

# DATEX II profile for Mobile Lane Closure Trailers

realised by



AlbrechtConsult GmbH, Aachen, Germany



Traffic information and management GmbH, Dieburg, Germany

Version: 01-00-00 - 2013-03-27

---

On behalf of Hessen Mobil

For any further information, please contact:

[jens.wetzel@mobil.hessen.de](mailto:jens.wetzel@mobil.hessen.de)

[j.freudenstein@albrechtConsult.com](mailto:j.freudenstein@albrechtConsult.com)

[b.kolbe@traffic-tim.de](mailto:b.kolbe@traffic-tim.de)

---

## Motivation

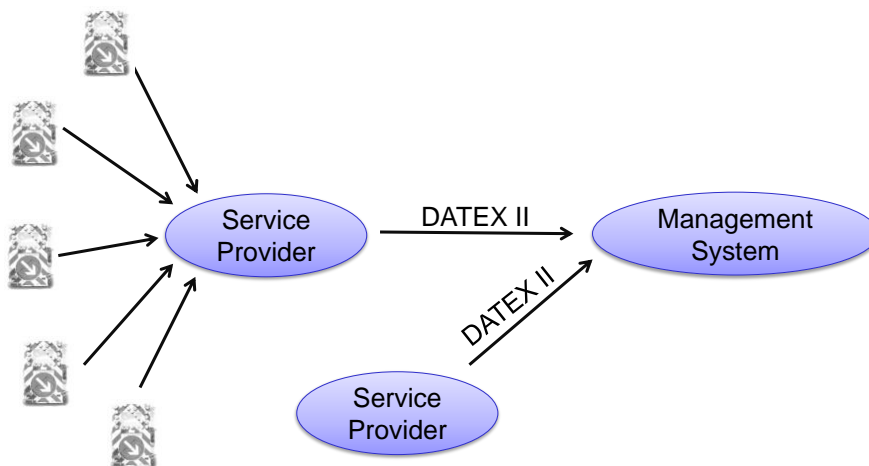
In 2003, Hessen started the initiative Hessen free of traffic jams („Staufreies Hessen“), which led to a jam reduction of 80% in more than ten years. To generate a smooth traffic flow, a lot of activities have been initiated, e.g. optimizing road works planning.

Traffic data is collected through automated systems along the highways and is evaluated in the Hessian Traffic Centre (VZH). Also the position data from GPS-equipped Mobile Lane Closure Trailers is collected by a service provider can be transferred to the VZH with the help of DATEX II. The usage is to filter out the relevant information and process the data to inform all drivers accordingly about current road works or road maintenance.

## Outline

Mobile Lane Closure Trailers are used to indicate road works or road maintenance, lane closures or road closures.

This DATEX II profile can be used to transfer information from Mobile Lane Closure Trailers from central to central, for example from some service provider to some management system. Usually the data is generated inside the trailer system itself and collected by a service provider:



This profile can be especially useful for short term events, in which the situation cannot be scheduled in advance. The information can be subject to change, for instance the position (moving road maintenance) or the signals and symbols displayed to the drivers. Therefore it is possible to transfer the data at a high frequency.

Despite some common transfer information (version, timestamps, ...), the following information is included in the DATEX II profile:

- Data supplier
- Bundle of activities and single activity (Situation and SituationRecord)
- Validity of the message
- Public and internal information for situation description
- Georeferencing by point location
- Trajectory of last positions to identify correct lane
- Type of road work
- Status of systems
- Signalizing of the trailer

## Technical Information

Please note that not all parts of the data model are explained here; the description is limited to valuable parts.

### Version information

Version and extension name of the XML-Schema (.xsd) can be found in the following lines of the schema file:

```
334 <xs:attribute name="extensionName" use="optional" default="MobileLaneClosureTrailers" />
335 <xs:attribute name="extensionVersion" use="optional" default="01-00-00" />
```

The header of an XML-Instanz (.xml) can look like this:

```
1 <?xml version="1.0" encoding="UTF-8"?>
2 <d2:d2LogicalModel xmlns:d2="http://datex2.eu/schema/2/2_0"
3   xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
4   xsi:schemaLocation="http://datex2.eu/schema/2/2_0 DATEX_II_Profile_MobileLaneClosureTrailers.xsd modelBaseVersion="2"
5   extensionName="MobileLaneClosureTrailers" extensionVersion="01-00-00">
```

### Bundle of activities (Situation)

One **Situation** encapsulates an arbitrary number of **SituationRecords**, each representing a single activity of a mobile lane closure trailer.

<i>DATEX II attributes</i>	<i>Enumeration values</i>
informationStatus	<div style="border: 1px solid black; padding: 5px;"> <p style="text-align: center;">«enumeration» <b>InformationStatusEnum</b></p> <hr/> <p>real technicalExercise</p> </div>
confidentiality	<div style="border: 1px solid black; padding: 5px;"> <p style="text-align: center;">«enumeration» <b>ConfidentialityValueEnum</b></p> <hr/> <p>noRestriction</p> </div>
<pre>&lt;d2:situation id="60C6ADFD-27BD-4662-9ABA-4D7023F0493C" version="1"&gt;   &lt;d2:headerInformation&gt;     &lt;d2:confidentiality&gt;noRestriction&lt;/d2:confidentiality&gt;     &lt;d2:informationStatus&gt;real&lt;/d2:informationStatus&gt;   &lt;/d2:headerInformation&gt;</pre>	

### Single activity (SituationRecord)

A **SituationRecord** represents one activity of a trailer. As with the **Situation**, the **SituationRecord** has a unique id and version.

<i>DATEX II attributes</i>	<i>Content (examples) and enumeration values</i>
<i>situationRecordCreationReference</i>	<b>Absperrtafel tim_1283</b> <i>(Example for usage in Germany with keyword and internal id)</i>
<i>situationRecordCreationTime</i>	<b>2012-11-04T18:13:51.OZ</b>
<i>situationRecordVersionTime</i>	<b>2012-11-04T18:13:51.OZ</b>
<i>situationRecordFirstSupplierVersionTime</i> <i>(optional)</i>	<b>2012-11-04T18:13:51.OZ</b>
<i>probabilityOfOccurrence</i>	<div style="border: 1px solid black; background-color: #e6f2ff; padding: 5px; width: fit-content; margin: auto;"> <p style="text-align: center;">«enumeration» <b>ProbabilityOfOccurrenceEnum</b></p> <hr style="border: 0; border-top: 1px solid black; margin: 2px 0;"/> <p style="text-align: center;">certain</p> </div>
<pre>&lt;d2:situationRecord xsi:type="d2:MaintenanceWorks" id="5E9657B6-A458-48D3-84CC-268CD7C1ACF7" version="3"&gt;   &lt;d2:situationRecordCreationReference&gt;Absperrtafel tim_1283&lt;/d2:situationRecordCreationReference&gt;   &lt;d2:situationRecordCreationTime&gt;2012-11-04T18:13:51.OZ&lt;/d2:situationRecordCreationTime&gt;   &lt;d2:situationRecordVersionTime&gt;2012-11-04T18:13:51.OZ&lt;/d2:situationRecordVersionTime&gt;   &lt;d2:situationRecordFirstSupplierVersionTime&gt;2012-11-04T18:13:51.OZ&lt;/d2:situationRecordFirstSupplierVersionTime&gt;   &lt;d2:probabilityOfOccurrence&gt;certain&lt;/d2:probabilityOfOccurrence&gt;</pre>	

## Validity

Usually, the **validityStatus** should be **definedByValidityTimeSpec**, i.e. **overallStartTime** and **overallEndTime** are used. In a specific German scenario, 40 minutes are intended as a default time slot (which is continuously adapted). Furthermore, the **overallStartTime** will be identical with **SituationRecordVersionTime**.

The ending of an activity (flipping down the panel) can be denoted by using the literal **suspended**.

The value **active** will always overwrite start and end time; it should only be used rarely.

DATEX II attributes	Content (examples) and enumeration values
validityStatus	<div style="border: 1px solid black; padding: 5px; background-color: #e6f2ff;"> <p style="text-align: center;">«enumeration» <b>ValidityStatusEnum</b></p> <p>active suspended definedByValidityTimeSpec</p> </div>
overallStartTime	2012-11-04T18:13:51.0Z
overallEndTime (optional)	2012-11-04T18:13:51.0Z
<pre> &lt;d2:validity&gt;   &lt;d2:validityStatus&gt;definedByValidityTimeSpec&lt;/d2:validityStatus&gt;   &lt;d2:validityTimeSpecification&gt;     &lt;d2:overallStartTime&gt;2012-11-04T18:13:51.0Z&lt;/d2:overallStartTime&gt;     &lt;d2:overallEndTime&gt;2012-11-04T22:13:51.0Z&lt;/d2:overallEndTime&gt;   &lt;/d2:validityTimeSpecification&gt; &lt;/d2:validity&gt; </pre>	

## Public comments / descriptions

**GeneralPublicComments** (optional, maximum of three) are describing the type of work, usually short time roadworks (“Tagesbaustelle”) and a written description of the location.

Examples for a German Scenario are:

- Bsp. Freie Strecke:  
A3 Richtung Köln von [Raststätte] Medenbach nach [Anschlussstelle] Niedernhausen
- Bsp. Anschlußstelle:  
A5 Frankfurter Kreuz Ast von Würzburg nach Darmstadt, Köln

```

<d2:generalPublicComment>
  <d2:comment>
    <d2:values>
      <d2:value lang="de">Tagesbaustelle</d2:value>
    </d2:values>
  </d2:comment>
</d2:generalPublicComment>
<d2:generalPublicComment>
  <d2:comment>
    <d2:values>
      <d2:value lang="de">A3 Richtung Köln von [Raststätte] Medenbach nach [Anschlussstelle] Niedernhausen</d2:value>
    </d2:values>
  </d2:comment>
</d2:generalPublicComment>
  
```

### Internal information for describing the activity

The public information is extended by **nonGeneralPublicComments** (optional, maximum of three). In a German scenario, a number plate information as well as a TMC-Code is written down there.

The following table shows TMC-Codes for the German scenario, which can be used inside the comment:

815	Tagesbaustelle
504	Standstreifen gesperrt
409	Beschränkung der Anschlussstelle
501	Rechter Fahrstreifen gesperrt
503	Linker Fahrstreifen gesperrt

<i>DATEX II attributes</i>	<i>Content (examples)</i>
<b>nonGeneralPublicComment</b> - value	<b>Kennzeichen: WI - 1001</b>
<b>nonGeneralPublicComment</b> - value	<b>TMC: 0815</b>

```

<d2:nonGeneralPublicComment>
  <d2:comment>
    <d2:values>
      <d2:value lang="de">Kennzeichen: WI-1001</d2:value>
    </d2:values>
  </d2:comment>
</d2:nonGeneralPublicComment>
<d2:nonGeneralPublicComment>
  <d2:comment>
    <d2:values>
      <d2:value lang="de">TMC:0815</d2:value>
    </d2:values>
  </d2:comment>
</d2:nonGeneralPublicComment>
<d2:nonGeneralPublicComment>
  <d2:comment>
    <d2:values>
      <d2:value lang="de">TMC:504</d2:value>
    </d2:values>
  </d2:comment>
</d2:nonGeneralPublicComment>

```

### Location information (point)

The height above sea (altitude) was implemented as a DATEX II Level B-extension.

DATEX II attributes	Content (examples)
[reference method]	pointByCoordinates
bearing (optional)	45
latitude	50.052794
longitude	8.264716
altitude (height above sea, optional)	300



```

<d2:groupOfLocations xsi:type="d2:Point">
  <d2:locationForDisplay>
    <d2:latitude>1234.56</d2:latitude>
    <d2:longitude>1234.56</d2:longitude>
  </d2:locationForDisplay>
  <d2:pointByCoordinates>
    <d2:bearing>45</d2:bearing>
    <d2:pointCoordinates>
      <d2:latitude>0</d2:latitude>
      <d2:longitude>0</d2:longitude>
      <d2:pointCoordinatesExtension>
        <d2:pointCoordinatesExtended>
          <d2:altitude>300</d2:altitude>
        </d2:pointCoordinatesExtended>
      </d2:pointCoordinatesExtension>
    </d2:pointCoordinates>
  </d2:pointByCoordinates>
</d2:groupOfLocations>
    
```

## Type of roadworks, status of systems

The roadworks are classified as `shortTerm`.

The activity of the trailer can be `stationary` (speed below 4 km per hour) or `dynamic` (`mobile`, speed above 4 km per hour), it can be also `unknown`. Furthermore, details of the obstacle can be expressed with `blockingDirection` in combination with `bearing` (see point location). The status of the GPS system can be classified by number of used satellites or an error information.

*Elements of the `MobilityExtended`-class have been implemented as a Level B extension to the DATEX II model.*

DATEX II attributes	Content (examples) and enumeration values
roadworksDuration (optional)	<div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 0 auto;"> <p>«enumeration»  <b>RoadworksDurationEnum</b></p> <hr style="border: 0; border-top: 1px solid black; margin: 2px 0;"/> <p><code>shortTerm</code></p> </div>

<p>The following block is <b>optional</b>. If it is used, <b>mobilityType</b>, <b>numberOfSatellites</b> und <b>gpsStatus</b> are mandatory.</p>	
<p>mobilityType</p>	<div style="border: 1px solid black; padding: 5px; background-color: #e6f2ff;"> <p>«enumeration» <b>MobilityEnum</b></p> <hr/> <p>mobile stationary unknown</p> </div>
<p>speed (<b>optional</b>)</p>	<p>15</p>
<p>blockingDirection (<b>optional</b>)</p>	<div style="border: 1px solid black; padding: 5px; background-color: #e6f2ff;"> <p>«enumeration» <b>BlockingDirectionEnum</b></p> <hr/> <p>inDirectionOfBearing oppositeToBearing</p> </div>
<p>numberOfSatellites</p>	<p>2</p>
<p>gpsStatus</p>	<div style="border: 1px solid black; padding: 5px; background-color: #e6f2ff;"> <p>«enumeratio...» <b>GpsStatusEnum</b></p> <hr/> <p>noSignal gps2D gps3D dgps2D dgps3D</p> </div>
<p>errorState (<b>optional</b>)</p>	<div style="border: 1px solid black; padding: 5px; background-color: #e6f2ff;"> <p>«enumeration» <b>ErrorStateEnum</b></p> <hr/> <p>unknown gpsDefect unknownTableState externalError externalErrorNoReaction</p> </div>

```
<d2:roadworksDuration>shortTerm</d2:roadworksDuration>
<d2:mobility>
  <d2:mobilityType>mobile</d2:mobilityType>
  <d2:mobilityExtension>
    <d2:mobilityExtended>
      <d2:speed>15</d2:speed>
      <d2:blockingDirection>inDirectionOfBearing</d2:blockingDirection>
      <d2:numberOfSatellites>2</d2:numberOfSatellites>
      <d2:gpsStatus>gps3D</d2:gpsStatus>
      <d2:errorState>gpsDefect</d2:errorState>
```

**Last positions (better quality in positioning)**

A significant innovation is to include up to three previous positions in the message. This is especially useful in the case of physically separated lanes to get most detailed information about the correct geo-position. Referencing is identical to the point referencing introduced above.

The information about last positions is **optional**.

<i>DATEX II attributes</i>	<i>Content (examples)</i>
index	0-2
latitude	50.051655
longitude	8.277977

```
<d2:lastPositions>
  <d2:locationContainedInItinerary index="0">
    <d2:location xsi:type="d2:Point">
      <d2:pointByCoordinates>
        <d2:pointCoordinates>
          <d2:latitude>50.051655</d2:latitude>
          <d2:longitude>8.277977</d2:longitude>
        </d2:pointCoordinates>
      </d2:pointByCoordinates>
    </d2:location>
  </d2:locationContainedInItinerary>
  <d2:locationContainedInItinerary index="1">
    <d2:location xsi:type="d2:Point">
      <d2:pointByCoordinates>
        <d2:pointCoordinates>
          <d2:latitude>50.051077</d2:latitude>
          <d2:longitude>8.282139</d2:longitude>
        </d2:pointCoordinates>
      </d2:pointByCoordinates>
    </d2:location>
  </d2:locationContainedInItinerary>
</d2:lastPositions>
```

## Signage of the trailer

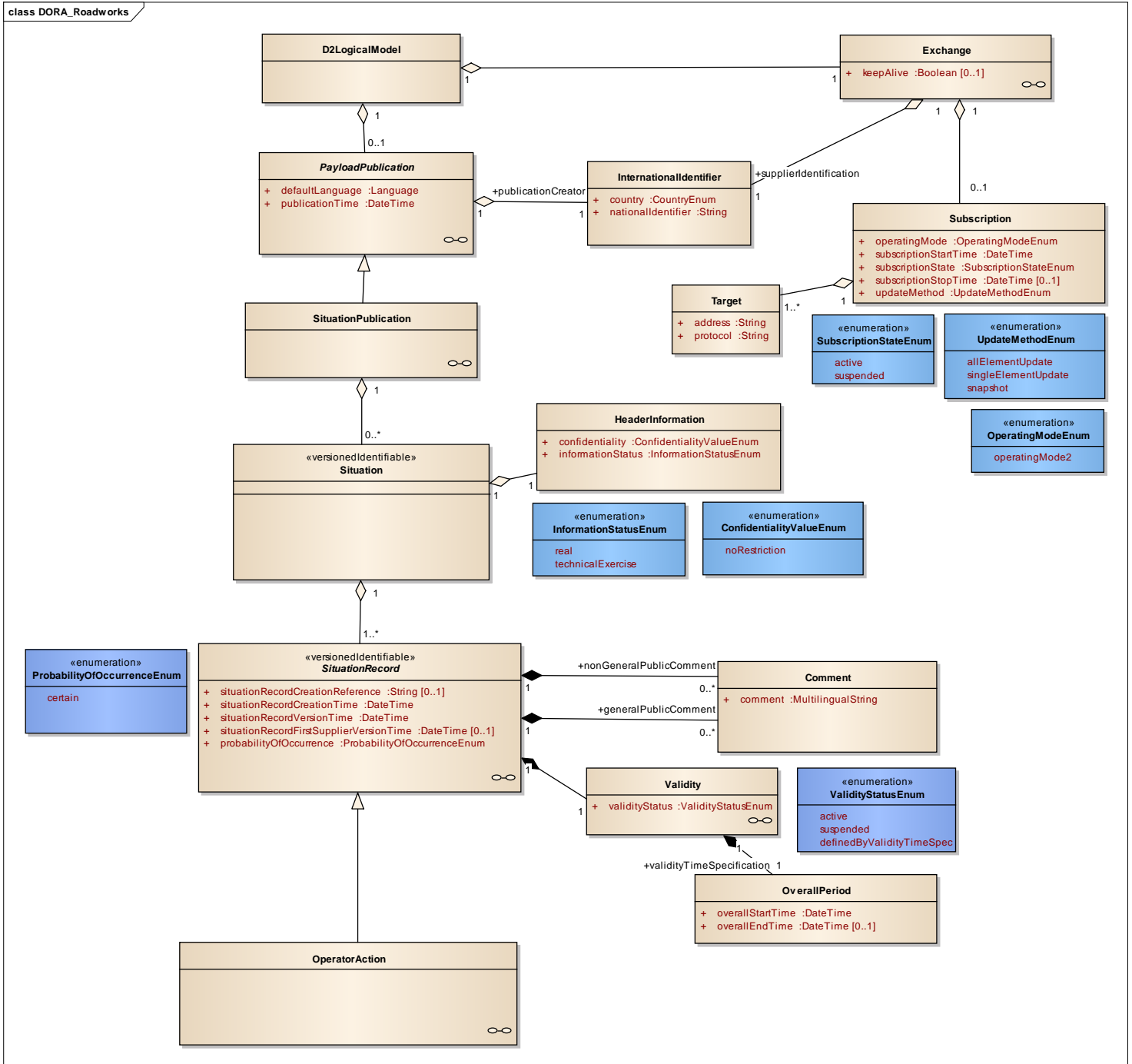
The roadwork itself are characterised by the mandatory value `maintenanceWork`.

The signage of the trailer is expressed by the following enumerations (which are as well Level-B extensions):

<i>DATEX II attributes</i>	<i>Content (examples) and enumeration values</i>
roadMaintenanceType	<div style="border: 1px solid black; padding: 5px; background-color: #e6f2ff;"> <p style="text-align: center;">«enumeration» <b>RoadMaintenanceTypeEnum</b></p> <hr style="border: 0; border-top: 1px solid black; margin: 2px 0;"/> <p style="text-align: center;"><code>maintenanceWork</code></p> </div>
<p>The following block of three attributes is <b>optional</b>. But if it is used, all three attributes are mandatory.</p>	
maintenanceLightState	<div style="border: 1px solid black; padding: 5px; background-color: #e6f2ff;"> <p style="text-align: center;">«enumeration» <b>MaintenanceLightStateEnum</b></p> <hr style="border: 0; border-top: 1px solid black; margin: 2px 0;"/> <p style="text-align: center;"><code>unknown</code> <code>off</code> <code>cross</code> <code>arrowLeft</code> <code>arrowRight</code> <code>specialSymbol</code></p> </div>
maintenanceTableState	<div style="border: 1px solid black; padding: 5px; background-color: #e6f2ff;"> <p style="text-align: center;">«enumeration» <b>MaintenanceTableStateEnum</b></p> <hr style="border: 0; border-top: 1px solid black; margin: 2px 0;"/> <p style="text-align: center;"><code>unknown</code> <code>flippedUp</code> <code>flippedDown</code> <code>intermediateState</code></p> </div>
maintenanceArrowState	<div style="border: 1px solid black; padding: 5px; background-color: #e6f2ff;"> <p style="text-align: center;">«enumeration» <b>MaintenanceArrowStateEnum</b></p> <hr style="border: 0; border-top: 1px solid black; margin: 2px 0;"/> <p style="text-align: center;"><code>unknown</code> <code>left</code> <code>middle</code> <code>right</code></p> </div>

```
<d2:maintenanceVehicles>
  <d2:maintenanceVehiclesExtension>
    <d2:maintenanceVehiclesExtended>
      <d2:maintenanceLightState>arrowLeft</d2:maintenanceLightState>
      <d2:maintenanceTableState>fliipedUp</d2:maintenanceTableState>
      <d2:maintenanceArrowState>unknown</d2:maintenanceArrowState>
    </d2:maintenanceVehiclesExtended>
  </d2:maintenanceVehiclesExtension>
</d2:maintenanceVehicles>
<d2:roadMaintenanceType>maintenanceWork</d2:roadMaintenanceType>
```

## UML visualisation of the data model



# DATEX II profile for Mobile Lane Closure Trailers

