SIP · MIC Ministry of Internal Affairs and Communications
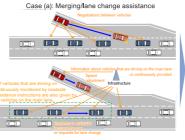
A Study on 5.9GHz band V2X Communication Protocol for Achieving Use Cases of Cooperative Driving Automation

Introduction

In 2021, the roadmap was formulated for realizing specific requirements for wireless communication technology for "cooperative driving automation 25 use cases". Based on this roadmap, this research will formulate a draft specification for communication protocols and communication terminal this year.

Case (a): Merging/lane change assistance

Negotiations between vehicles

Information about vehicles that are driving on the main lane is continuously provided

Speed adjustment

Infrastructure

The driving status of vehicles that are driving on the main lane is continuously monitored by roadside sensor. Merging assistance instructions are also given by the infrastructure to vehicles on the main lane.

Leveraging existing 700MHz band for early start use cases

+

A new communication method will need to be introduced from around 2030 in order for cooperative autonomous vehicles to spread by 30% around 2040.

Summary

Requirement definition for 5.9GHz band communication system
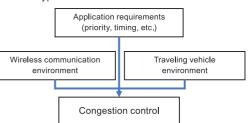
[Channel assignments]
Assign according to communication type, content

Content \ Type	V2I	V2V
Broadcast (periodic)	ex. Driving assistance by using traffic signal information	ex. Driving assistance based on intersection Information
Broadcast (events, emergency)	—	ex. Collision avoidance assistance when a vehicle ahead stops or decelerates suddenly
Mediation(V2I) Negotiation(V2V)	ex. Cooperative merging assistance	ex. Lane change assistance when the traffic is heavy

[Congestion control]
Examine specifications referring to those Type in the US and EU

Application requirements (priority, timing, etc.)

Wireless communication environment

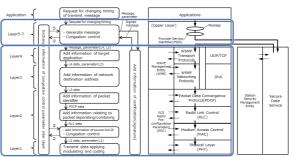Traveling vehicle environment

Congestion control

5.9GHz band V2X communication protocol and message set(s)

[Protocol stack]
Design a layer architecture and communication procedures adapting V2X in Japan referring to specifications in the US and EU

Referring to the frameworks for providing communication services to lower layers, complementing the applications, communication scenarios and messages considered in Japan

Referring to wireless devices from the way that can be standardized in consideration of international cooperation

①Status of congestion measured by myself (Channel utilization)
②Congestion control parameter (Priority of message)

OKI NEC