

SIP adus Workshop2020

Connected Vehicles



V2X communication for Cooperative Driving Automation and Roadmap

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1. Current status and challenges of Cooperative Driving Automation (CDA)

◆ Current status of ITS wireless communication in Japan

- ETC / ETC2.0 (DSRC): Toll collection and Expressway information since 2000
- ITS Connect (DSRC): Support for safe driving at general road intersections since 2015

◆ Challenges for realizing CDA

- Can ITS communication, which has already been put into practical use, be used for CDA?
- What kind of communication method is needed in the era of automated driving?



- **TF on V2X communication for CDA has been established in SIP since 2019**
- **Started researching communication methods for CDA**

2. Activities of TF on V2X Communication for CDA

◆ Activities of TF on V2X Communication for CDA

- Define CDA
- Develop CDA use cases based on the definition

Phase1

Done

- Define communication requirements based on use cases
- Examination of applicability of existing ITS communication

Phase2

- Technology verification for Communication methods (frequency / bandwidth) for CDA
- Proposal of communication method and the roadmap

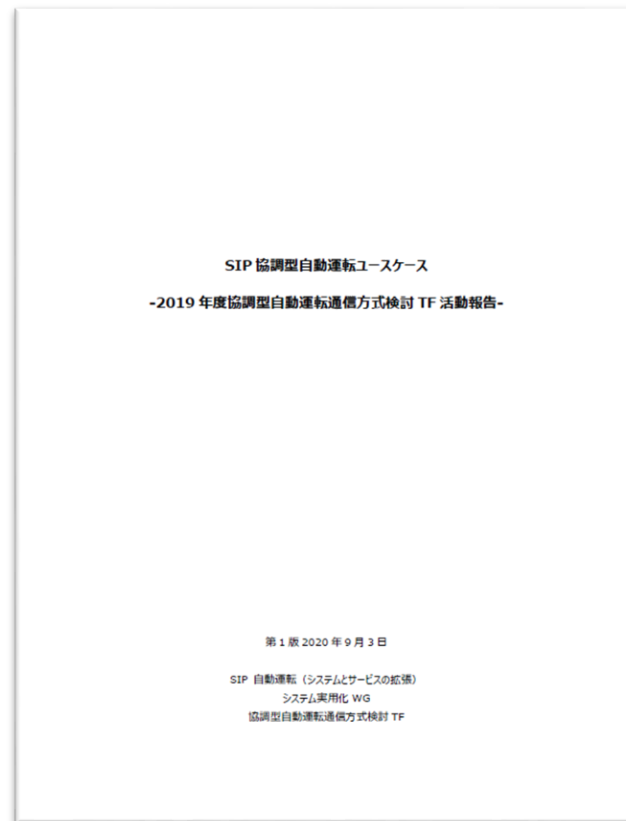
Phase3

3. SIP Use Case for CDA 1st Edition Overview

SIP Cooperative Autonomous Driving Use Case 1st Edition

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2. Definition of terms
3. CDA system definition/ Scope of study
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3. SIP Use Case for CDA 1st Edition Overview

◆ Cooperative driving automation system definition

CDA system is that enables safer and smoother automated driving control based on the autonomous driving system, by obtaining the information not detected by the in-vehicle sensor, by providing the information possessed by the vehicles, and by communicating mutually by using V2I and V2V.

- **Communication reliability cannot be guaranteed 100%**
- **Automated Driving control must be done by in-vehicle sensors**
- **Support on autonomous driving by communication**
- **Utilize communication to enable safer and smoother automated driving**

4. V2X communication and Roadmap for CDA

Selected 25 feasible use cases

3.communicating mutually by using V2I and V2V(7)

2.providing the information possessed by the vehicles(4)

1.obtaining the information not detected by the in-vehicle sensor(14)

ユースケース名	合流支援 (手動運転支援)
対象場所	高速道路
対象車両	乗用車、自動車
実現すること	円滑な合流を実現するために、本線走行車両の速度、追従車距に配慮する。
関連したユースケース	4-1 合流車線側車両に対する合流支援 (V2I)、4-2 本線車線側車両に対する合流支援 (V2I)
ユースケースイメージ	
適用	合流時、本線走行時
適用車種	乗用車
データ区分	手動
データ種	小

- 19 -

study communication method based on the use case

Communication requirements for CDA

Proposal for V2X communication method

4. V2X communication and Roadmap for CDA

Merging and lane change support

congestion

Complexity of traffic environment

Difficulty of communication

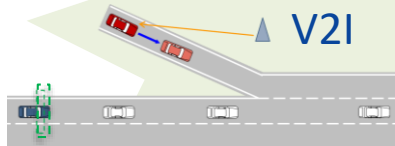
Free flow

2020

Penetration of CDA

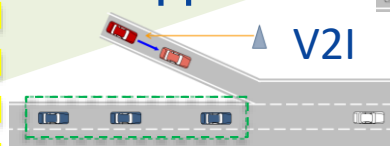
20XX

SIP FOT in Tokyo
Preliminary acceleration and deceleration support



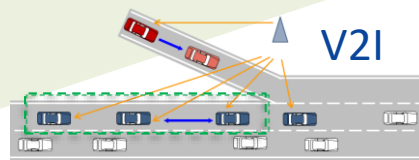
Traffic flow sensing by spot

Main line gap aiming merge support



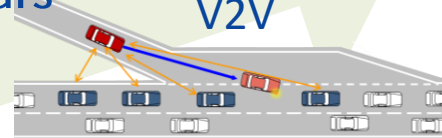
Traffic flow sensing by area

Merging control by infrastructure



Control request by infrastructure

Merging by negotiation between cars
V2V



Negotiation between cars

5. Next step

- Define CDA
- Develop CDA use cases based on the definition

Phase1

Done

- Define communication requirements based on use cases
- Examination of applicability of existing ITS communication

Phase2
FY2020

- Technology verification for Communication methods (frequency / bandwidth) for CDA
- Proposal of communication methods and the roadmap

Phase3
FY2021

5. Next step

◆ Organization

TF on V2X communication for CDA

- Phase1

- ITS-related ministries
- Academic experts
- Japan Automobile Manufacturers Association

Phase2/Phase3

- National Institute for Land and Infrastructure Management
- UTMS Society of Japan
- Japan Electronics and Information Technology Industries Association
- ITS Info-communications Forum
- Society Automotive Engineers of Japan

6. Summary

- Started researching communication methods for CDA in SIP
- Completed the development of use cases to be the basis for the next research
- Use cases opened to the public
(SIP homepage: <https://www.sip-adus.go.jp/rd/rddata/usecase.pdf>)
- Started researching the definition of communication requirements based on use cases and the applicability to existing ITS communication.
- Consider a new communication method if it is not applicable to existing ITS wireless communication
- Provide the proposal of communication methods for CDA and roadmap until

Thank you

