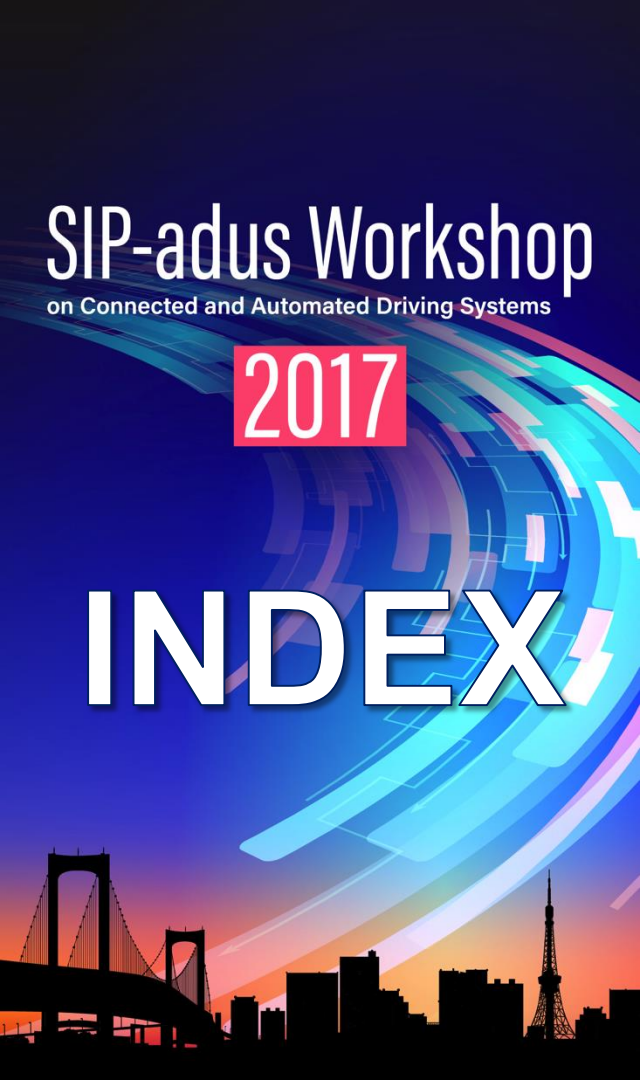
SIP-adus Workshop 2017 Summary Report

December 27th, 2017

SIP-adus International Cooperation WG
ITS Japan

SIP

Cabinet Office



1. Main Theme of SIP-adus Workshop 2017

◆ Goals

1. Enhance global reporting on SIP-adus Development status, advanced to the FOTs (Field Operational Tests) phase
2. Enhance International cooperation activities through FOTs

◆ Specific Programs

1. FOT-related discussions
2. Test Rides on Automated Vehicle prepared by SIP-adus FOT Global Participants

“SIP-adus”

– Mobility Bringing Everyone a Smile –

SIP : Cross-Ministerial Strategic Innovation Promotion Program

adus : Innovation of Automated Driving for Universal Services

2. Summary of SIP-adus Workshop 2017

- **Receiving increased interests from speakers and participants from overseas as Workshop on Connected and Automated Driving system**
- **Highly evaluated as Workshop to discuss key issues and build international cooperation activities, and received high expectation to the next meetings**

- Organizer: Cross-Ministerial Strategic Innovation Promotion Program, Council for Science, Technology and Innovation, Cabinet Office, Government of Japan
- Date : November 14-16, 2017
- Venue: Tokyo International Exchange Center
  （Tokyo Academic Park, 2-2-1 Aomi, Koto-ku, Tokyo 135-8630 Japan）
  http://www.jasso.go.jp/en/kyoten/tiec/index.html
- Attendees: 477 from 16 Countries (425 from 17 Countries in 2016)
- Speakers: 59 includes 35 speakers and moderators from overseas
  (61 includes 34 speakers and moderators from overseas in 2016)

3. Program

	Tuesday November 14	Wednesday November 15	Thursday November 16 (Breakout Workshop)
AM	9:00～9:45 Opening Session	9:00～10:30 SIP-adus Report Session	9:00～12:00 Breakout Workshop
	9:45～12:30 Regional Activities and FOTs	10:45～12:30 Impact Assessment	
	Poster Session		
PM	13:30～14:40 Dynamic Map	13:30～15:15 Next Generation Transport	13:00～15:00 Breakout Workshop
	14:55～16:35 Connected Vehicles		
	16:50～18:40 Cyber Security	15:30～18:00 Human Factors	15:30～17:15 Breakout Workshop Summary
	Preparatory Meeting for Breakout Workshop		17:15～17:45 Closing Session

13:30～13:35 Minister Greeting

Breakout Workshop was held with SIP-adus members and invited participants.

4.1. Opening Session

■Welcome Speech Outline

Ryo Kuroda SIP-adus / Cabinet Office, Japan

- Greeting to participants
- Expectation to Workshop result

■Keynote Speaker Outline

Kenneth M. Leonard U.S. Department of Transportation, USA

- US policy about automated vehicles R&D

Ludger Rogge European Commission, Belgium

- EC policy about automated vehicles R&D
- Horizon2020 progress, especially about EU regional FOTs
- Importance appeal about international cooperation
- Call for participation to TRA2018

Seigo Kuzumaki SIP-adus Program Director / TOYOTA Motor Corporation, Japan

- Thanks to overseas participation to SIP-adus Workshop and FOT
- Call for discussion about workshop 7 main themes

Opening Session Speakers

4.1. Opening Session

■Welcome Speech Outline

Masaji Matsuyama Minister of State for Science and Technology Policy

- ・Greeting to participants
- ・Japan R&D technology action to AV(Automated Vehicle)
- ・International cooperation importance for AV realization

Photo of CAO Minister Matsuyama and overseas speakers

After welcome speech, Minister Matsuyama attended AV test rides

4.2. Regional Activities and FOTs

Regional Activities and FOTs

- Extended scope:
  - vehicles and services (private cars, public transportation and freight)
  - areas (urban or rural, climate and cross border)
- Diverse objectives:
  - validation of technologies
  - collection of 'unexpected' instances
  - benefit / risk and social acceptance evaluation
- Dependency on both vehicle automation levels and driving environment
- More emphasis on non-technical challenges to benefit from CAV technologies

Regional Activities and FOTs speakers

4.2. Regional Activities and FOTs

■Moderator

Hajime Amano ITS Japan, Japan

■Speaker Presentation Outline

Masato Minakata TOYOTA Motor Corporation, Japan

・SIP-adus FOT outline started at Oct. 2017 and MaaS FOT outline

Jan Hellaker DRIVE SWEDEN, Sweden

・DRIVE SWEDEN Outline (Track platooning, Low speed garbage truck, MaaS business concept)

Helge Neuner Volkswagen Group Research, Germany

・AdaptIVe、PEGASUS、L3Pilot Outline

2 directions： Evolution（Expected evolution）

Revolution（MaaS by revolutionary driverless car)

Christian Michel Rousseau RENAULT GROUP, France

・French cooperative field action based on ‘passenger car, freight vehicle, urban transport’ roadmap respectively

4.2. Regional Activities and FOTs

Speaker Presentation Outline

Reija Viinanen Finnish Transport Agency, Finland

- Arctic Automated Vehicle FOT (AURORA) outline
  Weather change robust Automated Driving system R&D
- Call for participation to AURORA summit held on Jan. 2018

Paul Retter National Transport Commission, Australia

- Australian regulatory reform action for Automated Driving
- Policy document, regulatory document and guideline issue for early AD introduction

Tom Alkim Ministry of Infrastructure and the Environment, The Netherlands

- Netherland Automated Driving action outline
- Problem presentation that AD is not perfect yet and appropriate under ODD restriction realistically.

Takashi Oguchi The University of Tokyo, Japan

- AD technology introduction to public transport including next generation urban transport and rural area expansion

Dynamic Map

- Integration of static high-definition map database, vehicle sensor data and dynamic data obtained from other vehicles and infrastructure
- Sustainable ecosystem to create and maintain Dynamic Map among map suppliers, auto industries and telecommunication operators
- Structure of large scale map database and vehicle data collection:
  - layers of map supplier backend and OEM specific backend
  - layers of service cloud and vehicle cloud
- Diverse potential users of both public sectors and private sectors

Dynamic Map speakers

4.3. Dynamic Map

■Moderator

Satoru Nakajo The University of Tokyo, Japan

■Speaker Presentation Outline

Yoshiaki Tsuda Mitsubishi Electric Corporation, Japan

・Latest update of Japanese dynamic map and FOT

Tsutomu Nakajima Dynamic Map Platform Co.,Ltd. , Japan

・Action outline of Dynamic Map Platform Co., Ltd.

Volker Sasse NavInfo / NDS / OADF, Germany

・Latest update of Navigation Data Standard (NDS)

Jean-Charles Pandazis ERTICO – ITS Europe, Bergium

・ERTICO action such as latest update of AD eco-system

4.4. Connected Vehicles

Connected Vehicles

- Evolution of applications:
  from information provision for human drivers
  to safety critical applications for the control systems
  to act on it
- Beyond Vehicle sensor range, a new set of requirements to be defined : for real-time safety and further extended preview
- Integrated communication technologies (DSRC and cellular) and innovative network structure (edge, vehicle cloud and service cloud)
- Common platform for localized services and scalability
- A variety of field operational tests to verify real world use cases
- Cooperative-ACC performs much better than Autonomous-ACC

Connected Vehicles speakers

4.4. Connected Vehicles

■Moderator

Vincent Blervaque BLERVAQUE Sprl, France

- Status of C-ITS deployment of Europe

■Speaker Presentation Outline

Kevin Dopart U.S. Department of Transportation, USA

- US CAV actions on regulation and pilot program

Maxime Flament ERTICO – ITS Europe, Belgium

- Needs and challenges on connectivity for AD in Europe

Frank Foersterling Continental, Germany

- Continental’s CAD, eHorizon action and the importance of telecommunication infrastructure for its realization

John Kenney Toyota InfoTechnology Center USA, USA

- A perspective on V2X in United States

Norifumi Ogawa Mazda Motor Corporation, Japan

- Status of CV technology development for AV in Japan

4.5. Cyber Security

Cyber Security

- Efforts to analyze vulnerability, develop protection and validate it
  - effective to systematically protect from known threats
  - no perfect protection technologies
  - attackers may be smarter
- Auto ISAC to share information on cyber attacks and best practices
  - minimize propagation of damages
  - keep up with the maximum attainable level of protection
- Standardization efforts
  - SAE, ISO, IEC and NIST

Cyber Security speakers

4.5. Cyber Security

■Moderator

Satoru Taniguchi Toyota InfoTechnology Center Co., Ltd. , Japan

■Speaker Presentation Outline

Annie Bracquemond VEDECOM, France

- Importance proposal of redundancy, structuration / encryption, fail-safe and evaluation for safety and privacy protection

Shigeru Uehara TOYOTA Motor Corporation, Japan

- Japanese Auto ISAC outline, cyber-attack tendancy

Dan Klinedinst Carnegie Mellon University, USA

- Security vulnerability of CAN-bus, after-market telematics and V2X/I in USDOT cooperative activity

Ingo Dassow Deloitte GmbH, Germany

- Cyber-risk increase / attack trend in proportion to software size and standardization activity such as ISO-SAE21434

4.5. Cyber Security

■Speaker Presentation Outline

Rob Shein PwC, USA

- Problem concern presentation of affiliate number increase and management difficulty due to low-price attack tool, easy availability and connected service

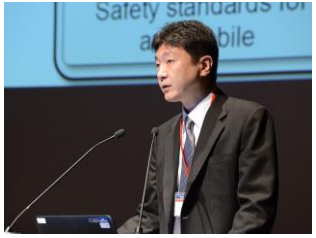
Jonathan Petit OnBoard Security, USA

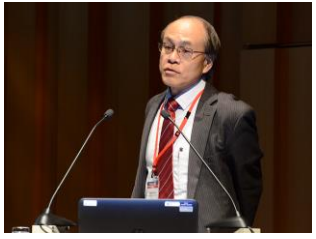
- Importance of automated penetration testing tool, HW security, security level as weight, secure external data and automation-aware misbehavior detection system

Tsutomu Matsumoto Yokohama National University, Japan

- Latest Automated Vehicle cyber-security topics such as sensor spoofing including experimental case

4.6. SIP-adus Report Session





Speaker Presentation Outline

Koichi Sakai The University of Tokyo, Japan

- Analysis of social and industrial aspects to develop more advanced automated driving systems and ensure their widespread use

Syuetsu Shibuya National Police Agency, Japan

- Activities of the Japanese Police in SIP-adus

Hideaki Nanba DENSO Corporation, Japan

- Development of V2V, V2I technology towards AD system

Akio Kani Hitachi, Ltd. , Japan

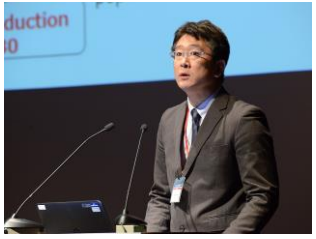
- Development of necessary function for ART information center

Hidenori Yoshida Ministry of Land, Infrastructure, Transport and Tourism, Japa

- Automated Driving Service based at “Michi-no-eki” in Rural Mountainous Areas by MLIT

Yasuhiro Aoyama Panasonic Corporation, Japan

- Development of V2P communication technology



4.7. Impact Assessment

Impact Assessment

- Modeling human driven behavior
  - observation, microscopic analysis and calibration based on field tests
- Modeling accident cases and simulating effects of CAVs
  - quantitative analysis to gain plausible evidence
  - holistic approach needs to be integrated
- Euro-FOT and L3 Pilot are rich sources of field data
  - data from other field tests need to be shared
- Penetration of CAVs
  - affects traffic environment
  - affects human behavior (both drivers and other road users)

Impact Assessment speakers

4.7. Impact Assessment

■Moderator

Koichi Sakai The University of Tokyo, Japan

■Speaker Presentation Outline

Steven E. Shladover University of California, Berkeley, USA

・Assessment of the traffic and energy Impacts of CAVs

Felix Fahrenkrog BMW Group, Germany

・Latest trend of safety assessment in Europe

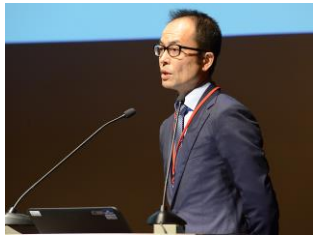
Adrian Zlocki fka, Germany

・Latest trend of impact assessment of Automated Driving in Europe

Satu Innamaa VTT Technical Research Centre of Finland Ltd., Finland

・ Framework for assessing impact of automation in road transportation

4.7. Impact Assessment



Speaker Presentation Outline

Nobuyuki Uchida Japan Automobile Research Institute, Japan

- Development of traffic accident simulation to evaluate safety benefits of ADAS (Advanced Driver Assistance Systems) / ADS(Automated Driving Systems)

Hiroaki Miyoshi Doshisha University, Japan

- Economic benefits of Advanced Driver Assistance Systems (ADAS)

4.8. Next Generation Transport

◆ Next Generation Transport

- Connected and automated vehicles as a component of integrated mobility services with existing or new public transportation
- Environment dependent and user-centric solutions
  - urban
  - rural, daily life support
  - level of existing mobility services
- Low Speed Automated Driving systems
  - field operational tests are actively conducted
  - user acceptance and business feasibility are being investigated
  - framework for safety validation and certification needs to be established
- High expectation to freight systems

Next Generation Transport speakers

4.8. Next Generation Transport

■Moderator

Jane Lappin Toyota Research Institute, USA

■Speaker Presentation Outline

Nadege Faul VEDECOM, France

- Next generation transport roadmap in Europe

Habib Shamskhou GoMentum Station Inc. , USA

- US AV test-site GoMentum Station latest report

Elizabeth Machek U.S. Department of Transportation, USA

- Low-speed automated shuttles foundational research

Naohisa Hashimoto National Institute of Advanced Industrial Science and Technology, Japan

- Japanese social implementation of the last one mile mobility system by CAV in dedicated zone

4.8. Next Generation Transport

■Speaker Presentation Outline

Yoshihiro Suda The University of Tokyo, Japan

・Japanese Automated Driving bus FOT status

Kazuki Takahashi YAMAHA Motor Co., Ltd., Japan

・Current status of international standardization of Low-speed Automated Driving systems

Alain Paul Dunoyer SBD, UK

・Study on whether Automated Vehicle can be a solution of next generation transport system

4.9. Human Factors

◆ Next Generation Transport

- Connected and automated vehicles as a component of integrated mobility services with existing or new public transportation
- Environment dependent and user-centric solutions
  - urban
  - rural, daily life support
  - level of existing mobility services
- Low-speed Automated Driving systems
  - field operational tests are actively conducted
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  - framework for safety validation and certification needs to be established
- High expectation to freight systems

Human Factors speakers

4.9. Human Factors

■Moderator

Satoshi Kitazaki National Institute of Advanced Industrial Science and Technology, Japan

■Speaker Presentation Outline

Daniel V. McGehee University of Iowa, USA

- Driver performance and understanding assessment in Automated Driving systems

Brian H. Philips U.S. Department of Transportation, USA

- Human factor research of C-ACC safety side in US

C. Y. David Yang AAA Foundation, USA

- AAA Foundation outline and its research on human issues

Peter Burns Transport Canada, Canada

- Safe human-machine interfaces for Automated Vehicles

4.9. Human Factors

Speaker Presentation Outline

Panos Konstantopoulos SBD, UK

- Customer expectations, trends and human factors in car display

Natasha Merat University of Leeds, UK

- Human factors research overview on CAV at Leeds

Makoto Itoh University of Tsukuba, Japan

- Task A : Effects of system information on drivers' behavior in transition from auto to manual

Toshihisa Sato National Institute of Advanced Industrial Science and Technology, Japan

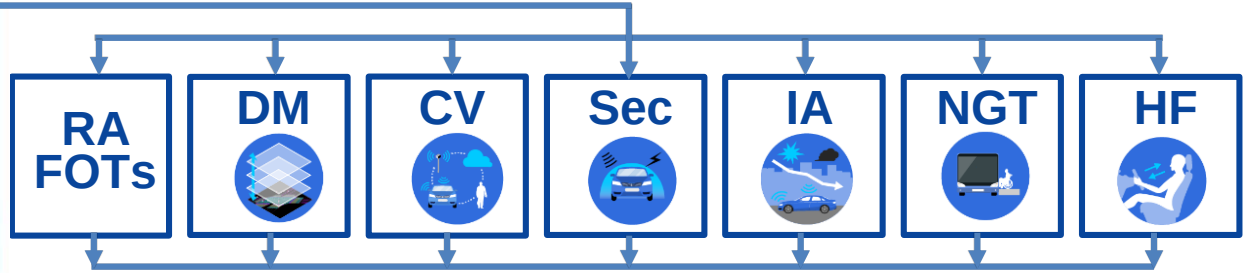
- Task B : Assessment of driver states in automated driving and Investigation of driver controllability in transition from automated to manual driving

Tatsuru Daimon Keio University, Japan

- Task C : Study of communication between Automated Vehicle and other road users

◆ Seven Breakout Workshops simultaneously

	Thursday November 16 (Breakout Workshop)
AM	9:00～12:00 Breakout Workshop
PM	13:00～15:00 Breakout Workshop
	15:30～17:15 Breakout Workshop Summary
	17:15～17:45 Closing Session



All Breakout Workshop attendees

Breakout Workshop Summary

5.1. Regional Activities and FOTs (Breakout Workshop)

Goals

- Information sharing and discussion about following theme
  - Theme 1: Regional FOT case, action background, goal and expected result
  - Theme 2: Regional action about social system, regulation and safety for FOT

Major Discussion

- Regional FOT's information sharing from plenary session speakers
- Role sharing between public and private sectors about physical/digital infrastructure
- Effective action to accelerate social acceptance for Automated Driving
- How to introduce Automated Driving to current society
- How much safety is secured and How safety is proved for Automated Driving introduction to current society
- Obstacle to overcome other than technology in FOT
  - Regulation such as guideline for public road FOT
  - Liability issues of Automated Driving in legal point of view
- Data Utilization in case of traffic accident/traffic law violation in FOT

Future Initiative

- Continuous FOT information sharing because each regional FOT has produced its result.
- Re-examination of legal framework such as car accident liability for Automated Driving social acceptance
- Necessity sharing of continuous discussion on non-technological scope such as regulation and liability

5.2. Dynamic Map (Breakout Workshop)

Goals

- Information sharing about SIP-adus Dynamic Map development action
- Information sharing for standardization and discussion on future plan

Major Discussion

- Information sharing with following members in addition to plenary session speakers
  SIP-adus FOT consortium, JAMA, JasPar, OADF/NDS, SENSORIS, TISA
- Confirmation on Dynamic Map standardization activity scope including ISO using data flow diagram
- More detail discussion is needed for duplicated standardization portion.
  (Main purpose is not unification but detail confirmation of duplicated portion.）
- OADF membership official application from SIP-adus
- SIP-adus adoption/rejection of Navigation Data Standard(NDS) is key point

Future Initiative

- Continuous information sharing at OADF, SIP-adus Workshop etc.
- SIP-adus official membership to OADF
- Promotion on international/domestic Dynamic Map discussion

5.3. Connected Vehicles (Breakout Workshop)

Goals

- Detailed discussion on the themes selected at CY2016 discussion

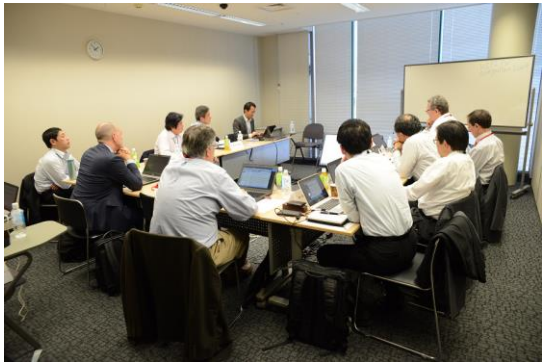
1. Automated Driving use case using telecommunication
2. Telecommunication standardization trend for Automated Driving
3. 5G usage possibility for Automated Driving

Major Discussion

- 5G usage for Automated Driving
- Driving data usage as predictive information
- Probe data usage and the data linkage to Dynamic Map
- Business model for infrastructure investment return
- Legislation trend of V2V on-board unit in US
- V2V necessity for Automated Driving
- Wireless communication usage task for AV such as use case and business model

Future Initiative

- Information dissemination continuation from Japan
- Continuation of information sharing and wireless communication usage discussion for AD



5.4. Cyber Security (Breakout Workshop)

- **Goals**
  - Information sharing about knowledge and tendency gathered from ‘EU, US and Japan’ evaluation activities and discussion on security measures
- **Major Discussion**
  - Related information sharing
    - Plenary Session outline
    - Cooperative activities among SIP-adus, JasPar and JAMA
    - Trend of NHTSA, ISO-SAE standardization and ISAC
  - Exchange of opinions on notable technical topic and standardization direction
    1. Sensor spoofing
    2. Intrusion detection technology
    3. How to deal with connected information
    4. System safety
    5. Standardization about cyber-attack potential (AP) / damage potential (DP)
    6. Introduction of hacker’s view point for design / evaluation guideline
    7. PDCA process implementation for design / evaluation for components and automobile
- **Future Initiative**
  - Continuation of information sharing and exchange of opinions

5.5. Impact Assessment (Breakout Workshop)

Goals

- Discussion on ‘future AV dissemination scenario’s social impact and traffic accident reduction/smooth transportation impact quantitative analysis’ and promotion of international cooperation and mutual understanding
  - Theme
    1. Social change by Automated Driving and dissemination
    2. Quantitative analysis method for environment and traffic impact
    3. Quantitative analysis method for safety (traffic accident reduction) impact

Major Discussion

- Information sharing of regional impact assessment samples
  - Japanese impact assessment : Automated Driving at SIP-adus
  - US impact assessment quantitative analysis : ACC and traffic flow/energy consumption
  - German Impact assessment : safety impact of Automated Driving level 3
- Quantitative analysis method is important because Automated Vehicle / ADAS impact quantization discussion is active using numerical simulation

Future Initiative

- Discussion and action for harmonization of evaluation and quantitative analysis method
- Cooperation project proposal using EU, US and Japan trilateral meeting

5.6. Next Generation Transport (Breakout Workshop)

Goals

- Discussion on road infrastructure and city planning to support first / last one mile mobility by expanding plenary session theme of first / last one mile mobility

Major Discussion

- Knowledge sharing about role of small mobility towards 2020 Olympics and beyond
- Next generation urban transportation (shared mobility, driverless mobility service) progress with stakeholders in EU and US by clear direction presentation of governmental and public policy
- Integrated collaboration between transportation plan and stakeholders for free and safe mobility in aging society in addition to collaboration with public transportation
- New business scheme and eco-system building for effective mobility by unification of mobility data and payment service
- Task to be solved for remote operation of first / last one mile mobility:
  - Maximum latency, maximum number of vehicles per operator
- How to get / use shared space for first / last one mile mobility
- Necessity of multi-sided AI for vehicle, HMI and infrastructure

Future Initiative

- Information sharing of regional activities
- Sustainable business model development including service system and its vicinity eco-system
- Building worldwide standard
- Building beyond-the-region industry-academia-government collaboration for regional first / last one mile mobility

5.7. Human Factors (Breakout Workshop)

- **Goals**
  - Discussion on SIP-adus Human Factors & HMI research Task A (user knowledge and mental model about Automated Driving system function)
- **Major Discussion**
  - Group discussion and result sharing after related research information sharing
  - Separate into positive / negative groups for user education and training
  - Negative group opinion is to develop HMI independent of education and training
- **Future Initiative**
  - Discussion in EU, US and Japan trilateral meeting on user knowledge and mental model because it is new focus point in human factor group of the trilateral meeting
  - Overseas interest raise and dissemination of Task A (user knowledge and mental model about Automated Driving system function) research result

5.8. Breakout Workshop Summary

- **Breakout Workshop** Each theme result is reported by leader and shared by participants

Regional Activities and FOTs : Masato Minakata
Dynamic Map : Satoru Nakajo
Connected Vehicles : Norifumi Ogawa
Cyber Security : Satoru Taniguchi

Impact Assessment : Nobuyuki Uchida
Next Generation Transport : Masayuki Kawamoto
Human Factors : Satoshi Kitazaki
Summary of Workshop : Hajime Amano

5.9. Closing Session

Speaker Presentation Outline

Yoshihiro Izawa SIP-adus / Cabinet Office, Japan

- Gratitude to participants

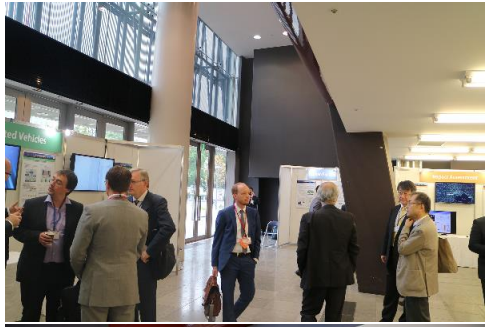
Seigo Kuzumaki SIP-adus Program Director / TOYOTA Motor Corporation, Japan

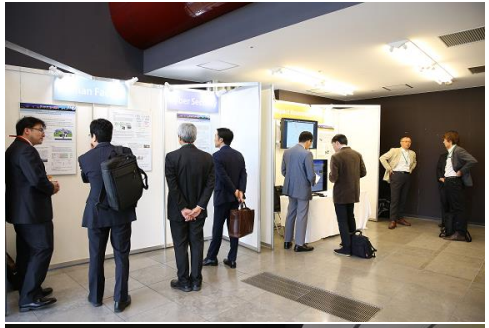
- Gratitude of SIP-adus Workshop 2017 success
- Awarding ceremony to overseas presenters

Hajime Amano ITS Japan, Japan

- Closing remarks of SIP-adus Workshop 2017

6. SIP-adus Display





- Exhibition panels were posted to SIP-adus Workshop 2017 website http://en.sip-adus.jp/evt/workshop2017/

SIP-adus
Innovation of Automated Driving for Universal Services

About SIP | Research & Development | The Promotion Committee for the SIP-adus' Project

Exhibition panel

[Overview]

Overview 01 (SIP-adus / Cabinet Office)

Overview 02 (SIP-adus / Cabinet Office)

Overview 03 (SIP-adus / Cabinet Secretariat)

[Dynamic Map]

Dynamic Map 01 (SIP-adus / Cabinet Office - NEDO)

Dynamic Map 02 (SIP-adus / National Police Agency)

[Connected Vehicles]

Connected Vehicles 01 (SIP-adus / National Police Agency)

Connected Vehicles 02 (SIP-adus / Ministry of Internal Affairs and Communications)

Connected Vehicles 03 (SIP-adus / Ministry of Internal Affairs and Communications)

Connected Vehicles 04 (SIP-adus / Ministry of Internal Affairs and Communications)

SIP-adus
Innovation of Automated Driving for Universal Services

About SIP | Research & Development | The Promotion Committee for the SIP-adus' Project | Events & Conferenc

[Human Factors]

Human Factors 01 (SIP-adus / Cabinet Office - NEDO)

[Cyber Security]

Cyber Security 01 (SIP-adus / Ministry of Economy, Trade and Industry)

[Impact Assessment]

Impact Assessment 01 (SIP-adus / Ministry of Economy, Trade and Industry)

Impact Assessment 02 (SIP-adus / Ministry of Economy, Trade and Industry)

[Next Generation Transport]

Next Generation Transport 01 (SIP-adus / Cabinet Office - NEDO)

Next Generation Transport 02 (SIP-adus / Cabinet Office - NEDO)

[Field Operational Tests]

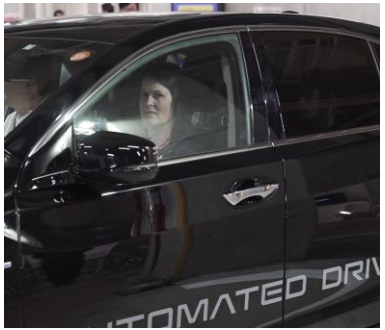
Field Operational Tests 01 (SIP-adus / Cabinet Office - NEDO)

Field Operational Tests 02 (SIP-adus / Cabinet Office)

Field Operational Tests 03 (SIP-adus / Ministry of Land, Infrastructure, Transport and Tourism)

7. Automated Vehicle Test Rides

- International AV test rides were held with SIP-adus FOT OEM cooperation
  - Speakers and Japanese government officials experienced latest AV technologies



SUZUKI HONDA The Power of Dreams NISSAN MOTOR CORPORATION BMW VOLKSWAGEN AKTIENGESELLSCHAFT TOYOTA

8. SIP-adus Workshop 2017 Website

- Event outline, program, speakers and presentation materials were posted
  http://en.sip-adus.jp/evt/workshop2017/

5th SIP-adus Workshop

Date: November 13 – 15, 2018

Venue: Tokyo International Exchange Center


Thank you
SIP-adus Workshop 2017
on Connected and Automated Driving Systems