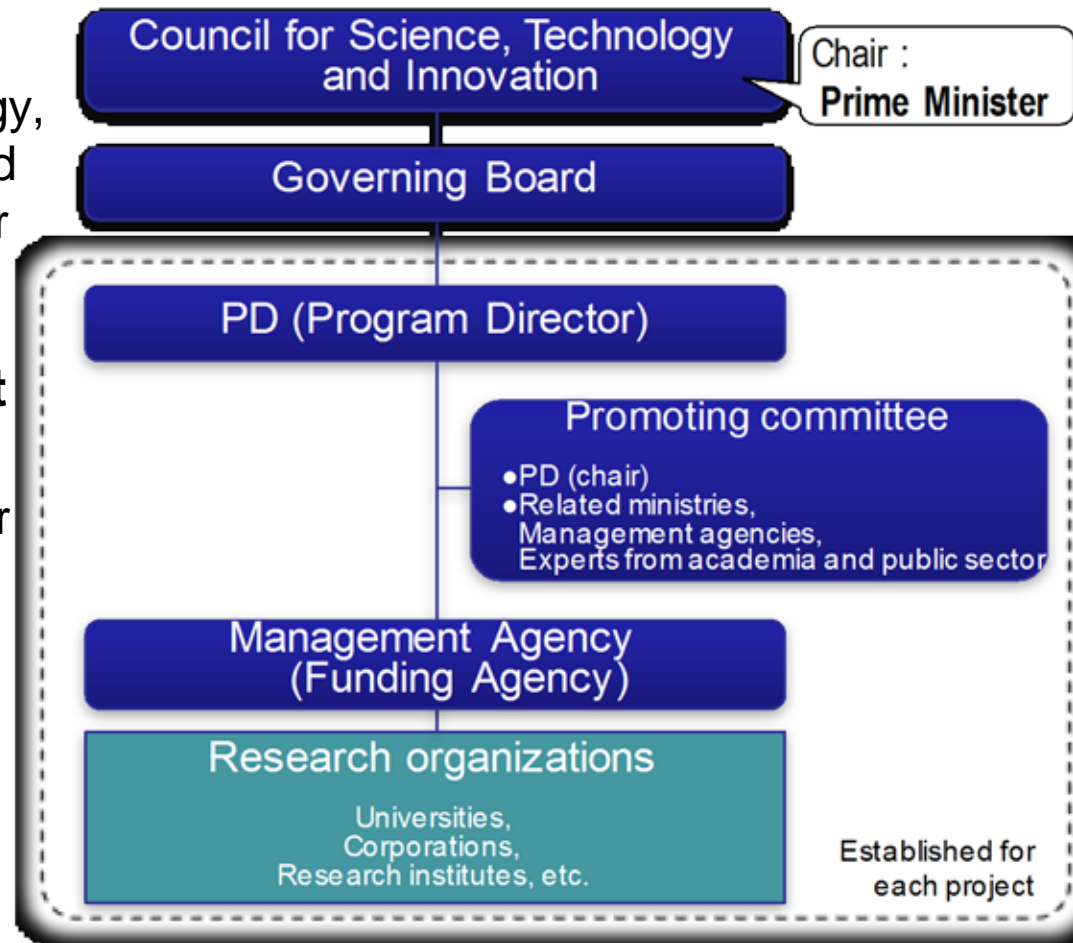
- **Leadership and total Budget**

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

  * 50 billion JPY in total per year
  = (approx.) USD 500 Million
        65% for SIP 11 themes
        35% for medical R&D

SIP Cross-ministerial Strategic Innovation Promotion Program

- Governance Structure -

Council for Science, Technology and Innovation

Chair : **Prime Minister**

Governing Board

PD (Program Director)

Promoting committee
- PD (chair)
- Related ministries, Management agencies, Experts from academia and public sector

Management Agency (Funding Agency)

Research organizations
Universities, Corporations, Research institutes, etc.

Established for each project

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

SIP-adus
(Innovation of Automated Driving for Universal Services)

Program Director

- Intensive R&D program supporting development of future advanced Automated Driving System
- Industry-academia-government collaboration
- Budget for SIP-adus : JPY 2.7 Billion (FY2016)
 = (approx.) USD 27 Million

Seigo Kuzumaki

Chief Safety Technology Officer Secretary,

Toyota Motor Corporation

Goal and Exit Strategy of SIP-adus

1. Ensuring safety and **traffic jam reduction** on the road

2. **Development and deployment** of **A**utomated **D**riving **S**ystem

3. Realization of <u>advanced next generation public bus service</u> especially for elderly and handicapped users (Advanced Rapid Transit: **ART**)
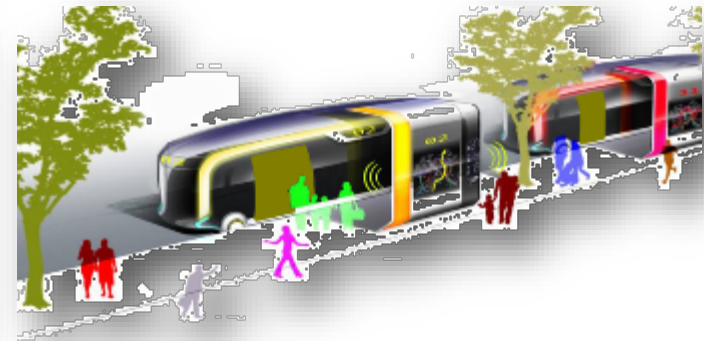
Technologies for Automated Driving
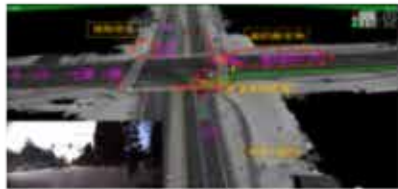

On-board Technologies
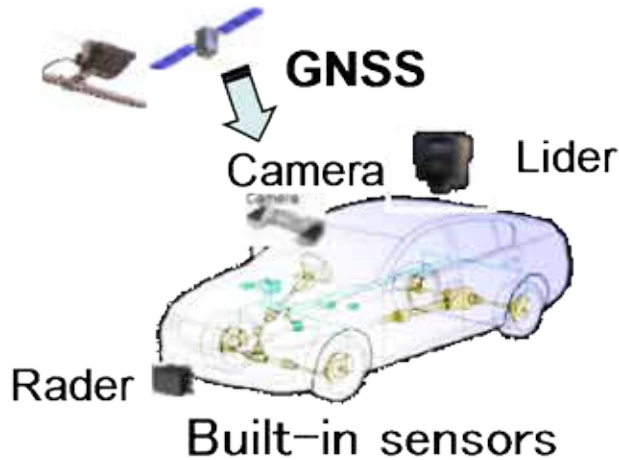
認知 Perception　判断 Decision　操作 Operation

HMI

人との協調 Coordination

Precise 3D digital map

V to X

GNSS
Camera　Lider
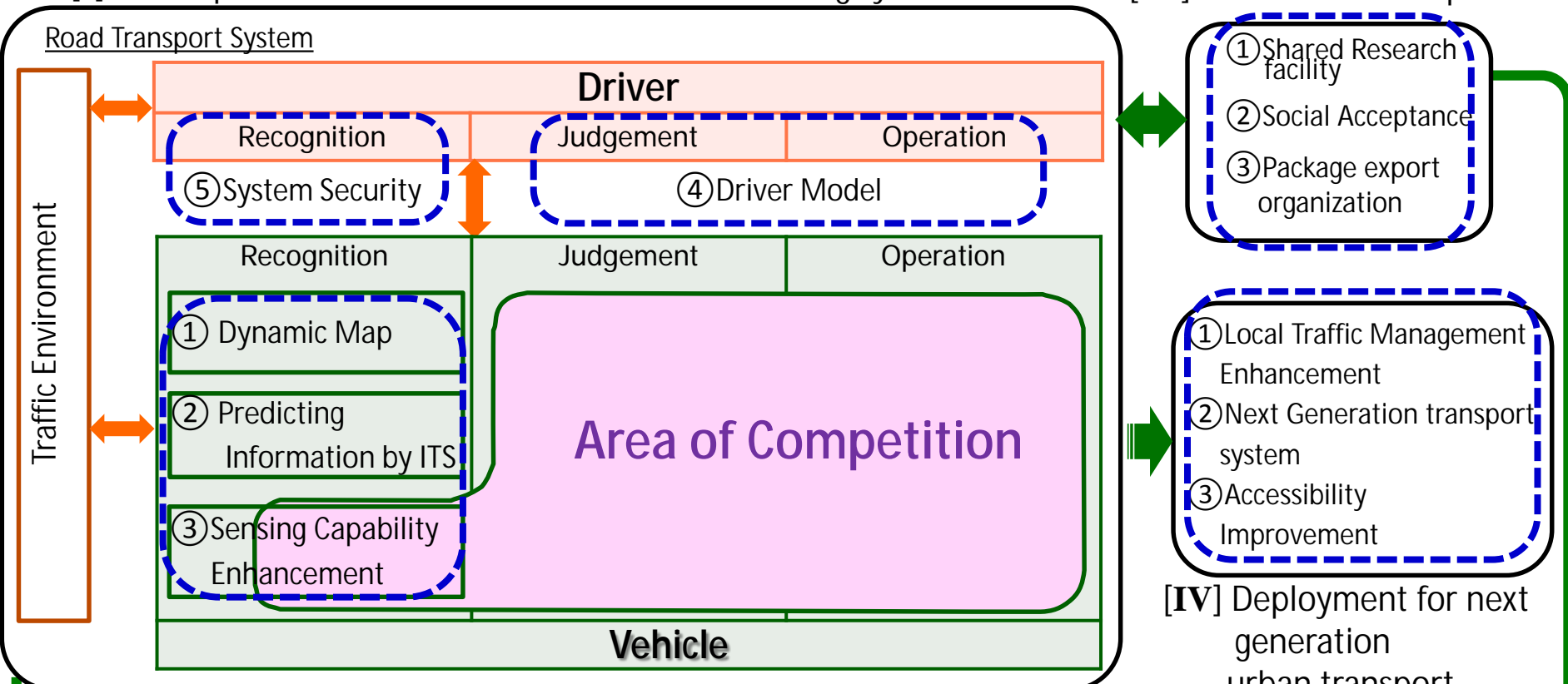Rader
Built-in sensors

Human Machine Interface

Platform Security, Simulation, Shared database, etc.

Major development theme of SIP-adus

[I] Development and verification of automated driving systems

[III] International cooperation

Road Transport System

Traffic Environment

Driver

Recognition	Judgement	Operation
⑤System Security	④Driver Model	

Recognition	Judgement	Operation
① Dynamic Map		
② Predicting Information by ITS	**Area of Competition**	
③Sensing Capability Enhancement		

Vehicle

①Shared Research facility
②Social Acceptance
③Package export organization

①Local Traffic Management Enhancement
②Next Generation transport system
③Accessibility Improvement
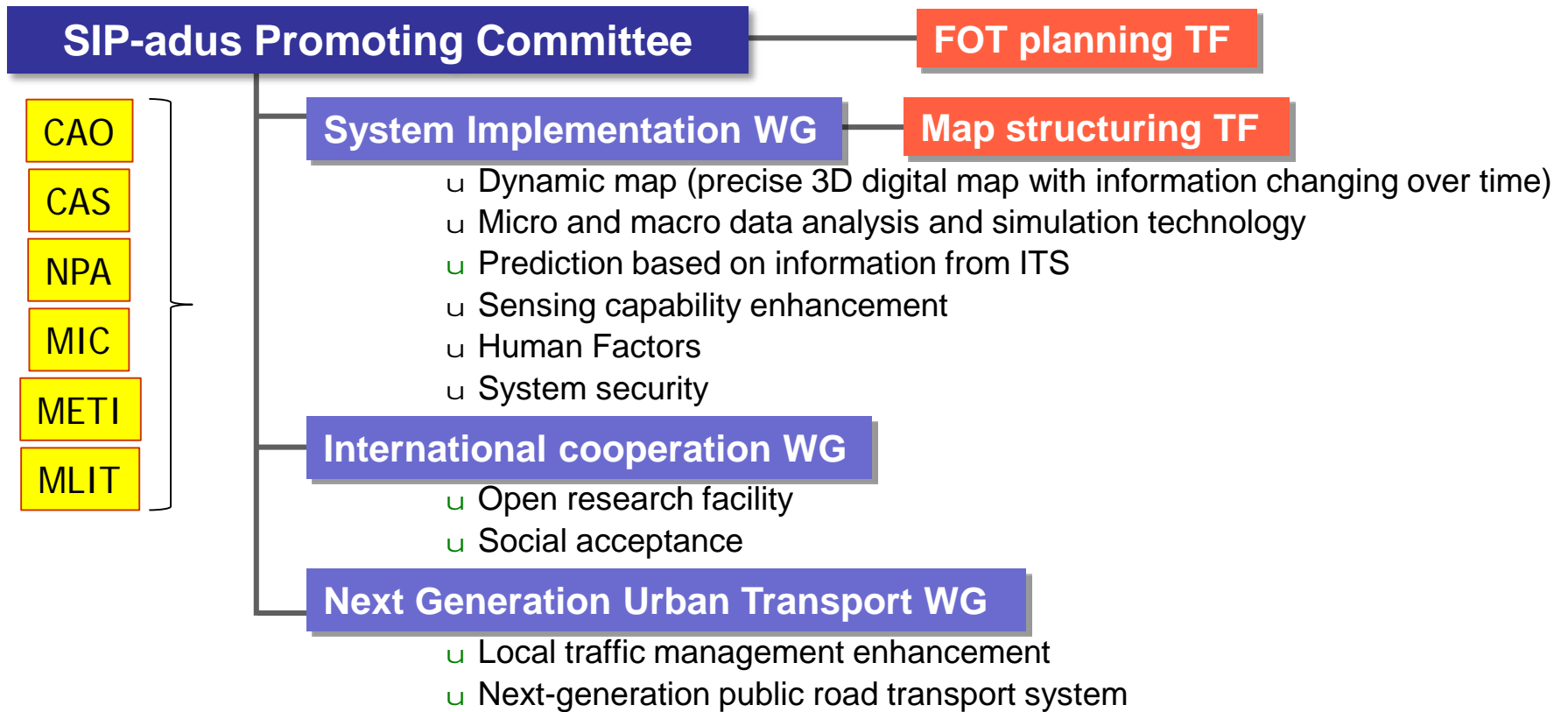
[IV] Deployment for next generation urban transport

①Traffic fatality reduction effect estimation method & national shared data base
②Micro and Micro data analysis and simulation technology
③Local traffic CO_2 emission visualization technology

[II] Basic technologies to reduce traffic fatalities and congestion

[V] Large scale experiment

⎯ ⎯ ⎯ Area of cooperation = focus of SIP program

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

CAO
CAS
NPA
MIC
METI
MLIT

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 Transport WG

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

<u>For "Ensuring safety and **traffic jam reduction** on the road"</u> …

- Enhancement of **surface public transport (PT) function** for ensuring safety of vulnerable users (disabled & aged)
  - Increased level & quality of services of **PT**
  - ART: Advanced **Rapid** Transit ß BRT
    - automated pull-over control ß ADS technology application
    - smooth & comfortable vehicle control ß ADS technology application
    - priority service for public transit (PTPS)
    - seamless fare-payment, quick & safe boarding for wheel-chairs
    - integrated services with seamless & stress-free connections
    - universal information provision service including vulnerable users
- Showcase for <u>**Olympic/Paralympic Games 2020 Tokyo**</u>
  - travel demand concentration prediction; including congestion avoidance campaign
  - à to promote ART in other urban areas in Japan, and abroad !!

Advanced PTPS(Public Transportation Priority System)
*Rapid and On-time operation

Advanced operation system with automated control systems
*Seamless and stress free connection

Automated acceleration control
*Smooth & Comfortable ride

Automated pull-over control
*Accessibility
*Short time and Safety boarding
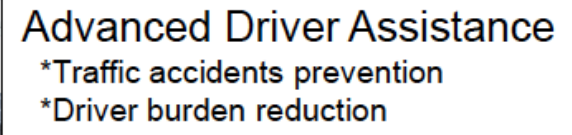
Advanced Driver Assistance
*Traffic accidents prevention
*Driver burden reduction
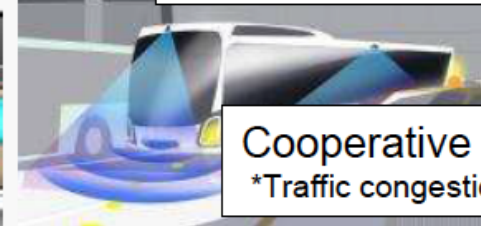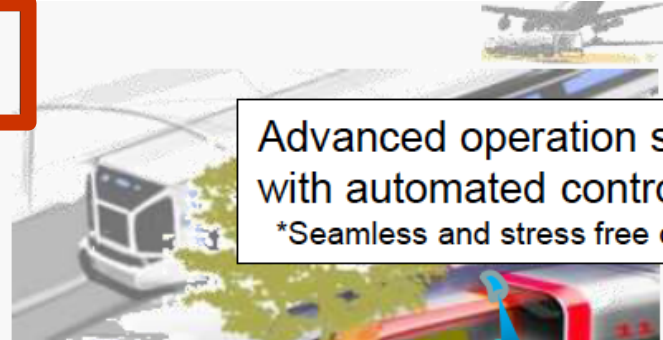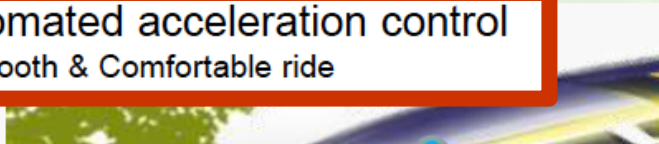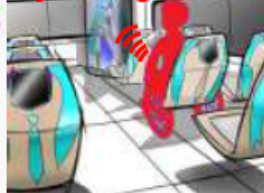
Cyber Agent

Universal built-in seats
Contactless electronic charging
*Cabin Safety and Convenience

Cooperative ACC
*Traffic congestion/CO2 reduction

1-2 Automatic controllability for ART [CAO4-FY2015]

Advanced PTPS(Public Transportation Priority System)
*Rapid and On-time operation

Advanced operation system with automated control systems
*Seamless and stress free connection

Automated acceleration control
*Smooth & Comfortable ride

Automated pull-over control
*Accessibility
*Short time and Safety boarding

Advanced Driver Assistance
*Traffic accidents prevention
*Driver burden reduction

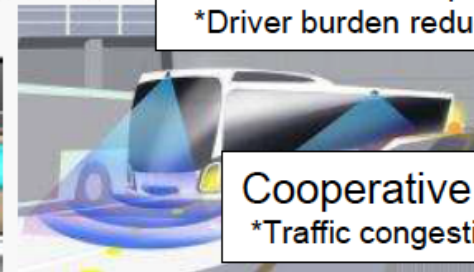**Universal built-in seats Contactless electronic charging**
*Cabin Safety and Convenience

Cyber Agent

Cooperative ACC
*Traffic congestion/CO2 reduction

1-3 Advanced PTPS service design [CAO5-FY2015]

2-1 advanced Traffic Signal Prediction Systems [NPA1-FY2015]

Advanced PTPS(Public Transportation Priority System)
*Rapid and On-time operation

Advanced operation system
with automated control systems
*Seamless and stress free connection

Automated acceleration control
*Smooth & Comfortable ride

Automated pull-over control
*Accessibility
*Short time and Safety boarding

Advanced Driver Assistance
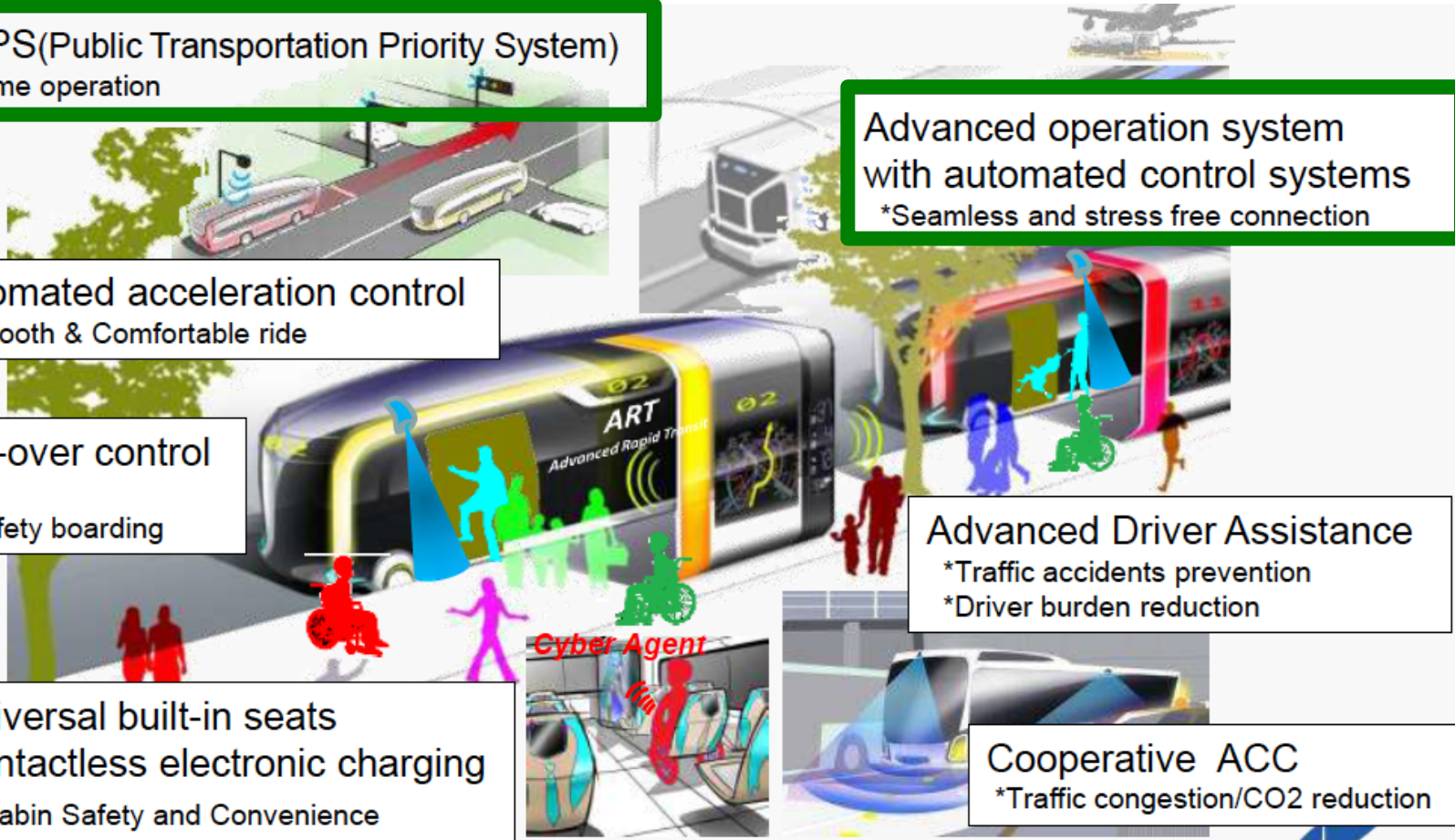*Traffic accidents prevention
*Driver burden reduction

Cyber Agent

Universal built-in seats
Contactless electronic charging
*Cabin Safety and Convenience

Cooperative ACC
*Traffic congestion/CO2 reduction

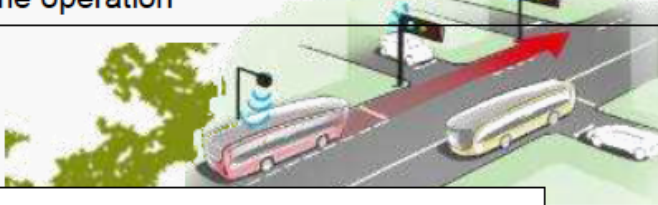## 2-2 advanced DSSS (Driving Safety Support Systems) [NPA3-FY2015]

3. Effective use of satellite positioning technology [METI7-FY2015]

Advanced PTPS(Public Transportation Priority System)
*Rapid and On-time operation

Advanced operation system with automated control systems
*Seamless and stress free connection

Automated acceleration control
*Smooth & Comfortable ride

Automated pull-over control
*Accessibility
*Short time and Safety boarding

Advanced Driver Assistance
*Traffic accidents prevention
*Driver burden reduction

Cyber Agent

Universal built-in seats
Contactless electronic charging
*Cabin Safety and Convenience

Cooperative ACC
*Traffic congestion/CO2 reduction