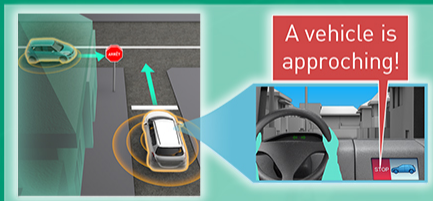


V2X Roadmap

2020

V2V / V2I

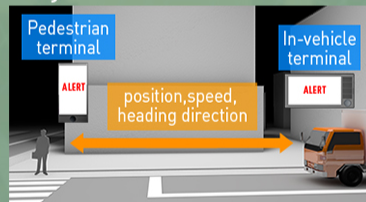
- ▶ Crash accident reduction
- ▶ Eco-driving support
- ▶ Low latency communication



2025

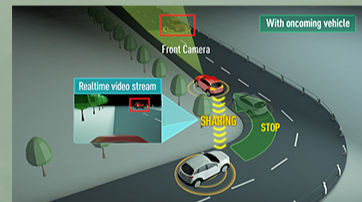
V2P (for pedestrian and bicycle)

- ▶ Alert timely under potentially dangerous situations
- ▶ High accuracy positioning
- ▶ Safety status estimation



Millimeter wave V2X

- ▶ Share surrounding situations clearly
- ▶ Decide actions ahead of time
- ▶ Drive with increased confidence

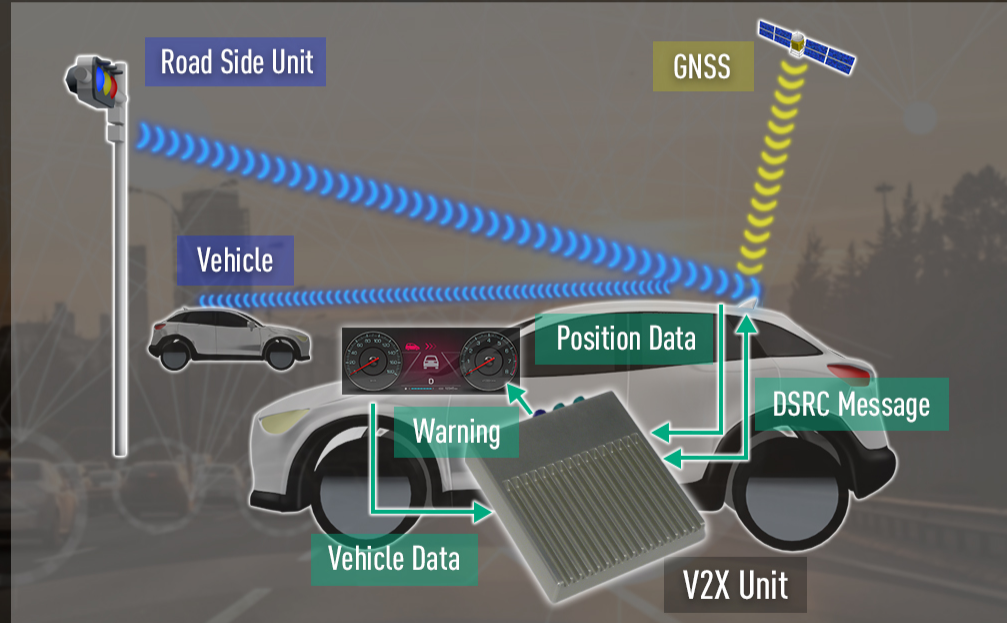


DSRC V2X Communication System

Wireless communication system for safer driving

Benefits :

- ▶ Warns driver of crash possibility to prevent traffic accidents.
- ▶ Enables fuel efficient driving in conjunction with roadside infrastructures.
- ▶ Further improves safe driving by interfacing with vehicle sensors.

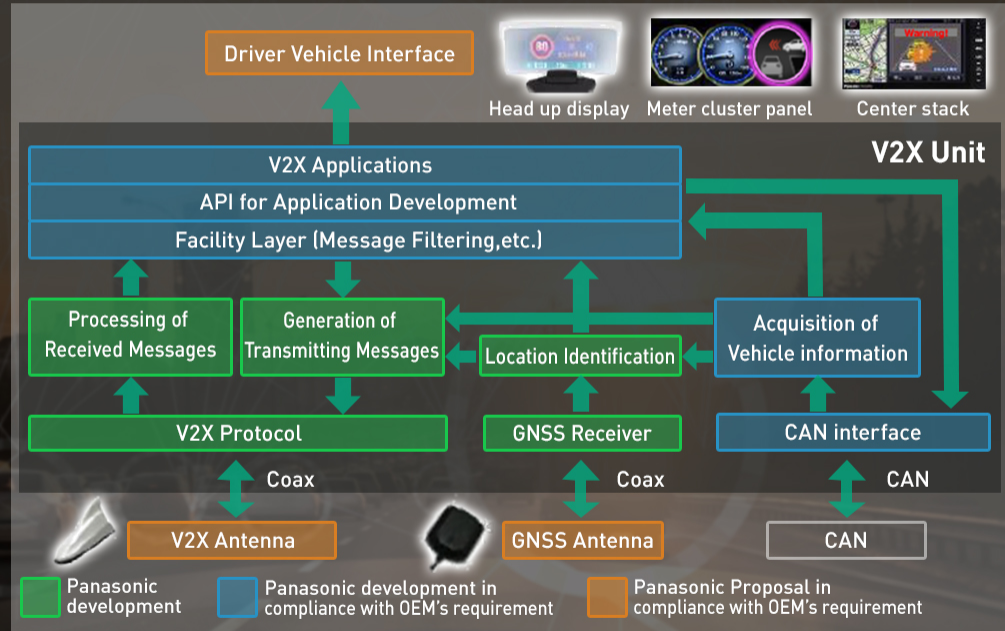


DSRC V2X Communication System

Wireless communication system for safer driving

Technical Advantages :

- ▶ Sophisticated hazard detection algorithm to support safer driving
- ▶ Capability of various types of antenna configuration (Single/Diversity, Active/Passive)
- ▶ Proposal of a whole system including antenna position and HMI based on our experiences and knowledge



DSRC V2X Communication System

Wireless communication system for safer driving

Applications :



Driving support



Cooperative ACC



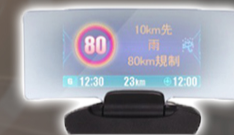
DSRC V2X OBU



Navigation



Center Cluster



HUD

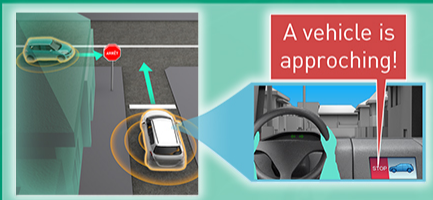


V2X Roadmap

2020

V2V / V2I

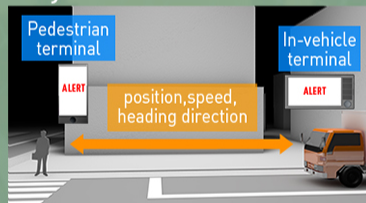
- ▶ Crash accident reduction
- ▶ Eco-driving support
- ▶ Low latency communication



2025

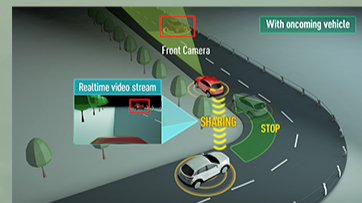
V2P (for pedestrian and bicycle)

- ▶ Alert timely under potentially dangerous situations
- ▶ High accuracy positioning
- ▶ Safety status estimation



Millimeter wave V2X

- ▶ Share surrounding situations clearly
- ▶ Decide actions ahead of time
- ▶ Drive with increased confidence



V2P (for pedestrian and bicycle)

Realization of a support system for pedestrian and bicycle to reduce traffic fatalities

Benefits : Alert pedestrian or driver timely under potentially dangerous situations

▶ Direct communication

Position, speed, heading direction information can be exchanged timely each other between pedestrians / bicycles and vehicles

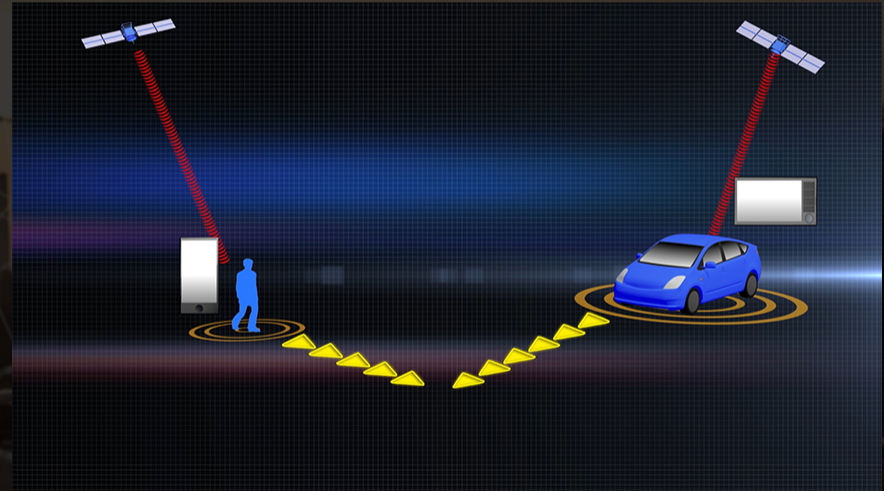
▶ High accuracy positioning

Positioning accuracy at high-rise building areas can be improved by 3D map compensation using height information of buildings

▶ Safety status estimation

Our application supports below use cases by safety status estimation based on position, speed, direction, map information and several sensors

- 5 cases requiring support: Single road crossing, blind crossing, etc.
- 5 cases not requiring support: Inside vehicle/building, walking in sidewalk, etc.



V2P (for pedestrian and bicycle)

Realization of a support system for pedestrian and bicycle to reduce traffic fatalities

Technical Advantages : Alert timely under potentially dangerous situations ~ Demonstration experiment ~

▶ Pedestrian existence notification at intersection

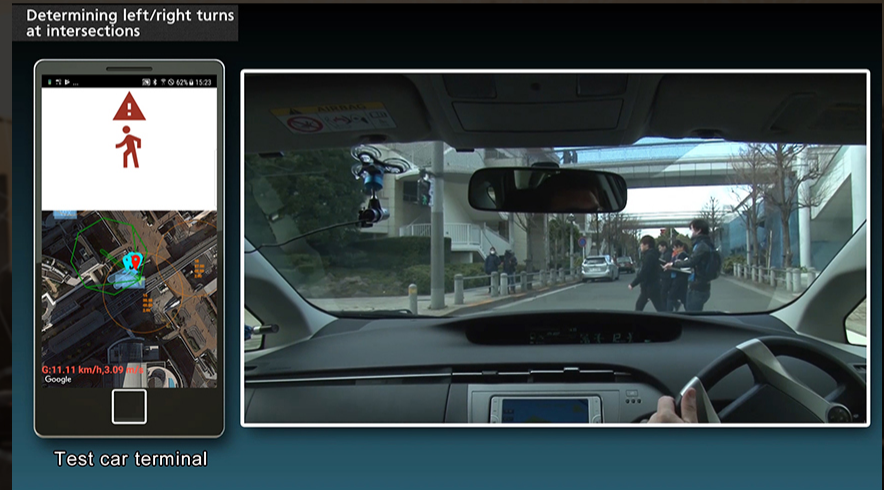
Turn left / right at intersection with / without signals

▶ Notification off while inside vehicle

- Moving speed more than the threshold
- When not walking

▶ Support for non-V2X vehicles

Collaboration with 79GHz infrastructure radar



V2P (for pedestrian and bicycle)

Realization of a support system for pedestrian and bicycle to reduce traffic fatalities

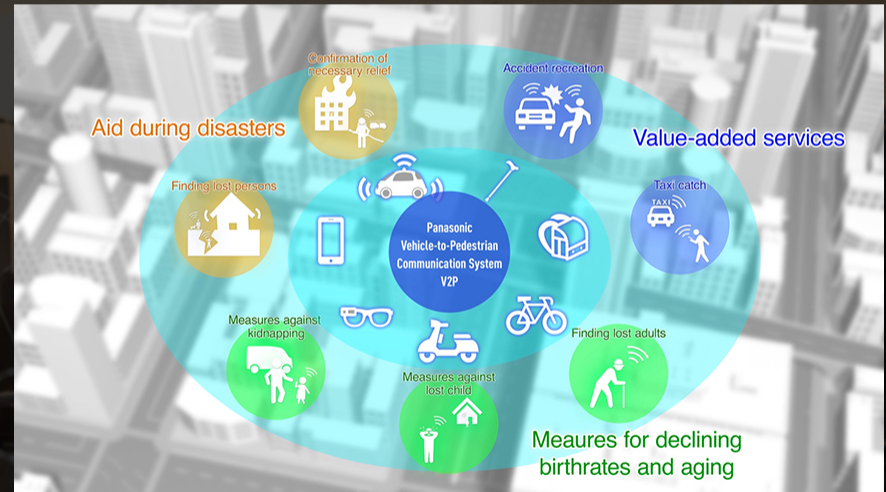
Applications : Aim for social infrastructure through pedestrian support and additional services

▶ Information notification to pedestrian and bicycle

Pedestrian terminal informs the approach of the vehicle and encourages behavior to avoid accidents

▶ Additional services

- Transportation value added service
- Watching over and rushing service for the elderly and children
- Aid during disasters

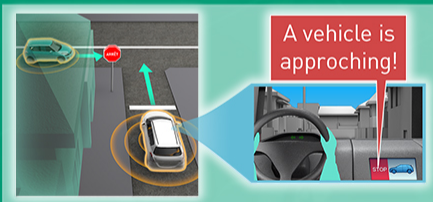


V2X Roadmap

2020

V2V / V2I

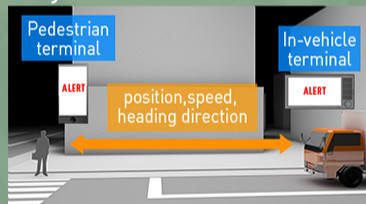
- ▶ Crash accident reduction
- ▶ Eco-driving support
- ▶ Low latency communication



2025

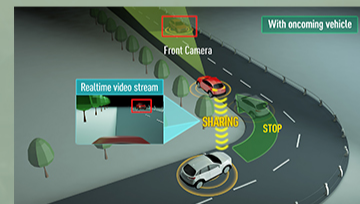
V2P (for pedestrian and bicycle)

- ▶ Alert timely under potentially dangerous situations
- ▶ High accuracy positioning
- ▶ Safety status estimation



Millimeter wave V2X

- ▶ Share surrounding situations clearly
- ▶ Decide actions ahead of time
- ▶ Drive with increased confidence

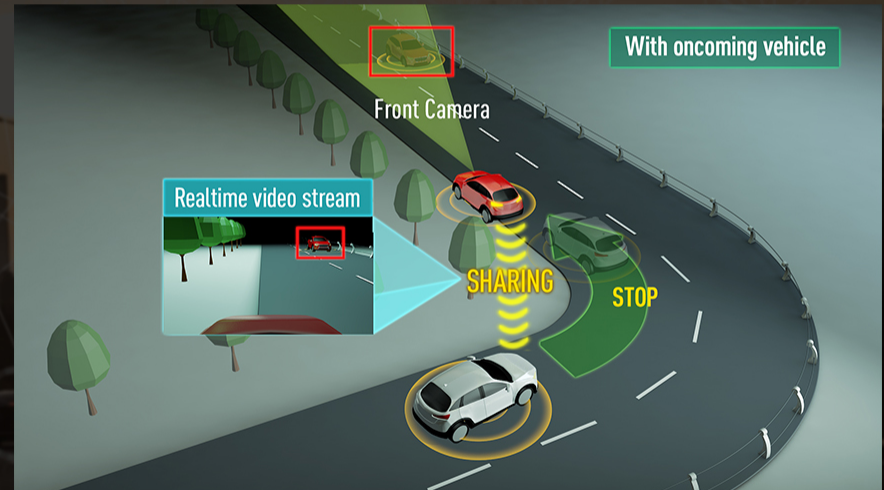


Millimeter wave V2X (Realtime Sensor Sharing)

Enhancing mobility for confidence and comfort

Benefits :

- ▶ In-depth awareness of surrounding situations
- ▶ Confidently decide next actions ahead of time
- ▶ Free use of unlicensed 60 GHz frequency band

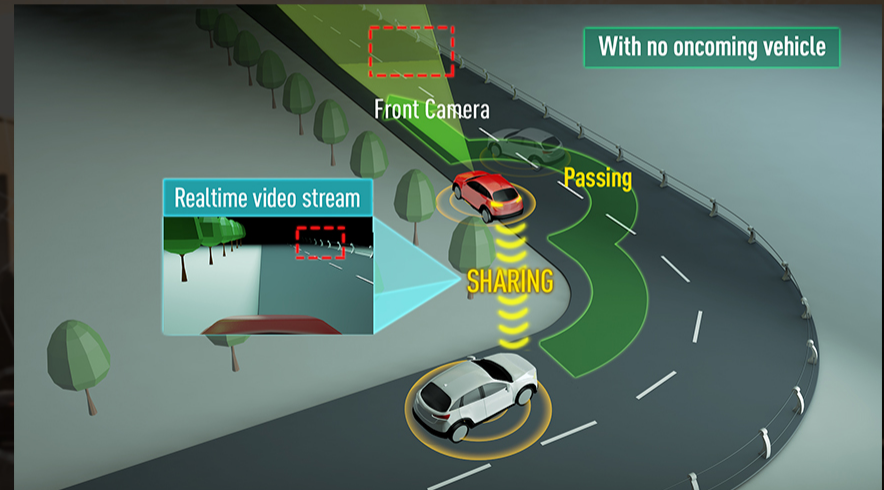


Millimeter wave V2X (Realtime Sensor Sharing)

Enhancing mobility for confidence and comfort

Benefits :

- ▶ In-depth awareness of surrounding situations
- ▶ Confidently decide next actions ahead of time
- ▶ Free use of unlicensed 60 GHz frequency band

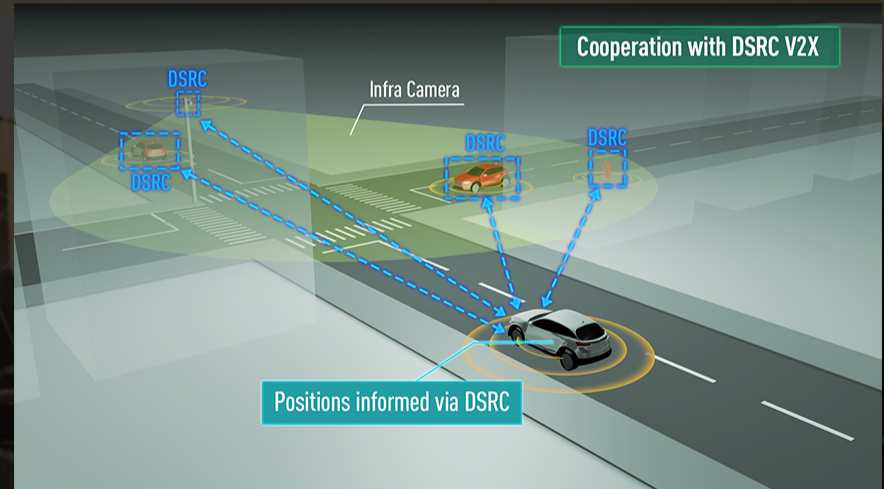


Millimeter wave V2X (Realtime Sensor Sharing)

Enhancing mobility for confidence and comfort

Technical Advantages :

- ▶ Cooperation with DSRC V2X for advanced notification and link selection
- ▶ Low-latency, high-speed communication in 60 GHz
- ▶ Realtime sensor data aggregation

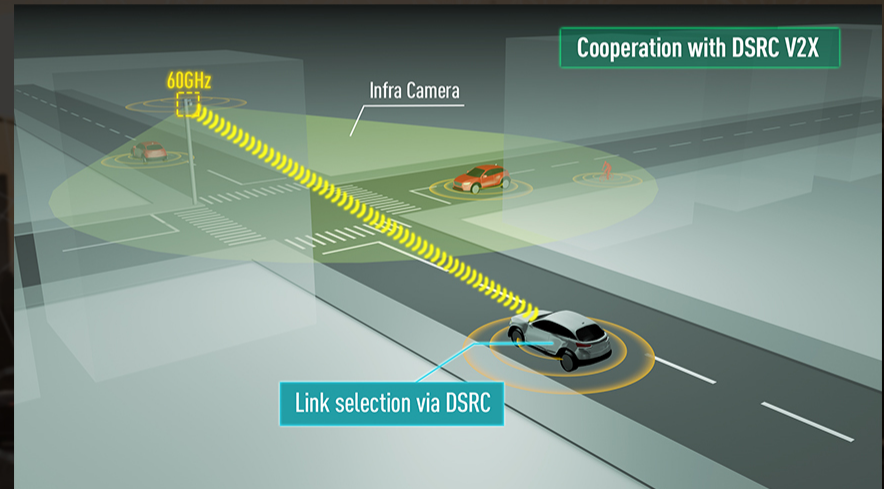


Millimeter wave V2X (Realtime Sensor Sharing)

Enhancing mobility for confidence and comfort

Technical Advantages :

- ▶ Cooperation with DSRC V2X for advanced notification and link selection
- ▶ Low-latency, high-speed communication in 60 GHz
- ▶ Realtime sensor data aggregation

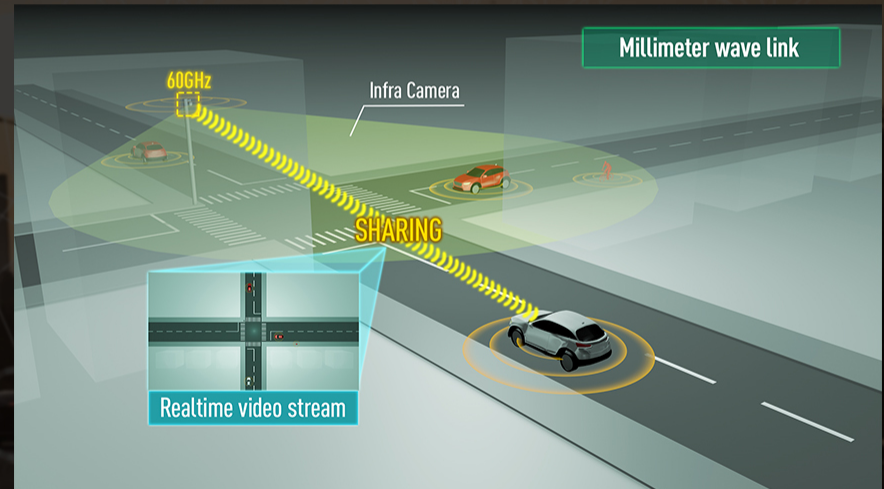


Millimeter wave V2X (Realtime Sensor Sharing)

Enhancing mobility for confidence and comfort

Technical Advantages :

- ▶ Cooperation with DSRC V2X for advanced notification and link selection
- ▶ Low-latency, high-speed communication in 60 GHz
- ▶ Realtime sensor data aggregation



Millimeter wave V2X (Realtime Sensor Sharing)

Enhancing mobility for confidence and comfort

Potential Applications :

- ▶ Sensor sharing at intersections for enhanced safety
- ▶ Sensor sharing for improved/smooth vehicle platooning operation
- ▶ High-speed bulk data upload and download with edge computing

