Launch of V2X services in Japan

V2V Communication Messages

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PIioneer Corporation
1. ITS Connect Promotion Consortium

2. V2V Communication Messages
The number of casualties due to traffic accidents have been decreasing in recent years.

Measures to prevent accidents at intersections with poor visibility are important.

**Analysis of Traffic Accidents in Japan**

- **Type of Fatal Traffic Accidents between Automobiles**
  - Crossing collisions: 32%
  - Right-turn collisions: 14%
  - Rear-end collision: 14%
  - Head-on collision: 25%
  - Others: 15%

- **Type of Seriously Injured Traffic Accidents between Automobiles**
  - Crossing collisions: 44%
  - Right-turn collisions: 18%
  - Rear-end collision: 10%
  - Head-on collision: 8%
  - Others: 20%

Source: National Police Agency
ITS Connect is one of the Japanese Cooperative ITS. The system can prevent traffic accidents on the basis of information transmitted by V2X (V2V, V2I, and V2P) communications.
Applications of ITS Connect

V2V
- Collision prevention system
- Approaching emergency vehicle information system
- Road-works vehicle information system
- Passengers getting on/off information system

Cooperative Adaptive Cruise Control
- Approaching tram information system

V2I
- Right-turn collision prevention support
- Crossing pedestrians recognition enhancement system
## National IT Strategy: Target World’s Safest, Eco-friendly and Cost-effective Road Traffic Society

### Roadmap for Cooperative ITS

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<tbody>
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<td>Early deployment of cooperative systems</td>
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<td>Operational framework</td>
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<td>2500 or below Fatalities per year</td>
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<td>World’s safest road traffic society</td>
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<td>automated driving</td>
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</table>

- OBU & V2P device: Study on Development, Practical
- Leading projects: Verification in the trial area
- Advanced driving assist systems: Study on Development

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Objective

- Promote R&D and FOT activities of Cooperative Driving Support utilizing ITS towards the practical use
- Planning of system operation, development and management of specification documents, supporting interoperability test, public-relations and promotion of the system

Diagram:

- General Assembly Meeting
  - Board Member Meeting
    - Steering Committee
      - Technology WG
    - Security committee
      - Interoperability WG
      - Promoting WG
<table>
<thead>
<tr>
<th>Classification</th>
<th>Role</th>
<th>Member</th>
</tr>
</thead>
<tbody>
<tr>
<td>Board members</td>
<td>Members who execute Council activities</td>
<td>DENSO CORPORATION Hitachi, Ltd. MITSUBISHI ELECTRIC CORPORATION Pioneer Corporation Panasonic Corporation Renesas Electronics Corporation Sumitomo Electric Industries, Ltd. TOYOTA MOTOR CORPORATION TOYOTA TSUSHO CORPORATION</td>
</tr>
<tr>
<td>Regular members</td>
<td>Members who discuss operations and technology in preparation for implementation of the ITS Connect System</td>
<td>Fuji Heavy Industries Ltd. FUJITSU LIMITED Japan Radio Co., Ltd. Mazda Motor Corporation Oki Electric Industry Co., Ltd.</td>
</tr>
<tr>
<td>Special members</td>
<td>Government, organizations and universities etc. that support Council activities</td>
<td>National Police Agency Ministry of Internal Affairs and Communications Ministry of Economy, Trade and Industry Ministry of Land, Infrastructure, Transport and Tourism ITS Japan etc</td>
</tr>
</tbody>
</table>
1. ITS Connect Promotion Consortium

2. V2V Communication Messages
Overview

■ Reasons for choosing 700MHz which is non-line-of-sight (NLOS) communication better than GHz band.
■ We examined construction of the effective V2V message for single channel.
# Data Structure

- **Efficiency**: Set of omissible optional Data Frame (DF)s in Common field
- **Extensibility**:
  - a) Can add new DF to Common field (Correspondence to future service)
  - b) Set of free field (Expansion of how to use)

<table>
<thead>
<tr>
<th>Field</th>
<th>Data structure</th>
<th>DF</th>
<th>Size (bytes)</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Common application header field</td>
<td></td>
<td>DF_CommonFieldManagementInformation</td>
<td>8</td>
<td>Mandatory</td>
</tr>
<tr>
<td>Common application data field</td>
<td></td>
<td>DF_TimeInformation</td>
<td>4</td>
<td>Mandatory. If no proper value is available, set the &quot;unavailable&quot; value.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>DF_PositionInformation</td>
<td>11</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>DF_VehicleStatusInformation</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>DF_VehicleAttributeInformation</td>
<td>4</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>DF_PositionOptionalInformation (*)</td>
<td>2</td>
<td>Optional. Setting sequence may not be changed.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>DF_GPSStatusOptionalInformation (*)</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>DF_PositionAcquisitionOptionalInformation (*)</td>
<td>2</td>
<td>0 to 26</td>
</tr>
<tr>
<td></td>
<td></td>
<td>DF_VehicleStatusOptionalInformation (*)</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>DF_IntersectionInformation (*)</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>DF_ExtendedInformation (*)</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Free field</td>
<td></td>
<td>DF_FreieFieldManagementInformation</td>
<td>1</td>
<td>Optional. Size depends on number of individual application data set.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>DF_IndividualAppDataManagementInformationSet</td>
<td>0 to 22</td>
<td></td>
</tr>
</tbody>
</table>

Free field MAX:60 bytes

Total MAX:100 bytes, MIN:36 bytes
The Japanese V2V message set corresponds to CAM, BSM.

V2V message set of ITS Connect

- Japan MSG
- MSG for V2V services
- MSG for V2I
- Europe MSG
- CAM
- DENM
- US MSG
- BSM
- SPAT+ MAP
- RSA
Based on evaluation of the fourth phase of ASV*.
ITS Connect Promotion Consortium is going to publish V2V message set specification by mid-2015.

* ASV: A research project of Ministry of Land, Infrastructure and Transport
* MIC: Ministry of Internal Affairs and Communications
Referred to the following documents in the development

“ETSI EN 302 637-2, Intelligent Transport Systems (ITS); Vehicular Communications; Basic Set of Applications; Part 2: Specification of Cooperative Awareness Basic Service” ETSI 2013

“SAE J2735, dedicated short range communication (DSRC) message set dictionary” SAE 2009

Mandatory Data Elements are almost the same as CAM, BSM.

[Comparison]

<table>
<thead>
<tr>
<th>same</th>
<th>VehicleID, Latitude, Longitude, Elevation, PositionConfidence, SemiMajorAxisOfPositionalErrorEllipse ...</th>
</tr>
</thead>
<tbody>
<tr>
<td>Need convert LSB</td>
<td>Speed, Heading, Acceleration, VehicleLength ...</td>
</tr>
<tr>
<td>Differ depending on areas</td>
<td>VehicleSizeClassification: By regulations and rules of each areas Timeinformation: Japanese add leap seconds correction availability</td>
</tr>
</tbody>
</table>
ITS Connect Promotion Consortium

• ITS Connect Promotion Consortium was established to put the V2X service to practical use in Japan.
• The members of the ITS Connect Promotion consortium are OEMs, suppliers and Ministries.

V2V Communication Messages

• ITS Connect Promotion Consortium is going to release V2V message set specification by mid-2015.
• Efficiency, Extensibility, Commonality with CAM and BSM

Launch of V2X services in Japan

• The ITS Connect products adopt to this message set are expected to be released within this year.
Thank you.