Open Transport Map = INSPIRE compatible and routable OpenStreetMap

The Open Transport Map allows routing and dynamic visualization of traffic volumes. It also offers many other ways of innovative exploitation. The underlying data are accessible in an open INSPIRE compatible format.
Open Transport Map = INSPIRE compatible and routable
OpenStreetMap

• Open Transport Map
  – Why a new map?
  – What it can do / what it will do?
  – How is it done?
    • Methodology
    • Technology
  – How it can be used?
• How is it achieved?
  – INSPIRE Transport Network specification
  – Model simplification (with respect to available data),
  – INSPIRE compatible
  – Model extension by adding domain specific attributes (various projects OTN, SDI4Apps a Foodie)
  – Transformation schema definition for OSM to OTM
  – Transformation schema for local data to OTM
  – Traffic volume calculation (pilot regions, Evropa)
  – Traffic capacity calculation
  – Real time calculation
  – Data OTM – OSM synchronization
Why Open Transport Map?

- OSM

- OTM
  - Routing
  - Traffic volume
  - INSPIRE compatible
How is it achieved?

- INSPIRE Transport Network specification
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- INSPIRE compatible
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- INSPIRE Transport Network
• INSPIRE compatible data model OTM

```
<<featureType>>
RoadLink

+inspireID: Identifier = DatasetSource_ID
+beginLifeSpanVersion: DateTime
+endLifeSpanVersion: DateTime
+validFrom: DateTime
+validTo: DateTime
+fictitious: Boolean
+centerLineGeometry: GM_Curve
+direction: LinkDirectionValue
+fromRoadNode: Identifier = RoadNode.inspireID
+toRoadNode: Identifier = RoadNode.inspireID
+RoadName: GeographicalName
+nationalRoadCode: CharacterString
+functionalRoadClass: FunctionalRoadClassValue
+formOfWay: FormOfWayValue
+roadSurfaceCategory: roadSurfaceCategoryValue
+speedLimit: SpeedLimitValue
+capacity: NumberOfMaximalTrafficVolumeValue
+maximumHeight: Float = meters
+maximumTotalWeight: Float = meters
+maximumWidth: Float = meters
+vehicleType: VehicleTypeValue

<<featureType>>
RoadNode

+inspireID: Identifier = DatasetSource_ID
+beginLifeSpanVersion: DateTime
+endLifeSpanVersion: DateTime
+validFrom: DateTime
+validTo: DateTime
+fictitious: Boolean
+geometry: GM_Point
+geographicalName: GeographicalName
+formOfRoadNode: FormOfRoadNodeValue
+country: Identifier
+area: Identifier

<<table>>
TrafficVolume

+ID: Identifier
+roadLinkID: Identifier = RoadLink.inspireID
+trafficVolume: NumberOfVehiclesCrossingTheSegmentInTimePeriod
+trafficVolumeTimePeriod: TimePeriodValue
+fromTime: DateTime
+toTime: DateTime
+vehicleType: VehicleTypeValue
```
### INSPIRE compatible data model OTM

<table>
<thead>
<tr>
<th>VehicleTypeValue</th>
<th>TimePeriodValue</th>
<th>LinkDirectionValue</th>
<th>RoadSurfaceCategoryValue</th>
</tr>
</thead>
<tbody>
<tr>
<td>all vehicle</td>
<td>hour</td>
<td>bothDirections</td>
<td>paved</td>
</tr>
<tr>
<td>bicycle</td>
<td>day</td>
<td>inDirection</td>
<td>unpaved</td>
</tr>
<tr>
<td>car with trailer</td>
<td>monday, ..., sunday</td>
<td>inOppositeDirection</td>
<td></td>
</tr>
<tr>
<td>delivery truck</td>
<td>weekday</td>
<td></td>
<td></td>
</tr>
<tr>
<td>emergency vehicle</td>
<td>weekend</td>
<td></td>
<td></td>
</tr>
<tr>
<td>employee vehicle</td>
<td>week</td>
<td></td>
<td></td>
</tr>
<tr>
<td>facility vehicle</td>
<td>month</td>
<td></td>
<td></td>
</tr>
<tr>
<td>farm vehicle</td>
<td>year</td>
<td></td>
<td></td>
</tr>
<tr>
<td>high occupancy vehicle</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>light rail</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>mail vehicle</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>military vehicle</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>moped</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>motorcycle</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>passenger car</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>pedestrian</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>private bus</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>public bus</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>residential vehicle</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>school bus</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>snow chain equipped vehicle</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>tanker</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>taxi</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>transport truck</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>trolley bus</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>vehicle for disabled person</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>vehicle with explosive load</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>vehicle with other dangerous load</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>vehicle with water polluting load</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>FormOfWayValue</th>
<th>FormOfRoadNodeValue</th>
<th>FunctionalRoadClassValue</th>
</tr>
</thead>
<tbody>
<tr>
<td>bicycleRoad</td>
<td>enclosed traffic area</td>
<td>mainRoad</td>
</tr>
<tr>
<td>dualCarriageway</td>
<td>junction</td>
<td>firstClass</td>
</tr>
<tr>
<td>enclosedTrafficArea</td>
<td>level crossing</td>
<td>secondClass</td>
</tr>
<tr>
<td>entranceOrExitCarPark</td>
<td>pseudo node</td>
<td>thirdClass</td>
</tr>
<tr>
<td>entranceOrExitService</td>
<td>road end</td>
<td>fourthClass</td>
</tr>
<tr>
<td>freeway</td>
<td>road service area</td>
<td>fifthClass</td>
</tr>
<tr>
<td>motorway</td>
<td>roundabout</td>
<td></td>
</tr>
<tr>
<td>pedestrianZone</td>
<td>traffic square</td>
<td></td>
</tr>
<tr>
<td>roundabout</td>
<td></td>
<td></td>
</tr>
<tr>
<td>serviceRoad</td>
<td></td>
<td></td>
</tr>
<tr>
<td>singleCarriageway</td>
<td></td>
<td></td>
</tr>
<tr>
<td>slipRoad</td>
<td></td>
<td></td>
</tr>
<tr>
<td>tractor</td>
<td></td>
<td></td>
</tr>
<tr>
<td>trafficSquare</td>
<td></td>
<td></td>
</tr>
<tr>
<td>walkway</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>FormOfRoadNodeValue</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>enclosed traffic area</td>
<td></td>
</tr>
<tr>
<td>junction</td>
<td></td>
</tr>
<tr>
<td>level crossing</td>
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</tr>
<tr>
<td>pseudo node</td>
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<tr>
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<td>traffic square</td>
<td></td>
</tr>
</tbody>
</table>
**Open Transport Map = INSPIRE compatible and routable OpenStreetMap**

- **OSM → OTM conversion schema**

<table>
<thead>
<tr>
<th>Layer</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>OSM Map</td>
<td>Source map data</td>
</tr>
<tr>
<td>OTM Map</td>
<td>INSPIRE compatible map</td>
</tr>
</tbody>
</table>

### Conversion Process

1. **Data Transformation**
   - OSM data is transformed into OTM format.
   - Key attributes are redefined to meet INSPIRE standards.

2. **Map Generation**
   - Updated OTM map is generated.
   - Maps are now compatible with INSPIRE guidelines.

3. **Quality Assurance**
   - Maps undergo quality checks to ensure accuracy and compliance.

This process ensures that the OpenStreetMap data is fully compatible with INSPIRE standards, making it usable for routing and other INSPIRE compliant applications.
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- **OSM → OTM transformation schema**

```
==========
«featureType»
RoadLink source
==========
+ inspireID: Identifier [1] OSM.roads.osm_id_segments
.
.
+ roadSurfaceCategory: RoadSurfaceCategoryValue «codelist» OSM.roads.surface
.
.
==========
«codeList»
RoadSurfaceCategoryValue OSM.roads.surface
==========
+ unpaved: <all other values>
```
• **Traffic volume**

1. **Traffic generators**

2. **Traffic flow**

3. **Modal split**
   - Individual:
     - cars
     - cyclists
     - pedestrian
   - Public:
     - bus
     - train
     - city transport ...

4. **Traffic Flow allocated on the net**
- **Traffic volume**
  - Number of cars per time interval unit
  - Dynamic. Different for:
    - Time
    - Direction
    - Car type

- **Road segment capacity**
  - Maximal number of cars per time interval
  - Static – e.g. different in each direction

- **Traffic flow**
  - Free, without traffic
  - Traffic jam

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![Diagram of traffic flow and volume](image)
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OpenStreetMap
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- Used technology

- Open Transport Map
  - TrafficVolume
    - Pilots
    - EU
  - Capacity

- PostGIS
  - OSM Raw Export Data
  - ImpOSM
  - OSM Raw Export Data
  - OSM2PO
  - Routable OSM
  - OSM->OTM

- Measurements of traffic
  - Omnitrans Hadoop
  - Demographic Data
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• How to use OTM?
  www.opentransportmap.info

How can I use it?

- **AS DATA**
  - Download OTM here

- **AS A MAP**
  - Embed OTM to your own website
  - Use OTM as a map layer in your own map

- **AS A SERVICE**
  - OTM as a geodata service
  - OTM routing API

How can I contribute?

OTM has a simple data structure depicted at the figure above. Take a closer look at attributes and codelists, if interested. This data structure has been populated by OSM attributes as much as it is possible and traffic volumes have been calculated. But further contributions are more than welcome. Feel free to contact the team.
• Road Map of Open Transport Map
  – January 2016
    • WMS
    • WFS
  – March 2016
    • Traffic volume for pilot regions of OTN
  – September 2016
    • Periodic update
    • Road capacities
  – January 2017
    • Traffic volume for whole Europe
    • Real time calculation
    • Ready for production environment
Applications – traffic volume calculation
  – Traffic volume for large scale network (millions of edges)
  • Based on Apache Spark
  • Enable to calculate traffic volume country
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- Applications – traffic volume calculation
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- Applications – visualization based on webglayer.org
  - Interactive visualization of changes in traffic volume - http://home.zcu.cz/~jezekjan/otn/
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- Applications – visualization – HSLayers and OTN portal -
  http://opentransportnet.eu/cs/pilsen-traffic-volumes
Thank you for your attention!

http://opentransportmap.info/