Dynamic Location Referencing in Inspire

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simalcan trends

**SOCIAL DRIVERS**
- Increasing Population Density
- Drive for Sustainability
- Desire for Community
- Generational Altruism

**ECONOMIC DRIVERS**
- Monetize Excess or Idle Inventory
- Increase Financial Flexibility
- Access Over Ownership
- Influx of VC Funding

**TECHNOLOGY DRIVERS**
- Social Networking
- Mobile Devices and Platforms
- Payment System
Central computer: It’s software must understand the rules of the road, both formal and informal.
simacan  our reality

- Multiple real-time data sources:
  - 250,000 road segments updated every 30 seconds
  - 25,000 sensor probes
  - 4000 matrix signs
- Multiple Inspire datasets
- Multiple location referencing methods
- Multiple map vendors and versions
- Combining data in same grid of space and time

- In a single WEB-API and web browser
Inspire dataset: national road restrictions The Netherlands
exchanging locations between different maps & datasets
what is a location?

A location (point, line, etc) on earth referenced by coordinates (grid/crs) becomes usable on a map (spatial context).
what is a map?
• exchange of **location information**
• e.g.: traffic information, safety information, roadworks, routes, weather information, detailed configuration of infrastructure (e.g. road restrictions)
simacan - the same map?
Different digital map providers introduce technical challenges:

- Inconsistency in naming conventions
- Different data models
- Difference in map attributes/features and semantics
- Difference in data quality (coverage, geometry)
- Transformations and languages
a real world example

- Sliproad goes of the motorway
- Sliproad starts
- Lane separation starts
same location
different geometry
same location
different geometry
same location
different geometry

Road closure: The entire highway, the sliproad or the exit?
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same location
different geometry
simacan different network / road segments (links)
Map providers:
different roadsegment, link_id’s

- even more different map providers
- other (specialized) geometric networks
- multiple different versions over time
- across different users using different maps

Inspire dataset:
national road restrictions The Netherlands
location referencing in Inspire

- INSPIRE is centred on ISO 19100 series standards

- Current support for location referencing:
  - ISO/AWI 19148:2012 Geographic information -- Location based services -- Linear referencing system

Source: ISO/AWI 19148:2012 Geographic information -- Location based services -- Linear referencing system
linear referencing

relies on:

- Pre-defined locations (arbitrarily chosen points and or lines)
- Pre-defined locations means a new dataset to be maintained, both sender and receiver must have the same dataset of locations
- Quality of link coverage is determined by the number of pre-defined locations
• DATEX II has been extended to support linear referencing. It provides a simplified version of the ISO19148 model.

• TMC is a widely used linear referencing method implementation for traffic information

• Different TMC tables, different versions and not available in all EU member states
Dynamic Location Referencing

1. Identification of the location
2. Encoding with the transmitter's map database
3. Transmission of the location
4. Decoding of the location with receiver's map database
5. Presentation of the location in the receiver
simacan  dynamic location referencing

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1 location 3 maps

**Encoding**

Original location

**Decoding**

Green = National Road map segments (links)
Blue = Open Streetmaps segments (links)
Red = TomTom multimap segments
dynamic location referencing

relies on:

• Dynamically (on-the-fly) created reference points
• Dynamically (on-the-fly) reconstructing a location using shortest-path on different maps
• Quality of link coverage is determined by the map a location is encoded or decoded on
• a number of common map database features (e.g. functional road class, form of way, driving direction)
DATEX II has been extended to support dynamic location referencing using OpenLR

OpenLR DATEX2 extension is used nation wide in Sweden

In 2014 OpenLR will be added to dutch Datex2 profile

OpenLR is used within Automotive industry

OpenLR standardised as TPEG2-OLR TISA standard: SP12008, September 2012, currently in progress: ISO/TS 21219-22

Datex2 extension can be downloaded from www.datex2.eu (specification) and via www.openlr.org (open source software implementatie)
## Linear vs Dynamic

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Linear (eg TMC)</th>
<th>Dynamic (eg. OpenLR)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Network coverage</td>
<td>Main roads, varies per country</td>
<td>Complete network</td>
</tr>
<tr>
<td>Pre-processing and maintenance</td>
<td>For every new map release</td>
<td>None</td>
</tr>
<tr>
<td>Reference method</td>
<td>static/table</td>
<td>On-the-fly (shortest path)</td>
</tr>
<tr>
<td>Availability</td>
<td>Some countries</td>
<td>Worldwide</td>
</tr>
<tr>
<td>Amount of data</td>
<td>Small</td>
<td>Medium</td>
</tr>
<tr>
<td>License</td>
<td>Varies per country</td>
<td>Open Source</td>
</tr>
</tbody>
</table>
• Difference in network coverage between TMC and OpenLR in the Netherlands
functional:
- Better geographical coverage: more roads
- Reduce dependence on (pre-defined) locations or segments: more flexibility, increase interoperability
- Make it easier to share, combine and use Inspire (real-time) datasets between applications

technical:
- Location referencing independent of map vendors or predefined locations
- Exchange data across different geometric networks without relying on map specific features or attributes
- Minimize technical impact on existing implementations
Dynamic Location Referencing could be a solution in helping governments, ngo’s, business and consumers to improve the availability, accessibility and usability of Inspire data.
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