



## Connected Vehicles

### V2X communications

#### Theme1:

### Development of V2V,V2I Communication Technology Toward the Automated Driving Systems

DENSO CORPORATION  
Panasonic Corporation  
PIONEER CORPORATION  
The University of Electro-Communications

#### Purpose of the Project

The purpose of the project is to realize the cooperative automated driving system. The automated driving system can be further advanced as “the cooperative automated driving system” utilizing the V2V and V2I radio communication systems. To achieve the purpose, we worked on three subjects which are “Penetration of V2X systems”, “Application of V2X to automated driving systems” and “Development of communication technology for cooperated automated driving systems”.

#### Study and development themes

##### 1. Penetration of V2X systems

- Evaluate the performance of V2X communication at vehicle intensive intersection
- Evaluate the travelling time reduction of emergency vehicles by installing V2V to other vehicles
- Study on the efficiency improvement method of V2V communication data processing

##### 2. Application of V2X to automated driving

- Improve the V2V communication performance for cooperative automated driving systems
- Study on use cases to verify the feasibility of cooperative automated driving systems
- Study on use cases to verify the feasibility at AD(Automated Driving) car meeting an ambulance

##### 3. Development of communication technology for cooperated automated driving

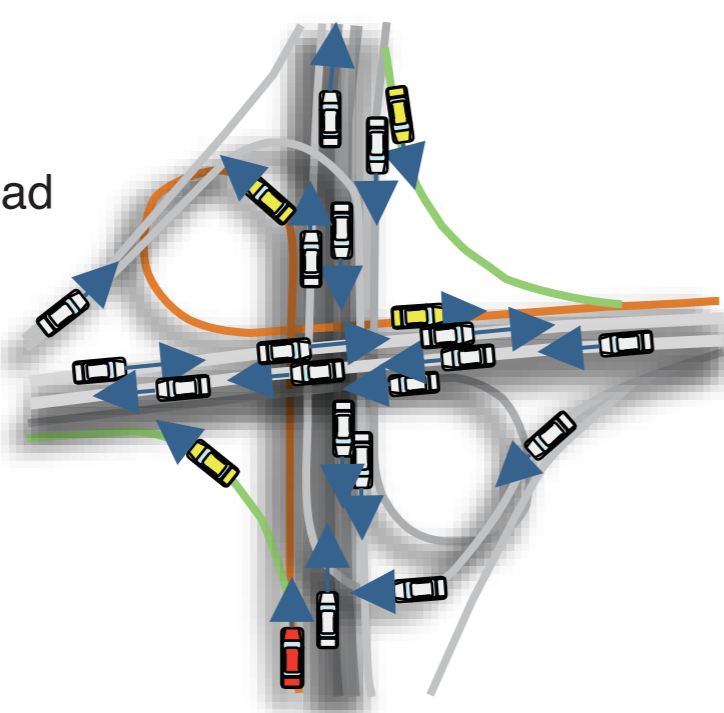
- Study on multidimensional distributed cooperative diversity method for high reliability
- Study on cooperative relay system with sectored roadside relay unit for high reliability
- Study on error correction coding technology for high reliability

### The Application Images of the Project Results

#### On the Freeway

##### [PIONEER]

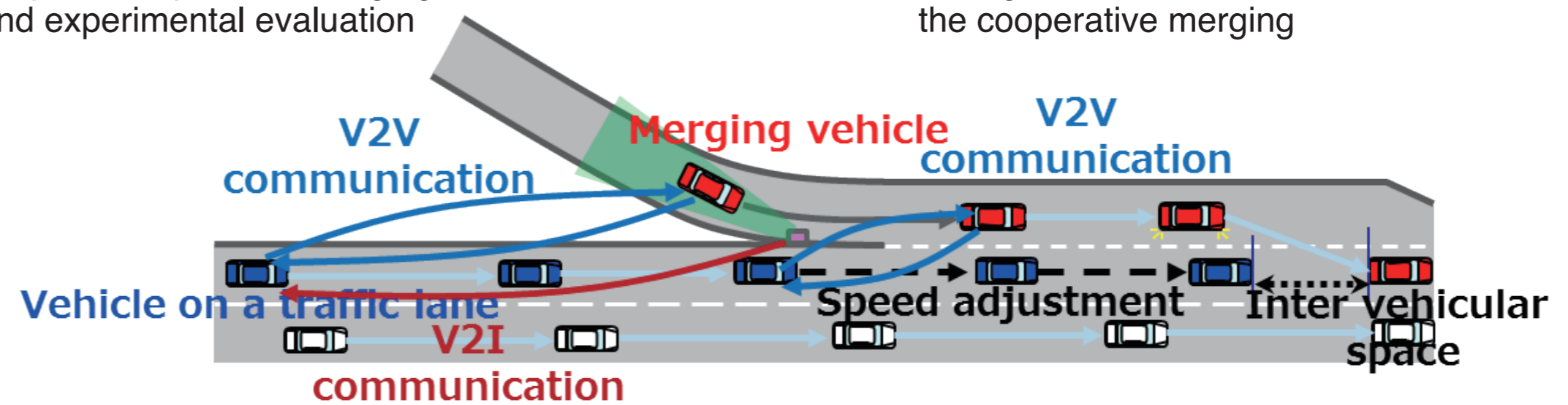
Monitoring car filtering technology to reduce CPU load



Beginning of Automated Drivings

##### [Panasonic]

Propose cooperative merging and experimental evaluation



Growth stage of Automated Driving on the Freeway

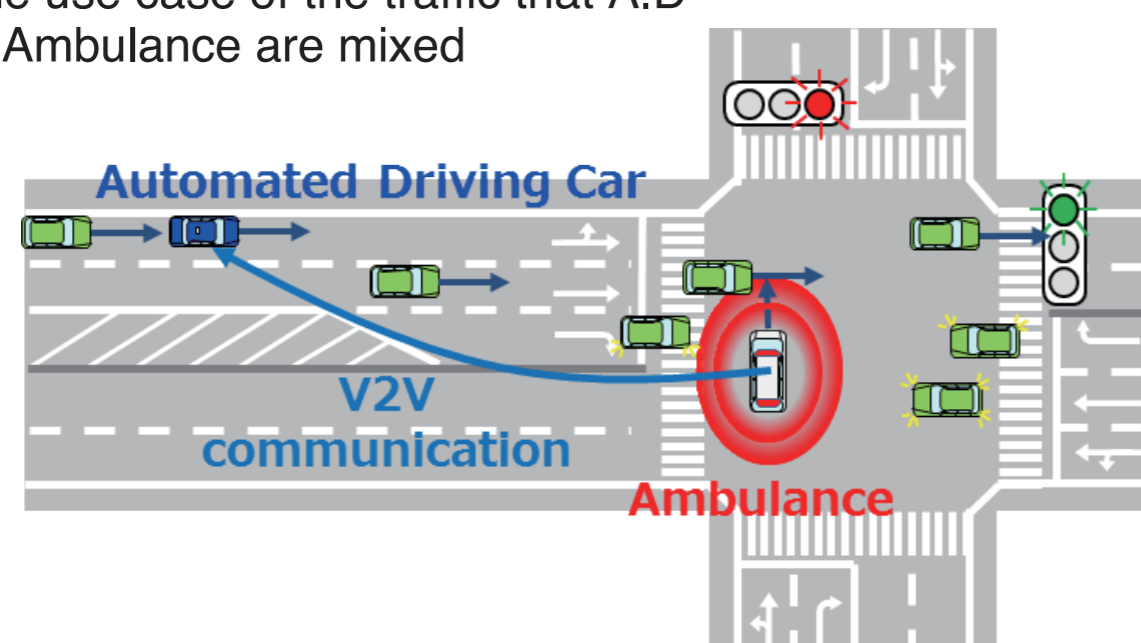
##### [DENSO]

Enlarge the communication data size for the cooperative merging

#### On the Ordinary Road

##### [DENSO]

Study on the use case of the traffic that A.D car and an Ambulance are mixed

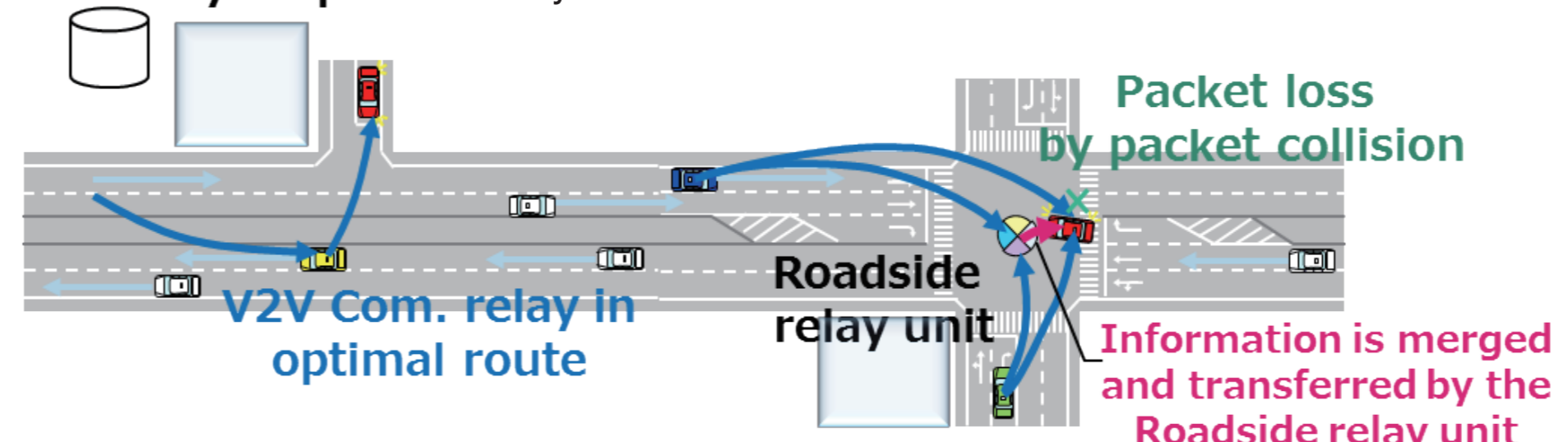


Early stage of AD on ordinary roads

##### [The University of Electro-Communications]

- Study on multidimensional distributed cooperative diversity method for high reliability V2V communication
- Study on cooperative relay system with sectored roadside relay unit for high reliability V2V communication
- Study on error correction coding technology for high reliability and low latency V2V communication

##### Communication Reliability map



The stage that Automated Driving becomes popular