Tab 1

Supported Applications Document for Intersection Programming Interface (IPI)

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| Version Number | Editor | Reviewer |
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# Abbreviations and Terminology

| **Abbr.** | **Terminology** |
| --- | --- |
| IPI | Intersection Programming Interface |
| V2X | Vehicle to Everything Communications |
| BSM | Basic Safety Message |
| SPaT | Signal Time and Phasing |
| SRM | Signal Request Message |
| SSM | Signal Status Message |
| ADAS | Advanced Driving Assistance System |
| AV | Autonomous Vehicle |
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# 00 : J2735 Support

| **Application ID** | **A00 - 0000** |
| --- | --- |
| **Name** | J2735 - Receive BSM |
| **Description** | Infrastructure is able to receive and correctly parse BSM messages for downstream tasks. |
| **Supporting Function** |  |

| **Application ID** | **A00 - 0001** |
| --- | --- |
| **Name** | J2735 - Broadcast SPaT |
| **Description** | Infrastructure is able to correctly encode and broadcast SPaT messages. |
| **Supporting Function** |  |

| **Application ID** | **A00 - 0002** |
| --- | --- |
| **Name** | J2735 - Broadcast MAP |
| **Description** | Infrastructure is able to correctly encode and broadcast MAP messages. |
| **Supporting Function** |  |

| **Application ID** | **A00 - 0003** |
| --- | --- |
| **Name** | J2735 - Receive SRM |
| **Description** | In the event of an emergency vehicle broadcasting a SRM message, the infrastructure is able to decode and parse a SRM message. |
| **Supporting Function** |  |

| **Application ID** | **A00 - 0004** |
| --- | --- |
| **Name** | J2735 - Broadcast SSM |
| **Description** | In the event of receiving a SRM message, infrastructure is able to correctly encode and broadcast SSM messages. |
| **Supporting Function** |  |

# 01 : Personal Connected Vehicles to Intersection

| **Application ID** | **A01 - 0000** |
| --- | --- |
| **Name** | Personal Vehicle to Intersection - Request for Availability for Left Change Maneuver at Unprotected Left |
| **Description** | In the event of a personal vehicle requesting the availability or safety and an unprotected left turn, the Intersection should be able to respond to the vehicle requesting the service whether or not it is safe to make the unprotected left turn. |
| **Supporting Function** |  |

| **Application ID** | **A01 - 0001** |
| --- | --- |
| **Name** | Personal Vehicle to Intersection - Request for ADAS Functions - Lane Keeping |
| **Description** | In the event where lane markings are not visible to the vehicle’s ADAS lane keeping functions, the vehicle may request the Intersection to aid its lane keeping functions. The Intersection should respond to the vehicle requesting the service where the lanes are using GPS coordinates and its location in the current lane. |
| **Supporting Function** |  |

# 02: Personal Connected and Autonomous Vehicles to Intersection

| **Application ID** | **A02 - 0000** |
| --- | --- |
| **Name** | Personal Vehicle to Intersection - Request for AV Functions - Perception Sharing and Aid |
| **Description** | In the event where visibility is low or the autonomous vehicle is uncertain where obstacles (including but not limited to vehicle and pedestrians) are or when the vehicle’s onboard sensors have malfunctioned, the vehicle may request the Intersection to aid its Perception functions. The Intersection should respond to the vehicle requesting the service where obstacles are using GPS coordinates. This information may come from BSM messages from other vehicles or from perception algorithms onboard the Intersection. |
| **Supporting Function** |  |

| **Application ID** | **A02 - 0001** |
| --- | --- |
| **Name** | Personal Vehicle to Intersection - Request for AV Functions - Planning Aid |
| **Description** | In the case where the autonomous vehicle’s onboard planning algorithm malfunctions, the vehicle may request the Intersection to aid its Planning functions. The Intersection should respond to the vehicle requesting the service with a planned path with waypoints based on the nearest safe location so that the malfunctioning AV can wait safely for additional help. |
| **Supporting Function** |  |

| **Application ID** | **A02 - 0002** |
| --- | --- |
| **Name** | Personal Vehicle to Intersection - Request for AV Functions - Control Aid |
| **Description** | In the event where the autonomous vehicle’s onboard control algorithms malfunction, the vehicle may request the Intersection to aid its Control functions. The Intersection should respond to the vehicle requesting the service with a planned path with waypoints and generic control commands based on the nearest safe location so that the malfunctioning AV can wait safely for additional help. |
| **Supporting Function** |  |

| **Application ID** | **A02 - 0003** |
| --- | --- |
| **Name** | Personal Vehicle to Intersection - Request for AV Functions - Computation Aid |
| **Description** | In the event where the autonomous vehicle’s onboard computing systems malfunction (e.g. missing too many deadlines, deadlock, temporary computational module restarting), the vehicle may request the Intersection to aid its computing functions. The Intersection should respond to the vehicle requesting the service with a planned path with waypoints and generic control commands based on the nearest safe location so that the malfunctioning AV can wait safely for modules to restart or for additional help. |
| **Supporting Function** |  |

| **Application ID** | **A02 - 0004** |
| --- | --- |
| **Name** | Personal Vehicle to Intersection - Request for AV Functions - HDMap and LaneletMap Updates |
| **Description** | In the event where the autonomous vehicle’s localization service detects a major change in the HDMaps and LanletMaps provided by the OEMs, the vehicle may request Intersection for an updated nearby HDMap and LaneletMap. The Intersection should respond to the vehicle requesting the service with the most recent verified version of the nearby HDMap and LaneletMap. |
| **Supporting Function** |  |

| **Application ID** | **A02 - 0005** |
| --- | --- |
| **Name** | Personal Vehicle to Intersection - Request for AV Functions - Request for Availability for Left Change Maneuver at Unprotected Left |
| **Description** | In the event of an AV requesting the availability or safety and an unprotected left turn, the Intersection should be able to respond to the vehicle requesting the service whether or not it is safe to make the unprotected left turn. |
| **Supporting Function** |  |

| **Application ID** | **A02 - 0006** |
| --- | --- |
| **Name** | Personal Vehicle to Intersection - Request for AV Functions - Lane Keeping |
| **Description** | In the event where lane markings are not visible to the AV’s ADAS lane keeping functions, the vehicle may request the Intersection to aid its lane keeping functions. The Intersection should respond to the vehicle requesting the service where the lanes are using GPS coordinates and its location in the current lane. |
| **Supporting Function** |  |

# 03 : Intersection to Personal Connected Vehicles

| **Application ID** | **A03 - 0000** |
| --- | --- |
| **Name** | Intersection to Personal Connected Vehicles - Pedestrian Warning |
| **Description** | In the event of a pedestrian crossing the street in low-visibility conditions and the incoming vehicle shows no sign of deceleration, the Intersection should send a pedestrian warning message to the incoming vehicle. |
| **Supporting Function** |  |

# 04 : Intersection to Person

| **Application ID** | **A04 - 0000** |
| --- | --- |
| **Name** | Intersection to Person - Incoming Vehicle Warning |
| **Description** | In the event of a pedestrian crossing the street in low-visibility conditions and the incoming vehicle shows no sign of deceleration, the Intersection should send an incoming warning message to the specific pedestrian using phone notification, sound cues, or visual cues. |
| **Supporting Function** |  |

# 05 : Intersection to Cloud

| **Application ID** | **A05 - 0000** |
| --- | --- |
| **Name** | Intersection to Cloud - Data Backlog |
| **Description** | In the event that data needs to be backlogged, the Intersection should be able to upload current logged data to a cloud server. |
| **Supporting Function** |  |

# 06 : Intersection to Intersection

| **Application ID** | **A06 - 0000** |
| --- | --- |
| **Name** | Intersection to Intersection - Data Passthrough |
| **Description** | In the event that data needs to be propagated to the next intersection, the current intersection should be able to pass the data to the next intersection. |
| **Supporting Function** |  |

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