WYOMING Department of Transportation

TMDD REST SERVICE

Introduction and User Guide for TMDD REST Service

Abstract

Web service to provide statewide road and travel information.

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Introduction

The State of Wyoming offers a Traffic Management Data Dictionary (TMDD[1]) web service that provides real-time road and weather information.

Wyoming's TMDD web service is a RESTful[2] API which runs over HTTP. The service provides data structured according to the TMDD and formatted as industry standard JSON[3].

This document will explain the goals of the service and describe how to access the service and interpret the data provided.

Purpose

Why is Wyoming adding this new web service?

Wyoming collects information about its roads and local weather conditions using remote weather sensors and web cameras, as well as reports from State Highway Patrol, State Snow Plow operators, meteorologists, the public and other designated highway users. Existing Wyoming services publish such data through a variety of web sites, web services and mobile applications designed and organized to be accessed by individuals. Wyoming's TMDD service is different from the existing services; using industry standards like TMDD and JSON, it is designed to be accessed primarily by automated systems.

The TMDD standard itself was designed for automated processing. Traditionally, web services based on TMDD used WSDL, XML and SOAP[4]. Wyoming chose to implement a REST API over HTTP and to export JSON data. RESTful interfaces using JSON are generally easier to manipulate by automated systems widely in use today. The rationale for using a JSON REST service for TMDD data is well articulated in the following white paper: DRAFT TMDD JSON-REST v0.4.docx from August 2016.

Wyoming's TMDD REST service provides data consumers timely and localized information on Wyoming road conditions, closures, advisories, incidents and weather. This service provides a snapshot (updated every 5 minutes) of all currently available data on the state's road and weather conditions. Requesting systems may access the service as often as they wish, according to their needs. Requesting systems retrieve all the data with one API call, and the JSON data can then be easily searched and filtered based on location and information type. It is expected that data consumers will develop a wide variety of uses for the information provided. Over time, WYDOT anticipates additional queries will be requested, so the TMDD REST service was designed to be extendible. Because changes are possible, WYDOT requires a Memorandum of Understanding (MOU) with each data consumer that details how changes will be announced.

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[1] TMDD is the standard for Center to Center Communications published by the American Association of State Highway and Transportation Officials (AASHTO) and the Institute of Transportation Engineers (ITE). https://www.ite.org/technical-resources/standards/tmdd/

[2] Representational state transfer (REST) Web services provide interoperability between computer systems and allow requesting systems to access and manipulate textual representations of Web resources using a uniform and predefined set of stateless operations.

[3] JSON (JavaScript Object Notation)

[4] SOAP (Simple Object Access Protocol), WSDL (Web Services Description Language)

REST API

Authentication

Requests must be authenticated using HTTP Basic Authentication (BA[5]). Basic Authentication relies on a username and password. Authentication will be provided using the credentials for WYDOT's Commercial Vehicle Operator Portal (CVOP[6]). Existing Commercial Vehicle Operator Portal users will find their existing credentials can be used to access the service. New users may request a user account at https://cvop.wyoroad.info/cvop/register. Users are not required to be commercial vehicle operators to request a CVOP account.

With Basic Authentication the user name and password are entered directly as plain text; however, since our server requires HTTPS, the connection between a client and the service is encrypted.

Basics

We designed the API using RESTful principles with predictable, resource-oriented URL, and Response Codes.

All requests for the API use the same host:

```
https://resdf.wyoroad.info/
```

Available Endpoint and Sample Query:

- tmdd/all

```
https://resdf.wyoroad.info/tmdd/all
```

The above query returns human readable JSON data which can be viewed using a standard web browser. To test it, simply enter the URL above and supply valid credentials.

Sample Output:

```
{"ns2:fEUMsg": {
 "xmlns:ns2": "http://www.tmdd.org/303/messages",
 "FEU": [
  {
   "event-element-details": {"event-element-detail": {
    "event-times": {"update-time": {
...
    "event-update": 1
   },
   "event-headline": {"headline": {"accidents-and-incidents": "incident"}}
  }
 ],
 "xmlns:ns3": "http://www.ntcip.org/c2c-message-administration"
}}
```

[5] HTTP Basic authentication (BA) implementation is the simplest technique for enforcing access controls to web resources because it doesn't require cookies, session identifiers, or login pages; rather, HTTP Basic authentication uses standard fields in the HTTP header, obviating the need for handshakes.
[6] (CVOP) Commercial Vehicle Operator Portal, https://cvop.wyoroad.info/cvop/

Appendix: A - Wyoming Data

The Department of Transportation of the State of Wyoming currently collects and provides the following information through various reporting services:

- Weather-related pavement conditions
- Atmospheric conditions
- Travel advisories
- Incidents
- Construction
- Restrictions

The existing systems in Wyoming organize the above information by reporting districts which are numbered 1-5 and by reporting sections which are designated road segments of varying lengths. Reporting districts are very large and partition the entire state as follows:

- (1) Southeast Wyoming: Cheyenne, Laramie, Rawlins and the surrounding region
- (2) Central Wyoming: Casper, Wheatland, Torrington, Lusk and the surrounding region
- (3) Southwest Wyoming: Rock Springs, Pinedale, Jackson, Afton and the surrounding region
- (4) Northeast Wyoming: Sheridan, Buffalo, Gillette and the surrounding region
- (5) Northwest Wyoming: Cody, Riverton, Big Horn Basin and the surrounding region

Example usage scenarios:

a) Data consumer ingests the WY data into their own application for distribution to their users
b) Commercial Vehicle Operator pulls data from WY when planning daily routing changes
c) Commercial Vehicle Operator pulls real-time data and notifies their fleet of sudden incidents (crashes) and rapidly changing road conditions like slick spots, high winds, reduced visibility.

The output from Wyoming's TMDD service is easily read as text and is easily processed by common development platforms like Java, C#, Python, Ruby, and C++.

Appendix: B - Client application example

A simple example of a client application that can programmatically access the TMDD REST Service is shown below. This example is written in Java and makes use of the RESTEasy framework.

The essential parts of this client are:

- The target URL
- The user name and password
- The call to perform the HTTP GET
- The return of the string data response to the HTTP GET

```
String strURL = "https://resdf.wyoroad.info/tmdd/all";
String strUsername = "xxx";
String strPassword = "xxx";


// Create RESTeasy client which can query REST services
ResteasyClient client = new ResteasyClientBuilder().build();

// Set the target URL
ResteasyWebTarget target = client.target(strURL);

// Set the Basic Authentication Credentials
target.register(new BasicAuthentication(strUsername, strPassword));

// Query the REST Service
Response response = (Response) target.request().get();

// Save the output in string format
String value = ((javax.ws.rs.core.Response) response).readEntity(String.class);

// Display the output to the console (aka. standard out)
System.out.println(value);

// Cleanup
response.close();
```

Appendix: C - TMDD - Traffic Management Data Dictionary

The TMDD Standard is described in the following documents which can be downloaded from the ITE website[7]:

- TMDDv3.03c-Vol1.pdf (2016)
- TMDDv3.03c-Vol2.pdf (2016)

The XML schema for the TMDD consists of the following documents which can be downloaded from the ITE website:

- TMDDv3.03c-schemas.zip [ATIS.xsd, C2C.xsd, ITIS-Adopted-03-00-02.xsd, ITIS-Local-03-00-02.xsd, LRMS-Adopted-02-00-00.xsd, LRMS-Local-02-00-00.xsd, NTCIP-References.xsd, TMDD.xsd]

The following drawing shows the basic structure of the Full Event Update message, the TMDD data structure which Wyoming's TMDD Service exports in JSON format. Refer to the TMDD standards documents to learn more about the data structure.

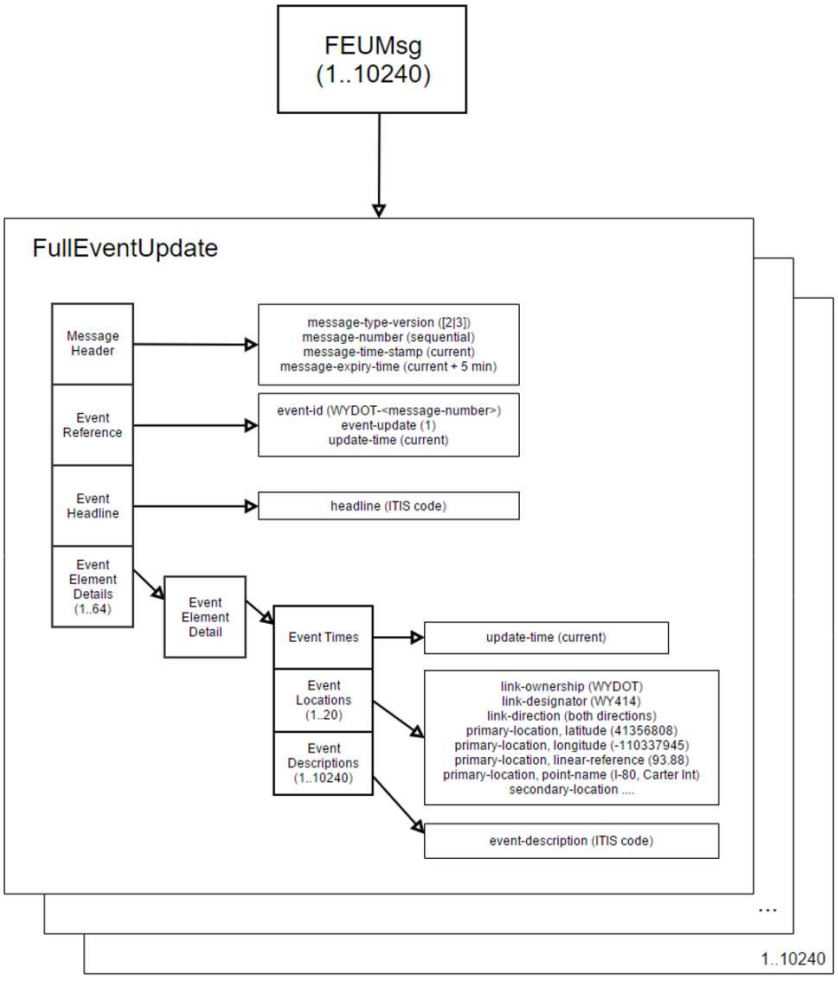

Figure 1 : Full Event Update Message Structure

[7] (ITE) Institute of Transportation Engineers, https://www.ite.org/technical-resources/standards/tmdd/

Appendix: D - ITIS-Categories and sub-codes

TMDD Element Type	TMDD Element Value
itis:AccidentsAndIncidents	abandoned vehicle
itis:AccidentsAndIncidents	accident
itis:AccidentsAndIncidents	accident cleared
itis:AccidentsAndIncidents	accident investigation work
itis:AccidentsAndIncidents	accident involving a bicycle
itis:AccidentsAndIncidents	accident involving a bus
itis:AccidentsAndIncidents	accident involving a motorcycle
itis:AccidentsAndIncidents	accident involving a pedestrian
itis:AccidentsAndIncidents	accident involving a semi trailer
itis:AccidentsAndIncidents	accident involving a train
itis:AccidentsAndIncidents	accident involving a truck
itis:AccidentsAndIncidents	accident involving hazardous materials
itis:AccidentsAndIncidents	acid spill
itis:AccidentsAndIncidents	bus stuck under bridge
itis:AccidentsAndIncidents	chemical spill
itis:AccidentsAndIncidents	derailed train
itis:AccidentsAndIncidents	disabled bus
itis:AccidentsAndIncidents	disabled semi trailer
itis:AccidentsAndIncidents	disabled train
itis:AccidentsAndIncidents	disabled truck
itis:AccidentsAndIncidents	disabled vehicle
itis:AccidentsAndIncidents	earlier accident
itis:AccidentsAndIncidents	fuel spill
itis:AccidentsAndIncidents	hazard
itis:AccidentsAndIncidents	hazardous materials spill
itis:AccidentsAndIncidents	incident
itis:AccidentsAndIncidents	incident cleared
itis:AccidentsAndIncidents	injury accident
itis:AccidentsAndIncidents	jackknifed semi trailer
itis:AccidentsAndIncidents	jackknifed trailer
itis:AccidentsAndIncidents	jackknifed trailer home
itis:AccidentsAndIncidents	medical emergency
itis:AccidentsAndIncidents	minor accident
itis:AccidentsAndIncidents	motorist assist
itis:AccidentsAndIncidents	multi vehicle accident
itis:AccidentsAndIncidents	numerous accidents
itis:AccidentsAndIncidents	oil spill
itis:AccidentsAndIncidents	overturned bus
itis:AccidentsAndIncidents	overturned semi trailer
itis:AccidentsAndIncidents	overturned truck
itis:AccidentsAndIncidents	overturned vehicle
itis:AccidentsAndIncidents	rescue and recovery work REMOVED
itis:AccidentsAndIncidents	secondary accident
itis:AccidentsAndIncidents	serious accident
itis:AccidentsAndIncidents	spillage occurring from moving vehicle
itis:AccidentsAndIncidents	spilled load
itis:AccidentsAndIncidents	stalled vehicle

itis:AccidentsAndIncidents	stuck vehicle
itis:AccidentsAndIncidents	toxic spill
itis:AccidentsAndIncidents	truck stuck under bridge
itis:AccidentsAndIncidents	vehicle in water
itis:AccidentsAndIncidents	vehicle on fire
itis:AccidentsAndIncidents	vehicle spun out
itis:AccidentsAndIncidents	vehicles slowing to look at accident
itis:AdviceInstructionsMandatory	traffic being diverted onto interchange ramps
itis:AdviceInstructionsMandatory	traffic being diverted onto shoulder
itis:AdviceInstructionsMandatory	use left lane
itis:AdviceInstructionsMandatory	use right lane
itis:AdviceInstructionsRecommendations	be prepared to stop
itis:AdviceInstructionsRecommendations	expect delays
itis:AdviceInstructionsRecommendations	only travel if absolutely necessary
itis:AdviceInstructionsRecommendations	prepare to slow down
itis:AdviceInstructionsRecommendations	proceed with caution
itis:AlternateRoute	use alternate route
itis:AdviceInstructionsRecommendations	watch for falling rock
itis:Closures	all lanes closed
itis:Closures	center lane blocked
itis:Closures	closed[8]
itis:Closures	closed due to border state request from Colorado
itis:Closures	closed due to border state request from Idaho
itis:Closures	closed due to border state request from Montana
itis:Closures	closed due to border state request from Multiple States
itis:Closures	closed due to border state request from Nebraska
itis:Closures	closed due to border state request from South Dakota
itis:Closures	closed due to border state request from Utah
itis:Closures	closed due to law enforcement request
itis:Closures	closed due to local authority request
itis:Closures	closed for the season
itis:Closures	left lane blocked
itis:Closures	right lane blocked
itis:Closures	rolling closure
itis:Closures	shoulder closed
itis:Closures	travel lane blocked
itis:Closures	winter conditions and closures
itis: DelayStatusCancellation	delays
itis:Disasters	fire
itis:Disasters	rail crash
itis:Disasters	weather emergency
itis:Disasters	wildfire
itis:IncidentResponseStatus	hazardous material clean-up
itis:MobileSituation	slow, oversize load
itis:MobileSituation	wide load
itis:Obstruction	avalanche
itis:Obstruction	downed power lines

[8] Custom closures will generate a closure element as well as a description element to contain the free text closure reason.

itis:Obstruction	flooding
itis:Obstruction	herd of animals on roadway
itis:Obstruction	landslide
itis:Obstruction	mudslide
itis:Obstruction	rockfall
itis:PavementConditions	black ice
itis:PavementConditions	dirt
itis:PavementConditions	dry pavement
itis:PavementConditions	gravel
itis:PavementConditions	ice
itis:PavementConditions	icy patches
itis:PavementConditions	milled
itis:PavementConditions	paved
itis:PavementConditions	road surface in poor condition
itis:PavementConditions	slush
itis:PavementConditions	snow drifts
itis:PavementConditions	wet pavement
itis:PavementConditions	winter conditions
itis:Precipitation	hail
itis:Precipitation	rain
itis:Precipitation	snow
itis:RestrictionClass	advise no light trailers
itis:RestrictionClass	closed to light, high profile vehicles
itis:RestrictionClass	closed to light, high-profile vehicles due to active blowovers in the area
itis:RestrictionClass	closed to light, high-profile vehicles due to gusting winds
itis:RestrictionClass	closed to light, high-profile vehicles due to gusting winds and slick conditions
itis:RestrictionClass	gross weight limit
itis:RestrictionClass	height limit
itis:RestrictionClass	local access only
itis:RestrictionClass	length limit
itis:RestrictionClass	no trailers
itis:RestrictionClass	restrictions
itis:RestrictionClass	width limit
itis:Roadwork	avalanche control activities
itis:Roadwork	mowing operations
itis:Roadwork	road construction
itis:Roadwork	sign installation
itis:SpecialEvents	local celebration
itis:TrafficConditions	slow traffic
itis:TrafficConditions	stopped traffic
itis:UnusualDriving	emergency vehicles on roadway
itis:VisibilityAndAirQuality	blowing snow
itis:VisibilityAndAirQuality	fog
itis:VisibilityAndAirQuality	visibility reduced
itis:WarningAdvice	extreme blow over risk
itis:WarningAdvice	law enforcement activity
itis:WarningAdvice	look out for workers
itis:WarningAdvice	pilot car in operation
itis:Winds	strong winds

itis:WinterDrivingRestrictions	chains or all wheel drive with snow tires required
itis:WinterDrivingRestrictions	snow tires or chains required
itis.SystemInformation	travel-information

Appendix: E - JSON Output

FullEventUpdate (FEU)

The *FullEventUpdate* contains information describing the current set of WYDOT events. A *FullEventUpdate* may contain up to 1024 events. A single event consists of the following fields: `message-header`, `event-reference`, `event-headline` and a list of 0 to 64 `event-element-details`.

Description of Fields

- `message-header` <*MessageHeader*>: Required. The header information associated with an event. Includes: organization information, time zone, data format version and a unique event message number.
- `event-reference` <*EventReference*>: Optional. Information describing a reference to an event that is associated with this event. Includes: organization information, time zone, the number of times the log has been modified for a specific roadway event.
- `event-headline` <*EventHeadline*>: Optional. Information describing an event, including a list of phrases and identification of the key phrase.
- `event-element-details` <*EventElementDetail*>: Required. The information content describing an event element detail, which itself may be the scale of an event.

Format Specification

```
"FEU": [
{
   "message-header": <MessageHeader>,
   "event-reference": <EventReference>,
   "event-headline": <EventHeadline>,
   "event-element-details": <sequence of 1 to 64 EventElementDetail>
},
...
]
```

Example GET response


```
"FEU": [
{
   "event-element-details": {
      "event-element-detail": {
        "event-times": {"update-time": {
          "date": 20190529,
          "offset": "-0600",
          "time": "093305"
        }},
      "event-descriptions": {"event-description": [
        {"phrase": {"pavement-conditions": "wet pavement"}},
        {"phrase": {"precipitation": "snow"}}
      ]},
    "event-locations": {"event-location": {"location-on-link": {
     "link-ownership": "WYDOT",
     "secondary-location": {
      "geo-location": {
       "latitude": 41634228,
       "longitude": -106283800
      },
      "linear-reference": 267.19,
      "point-name": "Exit 267, Wagonhound Rd"
     },
     "link-designator": "I80",
     "primary-location": {
      "geo-location": {
       "latitude": 41724391,
       "longitude": -106459790
      },
      "linear-reference": 255.6,
      "point-name": "Exit 255, WY 72"
     },
     "link-direction": "w"
    }}}
   }},
   "message-header": {
    "message-number": 125555612,
    "organization-sending": {"organization-id": "WYDOT"},
    "message-type-version": 2,
    "message-time-stamp": {
     "date": 20190716,
     "offset": "-0600",
     "time": "065935"
    }
   },
   "event-reference": {
    "update-time": {
     "date": 20190529,
     "offset": "-0600",
     "time": "093305"
    },
    "event-id": "EMI80ED",
    "event-update": 1
   },
   "event-headline": {"headline": {"system-information": "travel information"}}
  }
}
]
```

MessageHeader

The *MessageHeader* contains information content describing header information associated with an event. Includes the following fields: `organization-sending`, `message-time-stamp`, `message-type-version`, `message-number`, `message-expiry-time`.

Description of Fields

- `organization-sending` <*OrganizationInformation*>: Required. The information content describing an organization information for a single organization.
- `message-type-version` <*Event-message-type-version*>: Required. Identifies the version of the Full Event Update (FEU) message structure being used. A value of 1 represents Version 1 of the FEU is part of TMDD V2.1. A value of 2 represents Version 2 of the FEU is part of TMDD V3.0x
- `message-number` <*Event-message-number*>: Required. A unique identifier of a specific message instance.
- `message-time-stamp` <*DateTimeZone*>: Required. The date and time when the event associated with this message header should be considered as being valid or as having started.
- `message-expiry-time` <*DateTimeZone*>: Required. This is the date and time when the event associated with this message header should no longer be considered valid.

Format Specification

```
"message-header": {
   "organization-sending": <OrganizationInformation>,
   "message-type-version": <Event-message-type-version>,
   "message-number": <Event-message-number>,
   "message-time-stamp": <DateTimeZone>,
   "message-expiry-time": <DateTimeZone>
}
```

Example (subset of data from) GET response

```
"message-header": {
    "organization-sending": {
        "organization-id": "WYDOT"
    },
    "message-type-version": 2,
    "message-number": 125555612,
    "message-time-stamp": {
        "date": 20190716,
        "offset": "-0600",
        "time": "065935"
        }
    },
    "message-expiry-time": {
        "date": 20170622,
        "offset": "-0600",
        "time": 154529
    }
```

```
}
```

EventReference

The *EventReference* contains information content describing a reference to an event that is associated with this event. Includes the following fields: `event-id`, `event-update`, `update-time`.

Description of Fields

- `event-id` <*Organization-resource-identifier*>: Required. A unique identifier within an organization for a resource (organization, center, event, person, vehicle, device, etc). Also used to identify the attributes and details of that resource.
- `event-update` <*Event-update*>: Required. The number of times the log has been modified for a specific roadway event.
- `update-time` <*DateTimeZone*>: Required. The date and time of the latest update to the event.

Format Specification

```
"event-reference": {
   "event-id": <String 1-32 characters: Organization-resource-identifier>,
   "event-update": <Integer 1-655535: Event-update>,
   "update-time": <DateTimeZone>
}
```

Example (subset of data from) GET response

```
"event-reference": {
    "event-id": "WYDOT-17266179",
    "event-update": 1,
    "update-time": {
        "date": 20190529,
        "offset": "-0600",
        "time": "093305"
    }
}
```

EventHeadline

The *EventHeadline* contains information content describing an event, including a list of phrases and identification of the key phrase. Contains the following field: `headline`.

Description of Fields

- `headline` <*EventType*>: Required. The information content describing the type of event, based on the ITIS codes.

Format Specification

```
"event-headline": {
   "headline": <EventType>
}
```

Example (subset of data from) GET response

```
"event-headline": {
    "headline": {
        "system-information": "travel information"
    }
}
```

EventElementDetail

The *EventElementDetail* contains information content describing an event element detail, which itself may be the scale of an event. Contains the following fields: `event-times`, `event-descriptions`, `event-locations`.

Description of Fields

- `event-times` <*EventTimes*>: Required. The information content describing a schedule of start and end times associated with an event.
- `event-descriptions` <*EventDescription*>: Optional. A sequence of 1-1024. The information content describing the event including phrases, causes, quantities, advisories, descriptive text, and related locations associated with an event.
- `event-locations` <*EventLocation*>: Optional. A sequence of 1-20. The information content describing a point, area, landmark, or link associated with an event.

Format Specification

```
"event-element-detail": {
   "event-times": <EventTimes>,
   "event-descriptions": <Sequence of 1-1024 EventDescription>,
   "event-locations": <Sequence of 1-20 EventLocation>
}
```

Example (subset of data from) GET response


```
"event-element-detail": {
    "event-times": {
        "update-time": {
            "date": 20170622,
            "offset": "-0600",
            "time": 153746
        }
    },
    "event-descriptions": {
        "event-description": {
            "phrase": {
                "pavement-conditions": "dry pavement"
            }
        }
    },
    "event-locations": {
        "event-location": {
            "location-on-link": {
                "link-ownership": "WYDOT",
                "secondary-location": {
                    "geo-location": {
                        "latitude": 40997836,
                        "longitude": -109841876
                    },
                    "linear-reference": 140.36,
                    "point-name": "the Utah State Line"
                },
                "link-designator": "WY414",
                "primary-location": {
                    "geo-location": {
                        "latitude": 41356808,
                        "longitude": -110337945
                    },
                    "linear-reference": 93.88,
                    "point-name": "I-80, Carter Int"
                },
                "link-direction": "both directions"
            }
        }
    }
}
```

DateTimeZone

The *DateTimeZone* is a data frame used to describe local time, including date, time, and time zone. Contains the following fields: `Date`, `Time`, `Time-offset-utc`.

Description of Fields

- `Date` <*Date*>: Required. A representation of date. Format as: YYYYMMDD where YYYY is the year; MM the month, range 01 to 12, DD the day, range 01 to 31. Use zero for MM and DD when not applicable.
- `Time` <*Time*>: Required. A representation of time. Format: HHMMSSssss Use 24 hour notation. HH represents hours (00 to 23); MM represents minutes (00 to 59); SS represents seconds (00 to 59, or 00 if NA); ssss represents decimal seconds (0000 to 9999).
- `Time-offset-utc` <*Time-offset-utc* >: Required. Time zone offset for local time from UTC. Format as: -HHMM or +HHMM according to hemisphere. Plus refers to a western hemisphere offset, and minus to the eastern hemisphere. HH hour (-14 to +12); MM minutes (00 to 59).

Format Specification

```
{
   "date": <8 digits: Integer>,
   "time": <6 digits: Integer>,
   "offset": <Signed 4 digits with leading zeros: Integer>
}
```

Example (subset of data from) GET response

```
{
    "date": 20170622,
    "time": 153746,
    "offset": "-0600"
}
```

EventType

The *EventType* contains information content describing the type of event, based on the ITIS codes. Contains fields: `name`, `type`.

Description of Fields

- `name` <*ITIS-Category*>: Required. Enumeration. String representing an ITIS category.
- `type` <*sub-code for ITIS-Category*>: Required. Enumeration. String value representing one of a fixed set of ITIS sub-codes for the ITIS category in the name field.

Format Specification

```
{
    <ITIS-Category>, <sub-code for ITIS-Category>
}
```

Example (subset of data from) GET response

```
{
    "pavement-conditions": "dry pavement"
}
```

EventTimes

The *EventsTimes* contain information content describing a schedule of start and end times associated with an event. Contains field: `update-time`.

Description of Fields

- `update-time` <*DateTimeZone*>: Required. The date and time this event last updated.

Format Specification

```
"event-times": {
    "update-time": <DateTimeZone>
}
```

Example (subset of data from) GET response

```
"event-times": {
    "update-time": {
        "date": 20170622,
        "offset": "-0600",
        "time": 145448
    }
}
```

EventDescription

The *EventDescription* contains information content describing the event including phrases, causes, quantities, advisories, descriptive text, and related locations associated with an event. Contains one field: `phrase`.

Description of Fields

- `phrase` <*EventType*>: Required. The information content describing the type of event, based on the ITIS codes.

Format Specification

```
"event-description": {
    "phrase": {
        <ITIS-Category>, <sub-code for ITIS-Category>
    }
}
```

Example (subset of data from) GET response

```
"event-description": {
    "phrase": {
        "pavement-conditions": "dry pavement"
    }
}
```

EventLocation

The *EventLocation* contains information content describing a point, area, landmark, or link associated with an event.

Description of Fields

- `location-on-link <`*LinkLocation*`>`: Required. The information content describing a link-based location associated with an event.

Format Specification

```
"event-location": {
    "location-on-link": <LinkLocation>
}
```

Example (subset of data from) GET response

```
"event-location": {
    "location-on-link": {
        "link-ownership": "WYDOT",
        "secondary-location": {
            "geo-location": {
                "latitude": 45000113,
                "longitude": -105371314
            },
            "linear-reference": 170.11,
            "point-name": "the Montana State Line"
        },
        "link-designator": "WY59",
        "primary-location": {
            "geo-location": {
                "latitude": 44393698,
                "longitude": -105539006
            },
            "linear-reference": 119.24,
            "point-name": "US 14/16"
        },
        "link-direction": "both directions"
    }
}
```

LinkLocation

The *LinkLocation* contains information content describing a link-based location associated with an event. Contains the following fields: `link-ownership`, `link-designator`, `primary-location`, `secondary-location`, `link-direction`.

Description of Fields

- `link-ownership` <*Transportation-network-name*>: Optional. The user-defined name for a roadway, roadway reference, roadway network, route, link, node or intersection name. Also applies to transit elements.
- `link-designator` <*Link-route-designator*>: Optional. The information content describing a link-based location associated with an event.
- `primary-location` <*PointOnLink*>: Required. The information content describing a link-based location associated with an event.
- `secondary-location` <*PointOnLink*>: Optional. The information content describing a link-based location associated with an event.
- `link-direction` <*Link-direction*>: Optional. The information content describing a link-based location associated with an event.

Format Specification

```
"location-on-link": {
    "link-ownership": <Transportation-network-name>,
    "link-designator": <Link-route-designator>,
    "primary-location": <PointOnLink>,
    "secondary-location": <PointOnLink>,
    "link-direction": <Link-direction>
}
```

Example (subset of data from) GET response

```
"location-on-link": {
    "link-ownership": "WYDOT",
    "link-designator": "WY59",
    "primary-location": {
        "geo-location": {
            "latitude": 44393698,
            "longitude": -105539006
        },
        "linear-reference": 119.24,
        "point-name": "US 14/16"
    },
    "secondary-location": {
        "geo-location": {
            "latitude": 45000113,
            "longitude": -105371314
        },
        "linear-reference": 170.11,
        "point-name": "the Montana State Line"
    },
    "link-direction": "both directions"
}
```

PointOnLink

The *PointOnLink* contains information content describing a point on a link associated with an event.
Contains fields: `geo-location`, `linear-reference`, `point-name`.

Description of Fields

- `geo-location` <*GeoLocation*>: Required. The GeoLocation data frame conveys a two- or three-dimensional geographic location based on coordinates. The standard horizontal datum for a spot location is WGS-84; other horizontal datums can be specified by HorizontalDatum. Vertical Datum is an option within height.
- `point-name` <*Transportation-network-name*>: Optional. The user-defined name for a roadway, roadway reference, roadway network, route, link, node or intersection name. Also applies to transit elements.
- `linear-reference` <*Link-location-linear-reference*>: Optional. A marker reference point at a location on a roadway.

Format Specification

```
{
    "geo-location": <GeoLocation>,
    "linear-reference": <String: Link-location-linear-reference>,
    "point-name": <String 1-256 characters: Transportation-network-name>
}
```

Example (subset of data from) GET response

```
{
    "geo-location": {
        "latitude": 44393698,
        "longitude": -105539006
    },
    "linear-reference": 119.24,
    "point-name": "US 14/16"
}
```

GeoLocation

The *GeoLocation* data frame conveys a two- or three-dimensional geographic location based on coordinates. The standard horizontal datum for a spot location is WGS-84; other horizontal datums can be specified by HorizontalDatum. Vertical Datum is an option within height. Contains the following fields: `latitude`, `longitude`.

Description of Fields

- `latitude` <*Integer*>: Required. The geographic latitude of a node expressed in integer microdegrees, with reference to the horizontal datum specified by horizontalDatum.
- `longitude` <*Integer*>: Required. The geographic longitude of a node, expressed in integer microdegrees, with reference to the horizontal datum specified by horizontalDatum.

Format Specification

```
"geo-location": {
    "latitude": <INTEGER -900000000..900000001>,
    "longitude": <INTEGER -1800000000..1800000001>
}
```

Example (subset of data from) GET response

```
"geo-location": {
    "latitude": 44393698,
    "longitude": -105539006
}
```

Link-direction

The information content describing a link-based location associated with an event. This content contains enumerated values as follows:

- any other (0)
- n (1)
- ne (2)
- e (3)
- se (4)
- s (5)
- sw (6)
- w (7)
- nw (8)
- not directional (9)
- positive direction (10)
- negative direction (11)
- both directions (12)
- other (13)

Link-location-linear-reference

A marker reference point at a location on a roadway, such as a mile marker. Contains a string.

Transportation-network-name

WYDOT-defined name for a roadway, roadway reference, roadway network, route, link, node or intersection name. Also applies to transit elements. Value is a string from 1-256 characters long.

Link-route-designator

County, State, or Federal route numbers with any associated alphabetic designators. Value is a string from 1-64 characters long.

Organization-resource-identifier

A unique identifier within an organization for a resource (organization, center, event, person, vehicle, device, etc). Also used to identify the attributes and details of that resource. Value is a string from 1-32 characters long.

Event-update

The number of times the log has been modified for a specific roadway event.