

**JPO**

Operational Data Environment

**Output Schema Reference**

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|  |  |  |  |
| --- | --- | --- | --- |
| Version # | Implemented By | Revision Date | What Changed? |
| 0.1 | Hamid Musavi | 4/20/2018 | Initial draft |
| 0.2 | Hamid Musavi | 4/20/2018 | Converted end-notes to footnotes |
| 0.3 | Hamid Musavi | 4/23/2018 | Converted footnotes back to end-notes and added document references and more. |
| 0.4 | Hamid Musavi | 4/26/2018 | Addressed review comments |
| 0.5 | Hamid Musavi | 5/9/2018 | Documented changes related to schemaVersion 5 |
| 0.6 | Hamid Musavi | 5/18/2018 | Finalized document and accepted all change marks. |
| 0.7 | Hamid Musavi | 9/10/2018 | Added J2735 Broadcast TIM published topic and upgrade to schemaVersion 6. |
| 0.8 | Hamid Musavi | 11/16/2018 | Moved RSU Index to RSU specific objects and obfuscated rsuPassword |
| 0.9 | Hamid Musavi | 12/6/2018 | Corrected the structure of RSUS in a TIM Broadcast message. Also clarified that single-element JSON arrays will be represented by a JSON Object in J2735 TIM messages. |
| 0.10 | Hamid Musavi | 12/14/2018 | Updated two BSM sample messages |
| 0.11 | Hamid Musavi | 2/4/2019 | Updated values for recordGeneratedBy field |
| **0.12** | Drew Johnston | 3/15/2022 | Updated to support MAP, SSM, SRM, SPaT, and fill in TIM |

# Introduction

The Intelligent Transportation Systems Joint Program Office’s (ITS JPO) Operational Data Environment (ODE) is a real-time virtual data router that ingests and processes operational data from various connected devices—including vehicles, infrastructure, and traffic management centers—and distributes it to other devices and subscribing transportation management applications. Using the ITS ODE within intelligent transportation deployments increases data fluidity and interoperability while meeting operational needs and protecting user privacy. The software’s microservices architecture makes it easy to add new capabilities to meet local needs.

This document describes the schema of the data published by the ODE to be consumed by client applications. For additional information about developing applications to interface with the ODE, refer to the ODE Users Guide. (US DOT ITS JPO, 2018).

# Published Topics

ODE publishes Connected Vehicle data via Kafka messaging platform. The data is streamed in two basic formats:

* Plain Old Java Objects (POJO) – serialized in binary format
* JavaScript Object Notation (JSON) – serialized in plain text format
* eXtensible Markup Language (XML) – serialized in plain text format

The following table provides the name, record type and record format of the topics published by ODE.

|  |  |  |  |
| --- | --- | --- | --- |
| Topic Name | Content Description | Data Type | Format |
| topic.Asn1DecoderOutput | All J2735 ASN1 messages that are put into the topic.Asn1DecoderInput topic in JSON format come out of this topic in the form of XML resembling the J2735 standard. | String | XML |
| topic.Asn1EncoderOutput | The reverse of the decoder. JSON data put into the topic come out of this topic in the form of ASN1. | String | JSON |
| topic.OdeBsmPojo | All Basic Safety Messages process by ODE (unfiltered and un-sanitized) | us.dot.its.jpo.ode.model.OdeBsmData | POJO |
| topic.OdeBsmJson | All Basic Safety Messages process by ODE (unfiltered and un-sanitized) | us.dot.its.jpo.ode.model.OdeBsmData | JSON |
| topic.FilteredOdeBsmJson | Filtered based on a configured Geo-fence and sanitized (PII removed) Basic Safety Message | us.dot.its.jpo.ode.model.OdeBsmData | JSON |
| topic.OdeBsmRxPojo | Unfiltered and un-sanitized Basic Safety Message received by the Ego Vehicle (EV) OBU from a Remote Vehicles (RV) | us.dot.its.jpo.ode.model.OdeBsmData | POJO |
| topic.OdeBsmTxPojo | Unfiltered and un-sanitized Basic Safety Message transmitted by the Ego Vehicle (EV) OBU | us.dot.its.jpo.ode.model.OdeBsmData | POJO |
| topic.OdeBsmDuringEventPojo | Unfiltered and un-sanitized Basic Safety Message received by the Ego Vehicle (EV) OBU from a Remote Vehicles (RV) during an event. | us.dot.its.jpo.ode.model.OdeBsmData | POJO |
| topic.OdeTimJson | All Traveler Information Message processed by ODE (unfiltered and un-sanitized) | J2735 TravelerInformation | JSON |
| topic.FilteredOdeTimJson | Filtered based on a configured Geo-fence and sanitized (PII removed) Traveler Information Message | J2735 TravelerInformation | JSON |
| topic.OdeDNMsgJson | Unfiltered and un-sanitized Traveler Information Message containing a Distress Notification received by EV | J2735 TravelerInformation | JSON |
| topic.OdeTimRxJson | Unfiltered and un-sanitized Traveler Information Message received by the Ego Vehicle (EV) OBU from a Remote Vehicles (RV) | J2735 TravelerInformation | JSON |
| topic.OdeTimBroadcastPojo | Traveler Information Message broadcast by Transportation Management Center (TMC) | us.dot.its.jpo.ode.model.OdeTimData | POJO |
| topic.OdeTimBroadcastJson | Traveler Information Message broadcast request received from Transportation Management Center (TMC) | us.dot.its.jpo.ode.model.OdeTimData | JSON |
| topic.J2735TimBroadcastJson | Traveler Information Message broadcast by the ODE according to the TIM broadcast request received from Transportation Management Center (TMC) | J2735 TravelerInformation | JSON |
| topic.OdeDriverAlertJson | Driver Alert messages received by the EV OBU | us.dot.its.jpo.ode.model.OdeDriverAlertData | JSON |
| topic.OdeSpatTxPojo | Unfiltered and un-sanitized transmitted Signal Phase and Timing messages in POJO format. | us.dot.its.jpo.ode.model.OdeSpatData | POJO |
| topic.OdeSpatRxPojo | Unfiltered and un-sanitized received Signal Phase and Timing messages in POJO format. | us.dot.its.jpo.ode.model.OdeSpatData | POJO |
| topic.OdeSpatPojo | All unfiltered and un-sanitized Signal Phase and Timing messages in POJO format. | us.dot.its.jpo.ode.model.OdeSpatData | POJO |
| topic.OdeSpatJson | All Signal Phase and Timing messages processed by ODE (unfiltered and un-sanitized) | us.dot.its.jpo.ode.model.OdeSpatData | JSON |
| topic.OdeSpatRxJson | RSU received Signal Phase and Timing messages processed by ODE (unfiltered and un-sanitized) | us.dot.its.jpo.ode.model.OdeSpatData | JSON |
| topic.FilteredOdeSpatJson | Filtered based on a configured Geo-fence Signal Phase and Timing Message | us.dot.its.jpo.ode.model.OdeSpatData | JSON |
| topic.OdeMapTxPojo | Unfiltered and un-sanitized transmitted Map messages in POJO format. | us.dot.its.jpo.ode.model.OdeMapData | POJO |
| topic.OdeMapJson | Unfiltered and un-sanitized transmitted Map messages in JSON format. | us.dot.its.jpo.ode.model.OdeMapData | JSON |
| topic.OdeSrmTxPojo | Unfiltered and un-sanitized transmitted Signal Request messages in JSON format. | us.dot.its.jpo.ode.model.OdeSrmData | POJO |
| topic.OdeSrmJson | Unfiltered and un-sanitized transmitted Signal Request messages in JSON format. | us.dot.its.jpo.ode.model.OdeSrmData | JSON |
| topic.OdeSsmTxPojo | Unfiltered and un-sanitized transmitted Signal Status messages in JSON format. | us.dot.its.jpo.ode.model.OdeSsmData | POJO |
| topic.OdeSsmJson | Unfiltered and un-sanitized transmitted Signal Status messages in JSON format. | us.dot.its.jpo.ode.model.OdeSsmData | JSON |

**Table 1 - ODE Published Topics**

# Common Data Schemas

ODE output data is provided from the following sources:

* OBU Log files uploaded to ODE or sent to the ODE via immediate forward from the RSUs. These log files or immediate forward messages may contain one or more of the following data types:
  + J2735 (SAE International, 2016) Basic Safety Message (BSM)
  + J2735 (SAE International, 2016) Traveler Information Message (TIM)
  + J2735 (SAE International, 2016) Traveler Information Message (MAP)
  + J2735 (SAE International, 2016) Traveler Information Message (SPaT)
  + J2735 (SAE International, 2016) Traveler Information Message (SSM)
  + J2735 (SAE International, 2016) Traveler Information Message (SRM)
  + Driver alert message
  + TIM deposit request from Transportation Management Center (TMC)

## ODE Data

The top-level structure of ODE Data Message is defined in the Table 2 below:

|  |  |  |
| --- | --- | --- |
| **Name** | **Type** | **Description** |
| metadata | One of [OdeMsgMetadata](#_heading=h.3dy6vkm) types | See section 3.2 |
| payload | One of [OdeMsgPayload](#_heading=h.26in1rg) types. | See section 3.6 and its subsections |

**Table 2 – OdeData**

## ODE Message Metadata

The structure of OdeMsgMetadata is defined in **Table 3**.

|  |  |  |
| --- | --- | --- |
| **Name** | **Type** | **Description** |
| bsmSource[[1]](#footnote-1) | String | Present for BSM data only, one of **enum** BsmSource {***EV***, ***RV***, ***unknown***} constants. |
| Encodings | Array of [Encoding](#_heading=h.17dp8vu) | A list of [Asn1Encodings](#_heading=h.17dp8vu). See section 3.4 |
| logFileName | String | Simple name of the log file ingested. This element is defined in OdeLogMetadata |
| odeReceivedAt[[2]](#footnote-2)[[3]](#footnote-3) | String | The date and time that the payload paired with this metadata was received by the ODE. The ISO date-time format : **yyyy-MM-ddThh:mm:ss.sssZ**, such as 2017-10-25T22:38:59.592Z'. |
| payloadType | String | The Java type of the payload data structure |
| receivedMessageDetails[[4]](#footnote-4) | [ReceivedMessageDetails](#_heading=h.3rdcrjn) | See section 3.5 |
| recordGeneratedAt[[5]](#footnote-5) | String | The date and time that the data was generated at the source defined by recordGeneratedBy. The ISO date-time format: **yyyy-MM-ddThh:mm:ss.sssZ**, such as 2017-10-25T22:38:59.592Z'. |
| recordGeneratedBy3 | String | An enumeration constant value from **enum** GeneratedBy {***TMC***, ***OBU***, ***RSU, TMC\_VIA\_SAT, TMC\_VIA\_SNMP***}. All messages broadcast by TMC will have recordGeneratedBy = ***TMC***. Once those broadcast messages are received by a field device (either OBU or RSU) and messages logged back to ODE, the value of recordGeneratedBy will be set to ***RSU, TMC\_VIA\_SAT, TMC\_VIA\_SNMP*** depending on the value of receivedMessageDetails. rxSource:   |  |  | | --- | --- | | rxSource | recordGeneratedBy |  |  |  | | --- | --- | | ***RSU*** | ***RSU*** |  |  |  | | --- | --- | | ***RV*** | ***OBU*** |  |  |  | | --- | --- | | ***SAT*** | ***TMC\_VIA\_SAT*** | | ***SNMP*** | ***TMC\_VIA\_SNMP*** | |
| recordType[[6]](#footnote-6) | String | This field identifies the file type from which the record was ingested and the record type. Current valid file types are: {***bsmLogDuringEvent***, ***rxMsg***, ***dnMsg***, ***bsmTx***, ***driverAlert***, ***unsupported***}. |
| request[[7]](#footnote-7) | [ServiceRequest](#_heading=h.lnxbz9) | A structure containing the web service request received by ODE. |
| sanitized3 | Boolean String | true or false. True if the record has been processed by a privacy protection module. |
| schemaVersion[[8]](#footnote-8) | Integer | The version number for this schema, an integer starting with 1. Current/latest schemaVersion is 7. |
| securityResultCode[[9]](#footnote-9) | String | One of **enum** constant SecurityResultCode {***success***, ***unknown***, ***inconsistentInputParameters***, ***spduParsingInvalidInput***, ***spduParsingUnsupportedCriticalInformationField***, ***spduParsingCertificateNotFound***, ***spduParsingGenerationTimeNotAvailable***, ***spduParsingGenerationLocationNotAvailable***, ***spduCertificateChainNotEnoughInformationToConstructChain***, ***spduCertificateChainChainEndedAtUntrustedRoot***, ***spduCertificateChainChainWasTooLongForImplementation***, ***spduCertificateChainCertificateRevoked***, ***spduCertificateChainOverdueCRL***, ***spduCertificateChainInconsistentExpiryTimes***, ***spduCertificateChainInconsistentStartTimes***, ***spduCertificateChainInconsistentChainPermissions***, ***spduCryptoVerificationFailure***, ***spduConsistencyFutureCertificateAtGenerationTime***, ***spduConsistencyExpiredCertificateAtGenerationTime***, ***spduConsistencyExpiryDateTooEarly***, ***spduConsistencyExpiryDateTooLate***, ***spduConsistencyGenerationLocationOutsideValidityRegion***, ***spduConsistencyNoGenerationLocation***, ***spduConsistencyUnauthorizedPSID***, ***spduInternalConsistencyExpiryTimeBeforeGenerationTime***, ***spduInternalConsistencyextDataHashDoesntMatch***, ***spduInternalConsistencynoExtDataHashProvided***, ***spduInternalConsistencynoExtDataHashPresent***, ***spduLocalConsistencyPSIDsDontMatch***, ***spduLocalConsistencyChainWasTooLongForSDEE***, ***spduRelevanceGenerationTimeTooFarInPast***, ***spduRelevanceGenerationTimeTooFarInFuture***, ***spduRelevanceExpiryTimeInPast***, ***spduRelevanceGenerationLocationTooDistant***, ***spduRelevanceReplayedSpdu***, ***spduCertificateExpired***}. This element is defined in OdeLogMetadata |
| serialId | Object [SerialId](#_heading=h.2s8eyo1) | A unique serial number representing this record. |
| validSignature[[10]](#footnote-10) | Boolean | DEPRECATED: True if signature validation was successful, false otherwise. Replaced with securityResultCode as of schemaVersion 4. |
| originIp | String | Only populated if a J2735 message was sent over UDP to the ODE. Represents the RSU IP address of the origin of the message forwarded. |
| asn1 | String | The source ASN1 payload is used to generate the message. Defaults to an empty string if the payload can’t be parsed. |

**Table 3 - OdeMsgMetadata**

## SerialId

This data structure can serve as a unique key for each record.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Name** | **Type** | **Description** | **Units** | **Valid Min** | **Valid Max** |
| streamId | String | Universally Unique ID (UUID) of Stream that process the original log file. *bundleId*s increment for each log file processed within a stream. The REST API interface constitutes a unique stream. All records received from the REST API, therefore, should have the same streamId. The Log file ingest is also a unique stream, therefore, all records received in log files should also have the same unique streamId. | N/A | N/A | N/A |
| bundleSize | Integer | Size of the bundle within the processed file | N/A | 1 | MAX\_INT |
| bundleId | Integer | Bundle identifier within the stream | N/A | 0 | MAX\_LONG-1 |
| recordId | Integer | Record identifier within the bundle. *recordId*s increment for each record within a sbundle. So for example, for a bundle size of 10, recordIds will be 0-9. | N/A | 0 | MAX\_INT - 1 |
| serialNumber | Integer | Combined identifier within the stream, a combination of bundleSize, bundleId, and recordId. serialNumber can be considered a unique serial number within a stream. serialNumber can be used to easily sort or detect out of order records. | N/A | 0 | MAX\_LONG-1 |

**Table 4 - SerialId**

## ASN.1 Encodings

A list of ASN.1 encoding instructions provided to the ASN.1 CODEC module. This entire object is removed from the stream prior to publishing the data.

|  |  |  |
| --- | --- | --- |
| **Name** | **Type** | **Description** |
| elementName | String | Name of element to be ASN.1 encoded |
| elementType | String | ASN.1 type/data structure to be encoded |
| encodingRule | String | One of the following  **enum** EncodingRule {***UPER***, ***COER***} |

**Table 5 - Encodings**

## ReceivedMessageDetails

This data structure contains the location of the vehicle when this data record was logged and the source of the data. This object is present on all record types as of schemaVersion 5. Prior to schemaVersion 5, there was no receiveMessageDetails in BSM records.

For BSM records with bsmSource=RV, locationData will represent the location of the Ego Vehicle (EV) that received the BSM from a Remote Vehicle (RV) while the location data inside the BSM payload will represent the location of the RV. For BSMs inside a `rxMsg` log file, `rxSource` will be equal to `RV` as does `bsmSource`. For other log files that may contain BSM data (`bsmTx` and `bsmLogDuringEvent`), there `rxSource` will be `null` or not present in `receivedMessageDetails`.

For BSM records with bsmSource=EV, the locationData should be very close or identical to the location data within the BSM payload.

|  |  |  |
| --- | --- | --- |
| **Name** | **Type** | **Description** |
| locationData | Object | A data structure containing the following:  decimal latitude;  decimal longitude;  decimal elevation;  decimal speed;  decimal heading;  Latitude and longitude will be represented in degrees, elevation in meters, speed in meters per second and heading in degrees. |
| rxSource | String | One of **enum** RxSource {***RSU***, ***SAT***, ***RV***, ***SNMP***, ***NA, unknown***} constants. This element exists only in logs received in rxMsg files (i.e. rxMsg recordType. |

**Table 6 - ReceivedMessageDetails**

## OdeMessagePayload

OdeMsgPayload is the parent class for all payload data structures, each of which contain the following data elements.

|  |  |  |
| --- | --- | --- |
| **Name** | **Type** | **Description** |
| dataType | String | The type of data contained in the data element. |
| Data | OdeObject | The data within this payload |

**Table 7 - OdeMsgPayload**

The following subsections describe the child schemas of [OdeMsgPayload](#_heading=h.26in1rg). The following OdeMsgPayload types are currently supported:

* OdeTimPayload – This payload may contain one of the following data objects:
  + J2735TravelerInformationMessage
  + OdeTravelerInformationMessage
* OdeDriverAlertPayload – containing an *alert* text message
* OdeBsmPayload – containing a J2735Bsm
* OdeSpatPayload – containing a J2735Spat
* OdeMapPayload – containing a J2735Map
* OdeSrmPayload – containing a J2735Srm
* OdeSsmPayload – containing a J2735Ssm

The following subsections describe the structure, element types, and valid range of values for each of the above payload types.

## Service Request[[11]](#footnote-11)

Service request structure is contained within a RESTful API web service request and will contain the following data elements to describe the instructions for the ODE regarding the execution of the request.

|  |  |  |
| --- | --- | --- |
| **Name** | **Type** | **Description** |
| ode | [ServiceRequest.OdeInternal](#_heading=h.35nkun2) | This element data structure specifies parameters used internally by the ODE for troubleshooting purposes. |
| rsus | For Ode Broadcast TIM this element will be an Array of [RoadSideUnit.RSU](#_heading=h.44sinio)  For J2735 Broadcast TIM, array of [RoadSideUnit.RSU](#_heading=h.44sinio) will be embedded insdie anither JSON Object with {rsus} key. See [Sample TIM Data](#_heading=h.34g0dwd) for illustration. | The data structure contains parameters provided by the requester and used by the ODE to send messages the Roadside Units. |
| sdw | [SituationDataWarehouse.SDW](#_heading=h.1ksv4uv) | The data structure contains parameters provided by the requester and used by the ODE to deposit messages to U.S. DOT Situation Data Warehouse |
| snmp | [SNMP](#_heading=h.2jxsxqh) | The data structure contains parameters provided by the requester and used by the ODE to access the RSUs vial the SNMP interface. |

### ServiceRequest.OdeInternal

This element data structure specifies parameters and instructions to the ODE or from the ODE.

|  |  |  |
| --- | --- | --- |
| **Name** | **Type** | **Description** |
| verb | String | The request verb: one of {POST, PUT, DELETE, GET} |
| version | Integer | Current version of ServiceRequest.OdeInternal schema, 3 as of this writing. |

### SituationDataWarehouse.SDW

The data structure contains parameters provided by the requester and used by the ODE to deposit messages to U.S. DOT Situation Data Warehouse. This has been updated to the Situation Data Exchange hosted by Trihydro.

|  |  |  |
| --- | --- | --- |
| **Name** | **Type** | **Description** |
| deliverystart | String | Optional field, ISO string for message delivery start time. Identical to "deliverystart" field in SNMP for when RSU deposit not desired. |
| deliverystop | String | Optional field, ISO string for message delivery stop time. Identical to "deliverystop" field in SNMP for when RSU deposit not desired. |
| groupID | String | Eight-digit hex code of the groupID to use, for example "A123B456". GroupID is a DSRC.TemporaryID used for message identification. |
| recordID | String | Eight-digit hex code of the recordID to use, for example "A123B456". RecordID is a DSRC.TemporaryID used for message identification. |
| serviceRegion | [ServiceRegion](#_heading=h.z337ya) | Region to which this message is broadcast. |
| ttl | enumString | Message time to live. One of {  oneminute,  thirtyminutes,  oneday,  oneweek,  onemonth,  oneyear  } |

### RoadSideUnit.RSU

The data structure contains parameters provided by the requester and used by the ODE to send messages the Roadside Units.

|  |  |  |
| --- | --- | --- |
| **Name** | **Type** | **Description** |
| rsuIndex | Integer | Index of message storage on this RSU |
| rsuPassword | String | RSU password |
| rsuRetries | Integer | Number of retries upon message send failure |
| rsuTarget | String | IPv4 address of RSU |
| rsuTimeout | Integer | Timeout measured in milliseconds |
| rsuUsername | String | SNMP username |

### SNMP

The data structure contains parameters provided by the requester and used by the ODE to access the RSUs vial the SNMP interface.

|  |  |  |
| --- | --- | --- |
| **Name** | **Type** | **Description** |
| rsuid | String | OID of the RSU |
| msgid | String | Message ID |
| mode | String | Mode |
| channel | String | Channel |
| interval | String | Interval |
| deliverystart | String | ISO string for message delivery start time. Takes priority over "deliverystart" field in SDW. |
| deliverystop | String | ISO string for message delivery stop time. Takes priority over "deliverystop" field in SDW. |
| enable | String | Enable RSU: 1 = true, 0 = false |
| status | String | RSU Status |

### ServiceRegion

|  |  |  |
| --- | --- | --- |
| **Name** | **Type** | **Description** |
| nwCorner | Position2D | Northwest corner of the service region. |
| seCorner | Position2D | Southeast corner of the service region |

### Position2D

Two dimensional geographic position.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Name** | **Type** | **Description** | **Units** | **Valid Min** | **Valid Max** |
| latitude† | decimal | The geographic latitude of an object | Degrees | -90.0000000 | +90.0000001 |
| longitude† | decimal | The geographic longitude of an object | Degrees | - 179.9999999 | + 180.0000001 |

# OdeTimPayload

Traveler Information Messages (TIM) published by the ODE are of two categories: Broadcast TIM and Received TIM.

* ODE Broadcast TIMs are those messages received from the TMC and broadcast to the RSUs and/or SDW (C2I). The payload of broadcast TIMs are of the *OdeTravelerInformationMessage* type.
* J2735 Broadcast TIMs are ODE Broadcast TIMs received from the TMC, converted to a valid J2735 TravelerInformation format and broadcast to the RSUs and/or SDW (C2I). The payload of broadcast TIMs are of the *TravelerInformation* ASN.1 object.
* Received TIMs are those messages received from the OBUs (V2I). The payload of received TIMs contains the raw format specified in J2735 *TravelerInformation* ASN.1 object.

## OdeTravelerInformationMessage

The OdeTravelerInformationMessage is fully described in the [ODE REST API](https://usdot-jpo-ode.github.io/) documentation: <https://usdot-jpo-ode.github.io/>

## J2735 TravelerInformation

J2735 TravelerInformation messages are decoded from ASN.1 binary format to XER format and then directly translated into JSON format. No transformation of data is performed on the JSON format that is published to Kafka topics. For full details of the fields within TravelerInformation message please refer to J2735 Standard Specification (<http://standards.sae.org/j2735_201603/> ).

# OdeDriverAlertPayload

|  |  |  |
| --- | --- | --- |
| **Name** | **Type** | **Description** |
| Alert | Alert | Driver alert message in plain text. |

# OdeBsmPayload

The basic safety message (BSM) is used in a variety of applications to exchange safety data regarding vehicle state.

|  |  |  |
| --- | --- | --- |
| **Name** | **Type** | **Description** |
| coreData | [J2735BsmCoreData](#_heading=h.2bn6wsx) | This data frame contains the critical core data elements deemed to be needed with every BSM issued. See section 6.1 |
| partII | Array of [J2735BsmPart2Content](#_heading=h.3as4poj) | Part II data items are optional for a given BSM and are included as needed according to policies that are beyond the scope of this standard. See section 6.2 |

**Table 8 - OdeBsmPayload**

## J2735BsmCoreData

J2735BSMcoreData data frame contains the critical core data elements deemed to be needed with every BSM issued. This data frame’s contents are often referred to as the "BSM Part One", although it is reused in other places as well.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Name** | **Type** | **Description** | **Units** | **Valid Min** | **Valid Max** |
| msgCnt | Integer | MsgCount data element is used to provide a sequence number within a stream of messages with the same DSRCmsgID and from the same sender. | N/A | 0 | 127 |
| secMark | Integer | The DSRC second expressed in this data element consists of integer values from zero to 60999, representing the milliseconds within a minute. A leap second is represented by the value range 60000 to 60999. The value of 65535 shall represent an unavailable value in the range of the minute. The values from 61000 to 65534 are reserved. | Second | 0 | 65535 |
| speed[[12]](#footnote-12) | decimal | This data element represents the vehicle speed | m/s | 0 | 163.8 |
| heading† | decimal | This data element provides the current heading of the sending device. | Degrees | 0.000 | 360.000 |
| angle† | decimal | The angle of the driver’s steering wheel | Degrees | 0.000 | 360.000 |

**Table 9 - J2735BsmCoreData (1)**

|  |  |  |
| --- | --- | --- |
| **Name** | **Type** | **Description** |
| id | HEX String | This is the 4-octet random device identifier, called the TemporaryID. When used for a mobile OBU device, this value will change periodically to help ensure the privacy of the vehicle, unlike a typical wireless or wired 802 device ID. |
| position | [OdePosition3D](#_heading=h.1pxezwc) | Position of the vehicle. See section 6.3 |
| accelSet | [J2735AccelerationSet4Way](#_heading=h.2p2csry) | Acceleration values in 3 orthogonal directions of the vehicle and with yaw rotation rates. See section 6.4 |
| accuracy | [J2735PositionalAccuracy](#_heading=h.147n2zr) | See section 6.5 |
| transmission | string | Used to provide the current state of the vehicle transmission. One of:   * ***neutral***, // Neutral, speed relative to the vehicle alignment * ***park***, // Park, speed relative to the vehicle alignment * ***forwardGears***, // Forward gears, speed relative to the vehicle alignment * ***reverseGears***, // Reverse gears, speed relative to the vehicle alignment * ***reserved1***, ***reserved2***, ***reserved3***, * ***unavailable***; // not-equipped or unavailable value |
| brakes | [J2735BrakeSystemStatus](#_heading=h.3o7alnk) | See section 6.6 |
| size | [J2735VehicleSize](#_heading=h.23ckvvd) | See section 6.7 |

**Table 10 - J2735BsmCoreData (2)**

## J2735BsmPart2Content

Part II data items are optional for a given BSM and are included as needed according to policies that are beyond the scope of this standard.

|  |  |  |
| --- | --- | --- |
| **Name** | **Type** | **Description** |
| id | String | One of: {***VehicleSafetyExtensions***, ***SpecialVehicleExtensions***, ***SupplementalVehicleExtensions*** } |
| value | Object | One of the following object types:   * [J2735VehicleSafetyExtensions](#_heading=h.32hioqz) * [J2735SpecialVehicleExtensions](#_heading=h.1hmsyys) * [J2735SupplementalVehicleExtensions](#_heading=h.41mghml) |

**Table 11 - J2735BsmPart2Content**

## OdePosition3D

This data structure provides a precise location in the WGS-84 coordinate system, from which short offsets may be used to create additional data using a flat earth projection centered on this location.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Name** | **Type** | **Description** | **Units** | **Valid Min** | **Valid Max** |
| elevation† | decimal | The geographic position above or below the reference ellipsoid (typically WGS-84) | meters | -409.5 | 6143.9 |
| latitude† | decimal | The geographic latitude of an object | Degrees | -90.0000000 | +90.0000001 |
| longitude† | decimal | The geographic longitude of an object | Degrees | - 179.9999999 | + 180.0000001 |

**Table 12 - OdePosition3D**

## J2735AccelerationSet4Way

This data frame is a set of acceleration values in 3 orthogonal directions of the vehicle and with yaw rotation rates, expressed as a structure.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Name** | **Type** | **Description** | **Units** | **Valid Min** | **Valid Max** |
| accelLat† | decimal | Latitudinal acceleration, i.e. acceleration perpendicular to the direction of travel. | m/s2 | -20.00 | +20.00 |
| accelLong† | decimal | Longitudinal acceleration, i.e. acceleration in the direction of travel. | m/s2 | -20.00 | +20.00 |
| accelVert† | decimal | Vertical acceleration, i.e. acceleration along the z-axis | G | -3.4 | +1.54 |
| accelYaw† | decimal | Rotational acceleration around the z axis | Degrees/sec | -327.67 | +327.67 |

**Table 13 - J2735AccelerationSet4Way**

## J2735PositionalAccuracy

The J2735PositionalAccuracy data frame consists of various parameters of quality used to model the accuracy of the positional determination with respect to each given axis.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Name** | **Type** | **Description** | **Units** | **Valid Min** | **Valid Max** |
| semiMajor† | decimal | semi-major axis accuracy at one standard dev | Meter | 0.00 | 12.70 |
| semiMinor† | decimal | semi-major axis accuracy at one standard dev | Meter | 0.00 | 12.70 |
| orientation† | decimal | orientation of semi-major axis -- relative to true north (0~359.9945078786 degrees) | Degree | 0.0000000000 | 359.9945078786 |

**Table 14 - J2735PositionalAccuracy**

## J2735BrakeSystemStatus

The Brake System Status data frame conveys a variety of information about the current brake and system control activity of the vehicle. The structure consists of a sequence of items which provide status flags for any active brakes per wheel, the traction control system, the anti-lock brake system, the stability control system, the brake boost system, and the auxiliary brake system.

|  |  |  |
| --- | --- | --- |
| **Name** | **Type** | **Description** |
| wheelBrakes | [J2735BitString](#_heading=h.ihv636) | Indicates independently for each of four wheels whether braking is currently active. A Boolean dictionary of the following indicators:  **enum** {***unavailable***, ***leftFront***, ***leftRear***, ***rightFront***, ***rightRear***}   * unavailable -- When set, the brake applied status is unavailable * leftFront -- Left Front Active * leftRear -- Left Rear Active * rightFront -- Right Front Active * rightRear -- Right Rear Active |
| traction | string | Reflects the status of the vehicle traction control system. One of:   * unavailable -- B'00 Not Equipped with traction control or traction control status is unavailable * off -- B'01 traction control is Off * on -- B'10 traction control is On (but not Engaged) * engaged -- B'11 traction control is Engaged |
| abs | string | Reflects the status of the vehicle ABS. One of:   * unavailable -- B'00 Vehicle Not Equipped with ABS Brakes or ABS Brakes status is unavailable * off -- B'01 Vehicle's ABS are Off * on -- B'10 Vehicle's ABS are On ( but not Engaged ) * engaged -- B'11 Vehicle's ABS control is Engaged on any wheel |
| scs | string | Reflects the current state of the stability control system. One of:   * unavailable, -- B'00 Not Equipped with SC or SC status is unavailable * off, -- B'01 Off * on, -- B'10 On or active (but not engaged) * engaged -- B'11 stability control is Engaged |
| brakeBoost | string | This is a data element which, when set to the "on" state, indicates emergency braking. One of:   * unavailable, -- Vehicle not equipped with brake boost or brake boost data is unavailable * off, -- Vehicle's brake boost is off * on -- Vehicle's brake boost is on (applied) |
| auxBrakes | string | Reflects the status of the auxiliary brakes (sometimes referred to as the parking brake) of the vehicle. One of:   * unavailable -- B'00 Vehicle Not Equipped with Aux Brakes or Aux Brakes status is unavailable * Off -- B'01 Vehicle's Aux Brakes are Off * on -- B'10 Vehicle's Aux Brakes are On (Engaged) * reserved -- B'11 |

**Table 15 - J2735BrakeSystemStatus**

## J2735VehicleSize

The J2735VehicleSize is a data structure representing the vehicle length and vehicle width in a single data concept.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Name** | **Type** | **Description** | **Units** | **Valid Min** | **Valid Max** |
| length | integer | Vehicle length | Centimeter | 0 | 16383 |
| width | integer | Vehicle Width | Centimeter | 0 | 1023 |

**Table 16 - J2735VehicleSize**

## J2735BitString

A J2735BitString is represented by a Boolean dictionary, a collection of name-value pairs where the name identifies a Boolean indicator and the value represents the state of the indicator as *true* or *false*.

## J2735VehicleSafetyExtensions

J2735VehicleSafetyExtensions data frame is used to send various additional details about the vehicle.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Name** | **Type** | **Description** | **Units** | **Valid Min** | **Valid Max** |
| events | [J2735BitString](#_heading=h.ihv636) | Conveys the sender's state regarding a set of events. A Boolean dictionary of the following indicators:   * eventHazardLights * eventStopLineViolation -- Intersection Violation * eventABSactivated * eventTractionControlLoss * eventStabilityControlactivated * eventHazardousMaterials * eventReserved1 * eventHardBraking * eventLightsChanged * eventWipersChanged * eventFlatTire * eventDisabledVehicle -- The DisabledVehicle DF may also be sent * eventAirBagDeployment | | | |
| pathHistory | [J2735PathHistory](#_heading=h.2grqrue) | A geometric path reflecting time-tagged vehicle movement over some period of time and/or distance. | | | |
| pathPrediction | [J2735PathPrediction](#_heading=h.vx1227) | Allows vehicles and other type of users to share their predicted path trajectory by estimating a future path of travel. | | | |
| lights | [J2735BitString](#_heading=h.ihv636) | Provides the status of various exterior lights. A Boolean dictionary of the following indicators:   * lowBeamHeadlightsOn * highBeamHeadlightsOn * leftTurnSignalOn * rightTurnSignalOn * hazardSignalOn * automaticLightControlOn * daytimeRunningLightsOn * fogLightOn * parkingLightsOn | | | |

**Table 17 - J2735VehicleSafetyExtensions**

## J2735SpecialVehicleExtensions

J2735SpecialVehicleExtensions is used to send various additional optional information elements in the Part II BSM used by special vehicles.

|  |  |  |
| --- | --- | --- |
| **Name** | **Type** | **Description** |
| vehicleAlerts | [J2735EmergencyDetails](#_heading=h.3fwokq0) | Combines several bit level items into a structure for efficient transmission about the vehicle during a response call. See section 6.14. |
| description | [J2735EventDescription](#_heading=h.1v1yuxt) | Provides a short summary of an event or incident. It is used by a sending device (often a public safety vehicle) to inform nearby equipped devices about an event or about the driving action the sending device is taking or is about to take. Typical use cases include such concepts as a slow-moving vehicle as well as fire/police movement with flashing light details. |
| trailers | [J2735TrailerData](#_heading=h.4f1mdlm) | Provides a means to describe trailers pulled by a motor vehicle and/or other equipped devices. |

**Table 18 - J2735SpecialVehicleExtensions**

## J2735SupplementalVehicleExtensions

This data structure is used to send various optional additional information elements in the Part II BSM. The range of use cases supported by these elements is very broad and includes both additional V2V functionality and various V2I monitoring applications. A variety of "vehicle as probe" applications fit within this overall functionality as well. Further use cases and requirements are developed in relevant standards. It should be noted that the use of the regional extension mechanism here is intended to provide a means to develop experimental message content within this data frame.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Name** | **Type** | **Description** | **Units** | **Valid Min** | **Valid Max** |
| classification | Integer | Used to provide a common classification system to categorize DSRC- equipped devices for various cross-cutting uses. See J2735 spec for details. | N/A | 0 | 255 |

**Table 19 - J2735SupplementalVehicleExtensions (1)**

|  |  |  |
| --- | --- | --- |
| **Name** | **Type** | **Description** |
| classDetails | [J2735VehicleClassification](#_heading=h.2u6wntf) | Used in ITS and DSRC work. See 6.17 |
| vehicleData | [J2735VehicleData](#_heading=h.19c6y18) | Used to convey additional data about the vehicle not found in the BSM Part I data frame. |
| weatherReport | [J2735WeatherReport](#_heading=h.3tbugp1) | Used to convey weather measurements made by the sending device |
| weatherProbe | [J2735WeatherProbe](#_heading=h.28h4qwu) | Provides basic data on the air temperature and barometric pressure experienced by a vehicle, as well as the current status of the wiper systems on the vehicle, including front and rear wiper systems (where equipped) to indicate coarse rainfall levels. |
| obstacle | [J2735ObstacleDetection](#_heading=h.37m2jsg) | Used to relate basic location information about a detect obstacle or a road hazard in a vehicles path. |
| status | [J2735DisabledVehicle](#_heading=h.46r0co2) | Provides a means for a vehicle (or other equipped device) to describe its operational status and gross location to others using a subset of the ITIS codes. |
| speedProfile | [J2735SpeedProfile](#_heading=h.2lwamvv) | Supports connected vehicles which will be collecting and parsing BSMs as they travel: these consist of speed data reported from the opposite direction. Each equipped vehicle collects the reported BSM speeds from the vehicles traveling in the opposite direction and store the average speed of these vehicles every 100 meters. |
| theRTCM | [J2735RTCMPackage](#_heading=h.111kx3o) | Used to convey RTCM messages which deal with differential corrections between users from one mobile device to another. |
| regional | Array of [J2735RegionalContent](#_heading=h.3l18frh) | Regional extensions is NOT currently implemented. |

**Table 20 - J2735SupplementalVehicleExtensions (2)**

## J2735PathHistory

The J2735PathHistory data frame defines a geometric path reflecting time-tagged vehicle movement over some period of time and/or distance. A sequence of Path History Points is used along with an initial position (and the GNSS status at that time) to create a set of straight line segments representing the path.

|  |  |  |
| --- | --- | --- |
| **Name** | **Type** | **Description** |
| initialPosition | [J2735FullPositionVector](#_heading=h.2zbgiuw) | A complete report of the vehicle's position, speed, and heading at an instant in time. |
| currGNSSstatus | [J2735BitString](#_heading=h.ihv636) | A Boolean (true/false) dictionary (name/value pairs) of the following indicators:   * unavailable -- Not Equipped or unavailable * isHealthy * isMonitored * baseStationType -- Set to zero if a moving base station, or if a rover device (an OBU), set to one if it is a fixed base station * aPDOPofUnder5 -- A dilution of precision greater than 5 * inViewOfUnder5 -- Less than 5 satellites in view * localCorrectionsPresent -- DGPS type corrections used * networkCorrectionsPresent -- RTK type corrections used |
| crumbData | Array of [J2735PathHistoryPoint](#_heading=h.3cqmetx) | The Path History Point data frame is used to convey a single point in the path of an object (typically a motor vehicle) described as a sequence of such position points. The sequence and number of these points is selected to convey the desired level of accuracy and precision required by the application. |

**Table 21 - J2735PathHistory**

## J2735PathPrediction

The J2735PathPrediction data frame allows vehicles and other type of users to share their predicted path trajectory by estimating a future path of travel.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Name** | **Type** | **Description** | **Units** | **Valid Min** | **Valid Max** |
| confidence† | decimal | The Confidence is a data element representing the general confidence of another associated value, in this case, the confidence level of radiusOfCurve | percent | 0.0 | 100.0 |
| radiusOfCurve† | decimal | A data element representing an estimate of the current trajectory of the sender. See J2735 spec for details. | meters | -32767.0 | +32767.0 |

## J2735EmergencyDetails

This data structure combines several bit level items into a structure for efficient transmission about the vehicle during a response call.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Name** | **Type** | **Description** | **Units** | **Valid Min** | **Valid Max** |
| sspRights | integer | Index set by CERT. The SSP index (0-31) is used to control the data elements that follow the occurrence of the index. | | | |
| events | [J2735PrivilegedEvents](#_heading=h.1rvwp1q) | Provides a means to describe various public safety events. | | | |
| lightsUse | String | One of the following enumeration constants:   * ***unavailable***, * ***notInUse***, * ***inUse***, * ***yellowCautionLights***, * ***schooldBusLights***, * ***arrowSignsActive***, * ***slowMovingVehicle***, * ***freqStops*** | | | |
| multi | String | One of the following enumeration constants:   * ***unavailable***, * ***singleVehicle***, * ***multiVehicle***, * ***reserved*** | | | |
| responseType | String | One of the following enumeration constants:   * ***notInUseOrNotEquipped***, * ***emergency***, * ***nonEmergency***, * ***pursuit***, * ***stationary***, * ***slowMoving***, * ***stopAndGoMovement*** | | | |
| sirenUse | String | One of the following enumeration constants:   * ***unavailable***, * ***notInUse***, * ***inUse***, * ***reserved*** | | | |

## J2735EventDescription

This data structure provides a short summary of an event or incident. It is used by a sending device (often a public safety vehicle) to inform nearby equipped devices about an event or about the driving action the sending device is taking or is about to take. Typical use cases include such concepts as a slow moving vehicle as well as fire/police movement with flashing light details.

|  |  |  |
| --- | --- | --- |
| **Name** | **Type** | **Description** |
| description | Array of integers | 1 to 8 ITIS.ITIScodes |
| extent | string | The spatial distance over which this message applies and should be presented to the driver. An enumeration constant:   * ***USEINSTANTLYONLY***, * ***USEFOR3METERS***, * ***USEFOR10METERS***, * ***USEFOR50METERS***, * ***USEFOR100METERS***, * ***USEFOR500METERS***, * ***USEFOR1000METERS***, * ***USEFOR5000METERS***, * ***USEFOR10000METERS***, * ***USEFOR50000METERS***, * ***USEFOR100000METERS***, * ***USEFOR500000METERS***, * ***USEFOR1000000METERS***, * ***USEFOR5000000METERS***, * ***USEFOR10000000METERS***, * ***FOREVER*** |
| heading | [J2735BitString](#_heading=h.ihv636) | A Boolean dictionary of the following indicators:   * from000-0to022-5degrees * from022-5to045-0degrees * from045-0to067-5degrees * from067-5to090-0degrees * from090-0to112-5degrees * from112-5to135-0degrees * from135-0to157-5degrees * from157-5to180-0degrees * from180-0to202-5degrees * from202-5to225-0degrees * from225-0to247-5degrees * from247-5to270-0degrees * from270-0to292-5degrees * from292-5to315-0degrees * from315-0to337-5degrees * from337-5to360-0degrees |
| regional | Array of [J2735RegionalContent](#_heading=h.3l18frh) | Regional content is NOT currently implemented. |

**Table 22 - J2735EventDescription (1)**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Name** | **Type** | **Description** | **Units** | **Valid Min** | **Valid Max** |
| priority | Integer | The urgency of the message | N/A | 0 | 7 |
| typeEvent | Integer | A code from the list of ITIS.ITIScodes | N/A | 0 | 65535 |

**Table 23 - J2735EventDescription (2)**

## J2735TrailerData

Provides a means to describe trailers pulled by a motor vehicle and/or other equipped devices. The span of use is intended to cover use cases from simple passenger vehicles with trailers to class 8 vehicles hauling one or more trailers and dollies. The information in this data frame (along with the BSM message in which it is sent) can be used to determine various aspects of the sender. These include the path of the vehicle and its trailer(s) under various maneuvering conditions (lane matching) as well as the rear of the final trailer, which is often useful in signal control optimization and in intersection safety. This data frame is typically used in the BSM Part II content.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Name** | **Type** | **Description** | **Units** | **Valid Min** | **Valid Max** |
| sspRights | Integer | Index to CERT rights. The SSP index is used to control the data elements that follow the occurrence of the index. | N/A | 0 | 31 |

**Table 24 - J2735TrailerData (1)**

|  |  |  |
| --- | --- | --- |
| **Name** | **Type** | **Description** |
| connection | [J2735PivotPointDescription](#_heading=h.4bvk7pj) | Offset connection point details from the hauling vehicle to the first trailer unit. |
| units | Array of [J2735TrailerUnitDescription](#_heading=h.2r0uhxc) | One of more Trailer or Dolly Descriptions (each called a unit). |

**Table 25 - J2735TrailerData (2)**

## J2735VehicleClassification

This data frame is a structure with a composite set of common classification systems used in ITS and DSRC work. There are any number of such 'types' that can be used to classify a vehicle based on different systems and needs. A given use case will typically use only a subset of the items noted below.

|  |  |  |
| --- | --- | --- |
| **Name** | **Type** | **Description** |
| fuelType | String | One of the following enumeration constants:   * ***unknownFuel***, // FuelType::= 0 -- Gasoline Powered * ***gasoline***, // FuelType::= 1 * ***ethanol***, // FuelType::= 2 -- Including blends * ***diesel***, // FuelType::= 3 -- All types * ***electric***, // FuelType::= 4 * ***hybrid***, // FuelType::= 5 -- All types * ***hydrogen***, // FuelType::= 6 * ***natGasLiquid***, // FuelType::= 7 -- Liquefied * ***natGasComp***, // FuelType::= 8 -- Compressed * ***propane*** // FuelType::= 9 |
| hpmsType | String | One of the following enumeration constants:   * ***none***, * ***unknown***, * ***special***, * ***moto***, * ***car***, * ***carOther***, * ***bus***, * ***axleCnt2***, * ***axleCnt3***, * ***axleCnt4***, * ***axleCnt4Trailer***, * ***axleCnt5Trailer***, * ***axleCnt6Trailer***, * ***axleCnt5MultiTrailer***, * ***axleCnt6MultiTrailer***, * ***axleCnt7MultiTrailer*** |
| responderType | String | One of the following enumeration constants:   * ***emergency\_vehicle\_units***, * ***federal\_law\_enforcement\_units***, * ***state\_police\_units***, * ***county\_police\_units***, * ***local\_police\_units***, * ***ambulance\_units***, * ***rescue\_units***, * ***fire\_units***, * ***hAZMAT\_units***, * ***light\_tow\_unit***, * ***heavy\_tow\_unit***, * ***freeway\_service\_patrols***, * ***transportation\_response\_units***, * ***private\_contractor\_response\_units*** |

**Table 26 - J2735VehicleClassification (1)**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Name** | **Type** | **Description** | **Units** | **Valid Min** | **Valid Max** |
| iso3883 | Integer | Iso3833VehicleType data element represents the value domain provided by ISO 3833 for general vehicle types. It is a European list similar to the list used for the Highway Performance Monitoring System (HPMS) in the US region. In this standard, the HPMS list is used in the data concept named VehicleType. | N/A | 0 | 100 |
| keyType | Integer | The BasicVehicleRole data element provides a means to indicate the current role that a DSRC device is playing. | N/A | 0 | 255 |

**Table 27 - J2735VehicleClassification (2)**

## J2735VehicleData

This data structure is used to convey additional data about the vehicle not found in the BSM Part I data frame.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Name** | **Type** | **Description** | **Units** | **Valid Min** | **Valid Max** |
| height† | decimal | The height of the vehicle, measured from the ground to the highest surface, excluding any antenna(s) | Meter | 0 | 6.35 |
| mass | Integer | Represents the estimated weight of the vehicle over a span of stepwise linear values. See J2735 spec for details. | N/A | 0 | 255 |
| trailerWeight† | Integer | A data element re-used from the SAE J1939 standard. Also see SPN 180, PGN reference 65258 | Kg | 0 | 128,510 |

**Table 28 - J2735VehicleData (1)**

|  |  |  |
| --- | --- | --- |
| **Name** | **Type** | **Description** |
| bumpers | [J2735BumperHeights](#_heading=h.1664s55) | Conveys the height of the front and rear bumper of the vehicle or object (can also be used with trailers). |

**Table 29 - J2735VehicleData (2)**

## J2735WeatherReport

Used to convey weather measurements made by the sending device.

|  |  |  |
| --- | --- | --- |
| **Name** | **Type** | **Description** |
| isRaining | string | **enum** {***PRECIP***, ***NOPRECIP***, ***ERROR***} |
| precipSituation | string | **enum** {***OTHER***, ***UNKNOWN***, ***NOPRECIPITATION***, ***UNIDENTIFIEDSLIGHT***, ***UNIDENTIFIEDMODERATE***, ***UNIDENTIFIEDHEAVY***, ***SNOWSLIGHT***, ***SNOWMODERATE***, ***SNOWHEAVY***, ***RAINSLIGHT***, ***RAINMODERATE***, ***RAINHEAVY***, ***FROZENPRECIPITATIONSLIGHT***, ***FROZENPRECIPITATIONMODERATE***, ***FROZENPRECIPITATIONHEAVY***} |

**Table 30 - J2735WeatherReport (1)**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Name** | **Type** | **Description** | **Units** | **Valid Min** | **Valid Max** |
| rainRate† | decimal | The rainfall, or water equivalent of snow, rate in tenths of grams per square meter per second. For rain, this is approximately to 0.36 mm/hr. | g/square meters | 0.0 | 6553.4 |
| solarRadiation | integer | The direct solar radiation integrated over the 24 hours preceding the observation. | Joules/ square meters | 0 | 65534 |
| friction | integer | Indicates measured coefficient of friction in percent. The value 101 shall indicate an error condition or missing value. | None | 0 | 101 |
| roadFriction† | decimal | Coefficient of Friction of an object, typically a wheel in contact with the ground. This data element is typically used in sets where the value at each wheel is provided in turn as a measure of relative local traction. | micro | 0.00 | 1.00 |

**Table 31 - J2735WeatherReport (2)**

## J2735WeatherProbe

The J2735WeatherProbe data frame provides basic data on the air temperature and barometric pressure experienced by a vehicle, as well as the current status of the wiper systems on the vehicle, including front and rear wiper systems (where equipped) to indicate coarse rainfall levels.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Name** | **Type** | **Description** | **Units** | **Valid Min** | **Valid Max** |
| weatherAirPres† | integer | Used to relate the measured Ambient Pressure (Barometric Pressure) from a vehicle or other device. | hectopascals (hPa) | 580 | 1088 |
| weatherAirTemp† | integer | Used to relate the measured Ambient Air Temperature from a vehicle or other device. | Centigrade (Celcius) | -40 | +150 |
| rainRates | [J2735WiperSet](#_heading=h.nmf14n) | Provides the current status of the wiper systems on the subject vehicle, including front and rear wiper systems (where equipped). | See section 6.21 | N/A | N/A |

**Table 32 - J2735WeatherProbe**

## J2735WiperSet

The J2735WiperSet data frame provides the current status of the wiper systems on the subject vehicle, including front and rear wiper systems (where equipped).

|  |  |  |
| --- | --- | --- |
| **Name** | **Type** | **Description** |
| statusFront | string | **enum** {***UNAVAILABLE***, ***OFF***, ***INTERMITTENT***, ***LOW***, ***HIGH***, ***WASHERINUSE***, ***AUTOMATICPRESENT***} |
| statusRear | string | **enum** {***UNAVAILABLE***, ***OFF***, ***INTERMITTENT***, ***LOW***, ***HIGH***, ***WASHERINUSE***, ***AUTOMATICPRESENT***} |

**Table 33 - J2735WiperSet (1)**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Name** | **Type** | **Description** | **Units** | **Valid Min** | **Valid Max** |
| rateFront | integer | The current rate at which wiper sweeps are taking place on the subject vehicle, in units of sweeps per minute. A value of 1 is used for any sweep rate with a period greater than 60 seconds. | Sweeps/ minute | 0 | 127 |
| rateRear | integer | The current rate at which wiper sweeps are taking place on the subject vehicle, in units of sweeps per minute. A value of 1 is used for any sweep rate with a period greater than 60 seconds. | Sweeps/ minute | 0 | 127 |

**Table 34 - J2735WiperSet (2)**

## J2735ObstacleDetection

Used to relate basic location information about a detect obstacle or a road hazard in a vehicles path.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Name** | **Type** | **Description** | **Units** | **Valid Min** | **Valid Max** |
| obDist | integer | This data element draws from the output of a forward sensing system to report the presence of an obstacle and its measured distance from the vehicle detecting and reporting the obstacle. | meters | 0 | 32767 |
| obDirect† | decimal | As a companion data element to Obstacle Distance, this data element draws from the output of a forward sensing system to report the obstacle direction from the perspective of the vehicle detecting and reporting the obstacle. | degrees | 0.0000 | 359.9875 |
| description | integer | ITIS.ITIScodes(523..541) | ITIS code | 523 | 541 |
| locationDetails | String | An ITIS enumeration commonly referred to as "Generic Locations." The code is assigned the upper byte value of [31] (which provides for value ranges from 7936 to 8191, inclusive). | Generic Location IT IS enumeration | Enum for 7936 | Enum for 8191 |

**Table 35 - J2735ObstacleDetection (1)**

|  |  |  |
| --- | --- | --- |
| **Name** | **Type** | **Description** |
| dateTime | [J2735DDateTime](#_heading=h.1mrcu09) | The DSRC style date is a compound value consisting of finite-length sequences of integers (not characters) of the form: "yyyy, mm, dd, hh, mm, ss (sss+)" |
| vertEvent | [J2735BitString](#_heading=h.ihv636) | A dictionary (name/value pair) of boolean values enumerating when a preset threshold for vertical acceleration is exceeded at each wheel. Set of names include:  notEquipped, -- Not equipped or off  leftFront, -- Left Front Event  leftRear, -- Left Rear Event  rightFront, -- Right Front Event  rightRear -- Right Rear Event |

**Table 36 - J2735ObstacleDetection (2)**

## J2735DDateTime

The DSRC style date is a compound value consisting of finite-length sequences of integers (not characters) of the form: "yyyy, mm, dd, hh, mm, ss (sss+)" - as defined below.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Name** | **Type** | **Description** | **Units** | **Valid Min** | **Valid Max** |
| year | Integer | Year according to the Gregorian calendar date system. | Years | 1 | 4095 |
| month | Integer | Month within a year. | Months | 1 | 12 |
| day | Integer | Day of the month | Days | 1 | 31 |
| hour | Integer | Hours within a day. The range 24 to 30 is used in some transit applications to represent schedule adherence. | Hours | 0 | 30 |
| minute | Integer | Minutes within an hour. | Minutes | 0 | 59 |
| second | Integer | Milliseconds within a minute. A leap second is represented by the value range 60000 to 60999. The values from 61000 to 65534 are reserved. | Seconds | 0 | 65534 |
| offset | Integer | The DSRC (time zone) offset consists of a signed integer representing an hour and minute value set from -14:00 to +14:00, representing all the world’s local time zones in units of minutes. The value of zero (00:00) may also represent an unknown value. Note some time zones are do not align to hourly boundaries. | Minutes from UTC time | -840 | +840 |

**Table 37 - J2735DDateTime**

## J2735DisabledVehicle

The J2735DisabledVehicle data frame provides a means for a vehicle (or other equipped device) to describe its operational status and gross location to others using a subset of the ITIS codes.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Name** | **Type** | **Description** | **Units** | **Valid Min** | **Valid Max** |
| statusDetails | integer | ITIS.ITIScodes(523..541) | ITIS code | 523 | 541 |
| locationDetails | String | An ITIS enumeration commonly referred to as "Generic Locations." The code is assigned the upper byte value of [31] (which provides for value ranges from 7936 to 8191, inclusive). | Generic Location IT IS enumeration | Enum for 7936 | Enum for 8191 |

**Table 38 - J2735DisabledVehicle**

## J2735SpeedProfile

The J2735SpeedProfile data frame supports connected vehicles which will be collecting and parsing BSMs as they travel: these consist of speed data reported from the opposite direction. Each equipped vehicle collects the reported BSM speeds from the vehicles traveling in the opposite direction and store the average speed of these vehicles every 100 meters. The BSM tempID will be used to prevent duplicates. The opposite direction is considered to be the collecting vehicle's current direction +170 through 190 degrees. Up to 20 readings of average speed can be transmitted by the SpeedProfile. The SpeedProfile is added to the BSM Part II content, thus making it available to vehicles traveling in the opposite direction for whom it provides an up to 2 km SpeedProfile of the traffic on their road ahead. Should the vehicle collecting the SpeedProfile make a turn greater than 70°, then the SpeedProfile currently stored would be deleted. Further details of these operational concepts can be found in relevant standards.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Name** | **Type** | **Description** | **Units** | **Valid Min** | **Valid Max** |
| speedReports | Array of integers | Represents the average measured or reported speed of a series of objects traveling in the same direction over a period of time. The value 30 shall be used for speeds of 30 m/s or greater (67.1 mph) -- The value 31 shall indicate that the speed is unavailable | m/s | 0 | 31 |

## J2735RTCMPackage

The J2735RTCMPackage data frame is used to convey RTCM messages which deal with differential corrections between users from one mobile device to another. Encapsulated messages are those defined in RTCM Standard 10403.1 for Differential GNSS (Global Navigation Satellite Systems) Services - Version 3 adopted on July 1st 2011 and its successors.

|  |  |  |
| --- | --- | --- |
| **Name** | **Type** | **Description** |
| rtcmHeader | [J2735RTCMheader](#_heading=h.206ipza) | Precise antenna position and noise data for a rover. |
| msgs | Array of HEX Strings | The RTCMmessage data element contains the stream of octets of the actual RTCM message that is being sent. The message’s contents are defined in RTCM Standard 10403.1 and in RTCM Standard 10402.1 and its successors. Note that most RTCM messages are considerably smaller than the size limit defined here, but that some messages may need to be broken into smaller messages (as per the rules defined in the RTCM work) in order to be transmitted over DSRC. |

**Table 39 - J2735RTCMPackage**

## J2735RTCMheader

The J2735RTCMheader data frame is a collection of data values used to convey RTCM information between users. It is not required or used when sending RTCM data from a corrections source to end users (from a base station to devices deployed in the field which are called rovers).

|  |  |  |
| --- | --- | --- |
| **Name** | **Type** | **Description** |
| offsetSet | [J2735AntennaOffsetSet](#_heading=h.4k668n3) | A collection of three offset values in an orthogonal coordinate system which describe how far the electrical phase center of an antenna is in each axis from a nearby known anchor point in units of 1 cm. When the antenna being described is on a vehicle, the signed offset shall be in the coordinate system defined in section 11.4 of J2735 spec |
| status | [J2735BitString](#_heading=h.ihv636) | A dictionary of boolean (true or false) name/value pairs used to relate the current state of a GPS/GNSS rover or base system in terms of its general health, lock on satellites in view, and use of any correction information. Various bits can be asserted (made to a value of one) to reflect these values. A GNSS set with unknown health and no tracking or corrections would be represented by setting the unavailable bit to one. A value of zero shall be used when a defined data element is unavailable. The term "GPS" in any data element name in this standard does not imply that it is only to be used for GPS-type GNSS systems. Set of names include:   * unavailable, -- Not Equipped or unavailable * isHealthy, * isMonitored, * baseStationType, -- Set to zero if a moving base station,   + or if a rover device (an OBU),   + set to one if it is a fixed base station * aPDOPofUnder5, -- A dilution of precision greater than 5 * inViewOfUnder5, -- Less than 5 satellites in view * localCorrectionsPresent, -- DGPS type corrections used * networkCorrectionsPresent -- RTK type corrections used |

**Table 40 - J2735RTCMheader**

## J2735AntennaOffsetSet

The J2735AntennaOffsetSet data frame is a collection of three offset values in an orthogonal coordinate system which describe how far the electrical phase center of an antenna is in each axis from a nearby known anchor point in units of 1 cm. When the antenna being described is on a vehicle, the signed offset shall be in the coordinate system defined in section 11.4 of J2735 spec.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Name** | **Type** | **Description** | **Units** | **Valid Min** | **Valid Max** |
| antOffsetX† | decimal | Delta offset in X, Y or Z direction from some known point. For non-vehicle centric coordinate frames of reference, non-vehicle centric coordinate frames of reference, offset is positive to the East (X) and to the North (Y) directions. | meters | -20.47 | +20.47 |
| antOffsetY† | decimal | Delta offset in X, Y or Z direction from some known point. For non-vehicle centric coordinate frames of reference, offset is positive to the East (X) and to the North (Y) directions. | meters | -2.55 | +2.55 |
| antOffsetZ† | decimal | Delta offset in X, Y or Z direction from some known point. For non-vehicle centric coordinate frames of reference, offset is positive to the East (X) and to the North (Y) directions. | meters | -5.11 | +5.11 |

**Table 41 - J2735AntennaOffsetSet**

## J2735FullPositionVector

J2735FullPositionVector is a complete report of the vehicle's position, speed, and heading at an instant in time.

|  |  |  |
| --- | --- | --- |
| **Name** | **Type** | **Description** |
| utcTime | [J2735DDateTime](#_heading=h.1mrcu09) | Date and Time |
| position | [OdePosition3D](#_heading=h.1pxezwc) | Vehicle position |
| heading† | decimal | Vehicle heading in  Degrees:  0-359.9875 |
| speed | [J2735TransmissionAndSpeed](#_heading=h.1egqt2p) | The speed of the vehicle and the state of the transmission |
| posAccuracy | [J2735PositionalAccuracy](#_heading=h.147n2zr) | Various parameters of quality used to model the accuracy of the positional determination with respect to each given axis |
| timeConfidence | string | Provide the 95% confidence level for the currently reported value of time. One enumeration constant from   * ***UNAVAILABLE***, * ***TIME\_100\_000***, * ***TIME\_050\_000***, * ***TIME\_020\_000***, * ***TIME\_010\_000***, * ***TIME\_002\_000***, * ***TIME\_001\_000***, * ***TIME\_000\_500***, * ***TIME\_000\_200***, * ***TIME\_000\_100***, * ***TIME\_000\_050***, * ***TIME\_000\_020***, * ***TIME\_000\_010***, * ***TIME\_000\_005***, * ***TIME\_000\_002***, * ***TIME\_000\_001***, * ***TIME\_000\_000\_5***, * ***TIME\_000\_000\_2***, * ***TIME\_000\_000\_1***, * ***TIME\_000\_000\_05***, * ***TIME\_000\_000\_02***, * ***TIME\_000\_000\_01***, * ***TIME\_000\_000\_005***, * ***TIME\_000\_000\_002***, * ***TIME\_000\_000\_001***, * ***TIME\_000\_000\_000\_5***, * ***TIME\_000\_000\_000\_2***, * ***TIME\_000\_000\_000\_1***, * ***TIME\_000\_000\_000\_05***, * ***TIME\_000\_000\_000\_02***, * ***TIME\_000\_000\_000\_01***, * ***TIME\_000\_000\_000\_005***, * ***TIME\_000\_000\_000\_002***, * ***TIME\_000\_000\_000\_001***, * ***TIME\_000\_000\_000\_000\_5***, * ***TIME\_000\_000\_000\_000\_2***, * ***TIME\_000\_000\_000\_000\_1***, * ***TIME\_000\_000\_000\_000\_05***, * ***TIME\_000\_000\_000\_000\_02***, * ***TIME\_000\_000\_000\_000\_01*** |
| posConfidence | [J2735PositionConfidenceSet](#_heading=h.2dlolyb) | Represents the confidence level about the accuracy of position and elevation. |
| speedConfidence | [J2735SpeedandHeadingandThrottleConfidence](#_heading=h.sqyw64) | Represents the confidence level about the accuracy of speed, heading and throttle. |

**Table 42 - J2735FullPositionVector**

## J2735TransmissionAndSpeed

The J2735TransmissionAndSpeed data frame expresses the speed of the vehicle and the state of the transmission. The transmission state of 'reverse' can be used as a sign value for the speed element when needed.

|  |  |  |
| --- | --- | --- |
| **Name** | **Type** | **Description** |
| transmisson | string | An enumeration value of {   * ***NEUTRAL***, // Neutral, speed relative to the vehicle alignment * ***PARK***, // Park, speed relative the to vehicle alignment * ***FORWARDGEARS***, // Forward gears, speed relative the to vehicle alignment * ***REVERSEGEARS***, // Reverse gears, speed relative the to vehicle alignment * ***RESERVED1***, ***RESERVED2***, ***RESERVED3***, * ***UNAVAILABLE***; // not-equipped or unavailable value} |
| speed† | decimal | Reports vehicle velocity in meters per second in a range of 0 – 163.82 m/s |

**Table 43 - J2735TransmissionAndSpeed**

## J2735PositionConfidenceSet

The J2735PositionConfidenceSet data frame combines multiple related bit fields into a single concept.

|  |  |  |
| --- | --- | --- |
| **Name** | **Type** | **Description** |
| pos | string | An enumeration value of   * ***UNAVAILABLE***, * ***A500M***, * ***A200M***, * ***A100M***, * ***A50M***, * ***A20M***, * ***A10M***, * ***A5M***, * ***A2M***, * ***A1M***, * ***A50CM***, * ***A20CM***, * ***A10CM***, * ***A5CM***, * ***A2CM***, * ***A1CM*** |
| elevation | string | An enumeration value of   * ***UNAVAILABLE***, * ***ELEV\_500\_00***, * ***ELEV\_200\_00***, * ***ELEV\_100\_00***, * ***ELEV\_050\_00***, * ***ELEV\_020\_00***, * ***ELEV\_010\_00***, * ***ELEV\_005\_00***, * ***ELEV\_002\_00***, * ***ELEV\_001\_00***, * ***ELEV\_000\_50***, * ***ELEV\_000\_20***, * ***ELEV\_000\_10***, * ***ELEV\_000\_05***, * ***ELEV\_000\_02***, * ***ELEV\_000\_01*** |

**Table 44 - J2735PositionConfidenceSet**

## J2735SpeedandHeadingandThrottleConfidence

The J2735SpeedHeadingThrottleConfidence data frame is a single data frame combining multiple related bit fields into one concept.

|  |  |  |
| --- | --- | --- |
| **Name** | **Type** | **Description** |
| heading | string | One of enumeration values:   * ***UNAVAILABLE***, * ***PREC10DEG***, * ***PREC05DEG***, * ***PREC01DEG***, * ***PREC0\_1DEG***, * ***PREC0\_05DEG***, * ***PREC0\_01DEG***, * ***PREC0\_0125DEG*** |
| speed | string | One of enumeration values:   * ***UNAVAILABLE***, * ***PREC100MS***, * ***PREC10MS***, * ***PREC5MS***, * ***PREC1MS***, * ***PREC0\_1MS***, * ***PREC0\_05MS***, * ***PREC0\_01MS*** |
| throttle | string | One of enumeration values:   * ***UNAVAILABLE***, * ***PREC10PERCENT***, * ***PREC1PERCENT***, * ***PREC0\_5PERCENT*** |

## J2735PathHistoryPoint

The J2735PathHistoryPoint data frame is used to convey a single point in the path of an object (typically a motor vehicle) described as a sequence of such position points. The sequence and number of these points (defined in another data frame) is selected to convey the desired level of accuracy and precision required by the application.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Name** | **Type** | **Description** | **Units** | **Valid Min** | **Valid Max** |
| latOffset† | decimal | Delta offset in latitude direction from the last point | degrees | -0.0131071 | +0.0131071 |
| lonOffset† | decimal | Delta offset in longitude direction from the last point | degrees | -0.0131071 | +0.0131071 |
| elevationOffset† | decimal | Vertical delta offset in the Z direction from the last point | Meters vertical | -204.7 | +204.7 |
| timeOffset† | decimal | Offset backwards in time | seconds | 0.01 | 655.34 |
| speed† | decimal | Speed over the reported period | m/s | 0 | 163.82 |
| posAccuracy | [J2735PositionalAccuracy](#_heading=h.147n2zr) | The accuracy of position values. See section 6.5. | N/A | N/A | N/A |
| heading† | decimal | Overall coarse heading | degrees | 0.0 | 358.5 |

**Table 45 - J2735PathHistoryPoint**

## J2735PrivilegedEvents

The J2735PrivilegedEvents data frame provides a means to describe various public safety events. The information in this data frame (along with the BSM message in which it is sent) can be used to determine various aspects about the sender.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Name** | **Type** | **Description** | **Units** | **Valid Min** | **Valid Max** |
| sspRights | integer | CERT SSP Privilege Details. The SSP index is used to control the data elements that follow the occurrence of the index. | N/A | 0 | 31 |

**Table 46 - J2735PrivilegedEvents (1)**

|  |  |  |
| --- | --- | --- |
| **Name** | **Type** | **Description** |
| events | [J2735BitString](#_heading=h.ihv636) | The active event list. A Boolean dictionary of the following indicators:   * peUnavailable -- Not Equipped or unavailable * peEmergencyResponse -- The vehicle is a properly authorized public safety vehicle, is engaged in a service call, and is currently moving or is within the roadway. Note that lights and sirens may not be evident during any given response call * Emergency and Non Emergency Lights related   + peEmergencyLightsActive   + peEmergencySoundActive   + peNonEmergencyLightsActive   + peNonEmergencySoundActive |

**Table 47 - J2735PrivilegedEvents (2)**

## J2735PivotPointDescription

The J2735PivotPointDescription data frame is used to describe the geometric relationship between a vehicle and a trailer; or a dolly and another object to which it is connected.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Name** | **Type** | **Description** | **Units** | **Valid Min** | **Valid Max** |
| pivotOffset† | decimal | This gives a +- 10m range from the edge of the outline measured from the edge of the length of this unit a negative value is offset to inside the units a positive value is offset beyond the unit | meters | -10.23 | +10.23 |
| pivotAngle† | decimal | Measured between the center-line of this unit and the unit ahead which is pulling it. This value is required to project the units relative position. | degrees | 0 | 359.9875 |
| pivots | Boolean | *true* if this unit can rotate about the pivot connection point. | N/A | false | true |

**Table 48 - J2735PivotPointDescription**

## J2735TrailerUnitDescription

The J2735TrailerUnitDescription data frame provides a physical description for one trailer or a dolly element (called a unit), including details of how it connects with other elements fore and aft.

|  |  |  |
| --- | --- | --- |
| **Name** | **Type** | **Description** |
| isDolly | Boolean | If false this is a trailer |
| bumperHeights | [J2735BumperHeights](#_heading=h.1664s55) | Conveys the height of the front and rear bumper of the trailers. |
| frontPivot | [J2735PivotPointDescription](#_heading=h.4bvk7pj) | Offset connection point details from the hauling vehicle to the first trailer unit. |
| rearPivot | [J2735PivotPointDescription](#_heading=h.4bvk7pj) | Offset connection point details from the hauling vehicle to the first trailer unit. |
| positionOffset | [J2735Node\_XY](#_heading=h.25b2l0r) | Current Position relative to the hauling Vehicle – x-y axis offset |
| elevationOffset† | decimal | Current Position relative to the hauling Vehicle – z-axis offset |
| crumbData | Array of [J2735TrailerHistoryPoint](#_heading=h.3q5sasy) | Past Position history relative to the hauling Vehicle. |

**Table 49 - J2735TrailerUnitDescription (1)**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Name** | **Type** | **Description** | **Units** | **Valid Min** | **Valid Max** |
| width | integer | Vehicle width | cm | 0 | 1023 |
| length | integer | Vehicle length | cm | 0 | 4095 |
| height† | decimal | Vehicle height | meters | 0 | 6.35 |
| mass† | integer | Trailer mass | kg | 0 | 127,500 |
| centerOfGravity† | decimal | Vehicle center of gravity | meters | 0 | 6.35 |
| rearWheelOffset† | decimal | Rear wheel pivot point center-line offset measured from the rear of the above length | meters | -20.47 | +20.47 |
| elevationOffset† | decimal | Current Position relative to the hauling Vehicle – z-axis offset | meters | -6.3 | +6.3 |

**Table 50 - J2735TrailerUnitDescription (2)**

## J2735BumperHeights

The J2735BumperHeights data frame conveys the height of the front and rear bumper of the vehicle or object (can also be used with trailers).

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Name** | **Type** | **Description** | **Units** | **Valid Min** | **Valid Max** |
| front† | decimal | The height of the front bumper from ground surface. | meters | 0.00 | 1.27 |
| rear† | decimal | The height of the rear bumper from ground surface. | meters | 0.00 | 1.27 |

**Table 51 - J2735BumperHeights**

## J2735TrailerHistoryPoint

The J2735TrailerHistoryPoint data frame contains a single position point for a trailer, expressed relative to the vehicle’s BSM positional estimate at the same point in time.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Name** | **Type** | **Description** | **Units** | **Valid Min** | **Valid Max** |
| pivotAngle† | decimal | Angle with respect to the lead unit | degrees | 0 | 359.9875 |
| timeOffset† | decimal | offset backwards in time | seconds | 0 | 655.34 |
| positionOffset | [J2735Node\_XY](#_heading=h.25b2l0r) | Current Position relative to the hauling Vehicle – x-y axis offset | N/A | N/A | N/A |
| elevationOffset† | decimal | Current Position relative to the hauling Vehicle – z-axis offset | meters | -6.3 | +6.3 |
| heading† | decimal | Overall coarse heading | degrees | 0.0 | 358.5 |

**Table 52 - J2735TrailerHistoryPoint**

## J2735Node\_XY

The J2735Node\_XY data frame represents offset values from the last point in X and Y.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Name** | **Type** | **Description** | **Units** | **Valid Min** | **Valid Max** |
| x† | decimal | X axis offset | meters | -20.47 | +20.47 |
| y† | decimal | Y axis offset | meters | -20.47 | +20.47 |

**Table 53 - J2735Node\_XY**

# OdeSpatPayload

The signal phase and timing message (SPaT) is used at intersections to provide vehicles updates about the traffic lights and when they are changing signals.

|  |  |  |
| --- | --- | --- |
| **Name** | **Type** | **Description** |
| timeStamp | integer | Optional integer representing the year. |
| name | String | Optional name for the SPaT message. |
| intersectionStateList | [J2735IntersectionStateList](#_heading=h.k2qiqdsnverr) | An object containing a set of SPaT data. (One per intersection) |

**Table 54 - OdeSpatPayload**

## J2735IntersectionStateList

|  |  |  |
| --- | --- | --- |
| **Name** | **Type** | **Description** |
| intersectionStatelist | List<[J2735IntersectionState](#_heading=h.619wikqpxi8x)> | A set of SPaT data. (One per intersection) |

**Table 55 - J2735IntersectionStateList**

## J2735IntersectionState

The IntersectionState data frame is used to convey all the SPAT information for a single intersection. Both current and future data can be sent.

|  |  |  |
| --- | --- | --- |
| **Name** | **Type** | **Description** |
| name | String | An optional human readable name for the intersection. |
| id | [J2735IntersectionReferenceID](#_heading=h.gq5izbls6jey) | A globally unique value set, consisting of a regionID and intersection ID assignment provides a unique mapping to the intersection MAP in question which provides complete location and approach/move/lane data. |
| revision | integer | The version of the SPaT. |
| status | J2735IntersectionStatusObject | General status of the controller. One enumeration constant from   * ***MANUALCONTROLISENABLED*** * ***STOPTIMEISACTIVATED*** * ***FAILUREFLASH*** * ***PREEMPTISACTIVE*** * ***SIGNALPRIORITYISACTIVE*** * ***FIXEDTIMEOPERATION*** * ***TRAFFICDEPENDENTOPERATION*** * ***STANDBYOPERATION*** * ***FAILUREMODE*** * ***OFF*** * ***RECENTMAPMESSAGEUPDATE*** * ***RECENTCHANGEINMAPASSIGNEDLANESIDSUSED*** * ***NOVALIDMAPISAVAILABLEATTHISTIME*** * ***NOVALIDSPATISAVAILABLEATTHISTIME*** |
| moy | integer | Optional minute of current UTC year. |
| timeStamp | integer | Optional time of message creation in UTC. |
| enabledLanes | [J2735EnableLaneList](#_heading=h.p78aczwokqd0) | Optional list of lanes where the RevocableLane bit has been set. |
| states | [J2735MovementList](#_heading=h.1w7udgc4rm4c) | Each Movement is given in turn and contains its signal phase state, mapping to the lanes it applies to, and point in time it will end, and it may contain both active and future states. |
| maneuverAssistList | [J2735ManeuverAssistList](#_heading=h.kea7ryy2h9du) | Optional assist data. |

**Table 56 - J2735IntersectionState**

## J2735IntersectionReferenceID

The IntersectionReferenceID data frame conveys the combination of an optional RoadRegulatorID and of an IntersectionID that is unique within that region. When the RoadRegulatorID is present the IntersectionReferenceID is guaranteed to be globally unique.

|  |  |  |
| --- | --- | --- |
| **Name** | **Type** | **Description** |
| region | integer | An optional regional assignment value. |
| id | integer | A unique mapping to the intersection in question within the above region of use. If not populated, it represents a generic unique mapping. |

**Table 57 - J2735IntersectionReferenceID**

## J2735EnableLaneList

The Enabled Lane List data frame is a sequence of lane IDs for lane objects that are activated in the current map configuration

|  |  |  |
| --- | --- | --- |
| **Name** | **Type** | **Description** |
| enabledLaneList | List<integer> | The unique ID numbers for each lane object which is 'active' as part of the dynamic map contents.  The value 0 shall be used when the lane ID is not available or not known. |

**Table 58 - J2735EnableLaneList**

## J2735MovementList

|  |  |  |
| --- | --- | --- |
| **Name** | **Type** | **Description** |
| movementList | List<[J2735MovementState](#_heading=h.p9aipywt15tm)> | The MovementList data frame consists of a list of MovementState entries. |

**Table 59 - J2735MovementList**

## J2735MovementState

The MovementState data frame is used to convey various information about the current or future movement state of a designated collection of one or more lanes of a common type.

|  |  |  |
| --- | --- | --- |
| **Name** | **Type** | **Description** |
| movementName | String | An optional defining name for the movement. |
| signalGroup | integer | The signal group id is used to map to lists of lanes. |
| state\_time\_speed | [J2735MovementEventList](#_heading=h.uviyps8ltmwn) | Object container consisting of sets of movement data with:   * SignalPhaseState * TimeChangeDetails * AdvisorySpeeds (optional)   Note one or more of the movement events may be for a future time and that this allows conveying multiple predictive phase and movement timing for various uses for the current signal group. |
| maneuverAssistList | [J2735ManeuverAssistList](#_heading=h.kea7ryy2h9du) | Object container containing assist list data. May also be located in the [J2735IntersectionState](#_heading=h.619wikqpxi8x). |

**Table 60 - J2735MovementState**

## J2735MovementEventList

|  |  |  |
| --- | --- | --- |
| **Name** | **Type** | **Description** |
| movementEventList | List<[J2735MovementEvent](#_heading=h.t7wk46mjcjtn)> | The MovementEventList data frame consists of a list of MovementEvent entries. |

**Table 61 - J2735MovementEventList**

## J2735MovementEvent

The MovementEvent data frame contains details about a single movement. It is used by the movement state to convey one of a number of movements (typically occurring over a sequence of times) for a SignalGroupID.

|  |  |  |
| --- | --- | --- |
| **Name** | **Type** | **Description** |
| eventState | J2735MovementPhaseState | Single constant from enumeration below:   * ***UNAVAILABLE*** * ***DARK*** * ***STOP\_THEN\_PROCEED*** * ***STOP\_AND\_REMAIN*** * ***PRE\_MOVEMENT*** * ***PERMISSIVE\_MOVEMENT\_ALLOWED*** * ***PROTECTED\_MOVEMENT\_ALLOWED*** * ***PERMISSIVE\_CLEARANCE*** * ***PROTECTED\_CLEARANCE*** * ***CAUTION\_CONFLICTING\_TRAFFIC*** |
| timing | [J2735TimeChangeDetails](#_heading=h.aueceyqzqvul) | Optional timing Data in UTC time stamps for event includes start and min/max end times of phase confidence and estimated next occurrence. |
| speeds | [J2735AdvisorySpeedList](#_heading=h.dt15idwy2crx) | Optional various speed advisories for use by general and specific types of vehicles supporting green-wave and other flow needs See Section 11 for converting and translating speed expressed in mph into units of m/s. |

**Table 62 - J2735MovementEvent**

## J2735TimeChangeDetails

Conveys details about the timing of a phase within a movement. The core data concept expressed is the time stamp (time mark) at which the related phase will change to the next state. This is often found in the MinEndTime element, but the other elements may be needed to convey the full concept when adaptive timing is employed.

|  |  |  |
| --- | --- | --- |
| **Name** | **Type** | **Description** |
| startTime | integer | Optional value for when the phase first started. |
| minEndTime | integer | Expected shortest time for the phase to change. |
| maxEndTime | integer | Optional expected longest time for the phase to change. |
| likelyTime | integer | Optional best predicted time for the phase to change based on other data. |
| confidence | integer | Confidence of timing accuracy. |
| nextTime | integer | A rough estimate of when the current phase might occur again. |

**Table 63 - J2735TimeChangeDetails**

## J2735AdvisorySpeedList

|  |  |  |
| --- | --- | --- |
| **Name** | **Type** | **Description** |
| movementEventList | List<[J2735AdvisorySpeed](#_heading=h.oekf3hkfaang)> | The AdvisorySpeedList data frame consists of a list of AdvisorySpeed entries. |

**Table 64 - J2735AdvisorySpeedList**

## J2735AdvisorySpeed

Used to convey a recommended traveling approach speed to an intersection from the message issuer to various travelers and vehicle types.

|  |  |  |
| --- | --- | --- |
| **Name** | **Type** | **Description** |
| type | J2735AdvisorySpeedType | The type of advisory which this is.  Single constant from enumeration below:   * ***NONE*** * ***GREENWAVE*** * ***ECODRIVE*** * ***TRANSIT*** |
| speed | integer | Advised speed for approaching the intersection. (mph) |
| confidence | J2735SpeedConfidence | Optional confidence value for the above speed.  Single constant from enumeration below:   * ***UNAVAILABLE*** * ***PREC100MS*** * ***PREC10MS*** * ***PREC5MS*** * ***PREC1MS*** * ***PREC0\_1MS*** * ***PREC0\_05MS*** * ***PREC0\_01MS*** |
| distance | integer | Optional distance indicates the region for which the advised speed is recommended. (unit is in meters) |
| classId | integer | Optional vehicle types to which it applies when absent. |

**Table 65 - J2735AdvisorySpeed**

## J2735ManeuverAssistList

|  |  |  |
| --- | --- | --- |
| **Name** | **Type** | **Description** |
| maneuverAssistList | List<[J2735ConnectionManeuverAssist](#_heading=h.n501p95xrzxw)> | The ManeuverAssistList data frame consists of a list of ConnectionManeuverAssist entries. |

**Table 66 - J2735ManeuverAssistList**

## J2735ConnectionManeuverAssist

Contains information about the dynamic flow of traffic for the lane(s) and maneuvers in question.

|  |  |  |
| --- | --- | --- |
| **Name** | **Type** | **Description** |
| connectionID | integer | The common connectionID used by all lanes to which this data applies. |
| queueLength | integer | Optional distance from the stop line to the back -- edge of the last vehicle in the queue, as measured along the lane center line. (meters) |
| availableStorageLength | integer | Optional distance (e.g. beginning from the downstream stop-line up to a given distance) with a high probability for successfully executing the connecting maneuver between the two lanes during the current cycle. (meters) |
| waitOnStop | boolean | Optional. If "true", the vehicles on this specific connecting maneuver have to stop on the stop-line and not -- to enter the collision area. |
| pedBicycleDetect | boolean | Optional. True if ANY ped or bicycles are detected crossing the above lanes. Set to false ONLY if there is a high certainty that there are none present, otherwise the element is not sent. |

**Table 67 - J2735ConnectionManeuverAssist**

# OdeMapPayload

Map messages are used to convey many types of geographic road information. At the current time its primary use is to convey one or more intersection lane geometry maps within a single message. The map message content includes such items as complex intersection descriptions, road segment descriptions, high speed curve outlines (used in curve safety messages), and segments of roadway (used in some safety applications). A given single MapData message may convey descriptions of one or more geographic areas or intersections. The contents of this message involve defining the details of indexing systems that are in turn used by other messages to relate additional information (for example, the signal phase and timing via the SPAT message) to events at specific geographic locations on the roadway.

|  |  |  |
| --- | --- | --- |
| **Name** | **Type** | **Description** |
| timeStamp | integer | Optional integer representing the time in UTC. |
| msgIssueRevision | integer | Message revision number. |
| layerType | J2735LayerType | Optional. Used to uniquely identify the type of information to be found in a layer of a geographic map fragment such as an intersection  Single constant from enumeration below:   * ***none*** * ***mixedContent*** * ***generalMapData*** * ***intersectionData*** * ***curveData*** * ***roadwaySectionData*** * ***parkingAreaData*** * ***sharedLaneData*** |
| layerID | integer | Optional. Element used to uniquely identify the layers of a geographic map fragment |
| intersections | [J2735IntersectionGeometryList](#_heading=h.iwkxlzkpwt1e) | Optional. All Intersection definitions. |
| roadSegments | [J2735RoadSegmentList](#_heading=h.4lyhbl3l0pwa) | Optional. All roadway descriptions. |
| dataParameters | [J2735DataParameters](#_heading=h.k7dxxhiwccg2) | Optional. Any meta data regarding the map contents. |
| restrictionList | [J2735RestrictionClassList](#_heading=h.k2pz0tsqwjec) | Optional. Any restriction ID tables which have been established for these Map entries. |

**Table 68 - OdeMapPayload**

## J2735IntersectionGeometryList

|  |  |  |
| --- | --- | --- |
| **Name** | **Type** | **Description** |
| intersectionGeometry | List<[J2735IntersectionGeometry](#_heading=h.xk7w1al7tr8q)> | The IntersectionGeometryList data frame consists of a list of IntersectionGeometry entries. |

**Table 69 - J2735IntersectionGeometryList**

## J2735IntersectionGeometry

A complete description of an intersection's roadway geometry and its allowed navigational paths.

|  |  |  |
| --- | --- | --- |
| **Name** | **Type** | **Description** |
| name | String | Optional. Name for intersection geometry. |
| id | [J2735IntersectionReferenceID](#_heading=h.gq5izbls6jey) | A globally unique value set, consisting of a regionID and intersection ID assignment |
| revision | integer | Revision version for the message intersection. |
| refPoint | [OdePosition3D](#_heading=h.1pxezwc) | The reference from which subsequent data points are offset until a new point is used. |
| laneWidth | integer | Optional. Reference width used by all subsequent lanes unless a new width is given. (cm) |
| speedLimits | [J2735SpeedLimitList](#_heading=h.cpdlfntwva43) | Optional. Reference regulatory speed limits used by all subsequent lanes unless a new speed is given |
| laneSet | [J2735LaneList](#_heading=h.z6nd8hyk8imj) | Data about one or more lanes. |

**Table 70 - J2735IntersectionGeometry**

## J2735SpeedLimitList

|  |  |  |
| --- | --- | --- |
| **Name** | **Type** | **Description** |
| speedLimits | List<[J2735RegulatorySpeedLimit](#_heading=h.xby0zf2r1ys9)> | Consists of a list of RegulatorySpeedLimit entries. |

**Table 71 - J2735SpeedLimitList**

## J2735RegulatorySpeedLimit

Used to convey a regulatory speed about a lane, lanes, or roadway segment.

|  |  |  |
| --- | --- | --- |
| **Name** | **Type** | **Description** |
| type | J2735SpeedLimitType | The type of regulatory speed.  Single constant from enumeration below:   * ***unknown*** * ***maxSpeedInSchoolZone*** * ***maxSpeedInSchoolZoneWhenChildrenArePresent*** * ***maxSpeedInConstructionZone*** * ***vehicleMinSpeed*** * ***vehicleMaxSpeed*** * ***vehicleNightMaxSpeed*** * ***truckMinSpeed*** * ***truckMaxSpeed*** * ***truckNightMaxSpeed*** * ***vehiclesWithTrailersMinSpeed*** * ***vehiclesWithTrailersMaxSpeed*** * ***vehiclesWithTrailersNightMaxSpeed*** |
| speed | decimal | Speed in units of m/s. |

**Table 72 - J2735RegulatorySpeedLimit**

## J2735LaneList

|  |  |  |
| --- | --- | --- |
| **Name** | **Type** | **Description** |
| GenericLane | List<[J2735GenericLane](#_heading=h.5cpvpqua2j88)> | The LaneList data frame consists of a list of GenericLane entries. |

**Table 73 - J2735LaneList**

## J2735GenericLane

Describes the basic attribute information of the lane.

|  |  |  |
| --- | --- | --- |
| **Name** | **Type** | **Description** |
| laneID | integer | The unique ID number assigned to this lane object |
| name | String | Optional. Name for the lane. |
| ingressApproach | integer | Optional. Data element is used to relate the index of an approach, either ingress or egress within the subject lane. |
| egressApproach | integer | Optional. Data element is used to relate the index of an approach, either ingress or egress within the subject lane. |
| laneAttributes | [J2735LaneAttributes](#_heading=h.yad28gxumuxp) | All Attribute information about the basic selected lane type directions of use, geometric co-sharing and type specific attributes. These Attributes are 'lane - global' meaning they are true for the entire length of the lane. |
| maneuvers | [J2735BitString](#_heading=h.ihv636) (12) | Optional. The permitted maneuvers for this lane.  BitString values determined by J2735AllowedManeuvers:   * ***maneuverStraightAllowed*** * ***maneuverLeftAllowed*** * ***maneuverRightAllowed*** * ***maneuverUTurnAllowed*** * ***maneuverLeftTurnOnRedAllowed*** * ***maneuverRightTurnOnRedAllowed*** * ***maneuverLaneChangeAllowed*** * ***maneuverNoStoppingAllowed*** * ***yieldAllwaysRequired,goWithHalt*** * ***caution*** * ***reserved1*** |
| nodeList | [J2735NodeListXY](#_heading=h.v070tpeb24ci) | Lane spatial path information as well as various Attribute information along the node path Attributes found here are more general and may come and go over the length of the lane. |
| connectsTo | [J2735ConnectsToList](#_heading=h.y3t0dpyqdpxi) | Optional. A list of other lanes and their signal group IDs. Each connecting lane and its signal group ID is specified. |
| overlays | [J2735OverlayLaneList](#_heading=h.ednd338zwmu9) | Optional. A list of any lanes which have spatial paths that overlay the path of this lane when used. |

**Table 74 - J2735GenericLane**

## J2735LaneAttributes

Holds all of the constant attribute information of any lane object (as well as denoting the basic lane type itself) within a single structure. Constant attribute information are those values which do not change over the path of the lane, such as the direction of allowed travel.

|  |  |  |
| --- | --- | --- |
| **Name** | **Type** | **Description** |
| directionalUse | [J2735BitString](#_heading=h.ihv636) (2) | Directions of lane use.  BitString values determined by J2735LaneDirection:   * ***ingressPath*** * ***egressPath*** |
| shareWith | [J2735BitString](#_heading=h.ihv636) (10) | Co-users of the lane path.  BitString values determined by J2735LaneSharing:   * ***overlappingLaneDescriptionProvided*** * ***multipleLanesTreatedAsOneLane*** * ***otherNonMotorizedTrafficTypes*** * ***individualMotorizedVehicleTraffic*** * ***busVehicleTraffic*** * ***taxiVehicleTraffic*** * ***pedestriansTraffic*** * ***cyclistVehicleTraffic*** * ***trackedVehicleTraffic*** * ***pedestrianTraffic*** |
| laneType | [J2735LaneTypeAttributes](#_heading=h.jhgtiui35dlx) | Specific lane type data. |

**Table 75 - J2735LaneAttributes**

## J2735LaneTypeAttributes

Used to hold attribute information specific to a given lane type. Only one of the following J2735BitStrings will be filled out per lane. A bike lane cannot also be a trackedVehicle lane, for example.

|  |  |  |
| --- | --- | --- |
| **Name** | **Type** | **Description** |
| vehicle | [J2735BitString](#_heading=h.ihv636) (16) | Motor vehicle lanes.  BitString values determined by J2735LaneAttributesVehicle:   * ***isVehicleRevocableLane*** * ***isVehicleFlyOverLane*** * ***hovLaneUseOnly*** * ***restrictedToBusUse*** * ***restrictedToTaxiUse*** * ***restrictedFromPublicUse*** * ***hasIRbeaconCoverage*** * ***permissionOnRequest*** |
| crosswalk | [J2735BitString](#_heading=h.ihv636) (16) | Pedestrian crosswalks .  BitString values determined by J2735LaneAttributesCrosswalk:   * ***crosswalkRevocableLane*** * ***bicyleUseAllowed*** * ***isXwalkFlyOverLane*** * ***fixedCycleTime*** * ***biDirectionalCycleTimes*** * ***hasPushToWalkButton*** * ***audioSupport*** * ***rfSignalRequestPresent*** * ***unsignalizedSegmentsPresent*** |
| bikeLane | [J2735BitString](#_heading=h.ihv636) (16) | Bike lanes.  BitString values determined by J2735LaneAttributesBike:   * ***bikeRevocableLane*** * ***pedestrianUseAllowed*** * ***isBikeFlyOverLane*** * ***fixedCycleTime*** * ***biDirectionalCycleTimes*** * ***isolatedByBarrier*** * ***unsignalizedSegmentsPresent*** |
| sidewalk | [J2735BitString](#_heading=h.ihv636) (16) | Pedestrian sidewalk paths.  BitString values determined by J2735LaneAttributesSidewalk:   * ***sidewalkRevocableLane*** * ***bicyleUseAllowed*** * ***isSidewalkFlyOverLane*** * ***walkBikes*** |
| median | [J2735BitString](#_heading=h.ihv636) (16) | Medians & channelization.  BitString values determined by J2735LaneAttributesBarrier:   * ***medianRevocableLane*** * ***median*** * ***whiteLineHashing*** * ***stripedLines*** * ***doubleStripedLines*** * ***trafficCones*** * ***constructionBarrier*** * ***trafficChannels*** * ***lowCurbs*** * ***highCurbs*** |
| striping | [J2735BitString](#_heading=h.ihv636) (16) | Roadway markings.  BitString values determined by J2735LaneAttributesStriping:   * ***stripeToConnectingLanesRevocableLane*** * ***stripeDrawOnLeft*** * ***stripeDrawOnRight*** * ***stripeToConnectingLanesLeft*** * ***stripeToConnectingLanesRight*** * ***stripeToConnectingLanesAhead*** |
| trackedVehicle | [J2735BitString](#_heading=h.ihv636) (16) | Trains and trolleys.  BitString values determined by J2735LaneAttributesTrackedVehicle:   * ***specRevocableLane*** * ***specCommuterRailRoadTrack*** * ***specLightRailRoadTrack*** * ***specHeavyRailRoadTrack*** * ***specOtherRailType*** |
| parking | [J2735BitString](#_heading=h.ihv636) (16) | Parking and stopping lanes.  BitString values determined by J2735LaneAttributesParking:   * ***parkingRevocableLane*** * ***parallelParkingInUse*** * ***headInParkingInUse*** * ***doNotParkZone*** * ***parkingForBusUse*** * ***parkingForTaxiUse*** * ***noPublicParkingUse*** |

**Table 76 - J2735LaneTypeAttributes**

## J2735NodeListXY

Data structure provides the sequence of signed offset node point values for determining the Xs and Ys (and possibly Width or Zs when present), using the then current Position3D object to build a path for the centerline of the subject lane type. Each X,Y point is referred to as a Node Point. The straight line paths between these points are referred to as Segments.

|  |  |  |
| --- | --- | --- |
| **Name** | **Type** | **Description** |
| nodes | [J2735NodeSetXY](#_heading=h.dkza9rzdzh3g) | A lane made up of two or more XY node points and any attributes defined in those nodes |
| computed | [J2735ComputedLane](#_heading=h.p9hwzewjoqu0) | A lane path computed by translating the data defined by another lane. |

**Table 77 - J2735NodeListXY**

## J2735NodeSetXY

|  |  |  |
| --- | --- | --- |
| **Name** | **Type** | **Description** |
| NodeXY | List<[J2735NodeXY](#_heading=h.v5h0zue7zwmj)> | The NodeSetXY data frame consists of a list of Node entries using XY offsets. |

**Table 78 - J2735NodeSetXY**

## J2735NodeXY

Data frame presents a structure to hold data for a single node point in a path. Each selected node has an X and Y offset from the prior node point (or a complete lat-long representation in some cases) as well as optional attribute information. The node list for a lane (or other object) is made up of a sequence of these to describe the desired path

|  |  |  |
| --- | --- | --- |
| **Name** | **Type** | **Description** |
| delta | [J2735NodeOffsetPointXY](#_heading=h.u49jfemgixdg) | A choice of which X,Y offset value to use this includes various delta values as well as regional choices. |
| attributes | [J2735NodeAttributeSetXY](#_heading=h.cdp7bojrigdv) | Any optional Attributes which are needed. This includes changes to the current lane width and elevation. |

**Table 79 - J2735NodeXY**

## J2735NodeOffsetPointXY

A structure to hold different sized data frames for a single node point in a lane. Nodes are described in terms of X and Y offsets in units of 1 centimeter (when zoom is 1:1).

|  |  |  |
| --- | --- | --- |
| **Name** | **Type** | **Description** |
| nodeXY1 | [J2735Node\_XY](#_heading=h.25b2l0r) | Node is within 5.11m of last node |
| nodeXY2 | [J2735Node\_XY](#_heading=h.25b2l0r) | node is within 10.23m of last node |
| nodeXY3 | [J2735Node\_XY](#_heading=h.25b2l0r) | node is within 20.47m of last node |
| nodeXY4 | [J2735Node\_XY](#_heading=h.25b2l0r) | node is within 40.96m of last node |
| nodeXY5 | [J2735Node\_XY](#_heading=h.25b2l0r) | node is within 81.91m of last node |
| nodeXY6 | [J2735Node\_XY](#_heading=h.25b2l0r) | node is within 327.67m of last node |
| nodeLatLon | [J2735NodeLLmD64b](#_heading=h.57d9zhpht6ad) | node is a full 32b Lat/Lon range |

**Table 80 - J2735NodeOffsetPointXY**

## J2735NodeLLmD64b

|  |  |  |
| --- | --- | --- |
| **Name** | **Type** | **Description** |
| lon | decimal | Longitude value in decimal degrees. |
| lat | decimal | Latitude value in decimal degrees. |

**Table 81 - J2735NodeLLmD64b**

## J2735NodeAttributeSetXY

Used to convey one or more changes in the attribute set which occur at the node point at which it is used. Some of these attributes persist until the end of the lane or until changed again or turned off. Other attributes have a scope of use which is limited to the node in which they are found. Besides the basic attributes, optional data elements for increasing or decreasing the width and elevation values from the prior values are also provided.

|  |  |  |
| --- | --- | --- |
| **Name** | **Type** | **Description** |
| localNode | [J2735NodeAttributeXYList](#_heading=h.rc0dstoem031) | Optional. Attribute states which pertain to this node point. |
| disabled | [J2735SegmentAttributeXYList](#_heading=h.88arnyfh37xl) | Optional. Attribute states which are disabled at this node point. |
| enabled | [J2735SegmentAttributeXYList](#_heading=h.88arnyfh37xl) | Optional. Attribute states which are enabled at this node point. |
| data | [J2735LaneDataAttributeList](#_heading=h.apok4vqiad4v) | Optional. Attributes which require additional data values. |
| dWidth | integer | Optional. A value added to the current lane width. (cm) |
| dElevation | integer | Optional. A value added to the current Elevation at this node from this node onwards, in 10cm steps. |

**Table 82 - J2735NodeAttributeSetXY**

## J2735NodeAttributeXYList

|  |  |  |
| --- | --- | --- |
| **Name** | **Type** | **Description** |
| localNode | List<[J2735NodeAttributeXY](#_heading=h.kgeoj661lf6t)> (up to 8) | Consists of a list of J2735NodeAttributeXY entries. |

**Table 83 - J2735NodeAttributeXYList**

## J2735NodeAttributeXY

|  |  |  |
| --- | --- | --- |
| **Name** | **Type** | **Description** |
| nodeAttrList | J2735NodeAttribute | Attribute states.  Single constant from enumeration below:   * ***reserved*** * ***stopLine*** * ***roundedCapStyleA*** * ***roundedCapStyleB*** * ***mergePoint*** * ***divergePoint*** * ***downstreamStopLine*** * ***downstreamStartNode*** * ***closedToTraffic*** * ***safeIsland*** * ***curbPresentAtStepOff*** * ***hydrantPresent*** |

**Table 83 - J2735NodeAttributeXY**

## J2735SegmentAttributeXYList

|  |  |  |
| --- | --- | --- |
| **Name** | **Type** | **Description** |
| segAttrList | List<J2735SegmentAttributeXY> (up to 8) | Consists of a list of J2735SegmentAttributeXY enum objects that can be labeled as enabled or disabled for a lane.  Each entry is a single constant from the enumeration below:   * ***reserved*** * ***doNotBlock*** * ***whiteLine*** * ***mergingLaneLeft*** * ***mergingLaneRight*** * ***curbOnLeft*** * ***curbOnRight*** * ***loadingzoneOnLeft*** * ***loadingzoneOnRight*** * ***turnOutPointOnLeft*** * ***turnOutPointOnRight*** * ***adjacentParkingOnLeft*** * ***adjacentParkingOnRight*** * ***adjacentBikeLaneOnLeft*** * ***adjacentBikeLaneOnRight*** * ***sharedBikeLane*** * ***bikeBoxInFront*** * ***transitStopOnLeft*** * ***transitStopOnRight*** * ***transitStopInLane*** * ***sharedWithTrackedVehicle*** * ***safeIsland*** * ***lowCurbsPresent*** * ***rumbleStripPresent*** * ***audibleSignalingPresent*** * ***adaptiveTimingPresent*** * ***rfSignalRequestPresent*** * ***partialCurbIntrusion*** * ***taperToLeft*** * ***taperToRight*** * ***taperToCenterLine*** * ***headInParking*** * ***freeParking*** * ***timeRestrictionsOnParking*** * ***costToPark*** * ***midBlockCurbPresent*** * ***unEvenPavementPresent*** |

**Table 84 - J2735SegmentAttributeXYList**

## J2735LaneDataAttributeList

|  |  |  |
| --- | --- | --- |
| **Name** | **Type** | **Description** |
| localNode | List<[J2735LaneDataAttribute](#_heading=h.fun3tofvjadr)> (up to 8) | Consists of a list of J2735LaneDataAttribute entries. |

**Table 85 - J2735LaneDataAttributeList**

## J2735LaneDataAttribute

Used to relate an attribute and a control value at a node point or along a lane segment from an enumerated list of defined choices. It is then followed by a defined data value associated with it and which is defined elsewhere in this standard.

|  |  |  |
| --- | --- | --- |
| **Name** | **Type** | **Description** |
| pathEndPointAngle | integer | Adjusts final point/width slant of the lane to align with the stop line. With an angle range from negative 150 to positive 150. (degrees) |
| laneCrownPointCenter | integer | Sets the canter of the road bed from the centerline point. In LSB units of 0.3 degrees of angle over a range of -38.1 to + 38.1 degrees. The value -128 shall be used for unknown. The value zero shall be used for angles, which are between -0.15 and +0.15 (degrees) |
| laneCrownPointLeft | integer | Sets the canter of the road bed from the left edge. In LSB units of 0.3 degrees of angle over a range of -38.1 to + 38.1 degrees. The value -128 shall be used for unknown. The value zero shall be used for angles, which are between -0.15 and +0.15 (degrees) |
| laneCrownPointRight | integer | Sets the canter of the road bed from the right edge. In LSB units of 0.3 degrees of angle over a range of -38.1 to + 38.1 degrees. The value -128 shall be used for unknown. The value zero shall be used for angles, which are between -0.15 and +0.15 (degrees) |
| laneAngle | integer | The angle or direction of another lane.  (-180..180)  In units of 1.5 degrees from north the value -180 shall be used to represent data is not available or unknown |
| speedLimits | [J2735SpeedLimitList](#_heading=h.cpdlfntwva43) | Reference regulatory speed limits used by all segments |

**Table 86 - J2735LaneDataAttribute**

## J2735ComputedLane

Used to contain information needed to compute one lane from another (hence the name). This concept is used purely as a means of saving size in the message payload.

|  |  |  |
| --- | --- | --- |
| **Name** | **Type** | **Description** |
| referenceLaneId | integer | The lane ID upon which this computed lane will be based. |
| offsetXaxis | integer | Offset X value to affect all X values from the referenced lane. |
| offsetYaxis | integer | Offset Y value to affect all Y values from the referenced lane. |
| rotateXY | integer | A path rotation value for the entire lane. |
| scaleXaxis | integer | X value for translations or zooming of the path's points. |
| scaleYaxis | integer | Y value for translations or zooming of the path's points. |

**Table 87 - J2735ComputedLane**

## J2735ConnectsToList

|  |  |  |
| --- | --- | --- |
| **Name** | **Type** | **Description** |
| connectsTo | List<[J2735Connection](#_heading=h.e5wqy1ovxi90)> | Used in the generic lane descriptions to provide a sequence of other defined lanes to which each lane connects beyond its stop point. |

**Table 88 - J2735ConnectsToList**

## J2735Connection

Provides data about how the stop line at the end of a single lane connects to another lane beyond its stop point.

|  |  |  |
| --- | --- | --- |
| **Name** | **Type** | **Description** |
| connectingLane | [J2735ConnectingLane](#_heading=h.udwooljyy8p2) | The index of the connecting lane and also the maneuver from the current lane to it. |
| remoteIntersection | [J2735IntersectionReferenceID](#_heading=h.gq5izbls6jey) | Optional. This entry is only used when the indicated connecting lane belongs to another intersection layout. |
| signalGroup | integer | Optional. The matching signal group sent by the SPaT message for this lane/maneuver. |
| userClass | integer | Optional. The Restriction Class of users this applies to. |
| connectionID | integer | Optional. An optional connection index used to relate this lane connection to any dynamic clearance data in the SPaT. |

**Table 89 - J2735Connection**

## J2735ConnectingLane

Ties a single lane to a single maneuver needed to reach it from another lane.

|  |  |  |
| --- | --- | --- |
| **Name** | **Type** | **Description** |
| lane | integer | The index of the connecting lane. |
| maneuver | [J2735BitString](#_heading=h.ihv636) (12) | Optional. The maneuver between the enclosing lane and this lane at the stop line to connect them.  BitString values determined by J2735AllowedManeuvers:   * ***maneuverStraightAllowed*** * ***maneuverLeftAllowed*** * ***maneuverRightAllowed*** * ***maneuverUTurnAllowed*** * ***maneuverLeftTurnOnRedAllowed*** * ***maneuverRightTurnOnRedAllowed*** * ***maneuverLaneChangeAllowed*** * ***maneuverNoStoppingAllowed*** * ***yieldAllwaysRequired,goWithHalt*** * ***caution*** * ***reserved1*** |

**Table 90 - J2735ConnectingLane**

## J2735OverlayLaneList

|  |  |  |
| --- | --- | --- |
| **Name** | **Type** | **Description** |
| laneIds | List<integer> | A list of the unique ID numbers for any lane object which have spatial paths that overlay. |

**Table 91 - J2735OverlayLaneList**

## J2735RoadSegmentList

|  |  |  |
| --- | --- | --- |
| **Name** | **Type** | **Description** |
| roadSegList | List<[J2735RoadSegment](#_heading=h.yuwnvfoq1qhb)> | Consists of a list of J2735RoadSegment entries. |

**Table 92 - J2735RoadSegmentList**

## J2735RoadSegment

A complete description of a RoadSegment including its geometry and its allowed navigational paths (independent of any additional regulatory restrictions that may apply over time or from user classification) and any current disruptions such as a work zone or incident event.

|  |  |  |
| --- | --- | --- |
| **Name** | **Type** | **Description** |
| name | String | Optional. Name for intersection geometry. |
| id | [J2735RoadSegmentReferenceID](#_heading=h.57qf18cuyufe) | A globally unique value set, consisting of a regionID and intersection ID assignment |
| revision | integer | Revision version for the message intersection. |
| refPoint | [OdePosition3D](#_heading=h.1pxezwc) | The reference from which subsequent data points are offset until a new point is used. |
| laneWidth | integer | Optional. Reference width used by all subsequent lanes unless a new width is given. (cm) |
| speedLimits | [J2735SpeedLimitList](#_heading=h.cpdlfntwva43) | Optional. Reference regulatory speed limits used by all subsequent lanes unless a new speed is given |
| roadLaneSet | [J2735RoadLaneSetList](#_heading=h.k3am3bxi0gp4) | Data about one or more lanes. |

**Table 93 - J2735RoadSegment**

## J2735RoadSegmentReferenceID

Used to convey theRoadSegmentID which is unique to a given road segment of interest, and also the RoadRegulatorID assigned to the region in which it is operating.

|  |  |  |
| --- | --- | --- |
| **Name** | **Type** | **Description** |
| region | integer | Optional. A globally unique regional assignment value. |
| id | integer | A unique mapping to the road segment in question within the above region of use during its period of assignment and use. Note that unlike intersectionID values, this value can be reused by the region. |

**Table 94 - J2735RoadSegmentReferenceID**

## J2735RoadLaneSetList

|  |  |  |
| --- | --- | --- |
| **Name** | **Type** | **Description** |
| roadLanes | List<[J2735GenericLane](#_heading=h.5cpvpqua2j88)> | The roadLanes data frame consists of a list of GenericLane entries. |

**Table 95 - J2735RoadLaneSetList**

## J2735DataParameters

Used to provide basic (static) information on how a map fragment was processed or determined.

|  |  |  |
| --- | --- | --- |
| **Name** | **Type** | **Description** |
| processMethod | String | Optional. Details how the message was processed. |
| processAgency | String | Optional. Details which agency performed the processing of the message. |
| lastCheckedDate | String | Optional. Details the last checked date. |
| geoidUsed | String | Optional. Details the geoid used. |

**Table 96 - J2735DataParameters**

## J2735RestrictionClassList

Used to enumerate a list of user classes which belong to a given assigned index. The resulting collection is treated as a group by the signal controller when it issues movement data (signal phase information) with the GroupID for this group. This data frame is typically static for long periods of time (months) and conveyed to the user by means of the MAP message.

|  |  |  |
| --- | --- | --- |
| **Name** | **Type** | **Description** |
| restrictionList | List<[J2735RestrictionClassAssignment](#_heading=h.b1edqwht4h6y)> | The restrictionList data frame consists of a list of RestrictionClassAssignmnet entries. |

**Table 97 - J2735RestrictionClassList**

## J2735RestrictionClassAssignment

|  |  |  |
| --- | --- | --- |
| **Name** | **Type** | **Description** |
| id | integer | The unique value (within an intersection or local region) that is assigned to this group of users. |
| users | [J2735RestrictionUserTypeList](#_heading=h.hlrfua9q0ohk) | The list of user types/classes to which this restriction ID applies. |

**Table 98 - J2735RestrictionClassAssignment**

## J2735RestrictionUserTypeList

|  |  |  |
| --- | --- | --- |
| **Name** | **Type** | **Description** |
| restrictionUserType | List<[J2735RestrictionUserType](#_heading=h.5pmvk7l4dugw)> | Consists of a list of RestrictionUserType entries. |

**Table 99 - J2735RestrictionUserTypeList**

## J2735RestrictionUserType

Used to provide a means to select one, and only one, user type or class from a number of well-known lists. The selected entry is then used in the overall Restriction Class assignment process.

|  |  |  |
| --- | --- | --- |
| **Name** | **Type** | **Description** |
| basicType | J2735RestrictionAppliesTo | A set of the most commonly used types.  Single constant from enumeration below:   * ***none*** * ***equippedTransit*** * ***equippedTaxis*** * ***equippedOther*** * ***emissionCompliant*** * ***equippedBicycle*** * ***weightCompliant*** * ***heightCompliant*** * ***pedestrians*** * ***slowMovingPersons*** * ***wheelchairUsers*** * ***visualDisabilities*** * ***audioDisabilities*** * ***otherUnknownDisabilities*** |

**Table 100 - J2735RestrictionUserType**

# OdeSrmPayload

The signal request message (SRM) is used for either a priority signal request or a preemption signal request depending on the way each request is set. Each request defines a path through the intersection which is desired in terms of lanes and approaches to be used. Each request can also contain the time of arrival and the expected duration of the service.

|  |  |  |
| --- | --- | --- |
| **Name** | **Type** | **Description** |
| timeStamp | integer | Optional. Integer representing the minute of the year in UTC. |
| second | integer | The value of seconds in the minute in ms. |
| sequenceNumber | integer | Optional. Sequence number of the message relative to previou sent SRMs. |
| requests | [J2735SignalRequestList](#_heading=h.kpngui4hcrri) | Optional. Request Data for one or more signalized intersections that support SRM dialogs. |
| requestor | [J2735RequestorDescription](#_heading=h.wdiwn1mo0ma9) | Requesting device and other user data. Contains vehicle ID (if from a vehicle), type data, current position and may contain additional transit data. |

**Table 101 - OdeSrmPayload**

## J2735SignalRequestList

|  |  |  |
| --- | --- | --- |
| **Name** | **Type** | **Description** |
| signalRequestPackage | List<[J2735SignalRequestPackage](#_heading=h.11nbauk7dxv9)> | Data frame consists of a list of SignalRequest entries. |

**Table 102 - J2735SignalRequestList**

## J2735SignalRequestPackage

Contains both the service request itself (the preemption and priority details and the inbound-outbound path details for an intersection) and the time period (start and end time) over which this service is sought from one single intersection.

|  |  |  |
| --- | --- | --- |
| **Name** | **Type** | **Description** |
| request | [J2735SignalRequest](#_heading=h.6qkusfwkwdvl) | The specific request to the intersection. Contains IntersectionID, request type, requested action (approach/lane request). |
| minute | integer | Optional. Estimated time of arrival based on minute. |
| second | integer | Optional. Estimated time of arrival based on second. |
| duration | integer | Optional. The duration value is used to provide a short interval that extends the ETA so that the requesting vehicle can arrive at the point of service with uncertainty or with some desired duration of service. |

**Table 103 - J2735SignalRequestPackage**

## J2735SignalRequest

Used (as part of a request message) to request either a priority or a preemption service from a signalized intersection.

|  |  |  |
| --- | --- | --- |
| **Name** | **Type** | **Description** |
| id | [J2735IntersectionReferenceID](#_heading=h.gq5izbls6jey) | The unique ID of the target intersection. |
| requestID | integer | The unique request ID used by the requestor. |
| requestType | J2735PriorityRequestType | The type of request or cancel for priority or preempt use when a prior request is canceled, only the requestID is needed.  Single constant from enumeration below:   * ***priorityRequestTypeReserved*** * ***priorityRequest*** * ***priorityRequestUpdate*** * ***priorityCancellation*** |
| inBoundLane | [J2735IntersectionAccessPoint](#_heading=h.jwdhedrz5abk) | Desired entry approach or lane. |
| outBoundLane | [J2735IntersectionAccessPoint](#_heading=h.jwdhedrz5abk) | Optional. Desired exit approach or lane. |

**Table 104 - J2735SignalRequest**

## J2735IntersectionAccessPoint

Used to specify the index of either a single approach or a single lane at which a service is needed. Only one of the following will be populated in a single request.

|  |  |  |
| --- | --- | --- |
| **Name** | **Type** | **Description** |
| lane | integer | Specified lane for signal request. |
| approach | integer | Specified approach for signal request. |
| connection | integer | Specified connection for signal request. |

**Table 105 - J2735IntersectionAccessPoint**

## J2735RequestorDescription

|  |  |  |
| --- | --- | --- |
| **Name** | **Type** | **Description** |
| id | [J2735VehicleID](#_heading=h.5lur20ls8chl) | The ID used in the BSM or CAM of the requestor. This ID is presumed not to change during the exchange |
| type | [J2735RequestorType](#_heading=h.uqqnuixcl0tn) | Optional. Information regarding all type and class data about the requesting vehicle. |
| position | [J2735RequestorPositionVector](#_heading=h.a86oq1sk49u0) | Optional. The location of the requesting vehicle. |
| name | String | Optional. A human readable name for the requestor. |
| routeName | String | Optional. A string for transit operations use. |
| transitStatus | [J2735BitString](#_heading=h.ihv636) (8) | Optional. Current vehicle state.  BitString values determined by J2735TransitVehicleStatusNames:   * ***loading*** * ***anADAuse*** * ***aBikeLoad*** * ***doorOpen*** * ***charging*** * ***atStopLine*** |
| transitOccupancy | J2735TransitVehicleOccupancy | Optional. Current vehicle occupancy.  Single constant from enumeration below:   * ***occupancyUnknown*** * ***occupancyEmpty*** * ***occupancyVeryLow*** * ***occupancyLow*** * ***occupancyMed*** * ***occupancyHigh*** * ***occupancyNearlyFull*** * ***occupancyFull*** |
| transitSchedule | integer | Optional. Current vehicle schedule adherence. |

**Table 106 - J2735RequestorDescription**

## J2735VehicleID

Used to contain either a (US) TemporaryID or an (EU) StationID in a simple frame. These two different value domains are used to uniquely identify a vehicle or other object in these two regional DSRC environments. Only one of the two fields will be populated.

|  |  |  |
| --- | --- | --- |
| **Name** | **Type** | **Description** |
| entityID | String | Unique String ID. Support for US. |
| stationID | integer | Unique integer ID. Support for EU. |

**Table 107 - J2735VehicleID**

## J2735RequestorType

Used when a vehicle is requesting a signal preemption or priority service call from the signal controller in an intersection. This data frame provides the details of the requestor class taxonomy required to support the request.

|  |  |  |
| --- | --- | --- |
| **Name** | **Type** | **Description** |
| role | J2735BasicVehicleRole | Basic role of this user at this time.  Single constant from enumeration below:   * ***basicVehicle*** * ***publicTransport*** * ***specialTransport*** * ***dangerousGoods*** * ***roadWork*** * ***roadRescue*** * ***emergency*** * ***safetyCar*** * ***none\_unknown*** * ***truck*** * ***motorcycle*** * ***roadSideSource*** * ***police*** * ***fire*** * ***ambulance*** * ***dot*** * ***transit*** * ***slowMoving*** * ***stopNgo*** * ***cyclist*** * ***pedestrian*** * ***nonMotorized*** * ***military*** |
| subrole | J2735RequestSubRole | Optional. A local list with role based items.  Single constant from enumeration below:   * ***requestSubRoleUnKnown*** * ***requestSubRole1*** * ***requestSubRole2*** * ***requestSubRole3*** * ***requestSubRole4*** * ***requestSubRole5*** * ***requestSubRole6*** * ***requestSubRole7*** * ***requestSubRole8*** * ***requestSubRole9*** * ***requestSubRole10*** * ***requestSubRole11*** * ***requestSubRole12*** * ***requestSubRole13*** * ***requestSubRole14*** * ***requestSubRoleReserved*** |
| request | J2735RequestImportanceLevel | Optional. A local list with request items.  Single constant from enumeration below:   * ***requestImportanceLevelUnKnown*** * ***requestImportanceLevel1*** * ***requestImportanceLevel2*** * ***requestImportanceLevel3*** * ***requestImportanceLevel4*** * ***requestImportanceLevel5*** * ***requestImportanceLevel6*** * ***requestImportanceLevel7*** * ***requestImportanceLevel8*** * ***requestImportanceLevel9*** * ***requestImportanceLevel10*** * ***requestImportanceLevel11*** * ***requestImportanceLevel12*** * ***requestImportanceLevel13*** * ***requestImportanceLevel14*** * ***requestImportanceReserved*** |
| iso3883 | integer | Optional. Represents the value domain provided by ISO 3833 for general vehicle types. (0..100) |
| hpmsType | J2735VehicleType | Optional. HPMS classification types.  Single constant from enumeration below:   * ***none*** * ***unknown*** * ***special*** * ***moto*** * ***car*** * ***carOther*** * ***bus*** * ***axleCnt2*** * ***axleCnt3*** * ***axleCnt4*** * ***axleCnt4Trailer*** * ***axleCnt5Trailer*** * ***axleCnt6Trailer*** * ***axleCnt5MultiTrailer*** * ***axleCnt6MultiTrailer*** * ***axleCnt7MultiTrailer*** |

**Table 108 - J2735RequestorType**

## J2735RequestorPositionVector

|  |  |  |
| --- | --- | --- |
| **Name** | **Type** | **Description** |
| position | [OdePosition3D](#_heading=h.1pxezwc) | Requestor’s position. |
| heading | decimal | Optional. Requestor’s heading. (decimal degrees) |
| speed | [J2735TransmissionAndSpeed](#_heading=h.1egqt2p) | Optional. Requestor’s speed. (m/s) |

**Table 109 - J2735RequestorPositionVector**

# OdeSsmPayload

The signal status message (SSM) is a message sent by an RSU in a signalized intersection. It is used to relate the current status of the signal and the collection of pending or active preemption or priority requests acknowledged by the controller. It is also used to send information about preemption or priority requests which were denied.

|  |  |  |
| --- | --- | --- |
| **Name** | **Type** | **Description** |
| timeStamp | integer | Optional. Integer representing the minute of the year in UTC for the response. |
| second | integer | The value of seconds in the minute in ms for the response. |
| sequenceNumber | integer | Optional. Sequence number of the message relative to previou sent SSMs. |
| status | [J2735SignalStatusList](#_heading=h.z7lb22epsuaq) | Status Data for one of more signalized intersections. |

**Table 110 - OdeSsmPayload**

## J2735SignalStatusList

|  |  |  |
| --- | --- | --- |
| **Name** | **Type** | **Description** |
| signalStatus | List<[J2735SignalStatus](#_heading=h.2wh00nd3ijor)> | Data frame consists of a list of SignalStatus entries. |

**Table 111 - J2735SignalStatusList**

## J2735SignalStatus

|  |  |  |
| --- | --- | --- |
| **Name** | **Type** | **Description** |
| sequenceNumber | integer | Changes whenever the below contents have changed. |
| id | [J2735IntersectionReferenceID](#_heading=h.gq5izbls6jey) | This provides a unique mapping to the intersection map in question which provides complete location and approach/movement/lane data. |
| sigStatus | [J2735SignalStatusPackageList](#_heading=h.44u6y2m87py4) | A list of detailed status containing all priority or preemption state data, both active and pending, and who requested it. |

**Table 112 - J2735SignalStatus**

## J2735SignalStatusPackageList

|  |  |  |
| --- | --- | --- |
| **Name** | **Type** | **Description** |
| signalStatusPackage | List<[J2735SignalStatusPackage](#_heading=h.mnm933t0972a)> | Data frame consists of a list of SignalStatusPackage entries. |

**Table 113 - J2735SignalStatusPackageList**

## J2735SignalStatusPackage

|  |  |  |
| --- | --- | --- |
| **Name** | **Type** | **Description** |
| requestor | [J2735SignalRequestorInfo](#_heading=h.7lvbrdf6rt9) | Optional. The party that made the initial SRM request. |
| inboundOn | [J2735IntersectionAccessPoint](#_heading=h.jwdhedrz5abk) | The lanes or approaches used in the request |
| outboundOn | [J2735IntersectionAccessPoint](#_heading=h.jwdhedrz5abk) | Optional. The lanes or approaches used in the request |
| minute | integer | Optional. The Estimated Time of Arrival (ETA) when the service is requested. |
| second | integer | Optional. The Estimated Time of Arrival (ETA) when the service is requested. |
| duration | integer | Optional. The Estimated Time of Arrival (ETA) when the service is requested. |
| status | J2735PrioritizationResponseStatus | Status of request, this may include rejection.  Single constant from enumeration below:   * ***unknown*** * ***requested*** * ***processing*** * ***watchOtherTraffic*** * ***granted*** * ***rejected*** * ***maxPresence*** * ***reserviceLocked*** |

**Table 114 - J2735SignalStatusPackage**

## J2735SignalRequestorInfo

|  |  |  |
| --- | --- | --- |
| **Name** | **Type** | **Description** |
| id | [J2735VehicleID](#_heading=h.5lur20ls8chl) | Requestor vehicle ID. |
| request | integer | Requestor’s request ID. |
| sequenceNumber | integer | Requestor’s request sequenceNumber. |
| role | J2735BasicVehicleRole | Optional. The requestor’s vehicle role.  Single constant from enumeration below:   * ***basicVehicle*** * ***publicTransport*** * ***specialTransport*** * ***dangerousGoods*** * ***roadWork*** * ***roadRescue*** * ***emergency*** * ***safetyCar*** * ***none\_unknown*** * ***truck*** * ***motorcycle*** * ***roadSideSource*** * ***police*** * ***fire*** * ***ambulance*** * ***dot*** * ***transit*** * ***slowMoving*** * ***stopNgo*** * ***cyclist*** * ***pedestrian*** * ***nonMotorized*** * ***military*** |
| typeData | [J2735RequestorType](#_heading=h.uqqnuixcl0tn) | Optional. Used when additional data besides the role is needed, at which point the role entry above is not sent. |

**Table 115 - J2735SignalRequestorInfo**

# Sample Data

## Sample TIM Data

Due to the fact that XML standard does not support array construct, arrays must be embedded into another object in order to maintain separation from the other elements within a structure. Additionally, since there is no indicator in XML to identify an array, an array with only one element will be represented as a simple object.

In the following samples those data elements that appear as JSON Object but may come as JSON array if there were more than one child element are highlighted in ***bold-face*** font. Conversely, those elements that appear as JSON Array but may come as JSON object if only one child element exists are also highlight in ***bold-face*** font.

### ODE Broadcast TIM

This is sample TIM broadcast *request* message received from TMC. A TIM broadcast request is translated into a J2735 XER encoded TravelerInformation message, then encoded into ASN.1 binary Unaligned Packed Encoding Rule (UPER) format and finally deposited on to RSUs or SDW. This sample message format is before conversion to [J2735 Broadcast](#_heading=h.2afmg28)

{

"metadata": {

"request": {

"ode": {

"verb": "POST",

"version": 2,

},

"rsus": [

{

"rsuIndex": 10

"rsuTarget": "127.0.0.1",

"rsuUsername": "username",

"rsuRetries": 1,

"rsuTimeout": 1000,

"rsuPassword": "\*"

}

],

"snmp": {

"mode": 1,

"deliverystop": "2018-01-01T17:47:11-05:15",

"rsuid": "00000083",

"deliverystart": "2017-06-01T17:47:11-05:00",

"enable": 1,

"channel": 178,

"msgid": 31,

"interval": 2,

"status": 4

}

},

"payloadType": "us.dot.its.jpo.ode.model.OdeMsgPayload",

"serialId": {

"streamId": "cf02ba48-be29-4da9-b2a7-4ec34eeb831c",

"bundleSize": 1,

"bundleId": 0,

"recordId": 0,

"serialNumber": 0

},

"odeReceivedAt": "2018-09-09T20:00:36.952Z",

"schemaVersion": 6,

"recordGeneratedAt": "2017-03-13T01:07:11-05:00",

"recordGeneratedBy": "TMC",

"sanitized": false

},

"payload": {

"dataType": "us.dot.its.jpo.ode.plugin.j2735.OdeTravelerInformationMessage",

"data": {

"msgCnt": 13,

"timeStamp": "2017-03-13T01:07:11-05:00",

"packetID": "EC9C236B0000000000",

"urlB": "null",

"dataframes": [

{

"sspTimRights": 0,

"frameType": "advisory",

"msgId": {

"roadSignID": {

"position": {

"latitude": 41.678473,

"longitude": -108.782775,

"elevation": 917.1432

},

"viewAngle": "1010101010101010",

"mutcdCode": "warning",

"crc": "0000000000000000"

}

},

"startDateTime": "2017-12-01T17:47:11-05:00",

"durationTime": 22,

"priority": 0,

"sspLocationRights": 3,

"regions": [

{

"name": "bob",

"regulatorID": 23,

"segmentID": 33,

"anchorPosition": {

"latitude": 41.678473,

"longitude": -108.782775,

"elevation": 917.1432

},

"laneWidth": 7,

"directionality": 3,

"closedPath": false,

"direction": "1010101010101010",

"description": "geometry",

"geometry": {

"direction": "1010101010101010",

"extent": 1,

"laneWidth": 33,

"circle": {

"position": {

"latitude": 41.678473,

"longitude": -108.782775,

"elevation": 917.1432

},

"radius": 15,

"units": 7

}

}

}

],

"sspMsgTypes": 2,

"sspMsgContent": 3,

"content": "Advisory",

"items": [

"125",

"some text",

"250",

"'98765"

],

"url": "null"

}

]

}

}

}

### Received TIM from rxMsg

ODE receives TIM messages from OBU via RSU in binary ANS.1 UPER encoded format. ODE decodes the message into JSON and publishes it to the relevant topics for consumption by client applications. Below is a sample JSON decoded TIM message received by ODE.

{

"metadata": {

"securityResultCode": "unknown",

"recordGeneratedBy": "RSU",

"schemaVersion": "7",

"odePacketID": "",

"sanitized": "false",

"recordType": "rxMsg",

"recordGeneratedAt": "2023-11-06T16:49:27.583Z",

"maxDurationTime": "0",

"odeTimStartDateTime": "",

"receivedMessageDetails": {

"locationData": {

"elevation": "1494",

"heading": "0",

"latitude": "40.4740464",

"speed": "0",

"longitude": "-104.9692306"

},

"rxSource": "RSU"

},

"payloadType": "us.dot.its.jpo.ode.model.OdeTimPayload",

"serialId": {

"recordId": "278",

"serialNumber": "974",

"streamId": "4d5c6487-564e-4b8b-8ec3-c686f5575044",

"bundleSize": "279",

"bundleId": "5"

},

"logFileName": "rxMsg\_commsignia\_tim.gz",

"asn

"odeReceivedAt": "2024-08-12T23:26:33.500Z",

"originIp": ""

},

"payload": {

"data": {

"MessageFrame": {

"messageId": "31",

"value": {

"TravelerInformation": {

"packetID": "000000000019400DB8",

"dataFrames": {

"TravelerDataFrame": {

"notUsed": "1",

"durationTime": "18720",

"regions": {

"GeographicalPath": {

"closedPath": {

"false": ""

},

"anchor": {

"elevation": "0",

"lat": "404744115",

"long": "-1049690138"

},

"laneWidth": "1000",

"directionality": {

"both": ""

},

"description": {

"path": {

"offset": {

"xy": {

"nodes": {

"NodeXY": [

{

"delta": {

"node-LatLon": {

"lon": "-1049669003",

"lat": "404756357"

}

},

"attributes": {

"dElevation": "-20"

}

},

{

"delta": {

"node-LatLon": {

"lon": "-1049684023",

"lat": "404747543"

}

},

"attributes": {

"dElevation": "20"

}

},

{

"delta": {

"node-LatLon": {

"lon": "-1049702477",

"lat": "404736035"

}

},

"attributes": {

"dElevation": "10"

}

},

{

"delta": {

"node-LatLon": {

"lon": "-1049713956",

"lat": "404730730"

}

}

}

]

}

}

}

}

},

"direction": "1111111111111111"

}

},

"startYear": "2023",

"notUsed2": "1",

"frameType": {

"advisory": ""

},

"msgId": {

"roadSignID": {

"viewAngle": "1111111111111111",

"mutcdCode": {

"warning": ""

},

"position": {

"elevation": "0",

"lat": "404744115",

"long": "-1049690138"

}

}

},

"notUsed3": "1",

"startTime": "372541",

"notUsed1": "1",

"priority": "5",

"content": {

"advisory": {

"SEQUENCE": {

"item": {

"itis": "4083"

}

}

}

}

}

},

"msgCnt": "1"

}

}

}

},

"dataType": "TravelerInformation"

}

}

### Sample Distress Notification Message (dnMsg)

ODE receives Distress Notifications in the form of TIM messages from OBU via RSU in binary ANS.1 UPER encoded format. ODE decodes the message into JSON and publishes it to the relevant topics for consumption by client applications. Below is a sample JSON decoded distress notification message received by ODE.

{

"metadata": {

"securityResultCode": "success",

"recordGeneratedBy": "OBU",

"schemaVersion": "7",

"odePacketID": "",

"sanitized": "false",

"recordType": "dnMsg",

"recordGeneratedAt": "2018-05-02T16:47:45.603Z",

"maxDurationTime": "0",

"odeTimStartDateTime": "",

"receivedMessageDetails": {

"locationData": {

"elevation": "1372.4",

"heading": "297.3",

"latitude": "40.5655211",

"speed": "0.46",

"longitude": "-105.0323263"

},

"rxSource": "NA"

},

"payloadType": "us.dot.its.jpo.ode.model.OdeTimPayload",

"serialId": {

"recordId": "0",

"serialNumber": "975",

"streamId": "4d5c6487-564e-4b8b-8ec3-c686f5575044",

"bundleSize": "1",

"bundleId": "6"

},

"logFileName": "dnMsg.gz",

"asn1": "001F809D6332AAEBD3BAFF02000000000000240428555D42D03840765374B51D4B2BC76B126580C83FFFE0063165787C6CDD2D467316577CFD4DD2D531316577B834DD2D6CB316577AB94DD2DA39316577AA3CDD2E694316577A35CDD2F71B3165779AACDD2FB3831657783BCDD2FCEC08403010A0084E16ABCF2F24127769E9A70F4CB91044D3CFA72CBCF9C2B5B2E8D38F6655B0F661E7CDD20ABBB5EEDFDF7000",

"odeReceivedAt": "2024-08-12T23:38:51.076Z",

"originIp": ""

},

"payload": {

"data": {

"MessageFrame": {

"messageId": "31",

"value": {

"TravelerInformation": {

"timeStamp": "174827",

"packetID": "D3BAFF020000000000",

"dataFrames": {

"TravelerDataFrame": {

"notUsed": "1",

"durationTime": "2880",

"regions": {

"GeographicalPath": {

"anchor": {

"elevation": "14742",

"lat": "405662581",

"long": "-1050326099"

},

"laneWidth": "400",

"directionality": {

"forward": ""

},

"description": {

"path": {

"offset": {

"xy": {

"nodes": {

"NodeXY": [

{

"delta": {

"node-LatLon": {

"lon": "-1050329714",

"lat": "405662567"

}

}

},

{

"delta": {

"node-LatLon": {

"lon": "-1050335237",

"lat": "405662769"

}

}

},

{

"delta": {

"node-LatLon": {

"lon": "-1050335993",

"lat": "405663179"

}

}

},

{

"delta": {

"node-LatLon": {

"lon": "-1050336397",

"lat": "405664057"

}

}

},

{

"delta": {

"node-LatLon": {

"lon": "-1050336440",

"lat": "405667220"

}

}

},

{

"delta": {

"node-LatLon": {

"lon": "-1050336660",

"lat": "405671451"

}

}

},

{

"delta": {

"node-LatLon": {

"lon": "-1050336938",

"lat": "405672504"

}

}

},

{

"delta": {

"node-LatLon": {

"lon": "-1050337672",

"lat": "405672940"

}

}

}

]

}

}

}

}

},

"direction": "1111111111111111"

}

},

"notUsed2": "1",

"frameType": {

"advisory": ""

},

"msgId": {

"furtherInfoID": "0214"

},

"notUsed3": "1",

"startTime": "174826",

"notUsed1": "1",

"priority": "7",

"content": {

"advisory": {

"SEQUENCE": [

{

"item": {

"itis": "532"

}

},

{

"item": {

"itis": "531"

}

},

{

"item": {

"text": "User Initiated Distress"

}

},

{

"item": {

"text": "Vehicle-Class: Unknown"

}

}

]

}

}

}

},

"msgCnt": "51"

}

}

}

},

"dataType": "TravelerInformation"

}

}

### J2735 Broadcast TIM

This is sample J2735 TIM broadcast message. A [TIM broadcast request](#_heading=h.1jlao46) is received from TMC and then translated into a J2735 XER encoded TravelerInformation message, then encoded into ASN.1 binary Unaligned Packed Encoding Rule (UPER) format and finally deposited on to RSUs or SDW. This is the message after it has gone through the J2735 conversion.

{

"metadata": {

"request": {

"ode": {

"verb": "POST",

"version": 2,

},

***"rsus": {***

***"rsus": {***

"rsuTarget": "127.0.0.3",

"rsuUsername": "v3user",

"rsuRetries": 1,

"rsuTimeout": 1000,

"rsuPassword": "\*",

"rsuIndex": 10

***}***

***},***

"snmp": {

"mode": 1,

"deliverystop": "2018-01-01T17:47:11-05:15",

"rsuid": "00000083",

"deliverystart": "2017-06-01T17:47:11-05:00",

"enable": 1,

"channel": 178,

"msgid": 31,

"interval": 2,

"status": 4

}

},

"recordGeneratedBy": "TMC",

"schemaVersion": 6,

"payloadType": "us.dot.its.jpo.ode.model.OdeTimPayload",

"serialId": {

"recordId": 0,

"serialNumber": 0,

"streamId": "957ed6d1-ea50-4e22-92f1-86e0e7ec72d3",

"bundleSize": 1,

"bundleId": 0

},

"sanitized": false,

"recordGeneratedAt": "2017-03-13T06:07:11Z",

"odeReceivedAt": "2018-11-09T20:52:28.846Z"

},

"payload": {

"data": {

"MessageFrame": {

"messageId": 31,

"value": {

"TravelerInformation": {

"timeStamp": 102607,

"packetID": "EC9C236B0000000000",

"urlB": null,

"dataFrames": {

***"TravelerDataFrame": {***

"regions": {

***"GeographicalPath": {***

"closedPath": {

"false": ""

},

"anchor": {

"elevation": 9171,

"lat": 416784730,

"long": -1087827750

},

"name": "bob",

"laneWidth": 700,

"directionality": {

"both": ""

},

"description": {

"geometry": {

"extent": 1,

"laneWidth": 3300,

"circle": {

"center": {

"elevation": 9171,

"latitude": 416784730,

"longitude": -1087827750

},

"units": 7,

"radius": 15

},

"direction": 1010101010101010

}

},

"id": {

"id": 33,

"region": 23

},

"direction": 1010101010101010

}

},

"sspMsgRights1": 2,

"duratonTime": 22,

"sspMsgRights2": 3,

"startYear": 2017,

"msgId": {

"roadSignID": {

"crc": "0000",

"viewAngle": 1010101010101010,

"mutcdCode": {

"warning": ""

},

"position": {

"elevation": 9171,

"latitude": 416784730,

"longitude": -1087827750

}

}

},

"priority": 0,

"url": null,

"content": {

"advisory": {

***"SEQUENCE": [***

{

"item": {

"itis": 125

}

},

{

"item": {

"text": "some text"

}

},

{

"item": {

"itis": 250

}

},

{

"item": {

"text": 98765

}

}

]

}

},

"sspTimRights": 0,

"sspLocationRights": 3,

"frameType": {

"advisory": ""

},

"startTime": 482027

}

},

"msgCnt": 13

}

}

}

},

"dataType": "TravelerInformation"

}

}

## Sample Driver Alert

ODE receives Driver Alert messages from OBU via RSU in binary format. ODE decodes the message into JSON and publishes it to the relevant topics for consumption by client applications. Below is a sample JSON decoded Driver Alert message received, transformed and published by the ODE.

{

"metadata": {

"logFileName": "driverAlert\_1525191732\_fe80\_\_226\_adff\_fe05\_14b1.csv.gz",

"recordType": "driverAlert",

"receivedMessageDetails": {

"locationData": {

"latitude": "40.565498",

"longitude": "-105.0318336",

"elevation": "1513",

"speed": "1.32",

"heading": "93.95"

}

},

"payloadType": "us.dot.its.jpo.ode.model.OdeDriverAlertPayload",

"serialId": {

"streamId": "36075134-73bb-425e-bd08-4170804b1402",

"bundleSize": 1,

"bundleId": 3,

"recordId": 2,

"serialNumber": 0

},

"odeReceivedAt": "2018-05-01T21:34:03.367Z",

"schemaVersion": 6,

"recordGeneratedAt": "2018-05-01T15:27:13.520Z",

"recordGeneratedBy": "OBU",

"sanitized": false

},

"payload": {

"alert": "BSW"

}

}

## Sample BSM Data

### BSM from bsmTx

ODE receives BSM messages from OBU via RSU in binary ANS.1 UPER encoded format. ODE decodes, transforms, converts it to JSON and publishes it to the relevant topics for consumption by client applications. Below is a sample JSON decoded BSM message generated by the Ego Vehicle (EV), received, decoded, transformed and published by the ODE.

{

"metadata": {

"bsmSource": "EV",

"logFileName": "bsmTx.bin",

"recordType": "bsmTx",

"securityResultCode": "success",

"receivedMessageDetails": {

"locationData": {

"latitude": "40.5657881",

"longitude": "-105.0316742",

"elevation": "1489",

"speed": "0.4",

"heading": "267.4"

}

},

"payloadType": "us.dot.its.jpo.ode.model.OdeBsmPayload",

"serialId": {

"streamId": "a3a896e0-7464-4cb6-a4b1-ca49290bb118",

"bundleSize": 16,

"bundleId": 0,

"recordId": 0,

"serialNumber": 0

},

"odeReceivedAt": "2018-12-14T16:43:03.162Z",

"schemaVersion": 6,

"recordGeneratedAt": "2018-05-01T15:55:55.494Z",

"recordGeneratedBy": "OBU",

"sanitized": false

},

"payload": {

"dataType": "us.dot.its.jpo.ode.plugin.j2735.J2735Bsm",

"data": {

"coreData": {

"msgCnt": 37,

"id": "31325433",

"secMark": 25399,

"position": {

"latitude": 40.5659938,

"longitude": -105.0317754,

"elevation": 1440.9

},

"accelSet": {

"accelLat": 0,

"accelLong": 0.27,

"accelVert": 0,

"accelYaw": 0

},

"accuracy": {

"semiMajor": 9.3,

"semiMinor": 12.05

},

"transmission": "NEUTRAL",

"speed": 0.28,

"heading": 313.25,

"brakes": {

"wheelBrakes": {

"leftFront": false,

"rightFront": false,

"unavailable": true,

"leftRear": false,

"rightRear": false

},

"traction": "unavailable",

"abs": "unavailable",

"scs": "unavailable",

"brakeBoost": "unavailable",

"auxBrakes": "unavailable"

},

"size": {

"width": 190,

"length": 570

}

},

"partII": [

{

"id": "VehicleSafetyExtensions",

"value": {

"pathHistory": {

"crumbData": [

{

"elevationOffset": -0.6,

"latOffset": -0.0000113,

"lonOffset": 0.0000181,

"timeOffset": 1.9

},

{

"elevationOffset": -2.3,

"latOffset": -0.000031,

"lonOffset": 0.0000472,

"timeOffset": 6.1

},

{

"elevationOffset": -1.4,

"latOffset": -0.0000103,

"lonOffset": 0.0000636,

"timeOffset": 15.7

},

{

"elevationOffset": -1.3,

"latOffset": -0.0000052,

"lonOffset": 0.0000615,

"timeOffset": 18.7

},

{

"elevationOffset": -1.7,

"latOffset": 0.0000614,

"lonOffset": 0.000115,

"timeOffset": 25.89

},

{

"elevationOffset": 0.7,

"latOffset": 0.0001878,

"lonOffset": 0.0002503,

"timeOffset": 39.59

},

{

"elevationOffset": 3.1,

"latOffset": 0.0002333,

"lonOffset": 0.0002816,

"timeOffset": 45.39

},

{

"elevationOffset": 3.9,

"latOffset": 0.0002187,

"lonOffset": 0.0002952,

"timeOffset": 49.59

},

{

"elevationOffset": 4.6,

"latOffset": 0.0001976,

"lonOffset": 0.0002721,

"timeOffset": 56.99

},

{

"elevationOffset": 8.4,

"latOffset": 0.0001891,

"lonOffset": 0.0003655,

"timeOffset": 60.5

},

{

"elevationOffset": 13.7,

"latOffset": 0.0002022,

"lonOffset": 0.0004886,

"timeOffset": 63.49

},

{

"elevationOffset": 14.4,

"latOffset": 0.0001973,

"lonOffset": 0.0004861,

"timeOffset": 67.6

},

{

"elevationOffset": 14.4,

"latOffset": 0.0001795,

"lonOffset": 0.0004815,

"timeOffset": 72.7

},

{

"elevationOffset": 13.5,

"latOffset": 0.000171,

"lonOffset": 0.0004749,

"timeOffset": 75.7

},

{

"elevationOffset": 12.1,

"latOffset": 0.0001609,

"lonOffset": 0.0004566,

"timeOffset": 78.8

}

]

},

"pathPrediction": {

"confidence": 0,

"radiusOfCurve": 0

}

}

},

{

"id": "SupplementalVehicleExtensions",

"value": {}

}

]

}

}

}

### BSM from bsmLogDuringEvent

ODE receives BSM messages from OBU via RSU in binary ANS.1 UPER encoded format. ODE decodes, transforms, converts it to JSON and publishes it to the relevant topics for consumption by client applications. Below is a sample JSON decoded BSM message generated by the Ego Vehicle (EV) during and event, received, decoded, transformed and published by the ODE.

{

"metadata": {

"bsmSource": "RV",

"logFileName": "bsmLogDuringEvent.bin",

"recordType": "bsmLogDuringEvent",

"securityResultCode": "success",

"receivedMessageDetails": {

"locationData": {

"latitude": "40.565771",

"longitude": "-105.0318108",

"elevation": "1487",

"speed": "0.14",

"heading": "205.975"

}

},

"payloadType": "us.dot.its.jpo.ode.model.OdeBsmPayload",

"serialId": {

"streamId": "a3a896e0-7464-4cb6-a4b1-ca49290bb118",

"bundleSize": 222,

"bundleId": 1,

"recordId": 221,

"serialNumber": 237

},

"odeReceivedAt": "2018-12-14T16:46:23.651Z",

"schemaVersion": 6,

"recordGeneratedAt": "2018-05-01T16:04:23.694Z",

"recordGeneratedBy": "OBU",

"sanitized": false

},

"payload": {

"dataType": "us.dot.its.jpo.ode.plugin.j2735.J2735Bsm",

"data": {

"coreData": {

"msgCnt": 95,

"id": "31325431",

"secMark": 23794,

"position": {

"latitude": 40.5657318,

"longitude": -105.0318485,

"elevation": 1472.8

},

"accelSet": {

"accelLat": 0,

"accelLong": 0.52,

"accelVert": 0,

"accelYaw": 0

},

"accuracy": {

"semiMajor": 12.7,

"semiMinor": 12.4

},

"transmission": "NEUTRAL",

"speed": 0.1,

"heading": 250.9125,

"brakes": {

"wheelBrakes": {

"leftFront": false,

"rightFront": false,

"unavailable": true,

"leftRear": false,

"rightRear": false

},

"traction": "unavailable",

"abs": "unavailable",

"scs": "unavailable",

"brakeBoost": "unavailable",

"auxBrakes": "unavailable"

},

"size": {

"width": 190,

"length": 570

}

},

"partII": [

{

"id": "VehicleSafetyExtensions",

"value": {

"pathHistory": {

"crumbData": [

{

"elevationOffset": 0.3,

"latOffset": -0.0000044,

"lonOffset": -0.0000106,

"timeOffset": 0.59

},

{

"elevationOffset": 1.5,

"latOffset": 0.0000141,

"lonOffset": 0.0000047,

"timeOffset": 6.99

},

{

"elevationOffset": 2.8,

"latOffset": 0.0000385,

"lonOffset": 0.0000206,

"timeOffset": 15.09

},

{

"elevationOffset": 4.2,

"latOffset": 0.0000394,

"lonOffset": 0.0000051,

"timeOffset": 23.19

},

{

"elevationOffset": 8.6,

"latOffset": 0.0000586,

"lonOffset": 0.0000595,

"timeOffset": 37.89

},

{

"elevationOffset": 10.2,

"latOffset": 0.0000866,

"lonOffset": 0.0001174,

"timeOffset": 43.8

},

{

"elevationOffset": 8.5,

"latOffset": 0.0001026,

"lonOffset": 0.0001127,

"timeOffset": 49.2

},

{

"elevationOffset": -0.1,

"latOffset": 0.0001183,

"lonOffset": 0.0000434,

"timeOffset": 55.6

},

{

"elevationOffset": -8.1,

"latOffset": 0.0001101,

"lonOffset": -0.0000274,

"timeOffset": 59.09

},

{

"elevationOffset": -14.2,

"latOffset": 0.0001019,

"lonOffset": -0.0000492,

"timeOffset": 61.19

},

{

"elevationOffset": -19,

"latOffset": 0.0000944,

"lonOffset": -0.0000738,

"timeOffset": 63.49

},

{

"elevationOffset": -31.4,

"latOffset": 0.0000826,

"lonOffset": -0.0001389,

"timeOffset": 69.19

},

{

"elevationOffset": -39.8,

"latOffset": 0.0000788,

"lonOffset": -0.0001748,

"timeOffset": 73.09

},

{

"elevationOffset": -46.7,

"latOffset": 0.0000753,

"lonOffset": -0.0002035,

"timeOffset": 78.89

},

{

"elevationOffset": -48.9,

"latOffset": 0.0000831,

"lonOffset": -0.0002563,

"timeOffset": 82.09

}

]

},

"pathPrediction": {

"confidence": 0,

"radiusOfCurve": 0

}

}

},

{

"id": "SupplementalVehicleExtensions",

"value": {}

}

]

}

}

}

### BSM from rxMsg

ODE receives BSM messages from OBU via RSU in binary ANS.1 UPER encoded format. ODE decodes, transforms, converts it to JSON and publishes it to the relevant topics for consumption by client applications. Below is a sample JSON decoded BSM message received by the Ego Vehicle (EV) from a Remove Vehicle (RV) and reported to ODE. Ode has decoded, transformed and published the BSM.

{

"metadata": {

"bsmSource": "RV",

"logFileName": "rxMsg\_1525638388\_2620%3A31%3A40e0%3A802%3A%3A1.csv",

"recordType": "rxMsg",

"securityResultCode": "inconsistentInputParameters",

"receivedMessageDetails": {

"locationData": {

"latitude": "0",

"longitude": "0",

"elevation": "0",

"speed": "0",

"heading": "0"

},

"rxSource": "RV"

},

"payloadType": "us.dot.its.jpo.ode.model.OdeBsmPayload",

"serialId": {

"streamId": "2ef1bea6-804e-4646-9b18-658425bb8a14",

"bundleSize": 1,

"bundleId": 4,

"recordId": 2,

"serialNumber": 0

},

"odeReceivedAt": "2018-05-09T16:29:30.349Z",

"schemaVersion": 6,

"recordGeneratedAt": "2018-05-06T20:26:28.690Z",

"recordGeneratedBy": "OBU",

"sanitized": false

},

"payload": {

"dataType": "us.dot.its.jpo.ode.plugin.j2735.J2735Bsm",

"data": {

"coreData": {

"msgCnt": 127,

"id": "CB950124",

"secMark": 28589,

"position": {

"latitude": 41.2827318,

"longitude": -105.5912184,

"elevation": 2179.1

},

"accelSet": {

"accelLat": 0,

"accelLong": -0.6,

"accelVert": 0,

"accelYaw": 2.29

},

"accuracy": {

"semiMajor": 2.45,

"semiMinor": 3.1

},

"transmission": "NEUTRAL",

"speed": 7.52,

"heading": 82.4375,

"brakes": {

"wheelBrakes": {

"leftFront": false,

"rightFront": false,

"unavailable": true,

"leftRear": false,

"rightRear": false

},

"traction": "unavailable",

"abs": "unavailable",

"scs": "unavailable",

"brakeBoost": "unavailable",

"auxBrakes": "unavailable"

},

"size": {

"width": 190,

"length": 409

}

},

"partII": [

{

"id": "VehicleSafetyExtensions",

"value": {

"pathHistory": {

"crumbData": [

{

"elevationOffset": 0,

"latOffset": 0.0000118,

"lonOffset": 0.0000937,

"timeOffset": 1

},

{

"elevationOffset": -0.1,

"latOffset": 0.0000692,

"lonOffset": 0.0002635,

"timeOffset": 2.79

},

{

"elevationOffset": -0.3,

"latOffset": 0.0001574,

"lonOffset": 0.0003623,

"timeOffset": 4.19

},

{

"elevationOffset": -0.4,

"latOffset": 0.0002872,

"lonOffset": 0.0004046,

"timeOffset": 5.7

},

{

"elevationOffset": -1.1,

"latOffset": 0.0008191,

"lonOffset": 0.0003202,

"timeOffset": 9.69

},

{

"elevationOffset": -1.8,

"latOffset": 0.0017064,

"lonOffset": 0.0001896,

"timeOffset": 14.2

}

]

},

"pathPrediction": {

"confidence": 10,

"radiusOfCurve": 97.5

}

}

},

{

"id": "SupplementalVehicleExtensions",

"value": {

"classDetails": {

"fuelType": "unknownFuel",

"hpmsType": "none",

"keyType": 0,

"regional": [],

"role": "basicVehicle"

},

"vehicleData": {

"height": 1.5

},

"weatherProbe": {},

"regional": []

}

}

]

}

}

}

## Sample SPaT Data

### SPaT from OdeSpatJson

ODE receives SPaT messages from a RSU in binary ANS.1 UPER encoded format. ODE decodes, transforms, converts it to JSON and publishes it to the relevant topics for consumption by client applications. Below is a sample JSON decoded SPaT message transmitted by a RSU and forward to the ODE over the UDP ingest port 44910.

{

"metadata": {

"logFileName": "",

"recordType": "spatTx",

"securityResultCode": "success",

"receivedMessageDetails": {

"rxSource": "NA"

},

"payloadType": "us.dot.its.jpo.ode.model.OdeSpatPayload",

"serialId": {

"streamId": "faba1896-9599-4f41-923c-2b70a81296a0",

"bundleSize": 1,

"bundleId": 0,

"recordId": 0,

"serialNumber": 0

},

"odeReceivedAt": "2024-08-12T23:34:01.745Z",

"schemaVersion": 7,

"maxDurationTime": 0,

"recordGeneratedAt": "",

"recordGeneratedBy": "RSU",

"sanitized": false,

"odePacketID": "",

"odeTimStartDateTime": "",

"asn1": "001338000817A780000089680500204642B342B34802021A15A955A940181190ACD0ACD20100868555C555C00104342AAE2AAE002821A15571557000",

"spatSource": "RSU",

"originIp": "172.18.0.1",

"isCertPresent": false

},

"payload": {

"data": {

"intersectionStateList": {

"intersectionStatelist": [

{

"id": {

"id": 12111

},

"revision": 0,

"status": {

"failureFlash": false,

"noValidSPATisAvailableAtThisTime": false,

"fixedTimeOperation": false,

"standbyOperation": false,

"trafficDependentOperation": false,

"manualControlIsEnabled": false,

"off": false,

"stopTimeIsActivated": false,

"recentChangeInMAPassignedLanesIDsUsed": false,

"recentMAPmessageUpdate": false,

"failureMode": false,

"noValidMAPisAvailableAtThisTime": false,

"signalPriorityIsActive": false,

"preemptIsActive": false

},

"timeStamp": 35176,

"states": {

"movementList": [

{

"signalGroup": 2,

"state\_time\_speed": {

"movementEventList": [

{

"eventState": "PROTECTED\_MOVEMENT\_ALLOWED",

"timing": {

"minEndTime": 22120,

"maxEndTime": 22121

}

}

]

}

},

{

"signalGroup": 4,

"state\_time\_speed": {

"movementEventList": [

{

"eventState": "STOP\_AND\_REMAIN",

"timing": {

"minEndTime": 22181,

"maxEndTime": 22181

}

}

]

}

},

{

"signalGroup": 6,

"state\_time\_speed": {

"movementEventList": [

{

"eventState": "PROTECTED\_MOVEMENT\_ALLOWED",

"timing": {

"minEndTime": 22120,

"maxEndTime": 22121

}

}

]

}

},

{

"signalGroup": 8,

"state\_time\_speed": {

"movementEventList": [

{

"eventState": "STOP\_AND\_REMAIN",

"timing": {

"minEndTime": 21852,

"maxEndTime": 21852

}

}

]

}

},

{

"signalGroup": 1,

"state\_time\_speed": {

"movementEventList": [

{

"eventState": "STOP\_AND\_REMAIN",

"timing": {

"minEndTime": 21852,

"maxEndTime": 21852

}

}

]

}

},

{

"signalGroup": 5,

"state\_time\_speed": {

"movementEventList": [

{

"eventState": "STOP\_AND\_REMAIN",

"timing": {

"minEndTime": 21852,

"maxEndTime": 21852

}

}

]

}

}

]

}

}

]

}

},

"dataType": "us.dot.its.jpo.ode.plugin.j2735.J2735SPAT"

}

}

## Sample MAP Data

### MAP from OdeMapJson

ODE receives MAP messages from a RSU in binary ANS.1 UPER encoded format. ODE decodes, transforms, converts it to JSON and publishes it to the relevant topics for consumption by client applications. Below is a sample JSON decoded MAP message transmitted by a RSU and forward to the ODE over the UDP ingest port 44920.

{

"metadata": {

"logFileName": "",

"recordType": "mapTx",

"securityResultCode": "success",

"receivedMessageDetails": {

"locationData": null,

"rxSource": "NA"

},

"encodings": null,

"payloadType": "us.dot.its.jpo.ode.model.OdeMapPayload",

"serialId": {

"streamId": "baaf1097-de07-4e96-9e27-7793023cb130",

"bundleSize": 1,

"bundleId": 0,

"recordId": 0,

"serialNumber": 0

},

"odeReceivedAt": "2022-03-16T16:51:39.141756Z",

"schemaVersion": 6,

"maxDurationTime": 0,

"recordGeneratedAt": "",

"recordGeneratedBy": null,

"sanitized": false,

"odePacketID": "",

"odeTimStartDateTime": "",

"mapSource": "RSU",

"originIp": "10.11.81.12"

},

"payload": {

"data": {

"timeStamp": null,

"msgIssueRevision": 2,

"layerType": "intersectionData",

"layerID": 0,

"intersections": {

"intersectionGeometry": [

{

"name": null,

"id": {

"region": null,

"id": 12109

},

"revision": 2,

"refPoint": {

"latitude": 39.5880413,

"longitude": -105.0908854,

"elevation": 1691.0

},

"laneWidth": 366,

"speedLimits": null,

"laneSet": {

"GenericLane": [

{

"laneID": 1,

"name": null,

"ingressApproach": 1,

"egressApproach": null,

"laneAttributes": {

"directionalUse": {

"ingressPath": true,

"egressPath": false

},

"shareWith": {

"busVehicleTraffic": false,

"trackedVehicleTraffic": false,

"individualMotorizedVehicleTraffic": false,

"taxiVehicleTraffic": false,

"overlappingLaneDescriptionProvided": false,

"cyclistVehicleTraffic": false,

"otherNonMotorizedTrafficTypes": false,

"multipleLanesTreatedAsOneLane": false,

"pedestrianTraffic": false,

"pedestriansTraffic": false

},

"laneType": {

"vehicle": {

"isVehicleRevocableLane": false,

"isVehicleFlyOverLane": false,

"permissionOnRequest": false,

"hasIRbeaconCoverage": false,

"restrictedToBusUse": false,

"restrictedToTaxiUse": false,

"restrictedFromPublicUse": false,

"hovLaneUseOnly": false

},

"crosswalk": null,

"bikeLane": null,

"sidewalk": null,

"median": null,

"striping": null,

"trackedVehicle": null,

"parking": null

}

},

"maneuvers": {

"maneuverStraightAllowed": true,

"maneuverNoStoppingAllowed": false,

"goWithHalt": false,

"maneuverLeftAllowed": false,

"maneuverUTurnAllowed": false,

"maneuverLeftTurnOnRedAllowed": false,

"reserved1": false,

"maneuverRightAllowed": false,

"maneuverLaneChangeAllowed": false,

"yieldAllwaysRequired": false,

"maneuverRightTurnOnRedAllowed": false,

"caution": false

},

"nodeList": {

"computed": null,

"nodes": {

"NodeXY": [

{

"delta": {

"nodeXY1": null,

"nodeXY2": null,

"nodeXY3": {

"x": 1511,

"y": -1514

},

"nodeXY4": null,

"nodeXY5": null,

"nodeXY6": null,

"nodeLatLon": null

},

"attributes": null

},

{

"delta": {

"nodeXY1": null,

"nodeXY2": null,

"nodeXY3": null,

"nodeXY4": {

"x": 723,

"y": -3116

},

"nodeXY5": null,

"nodeXY6": null,

"nodeLatLon": null

},

"attributes": {

"localNode": null,

"disabled": null,

"enabled": null,

"data": null,

"dWidth": null,

"dElevation": 10

}

},

{

"delta": {

"nodeXY1": null,

"nodeXY2": null,

"nodeXY3": null,

"nodeXY4": {

"x": 892,

"y": -3818

},

"nodeXY5": null,

"nodeXY6": null,

"nodeLatLon": null

},

"attributes": {

"localNode": null,

"disabled": null,

"enabled": null,

"data": null,

"dWidth": null,

"dElevation": 20

}

},

{

"delta": {

"nodeXY1": null,

"nodeXY2": null,

"nodeXY3": null,

"nodeXY4": {

"x": 702,

"y": -2507

},

"nodeXY5": null,

"nodeXY6": null,

"nodeLatLon": null

},

"attributes": {

"localNode": null,

"disabled": null,

"enabled": null,

"data": null,

"dWidth": null,

"dElevation": 20

}

},

{

"delta": {

"nodeXY1": null,

"nodeXY2": null,

"nodeXY3": null,

"nodeXY4": {

"x": 681,

"y": -2412

},

"nodeXY5": null,

"nodeXY6": null,

"nodeLatLon": null

},

"attributes": {

"localNode": null,

"disabled": null,

"enabled": null,

"data": null,

"dWidth": null,

"dElevation": 10

}

},

{

"delta": {

"nodeXY1": null,

"nodeXY2": null,

"nodeXY3": null,

"nodeXY4": {

"x": 827,

"y": -2798

},

"nodeXY5": null,

"nodeXY6": null,

"nodeLatLon": null

},

"attributes": {

"localNode": null,

"disabled": null,

"enabled": null,

"data": null,

"dWidth": null,

"dElevation": 10

}

},

{

"delta": {

"nodeXY1": null,

"nodeXY2": null,

"nodeXY3": null,

"nodeXY4": {

"x": 1176,

"y": -3614

},

"nodeXY5": null,

"nodeXY6": null,

"nodeLatLon": null

},

"attributes": {

"localNode": null,

"disabled": null,

"enabled": null,

"data": null,

"dWidth": null,

"dElevation": 20

}

},

{

"delta": {

"nodeXY1": null,

"nodeXY2": null,

"nodeXY3": {

"x": 683,

"y": -1992

},

"nodeXY4": null,

"nodeXY5": null,

"nodeXY6": null,

"nodeLatLon": null

},

"attributes": null

},

{

"delta": {

"nodeXY1": null,

"nodeXY2": null,

"nodeXY3": null,

"nodeXY4": {

"x": 1000,

"y": -2818

},

"nodeXY5": null,

"nodeXY6": null,

"nodeLatLon": null

},

"attributes": {

"localNode": null,

"disabled": null,

"enabled": null,

"data": null,

"dWidth": null,

"dElevation": 10

}

},

{

"delta": {

"nodeXY1": null,

"nodeXY2": null,

"nodeXY3": {

"x": 466,

"y": -1295

},

"nodeXY4": null,

"nodeXY5": null,

"nodeXY6": null,

"nodeLatLon": null

},

"attributes": {

"localNode": null,

"disabled": null,

"enabled": null,

"data": null,

"dWidth": null,

"dElevation": 20

}

},

{

"delta": {

"nodeXY1": null,

"nodeXY2": null,

"nodeXY3": null,

"nodeXY4": null,

"nodeXY5": {

"x": 2505,

"y": -6164

},

"nodeXY6": null,

"nodeLatLon": null

},

"attributes": {

"localNode": null,

"disabled": null,

"enabled": null,

"data": null,

"dWidth": null,

"dElevation": 20

}

},

{

"delta": {

"nodeXY1": null,

"nodeXY2": null,

"nodeXY3": null,

"nodeXY4": null,

"nodeXY5": null,

"nodeXY6": {

"x": 6037,

"y": -13380

},

"nodeLatLon": null

},

"attributes": {

"localNode": null,

"disabled": null,

"enabled": null,

"data": null,

"dWidth": null,

"dElevation": 70

}

}

]

}

},

"connectsTo": {

"connectsTo": [

{

"connectingLane": {

"lane": 15,

"maneuver": {

"maneuverStraightAllowed": true,

"maneuverNoStoppingAllowed": false,

"goWithHalt": false,

"maneuverLeftAllowed": false,

"maneuverUTurnAllowed": false,

"maneuverLeftTurnOnRedAllowed": false,

"reserved1": false,

"maneuverRightAllowed": false,

"maneuverLaneChangeAllowed": false,

"yieldAllwaysRequired": false,

"maneuverRightTurnOnRedAllowed": false,

"caution": false

}

},

"remoteIntersection": null,

"signalGroup": 2,

"userClass": null,

"connectionID": 1

}

]

},

"overlays": null

},

{

"laneID": 2,

"name": null,

"ingressApproach": 1,

"egressApproach": null,

"laneAttributes": {

"directionalUse": {

"ingressPath": true,

"egressPath": false

},

"shareWith": {

"busVehicleTraffic": false,

"trackedVehicleTraffic": false,

"individualMotorizedVehicleTraffic": false,

"taxiVehicleTraffic": false,

"overlappingLaneDescriptionProvided": false,

"cyclistVehicleTraffic": false,

"otherNonMotorizedTrafficTypes": false,

"multipleLanesTreatedAsOneLane": false,

"pedestrianTraffic": false,

"pedestriansTraffic": false

},

"laneType": {

"vehicle": {

"isVehicleRevocableLane": false,

"isVehicleFlyOverLane": false,

"permissionOnRequest": false,

"hasIRbeaconCoverage": false,

"restrictedToBusUse": false,

"restrictedToTaxiUse": false,

"restrictedFromPublicUse": false,

"hovLaneUseOnly": false

},

"crosswalk": null,

"bikeLane": null,

"sidewalk": null,

"median": null,

"striping": null,

"trackedVehicle": null,

"parking": null

}

},

"maneuvers": {

"maneuverStraightAllowed": true,

"maneuverNoStoppingAllowed": false,

"goWithHalt": false,

"maneuverLeftAllowed": false,

"maneuverUTurnAllowed": false,

"maneuverLeftTurnOnRedAllowed": false,

"reserved1": false,

"maneuverRightAllowed": false,

"maneuverLaneChangeAllowed": false,

"yieldAllwaysRequired": false,

"maneuverRightTurnOnRedAllowed": false,

"caution": false

},

"nodeList": {

"computed": null,

"nodes": {

"NodeXY": [

{

"delta": {

"nodeXY1": null,

"nodeXY2": null,

"nodeXY3": {

"x": 1192,

"y": -1619

},

"nodeXY4": null,

"nodeXY5": null,

"nodeXY6": null,

"nodeLatLon": null

},

"attributes": null

},

{

"delta": {

"nodeXY1": null,

"nodeXY2": null,

"nodeXY3": null,

"nodeXY4": {

"x": 807,

"y": -3733

},

"nodeXY5": null,

"nodeXY6": null,

"nodeLatLon": null

},

"attributes": {

"localNode": null,

"disabled": null,

"enabled": null,

"data": null,

"dWidth": null,

"dElevation": 30

}

},

{

"delta": {

"nodeXY1": null,

"nodeXY2": null,

"nodeXY3": null,

"nodeXY4": null,

"nodeXY5": {

"x": 1010,

"y": -4226

},

"nodeXY6": null,

"nodeLatLon": null

},

"attributes": {

"localNode": null,

"disabled": null,

"enabled": null,

"data": null,

"dWidth": null,

"dElevation": 10

}

},

{

"delta": {

"nodeXY1": null,

"nodeXY2": null,

"nodeXY3": null,

"nodeXY4": null,

"nodeXY5": {

"x": 1612,

"y": -5477

},

"nodeXY6": null,

"nodeLatLon": null

},

"attributes": {

"localNode": null,

"disabled": null,

"enabled": null,

"data": null,

"dWidth": null,

"dElevation": 30

}

},

{

"delta": {

"nodeXY1": null,

"nodeXY2": null,

"nodeXY3": null,

"nodeXY4": {

"x": 1142,

"y": -3648

},

"nodeXY5": null,

"nodeXY6": null,

"nodeLatLon": null

},

"attributes": {

"localNode": null,

"disabled": null,

"enabled": null,

"data": null,

"dWidth": null,

"dElevation": 20

}

},

{

"delta": {

"nodeXY1": null,

"nodeXY2": null,

"nodeXY3": null,

"nodeXY4": {

"x": 1131,

"y": -3343

},

"nodeXY5": null,

"nodeXY6": null,

"nodeLatLon": null

},

"attributes": {

"localNode": null,

"disabled": null,

"enabled": null,

"data": null,

"dWidth": null,

"dElevation": 10

}

},

{

"delta": {

"nodeXY1": null,

"nodeXY2": null,

"nodeXY3": null,

"nodeXY4": null,

"nodeXY5": {

"x": 2259,

"y": -6170

},

"nodeXY6": null,

"nodeLatLon": null

},

"attributes": {

"localNode": null,

"disabled": null,

"enabled": null,

"data": null,

"dWidth": null,

"dElevation": 30

}

},

{

"delta": {

"nodeXY1": null,

"nodeXY2": null,

"nodeXY3": null,

"nodeXY4": null,

"nodeXY5": {

"x": 2359,

"y": -5737

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"nodeXY6": null,

"nodeLatLon": null

},

"attributes": {

"localNode": null,

"disabled": null,

"enabled": null,

"data": null,

"dWidth": null,

"dElevation": 30

}

},

{

"delta": {

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"nodeXY2": null,

"nodeXY3": null,

"nodeXY4": null,

"nodeXY5": null,

"nodeXY6": {

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"y": -11774

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"nodeLatLon": null

},

"attributes": {

"localNode": null,

"disabled": null,

"enabled": null,

"data": null,

"dWidth": null,

"dElevation": 50

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}

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"maneuverNoStoppingAllowed": false,

"goWithHalt": false,

"maneuverLeftAllowed": false,

"maneuverUTurnAllowed": false,

"maneuverLeftTurnOnRedAllowed": false,

"reserved1": false,

"maneuverRightAllowed": false,

"maneuverLaneChangeAllowed": false,

"yieldAllwaysRequired": false,

"maneuverRightTurnOnRedAllowed": false,

"caution": false

}

},

"remoteIntersection": null,

"signalGroup": 2,

"userClass": null,

"connectionID": 1

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]

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"overlays": null

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"name": null,

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"egressApproach": null,

"laneAttributes": {

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"ingressPath": true,

"egressPath": false

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"shareWith": {

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"trackedVehicleTraffic": false,

"individualMotorizedVehicleTraffic": false,

"taxiVehicleTraffic": false,

"overlappingLaneDescriptionProvided": false,

"cyclistVehicleTraffic": false,

"otherNonMotorizedTrafficTypes": false,

"multipleLanesTreatedAsOneLane": false,

"pedestrianTraffic": false,

"pedestriansTraffic": false

},

"laneType": {

"vehicle": {

"isVehicleRevocableLane": false,

"isVehicleFlyOverLane": false,

"permissionOnRequest": false,

"hasIRbeaconCoverage": false,

"restrictedToBusUse": false,

"restrictedToTaxiUse": false,

"restrictedFromPublicUse": false,

"hovLaneUseOnly": false

},

"crosswalk": null,

"bikeLane": null,

"sidewalk": null,

"median": null,

"striping": null,

"trackedVehicle": null,

"parking": null

}

},

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"goWithHalt": false,

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"maneuverUTurnAllowed": false,

"maneuverLeftTurnOnRedAllowed": false,

"reserved1": false,

"maneuverRightAllowed": false,

"maneuverLaneChangeAllowed": false,

"yieldAllwaysRequired": false,

"maneuverRightTurnOnRedAllowed": false,

"caution": false

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"nodeXY4": null,

"nodeXY5": null,

"nodeXY6": null,

"nodeLatLon": null

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"attributes": {

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"disabled": null,

"enabled": null,

"data": null,

"dWidth": null,

"dElevation": 10

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"nodeXY2": null,

"nodeXY3": {

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"y": -1813

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"nodeXY4": null,

"nodeXY5": null,

"nodeXY6": null,

"nodeLatLon": null

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"attributes": null

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"nodeXY6": null,

"nodeLatLon": null

},

"attributes": {

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"enabled": null,

"data": null,

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"dElevation": 30

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"y": -872

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"nodeXY3": null,

"nodeXY4": null,

"nodeXY5": null,

"nodeXY6": null,

"nodeLatLon": null

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"attributes": null

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"y": -482

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"nodeXY2": null,

"nodeXY3": null,

"nodeXY4": null,

"nodeXY5": null,

"nodeXY6": null,

"nodeLatLon": null

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"enabled": null,

"data": null,

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}

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"goWithHalt": false,

"maneuverLeftAllowed": true,

"maneuverUTurnAllowed": false,

"maneuverLeftTurnOnRedAllowed": false,

"reserved1": false,

"maneuverRightAllowed": false,

"maneuverLaneChangeAllowed": false,

"yieldAllwaysRequired": false,

"maneuverRightTurnOnRedAllowed": false,

"caution": false

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"signalGroup": 2,

"userClass": null,

"connectionID": 1

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"overlays": null

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"egressApproach": 2,

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"egressPath": true

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"shareWith": {

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"trackedVehicleTraffic": false,

"individualMotorizedVehicleTraffic": false,

"taxiVehicleTraffic": false,

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"cyclistVehicleTraffic": false,

"otherNonMotorizedTrafficTypes": false,

"multipleLanesTreatedAsOneLane": false,

"pedestrianTraffic": false,

"pedestriansTraffic": false

},

"laneType": {

"vehicle": {

"isVehicleRevocableLane": false,

"isVehicleFlyOverLane": false,

"permissionOnRequest": false,

"hasIRbeaconCoverage": false,

"restrictedToBusUse": false,

"restrictedToTaxiUse": false,

"restrictedFromPublicUse": false,

"hovLaneUseOnly": false

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"bikeLane": null,

"sidewalk": null,

"median": null,

"striping": null,

"trackedVehicle": null,

"parking": null

}

},

"maneuvers": null,

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"nodeXY2": null,

"nodeXY3": null,

"nodeXY4": {

"x": -988,

"y": -2151

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"nodeXY5": null,

"nodeXY6": null,

"nodeLatLon": null

},

"attributes": {

"localNode": null,

"disabled": null,

"enabled": null,

"data": null,

"dWidth": null,

"dElevation": 20

}

},

{

"delta": {

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"x": 69,

"y": -329

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"nodeXY2": null,

"nodeXY3": null,

"nodeXY4": null,

"nodeXY5": null,

"nodeXY6": null,

"nodeLatLon": null

},

"attributes": null

}

]

}

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"connectsTo": null,

"overlays": null

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"name": null,

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"egressApproach": 2,

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"egressPath": true

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"shareWith": {

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"trackedVehicleTraffic": false,

"individualMotorizedVehicleTraffic": false,

"taxiVehicleTraffic": false,

"overlappingLaneDescriptionProvided": false,

"cyclistVehicleTraffic": false,

"otherNonMotorizedTrafficTypes": false,

"multipleLanesTreatedAsOneLane": false,

"pedestrianTraffic": false,

"pedestriansTraffic": false

},

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"isVehicleRevocableLane": false,

"isVehicleFlyOverLane": false,

"permissionOnRequest": false,

"hasIRbeaconCoverage": false,

"restrictedToBusUse": false,

"restrictedToTaxiUse": false,

"restrictedFromPublicUse": false,

"hovLaneUseOnly": false

},

"crosswalk": null,

"bikeLane": null,

"sidewalk": null,

"median": null,

"striping": null,

"trackedVehicle": null,

"parking": null

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},

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"nodeXY2": null,

"nodeXY3": null,

"nodeXY4": {

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"y": -2062

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"nodeXY5": null,

"nodeXY6": null,

"nodeLatLon": null

},

"attributes": {

"localNode": null,

"disabled": null,

"enabled": null,

"data": null,

"dWidth": null,

"dElevation": 10

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"x": 76,

"y": -377

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"nodeXY2": null,

"nodeXY3": null,

"nodeXY4": null,

"nodeXY5": null,

"nodeXY6": null,

"nodeLatLon": null

},

"attributes": {

"localNode": null,

"disabled": null,

"enabled": null,

"data": null,

"dWidth": null,

"dElevation": 10

}

}

]

}

},

"connectsTo": null,

"overlays": null

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"name": null,

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"egressApproach": 2,

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"ingressPath": false,

"egressPath": true

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"shareWith": {

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"trackedVehicleTraffic": false,

"individualMotorizedVehicleTraffic": false,

"taxiVehicleTraffic": false,

"overlappingLaneDescriptionProvided": false,

"cyclistVehicleTraffic": false,

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"pedestriansTraffic": false

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"hasIRbeaconCoverage": false,

"restrictedToBusUse": false,

"restrictedToTaxiUse": false,

"restrictedFromPublicUse": false,

"hovLaneUseOnly": false

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"crosswalk": null,

"bikeLane": null,

"sidewalk": null,

"median": null,

"striping": null,

"trackedVehicle": null,

"parking": null

}

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"y": -2001

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"nodeXY4": null,

"nodeXY5": null,

"nodeXY6": null,

"nodeLatLon": null

},

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"localNode": null,

"disabled": null,

"enabled": null,

"data": null,

"dWidth": null,

"dElevation": 10

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"x": 76,

"y": -349

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"nodeXY2": null,

"nodeXY3": null,

"nodeXY4": null,

"nodeXY5": null,

"nodeXY6": null,

"nodeLatLon": null

},

"attributes": null

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]

}

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"overlays": null

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"egressPath": true

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"trackedVehicleTraffic": false,

"individualMotorizedVehicleTraffic": false,

"taxiVehicleTraffic": false,

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"cyclistVehicleTraffic": false,

"otherNonMotorizedTrafficTypes": false,

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"pedestriansTraffic": false

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"isVehicleFlyOverLane": false,

"permissionOnRequest": false,

"hasIRbeaconCoverage": false,

"restrictedToBusUse": false,

"restrictedToTaxiUse": false,

"restrictedFromPublicUse": false,

"hovLaneUseOnly": false

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"bikeLane": null,

"sidewalk": null,

"median": null,

"striping": null,

"trackedVehicle": null,

"parking": null

}

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"nodeXY3": null,

"nodeXY4": {

"x": -2374,

"y": 232

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"nodeXY5": null,

"nodeXY6": null,

"nodeLatLon": null

},

"attributes": {

"localNode": null,

"disabled": null,

"enabled": null,

"data": null,

"dWidth": null,

"dElevation": 10

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"x": -357,

"y": -96

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"nodeXY2": null,

"nodeXY3": null,

"nodeXY4": null,

"nodeXY5": null,

"nodeXY6": null,

"nodeLatLon": null

},

"attributes": null

}

]

}

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"overlays": null

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"egressApproach": null,

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"trackedVehicleTraffic": false,

"individualMotorizedVehicleTraffic": false,

"taxiVehicleTraffic": false,

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"cyclistVehicleTraffic": false,

"otherNonMotorizedTrafficTypes": false,

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"pedestrianTraffic": false,

"pedestriansTraffic": false

},

"laneType": {

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"isVehicleFlyOverLane": false,

"permissionOnRequest": false,

"hasIRbeaconCoverage": false,

"restrictedToBusUse": false,

"restrictedToTaxiUse": false,

"restrictedFromPublicUse": false,

"hovLaneUseOnly": false

},

"crosswalk": null,

"bikeLane": null,

"sidewalk": null,

"median": null,

"striping": null,

"trackedVehicle": null,

"parking": null

}

},

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"maneuverNoStoppingAllowed": false,

"goWithHalt": false,

"maneuverLeftAllowed": true,

"maneuverUTurnAllowed": false,

"maneuverLeftTurnOnRedAllowed": false,

"reserved1": false,

"maneuverRightAllowed": false,

"maneuverLaneChangeAllowed": false,

"yieldAllwaysRequired": false,

"maneuverRightTurnOnRedAllowed": false,

"caution": false

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"y": -514

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"nodeXY5": null,

"nodeXY6": null,

"nodeLatLon": null

},

"attributes": {

"localNode": null,

"disabled": null,

"enabled": null,

"data": null,

"dWidth": null,

"dElevation": 10

}

},

{

"delta": {

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"nodeXY3": null,

"nodeXY4": {

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"y": -581

},

"nodeXY5": null,

"nodeXY6": null,

"nodeLatLon": null

},

"attributes": null

},

{

"delta": {

"nodeXY1": null,

"nodeXY2": null,

"nodeXY3": null,

"nodeXY4": {

"x": -2887,

"y": -442

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"nodeXY5": null,

"nodeXY6": null,

"nodeLatLon": null

},

"attributes": {

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"disabled": null,

"enabled": null,

"data": null,

"dWidth": null,

"dElevation": 10

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},

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"nodeXY2": null,

"nodeXY3": null,

"nodeXY4": {

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"y": -339

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"nodeXY5": null,

"nodeXY6": null,

"nodeLatLon": null

},

"attributes": {

"localNode": null,

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"enabled": null,

"data": null,

"dWidth": null,

"dElevation": 10

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},

{

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"nodeXY2": null,

"nodeXY3": null,

"nodeXY4": {

"x": -3757,

"y": 27

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"nodeXY5": null,

"nodeXY6": null,

"nodeLatLon": null

},

"attributes": null

},

{

"delta": {

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"y": 361

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"nodeXY6": null,

"nodeLatLon": null

},

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"data": null,

"dWidth": null,

"dElevation": -10

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"nodeXY3": null,

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"y": 478

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"nodeXY6": null,

"nodeLatLon": null

},

"attributes": null

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"nodeXY3": null,

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"x": -3893,

"y": 1184

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"nodeXY5": null,

"nodeXY6": null,

"nodeLatLon": null

},

"attributes": null

},

{

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"nodeXY5": null,

"nodeXY6": null,

"nodeLatLon": null

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"disabled": null,

"enabled": null,

"data": null,

"dWidth": null,

"dElevation": -10

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"nodeXY3": null,

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"x": -2524,

"y": 607

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"nodeXY5": null,

"nodeXY6": null,

"nodeLatLon": null

},

"attributes": {

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"enabled": null,

"data": null,

"dWidth": null,

"dElevation": 10

}

},

{

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"nodeXY2": null,

"nodeXY3": null,

"nodeXY4": {

"x": -2280,

"y": 325

},

"nodeXY5": null,

"nodeXY6": null,

"nodeLatLon": null

},

"attributes": {

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"disabled": null,

"enabled": null,

"data": null,

"dWidth": null,

"dElevation": 10

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}

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}

},

"connectsTo": {

"connectsTo": [

{

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"goWithHalt": false,

"maneuverLeftAllowed": true,

"maneuverUTurnAllowed": false,

"maneuverLeftTurnOnRedAllowed": false,

"reserved1": false,

"maneuverRightAllowed": false,

"maneuverLaneChangeAllowed": false,

"yieldAllwaysRequired": false,

"maneuverRightTurnOnRedAllowed": false,

"caution": false

}

},

"remoteIntersection": null,

"signalGroup": 4,

"userClass": null,

"connectionID": 1

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]

},

"overlays": null

},

{

"laneID": 7,

"name": null,

"ingressApproach": 3,

"egressApproach": null,

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"egressPath": false

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"shareWith": {

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"trackedVehicleTraffic": false,

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"taxiVehicleTraffic": false,

"overlappingLaneDescriptionProvided": false,

"cyclistVehicleTraffic": false,

"otherNonMotorizedTrafficTypes": false,

"multipleLanesTreatedAsOneLane": false,

"pedestrianTraffic": false,

"pedestriansTraffic": false

},

"laneType": {

"vehicle": {

"isVehicleRevocableLane": false,

"isVehicleFlyOverLane": false,

"permissionOnRequest": false,

"hasIRbeaconCoverage": false,

"restrictedToBusUse": false,

"restrictedToTaxiUse": false,

"restrictedFromPublicUse": false,

"hovLaneUseOnly": false

},

"crosswalk": null,

"bikeLane": null,

"sidewalk": null,

"median": null,

"striping": null,

"trackedVehicle": null,

"parking": null

}

},

"maneuvers": {

"maneuverStraightAllowed": false,

"maneuverNoStoppingAllowed": false,

"goWithHalt": false,

"maneuverLeftAllowed": false,

"maneuverUTurnAllowed": false,

"maneuverLeftTurnOnRedAllowed": false,

"reserved1": false,

"maneuverRightAllowed": true,

"maneuverLaneChangeAllowed": false,

"yieldAllwaysRequired": false,

"maneuverRightTurnOnRedAllowed": false,

"caution": false

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"nodeXY2": null,

"nodeXY3": null,

"nodeXY4": {

"x": -2216,

"y": -915

},

"nodeXY5": null,

"nodeXY6": null,

"nodeLatLon": null

},

"attributes": {

"localNode": null,

"disabled": null,

"enabled": null,

"data": null,

"dWidth": null,

"dElevation": 10

}

},

{

"delta": {

"nodeXY1": null,

"nodeXY2": null,

"nodeXY3": null,

"nodeXY4": {

"x": -2322,

"y": -471

},

"nodeXY5": null,

"nodeXY6": null,

"nodeLatLon": null

},

"attributes": null

},

{

"delta": {

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"nodeXY2": null,

"nodeXY3": {

"x": -1877,

"y": -349

},

"nodeXY4": null,

"nodeXY5": null,

"nodeXY6": null,

"nodeLatLon": null

},

"attributes": {

"localNode": null,

"disabled": null,

"enabled": null,

"data": null,

"dWidth": null,

"dElevation": 10

}

},

{

"delta": {

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"nodeXY2": null,

"nodeXY3": {

"x": -1787,

"y": -235

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"nodeXY4": null,

"nodeXY5": null,

"nodeXY6": null,

"nodeLatLon": null

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"attributes": null

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"nodeXY4": {

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"nodeXY5": null,

"nodeXY6": null,

"nodeLatLon": null

},

"attributes": {

"localNode": null,

"disabled": null,

"enabled": null,

"data": null,

"dWidth": null,

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}

}

]

}

},

"connectsTo": {

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"maneuverNoStoppingAllowed": false,

"goWithHalt": false,

"maneuverLeftAllowed": false,

"maneuverUTurnAllowed": false,

"maneuverLeftTurnOnRedAllowed": false,

"reserved1": false,

"maneuverRightAllowed": true,

"maneuverLaneChangeAllowed": false,

"yieldAllwaysRequired": false,

"maneuverRightTurnOnRedAllowed": false,

"caution": false

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},

"remoteIntersection": null,

"signalGroup": null,

"userClass": null,

"connectionID": 1

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},

"overlays": null

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"laneID": 9,

"name": null,

"ingressApproach": 3,

"egressApproach": null,

"laneAttributes": {

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"trackedVehicleTraffic": false,

"individualMotorizedVehicleTraffic": false,

"taxiVehicleTraffic": false,

"overlappingLaneDescriptionProvided": false,

"cyclistVehicleTraffic": false,

"otherNonMotorizedTrafficTypes": false,

"multipleLanesTreatedAsOneLane": false,

"pedestrianTraffic": false,

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"isVehicleFlyOverLane": false,

"permissionOnRequest": false,

"hasIRbeaconCoverage": false,

"restrictedToBusUse": false,

"restrictedToTaxiUse": false,

"restrictedFromPublicUse": false,

"hovLaneUseOnly": false

},

"crosswalk": null,

"bikeLane": null,

"sidewalk": null,

"median": null,

"striping": null,

"trackedVehicle": null,

"parking": null

}

},

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"maneuverNoStoppingAllowed": false,

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"maneuverUTurnAllowed": false,

"maneuverLeftTurnOnRedAllowed": false,

"reserved1": false,

"maneuverRightAllowed": false,

"maneuverLaneChangeAllowed": false,

"yieldAllwaysRequired": false,

"maneuverRightTurnOnRedAllowed": false,

"caution": false

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"nodeXY6": null,

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"dWidth": null,

"dElevation": 10

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"y": -499

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"nodeXY6": null,

"nodeLatLon": null

},

"attributes": null

},

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"nodeXY5": null,

"nodeXY6": null,

"nodeLatLon": null

},

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"disabled": null,

"enabled": null,

"data": null,

"dWidth": null,

"dElevation": 10

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"nodeXY6": null,

"nodeLatLon": null

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"nodeXY6": null,

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"maneuverUTurnAllowed": false,

"maneuverLeftTurnOnRedAllowed": false,

"reserved1": false,

"maneuverRightAllowed": false,

"maneuverLaneChangeAllowed": false,

"yieldAllwaysRequired": false,

"maneuverRightTurnOnRedAllowed": false,

"caution": false

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"userClass": null,

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"egressApproach": null,

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"trackedVehicleTraffic": false,

"individualMotorizedVehicleTraffic": false,

"taxiVehicleTraffic": false,

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"cyclistVehicleTraffic": false,

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"pedestrianTraffic": false,

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"restrictedFromPublicUse": false,

"hovLaneUseOnly": false

},

"crosswalk": null,

"bikeLane": null,

"sidewalk": null,

"median": null,

"striping": null,

"trackedVehicle": null,

"parking": null

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"maneuverUTurnAllowed": false,

"maneuverLeftTurnOnRedAllowed": false,

"reserved1": false,

"maneuverRightAllowed": false,

"maneuverLaneChangeAllowed": false,

"yieldAllwaysRequired": false,

"maneuverRightTurnOnRedAllowed": false,

"caution": false

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"nodeXY5": null,

"nodeXY6": null,

"nodeLatLon": null

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"enabled": null,

"data": null,

"dWidth": null,

"dElevation": 10

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"nodeXY4": null,

"nodeXY5": {

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"y": 4854

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"nodeXY6": null,

"nodeLatLon": null

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}

},

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"nodeXY3": null,

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"nodeXY6": null,

"nodeLatLon": null

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"enabled": null,

"data": null,

"dWidth": null,

"dElevation": 10

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"nodeXY2": null,

"nodeXY3": {

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"nodeXY4": null,

"nodeXY5": null,

"nodeXY6": null,

"nodeLatLon": null

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"localNode": null,

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"enabled": null,

"data": null,

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"dElevation": -10

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"y": 3244

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"nodeXY5": null,

"nodeXY6": null,

"nodeLatLon": null

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"attributes": {

"localNode": null,

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"enabled": null,

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"nodeXY4": null,

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"y": 4510

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"nodeXY6": null,

"nodeLatLon": null

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"attributes": null

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"nodeXY6": null,

"nodeLatLon": null

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"enabled": null,

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"nodeXY6": null,

"nodeLatLon": null

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"attributes": null

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{

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"nodeXY3": null,

"nodeXY4": null,

"nodeXY5": null,

"nodeXY6": {

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"y": 11212

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"nodeLatLon": null

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"disabled": null,

"enabled": null,

"data": null,

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"nodeXY3": null,

"nodeXY4": null,

"nodeXY5": null,

"nodeXY6": {

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"y": 11176

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"nodeLatLon": null

},

"attributes": {

"localNode": null,

"disabled": null,

"enabled": null,

"data": null,

"dWidth": null,

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"maneuverUTurnAllowed": false,

"maneuverLeftTurnOnRedAllowed": false,

"reserved1": false,

"maneuverRightAllowed": false,

"maneuverLaneChangeAllowed": false,

"yieldAllwaysRequired": false,

"maneuverRightTurnOnRedAllowed": false,

"caution": false

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"signalGroup": 6,

"userClass": null,

"connectionID": 1

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]

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"overlays": null

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"name": null,

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"egressApproach": null,

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"egressPath": false

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"shareWith": {

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"trackedVehicleTraffic": false,

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"taxiVehicleTraffic": false,

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"cyclistVehicleTraffic": false,

"otherNonMotorizedTrafficTypes": false,

"multipleLanesTreatedAsOneLane": false,

"pedestrianTraffic": false,

"pedestriansTraffic": false

},

"laneType": {

"vehicle": {

"isVehicleRevocableLane": false,

"isVehicleFlyOverLane": false,

"permissionOnRequest": false,

"hasIRbeaconCoverage": false,

"restrictedToBusUse": false,

"restrictedToTaxiUse": false,

"restrictedFromPublicUse": false,

"hovLaneUseOnly": false

},

"crosswalk": null,

"bikeLane": null,

"sidewalk": null,

"median": null,

"striping": null,

"trackedVehicle": null,

"parking": null

}

},

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"maneuverUTurnAllowed": false,

"maneuverLeftTurnOnRedAllowed": false,

"reserved1": false,

"maneuverRightAllowed": false,

"maneuverLaneChangeAllowed": false,

"yieldAllwaysRequired": false,

"maneuverRightTurnOnRedAllowed": false,

"caution": false

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"nodeXY6": null,

"nodeLatLon": null

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"enabled": null,

"data": null,

"dWidth": null,

"dElevation": 10

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},

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"nodeXY6": null,

"nodeLatLon": null

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"data": null,

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},

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"nodeXY6": null,

"nodeLatLon": null

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"disabled": null,

"enabled": null,

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"dWidth": null,

"dElevation": 10

}

},

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"nodeXY1": null,

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"nodeXY3": null,

"nodeXY4": {

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"y": 2366

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"nodeXY6": null,

"nodeLatLon": null

},

"attributes": null

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"delta": {

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"nodeXY6": null,

"nodeLatLon": null

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"attributes": {

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"disabled": null,

"enabled": null,

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"dWidth": null,

"dElevation": -20

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"nodeXY6": null,

"nodeLatLon": null

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"enabled": null,

"data": null,

"dWidth": null,

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},

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"nodeXY6": null,

"nodeLatLon": null

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"disabled": null,

"enabled": null,

"data": null,

"dWidth": null,

"dElevation": -10

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"nodeXY6": null,

"nodeLatLon": null

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"attributes": {

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"disabled": null,

"enabled": null,

"data": null,

"dWidth": null,

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{

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"nodeXY3": null,

"nodeXY4": {

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"y": 2504

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"nodeXY5": null,

"nodeXY6": null,

"nodeLatLon": null

},

"attributes": null

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{

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"nodeXY2": null,

"nodeXY3": null,

"nodeXY4": null,

"nodeXY5": null,

"nodeXY6": {

"x": -740,

"y": 11165

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"nodeLatLon": null

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"attributes": {

"localNode": null,

"disabled": null,

"enabled": null,

"data": null,

"dWidth": null,

"dElevation": -30

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},

{

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"nodeXY2": null,

"nodeXY3": null,

"nodeXY4": null,

"nodeXY5": null,

"nodeXY6": {

"x": -253,

"y": 11359

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"nodeLatLon": null

},

"attributes": {

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"disabled": null,

"enabled": null,

"data": null,

"dWidth": null,

"dElevation": -70

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"maneuverLeftAllowed": false,

"maneuverUTurnAllowed": false,

"maneuverLeftTurnOnRedAllowed": false,

"reserved1": false,

"maneuverRightAllowed": false,

"maneuverLaneChangeAllowed": false,

"yieldAllwaysRequired": false,

"maneuverRightTurnOnRedAllowed": false,

"caution": false

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},

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"userClass": null,

"connectionID": 1

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{

"laneID": 11,

"name": null,

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"egressApproach": null,

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"egressPath": false

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"shareWith": {

"busVehicleTraffic": false,

"trackedVehicleTraffic": false,

"individualMotorizedVehicleTraffic": false,

"taxiVehicleTraffic": false,

"overlappingLaneDescriptionProvided": false,

"cyclistVehicleTraffic": false,

"otherNonMotorizedTrafficTypes": false,

"multipleLanesTreatedAsOneLane": false,

"pedestrianTraffic": false,

"pedestriansTraffic": false

},

"laneType": {

"vehicle": {

"isVehicleRevocableLane": false,

"isVehicleFlyOverLane": false,

"permissionOnRequest": false,

"hasIRbeaconCoverage": false,

"restrictedToBusUse": false,

"restrictedToTaxiUse": false,

"restrictedFromPublicUse": false,

"hovLaneUseOnly": false

},

"crosswalk": null,

"bikeLane": null,

"sidewalk": null,

"median": null,

"striping": null,

"trackedVehicle": null,

"parking": null

}

},

"maneuvers": {

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"maneuverNoStoppingAllowed": false,

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"maneuverUTurnAllowed": false,

"maneuverLeftTurnOnRedAllowed": false,

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"maneuverRightAllowed": true,

"maneuverLaneChangeAllowed": false,

"yieldAllwaysRequired": false,

"maneuverRightTurnOnRedAllowed": false,

"caution": false

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"nodeXY4": null,

"nodeXY5": null,

"nodeXY6": null,

"nodeLatLon": null

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"attributes": {

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"disabled": null,

"enabled": null,

"data": null,

"dWidth": null,

"dElevation": 10

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"nodeXY5": null,

"nodeXY6": null,

"nodeLatLon": null

},

"attributes": {

"localNode": null,

"disabled": null,

"enabled": null,

"data": null,

"dWidth": null,

"dElevation": -20

}

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"nodeXY5": null,

"nodeXY6": null,

"nodeLatLon": null

},

"attributes": {

"localNode": null,

"disabled": null,

"enabled": null,

"data": null,

"dWidth": null,

"dElevation": -10

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"nodeXY4": null,

"nodeXY5": null,

"nodeXY6": null,

"nodeLatLon": null

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"attributes": {

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"disabled": null,

"enabled": null,

"data": null,

"dWidth": null,

"dElevation": 10

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{

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"x": -155,

"y": 1778

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"nodeXY4": null,

"nodeXY5": null,

"nodeXY6": null,

"nodeLatLon": null

},

"attributes": null

}

]

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"connectsTo": [

{

"connectingLane": {

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"maneuverNoStoppingAllowed": false,

"goWithHalt": false,

"maneuverLeftAllowed": false,

"maneuverUTurnAllowed": false,

"maneuverLeftTurnOnRedAllowed": false,

"reserved1": false,

"maneuverRightAllowed": true,

"maneuverLaneChangeAllowed": false,

"yieldAllwaysRequired": false,

"maneuverRightTurnOnRedAllowed": false,

"caution": false

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"userClass": null,

"connectionID": 1

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"overlays": null

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{

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"name": null,

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"egressApproach": 6,

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"egressPath": true

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"trackedVehicleTraffic": false,

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"taxiVehicleTraffic": false,

"overlappingLaneDescriptionProvided": false,

"cyclistVehicleTraffic": false,

"otherNonMotorizedTrafficTypes": false,

"multipleLanesTreatedAsOneLane": false,

"pedestrianTraffic": false,

"pedestriansTraffic": false

},

"laneType": {

"vehicle": {

"isVehicleRevocableLane": false,

"isVehicleFlyOverLane": false,

"permissionOnRequest": false,

"hasIRbeaconCoverage": false,

"restrictedToBusUse": false,

"restrictedToTaxiUse": false,

"restrictedFromPublicUse": false,

"hovLaneUseOnly": false

},

"crosswalk": null,

"bikeLane": null,

"sidewalk": null,

"median": null,

"striping": null,

"trackedVehicle": null,

"parking": null

}

},

"maneuvers": null,

"nodeList": {

"computed": null,

"nodes": {

"NodeXY": [

{

"delta": {

"nodeXY1": null,

"nodeXY2": null,

"nodeXY3": {

"x": 398,

"y": 1931

},

"nodeXY4": null,

"nodeXY5": null,

"nodeXY6": null,

"nodeLatLon": null

},

"attributes": {

"localNode": null,

"disabled": null,

"enabled": null,

"data": null,

"dWidth": null,

"dElevation": -10

}

},

{

"delta": {

"nodeXY1": {

"x": -76,

"y": 356

},

"nodeXY2": null,

"nodeXY3": null,

"nodeXY4": null,

"nodeXY5": null,

"nodeXY6": null,

"nodeLatLon": null

},

"attributes": null

}

]

}

},

"connectsTo": null,

"overlays": null

},

{

"laneID": 15,

"name": null,

"ingressApproach": null,

"egressApproach": 6,

"laneAttributes": {

"directionalUse": {

"ingressPath": false,

"egressPath": true

},

"shareWith": {

"busVehicleTraffic": false,

"trackedVehicleTraffic": false,

"individualMotorizedVehicleTraffic": false,

"taxiVehicleTraffic": false,

"overlappingLaneDescriptionProvided": false,

"cyclistVehicleTraffic": false,

"otherNonMotorizedTrafficTypes": false,

"multipleLanesTreatedAsOneLane": false,

"pedestrianTraffic": false,

"pedestriansTraffic": false

},

"laneType": {

"vehicle": {

"isVehicleRevocableLane": false,

"isVehicleFlyOverLane": false,

"permissionOnRequest": false,

"hasIRbeaconCoverage": false,

"restrictedToBusUse": false,

"restrictedToTaxiUse": false,

"restrictedFromPublicUse": false,

"hovLaneUseOnly": false

},

"crosswalk": null,

"bikeLane": null,

"sidewalk": null,

"median": null,

"striping": null,

"trackedVehicle": null,

"parking": null

}

},

"maneuvers": null,

"nodeList": {

"computed": null,

"nodes": {

"NodeXY": [

{

"delta": {

"nodeXY1": null,

"nodeXY2": null,

"nodeXY3": {

"x": 838,

"y": 1985

},

"nodeXY4": null,

"nodeXY5": null,

"nodeXY6": null,

"nodeLatLon": null

},

"attributes": {

"localNode": null,

"disabled": null,

"enabled": null,

"data": null,

"dWidth": null,

"dElevation": -20

}

},

{

"delta": {

"nodeXY1": {

"x": -89,

"y": 349

},

"nodeXY2": null,

"nodeXY3": null,

"nodeXY4": null,

"nodeXY5": null,

"nodeXY6": null,

"nodeLatLon": null

},

"attributes": null

}

]

}

},

"connectsTo": null,

"overlays": null

}

]

}

}

]

},

"roadSegments": null,

"dataParameters": null,

"restrictionList": null

},

"dataType": "us.dot.its.jpo.ode.plugin.j2735.J2735MAP"

}

}

## Sample SRM Data

### SRM from OdeSrmJson

ODE receives SRM messages from a RSU in binary ANS.1 UPER encoded format that it first receives from an OBU. ODE decodes, transforms, converts it to JSON and publishes it to the relevant topics for consumption by client applications. Below is a sample JSON decoded SRM message transmitted by an OBU, received by a RSU and forward to the ODE over the UDP ingest port 44930.

{

"metadata": {

"logFileName": "",

"recordType": "srmTx",

"securityResultCode": null,

"receivedMessageDetails": {

"locationData": null,

"rxSource": "NA"

},

"encodings": null,

"payloadType": "us.dot.its.jpo.ode.model.OdeSrmPayload",

"serialId": {

"streamId": "f05c12f8-bf9e-44fe-9084-1dfcc1437eb3",

"bundleSize": 1,

"bundleId": 0,

"recordId": 0,

"serialNumber": 0

},

"odeReceivedAt": "2022-03-16T17:56:17.129055Z",

"schemaVersion": 6,

"maxDurationTime": 0,

"recordGeneratedAt": "",

"recordGeneratedBy": null,

"sanitized": false,

"odePacketID": "",

"odeTimStartDateTime": "",

"originIp": "172.250.250.77",

"srmSource": "RSU"

},

"payload": {

"data": {

"timeStamp": 75971,

"second": 0,

"sequenceNumber": 3,

"requests": {

"signalRequestPackage": [

{

"request": {

"id": {

"region": null,

"id": 12109

},

"requestID": 85,

"requestType": "priorityRequest",

"inBoundLane": {

"lane": 3,

"approach": null,

"connection": null

},

"outBoundLane": {

"lane": 10,

"approach": null,

"connection": null

}

},

"minute": null,

"second": null,

"duration": 6026

}

]

},

"requestor": {

"id": {

"entityID": null,

"stationID": 1880830118

},

"type": {

"role": "publicTransport",

"subrole": null,

"request": null,

"iso3883": null,

"hpmsType": null

},

"position": {

"position": {

"latitude": 39.5875986,

"longitude": -105.0907300,

"elevation": 1697.7

},

"heading": 348.5000,

"speed": {

"speed": 15.82,

"transmisson": "UNAVAILABLE"

}

},

"name": null,

"routeName": null,

"transitStatus": null,

"transitOccupancy": null,

"transitSchedule": null

}

},

"dataType": "us.dot.its.jpo.ode.plugin.j2735.J2735SRM"

}

}

## Sample SSM Data

### SSM from OdeSsmJson

ODE receives SSM messages from a RSU in binary ANS.1 UPER encoded format that it transmits in response to receiving a SRM. ODE decodes, transforms, converts it to JSON and publishes it to the relevant topics for consumption by client applications. Below is a sample JSON decoded SRM message transmitted by a RSU and forwarded to the ODE over the UDP ingest port 44900.

{

"metadata": {

"logFileName": "",

"recordType": "ssmTx",

"securityResultCode": null,

"receivedMessageDetails": {

"locationData": null,

"rxSource": "NA"

},

"encodings": null,

"payloadType": "us.dot.its.jpo.ode.model.OdeSsmPayload",

"serialId": {

"streamId": "2742f2dd-5f1c-4d8f-9e24-5872e2940b08",

"bundleSize": 1,

"bundleId": 0,

"recordId": 0,

"serialNumber": 0

},

"odeReceivedAt": "2022-03-16T13:11:11.182442Z",

"schemaVersion": 6,

"maxDurationTime": 0,

"recordGeneratedAt": "",

"recordGeneratedBy": null,

"sanitized": false,

"odePacketID": "",

"odeTimStartDateTime": "",

"originIp": "10.11.81.13",

"ssmSource": "RSU"

},

"payload": {

"data": {

"timeStamp": 107351,

"second": 0,

"sequenceNumber": null,

"status": {

"signalStatus": [

{

"sequenceNumber": 0,

"id": {

"region": null,

"id": 12111

},

"sigStatus": {

"signalStatusPackage": [

{

"requester": {

"id": {

"entityID": null,

"stationID": 2366845094

},

"request": 6,

"sequenceNumber": 0,

"role": null,

"typeData": {

"role": "publicTransport",

"subrole": null,

"request": null,

"iso3883": null,

"hpmsType": null

}

},

"inboundOn": {

"lane": 3,

"approach": null,

"connection": null

},

"outboundOn": null,

"minute": null,

"second": null,

"duration": null,

"status": "granted"

}

]

}

}

]

}

},

"dataType": "us.dot.its.jpo.ode.plugin.j2735.J2735SSM"

}

}

# References

SAE International. (2016, 03 30). *J2735 Standard*. Retrieved from SAE International: https://www.sae.org/standards/content/j2735\_201603/

US DOT ITS JPO. (2018). *ODE Users Guide*. Retrieved from https://github.com/usdot-jpo-ode/jpo-ode

1. Available starting with schemaVersion 4 [↑](#footnote-ref-1)
2. Midnight will be represented as 0:00 for all time fields [↑](#footnote-ref-2)
3. Formerly named timeStamp in version 1 of the schema. Renamed to receivedAt in version 2. Renamed to odeReceivedAt starting with schemaVersion 3 [↑](#footnote-ref-3)
4. This data element was not present for BSM payload data *prior to* schemaVersion 5. [↑](#footnote-ref-4)
5. Available starting with schemaVersion 3 [↑](#footnote-ref-5)
6. Available starting with schemaVersion 4 [↑](#footnote-ref-6)
7. Available starting with schemaVersion 6 [↑](#footnote-ref-7)
8. Formerly named ‘version’ in version 1 of the schema. Renamed to schemaVersion starting with version 2. [↑](#footnote-ref-8)
9. Available starting with schemaVersion 4 [↑](#footnote-ref-9)
10. Only available in schemaVersion 3. [↑](#footnote-ref-10)
11. All data structures defiend in this section are available starting with schemaVersion 6 [↑](#footnote-ref-11)
12. This field’s value is represented differently from the raw J2735 representation. The raw J2735 binary representation has been transformed to the J2735 described customary unit of measure or format without any loss of accuracy or precision. [↑](#footnote-ref-12)