



Linked Open Spatial Data and SDIs



Clemens Portele
with support from Marcel Reuvers, Geonovum



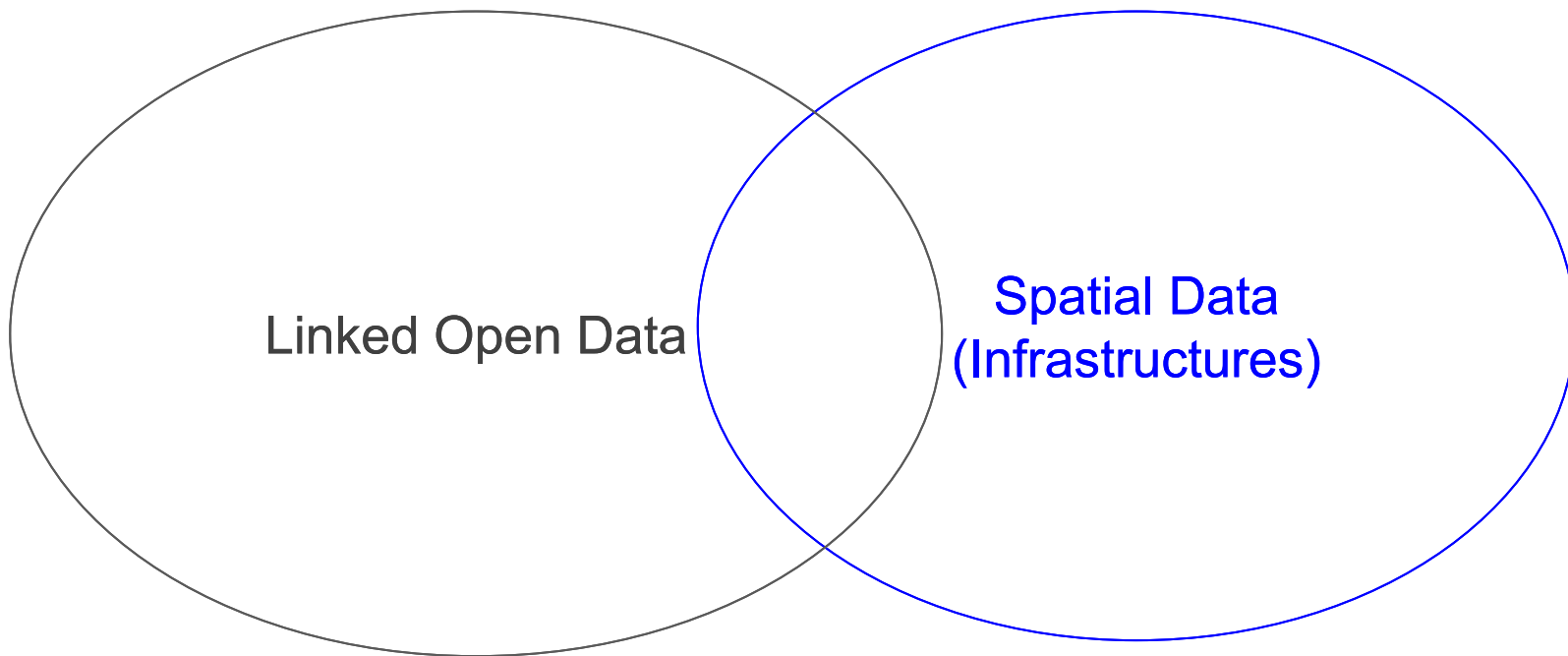
Linked Open Data

**Spatial Data
(Infrastructures)**



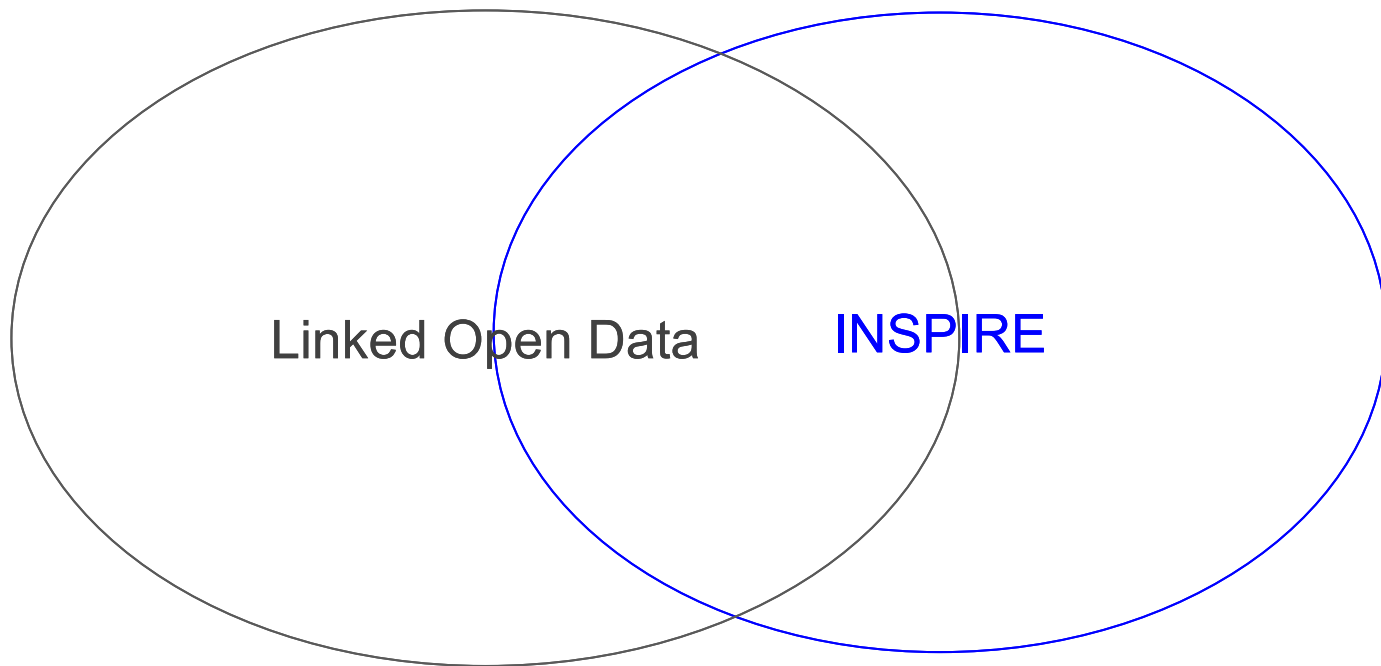
Linked Open Data

Spatial Data
(Infrastructures)



Linked Open Data

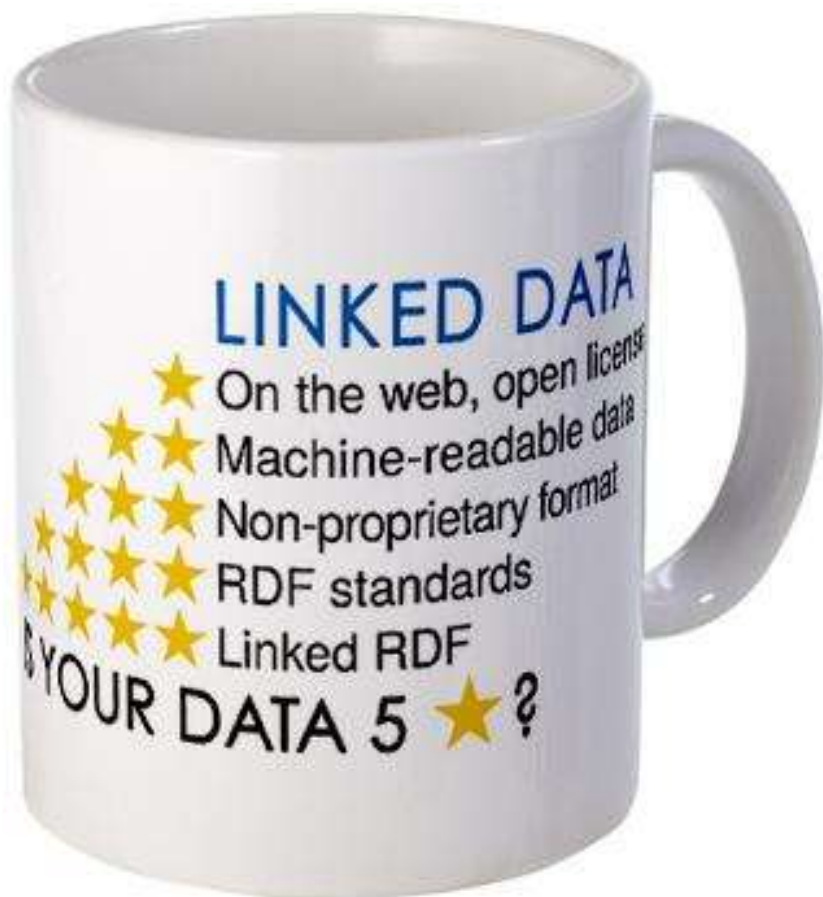
Spatial Data
(Infrastructures)



Linked Open Data

INSPIRE

Criteria for Linked Open Data



★	Available on the web (with a HTTP URI, whatever format), but with an open license
★★	Available as machine-readable structured data (e.g. excel instead of image scan of a table)
★★★	All the above plus: non-proprietary format (e.g. CSV instead of excel)
★★★★	All the above plus: use open standards from W3C (RDF and SPARQL) to identify things, so that people can point at your stuff
★★★★★	All the above plus: link your data to other people's data to provide context

Linked data is ...

- about contributing to the development of the Web of data
- not really a technical matter
- a philosophy of usage
- a set of principles and technologies
- a methodology for publishing structured data over the Web in a manner that it can be interlinked



(Spatial) data in Linked Open Data – Overview

Schema description	RDF-S / OWL preferred, other languages ok
Data encoding	RDF (XML or TTL) as preferred encoding, other encodings ok, should be open or at least structured
Geometry encoding	GeoSPARQL (OGC standard) specifies geometry encoding options: WKT and GML
Terms and vocabularies	Managed as resources, typically encoded in SKOS
Identifiers	HTTP URIs; for all resources; should be stable and not depend on implementation
Links	qualified by link type; uses HTTP URI to reference linked resource
Access	HTTP
Queries	SPARQL preferred, GeoSPARQL provides extensions for spatial query predicates

(Spatial) data in INSPIRE – Overview

Schema description	UML and XML Schema (derived from UML)
Data encoding, including geometry	GML as default encoding, other encodings ok, see http://inspire.ec.europa.eu/media-types
Terms and vocabularies	Managed as resources, encoded in GML and in the future SKOS
Identifiers	not required for all data; HTTP URIs may be used, but not a requirement; → more details later
Links	qualified by link type (property); uses URIs to reference linked resource in GML; restricted to associations identified in schemas; most datasets do not have links to external resources
Access	Pre-defined Download Service (Atom feed and/or WFS): no access to individual resources, only datasets; Direct Access Download Service (WFS): all features may be accessed using HTTP
Queries	only in Direct Access Download Service (WFS)

Linked Open Spatial Data and INSPIRE

- If INSPIRE data publishers want to support Linked Open Spatial Data, they need to consider the following beyond the INSPIRE interoperability requirements:
 - persistent, resolvable HTTP URIs for all features
 - support RDF as an additional encoding, potentially SPARQL for queries
 - add and maintain links to other data

Identifiers in INSPIRE

Resources:

- Spatial Objects
 - Spatial Data Sets
- Registered Items
 - Vocabularies and Terms
 - Coordinate Reference Systems
 - Portrayal Rules and Symbols
 - etc.
- Spatial Data Services

Main purpose:

- Unambiguously trace resources and their lifecycle
- Support reuse by providing access to these resources

From regulation to implementation

- Identifiers in the legal framework have been defined independent of an implementation platform as
 - a namespace and
 - a local identifier in the namespace
- In practice, INSPIRE is implemented as part of the web and the implementation of INSPIRE should follow the rules of the web
 - HTTP URIs for all information resources
 - must be stable
 - Expectation that information about the identified resource can be retrieved using HTTP

Implications

- Need to map all identifiers in INSPIRE to http URIs
- URIs must be independent of implementation details and should be short and mnemonic
- Member States, the Commission and other organisations assigning identifiers need to develop URI schemes to manage assignment of HTTP URIs
 - This should be done with a wider scope than just spatial data
- Infrastructure needs to be set up and maintained to resolve HTTP URIs and return information resources

Status

- Stable HTTP URIs as identifiers for spatial objects and spatial data sets are currently **recommendations** in INSPIRE
- Additional discussions between Member States and the Commission required to develop an **agreed URI strategy**
- Stable HTTP URIs for centrally managed, shared resources are being specified, not yet implemented

HTTP URIs for INSPIRE spatial objects – Relevance for Linked Open Data

- To provide location context to "business information" in a way that can be used in web/mobile applications
 - property rights associated with a parcel
 - timetable of a railway station
 - statistical information for a statistical unit
 - materials used at an industrial facility,
 - etc.
- Typically a RDF encoding of spatial objects will be useful to support Linked Open Data applications

Linked Data and Geonovum

Geonovum initiated a Linked Open Data Pilot

- Bring stakeholders together
 - Sponsors: Forum standardisation, Municipality of Amersfoort and Nijmegen, Geonovum, Geo-business Netherlands, Cadastre, Ministry of Infrastructure en Environment, Ministry of Internal affairs, Provinces
 - Open for everyone
- Just do it!
- Create awareness
- 10 months pilot: September 2012 – Juni 2013

Goals

- Collaborating with many stakeholders in 2 test areas where applications can be realized with the aim to be able to determine whether the linked open data approach is suitable for publishing governmental data to the Web
- Establishing links between the 'formal' government data and the 'informal' registrations on the Web
- Bringing together use cases, knowledge, technology and demand
- Awareness and communication

3 work areas with sub-topics

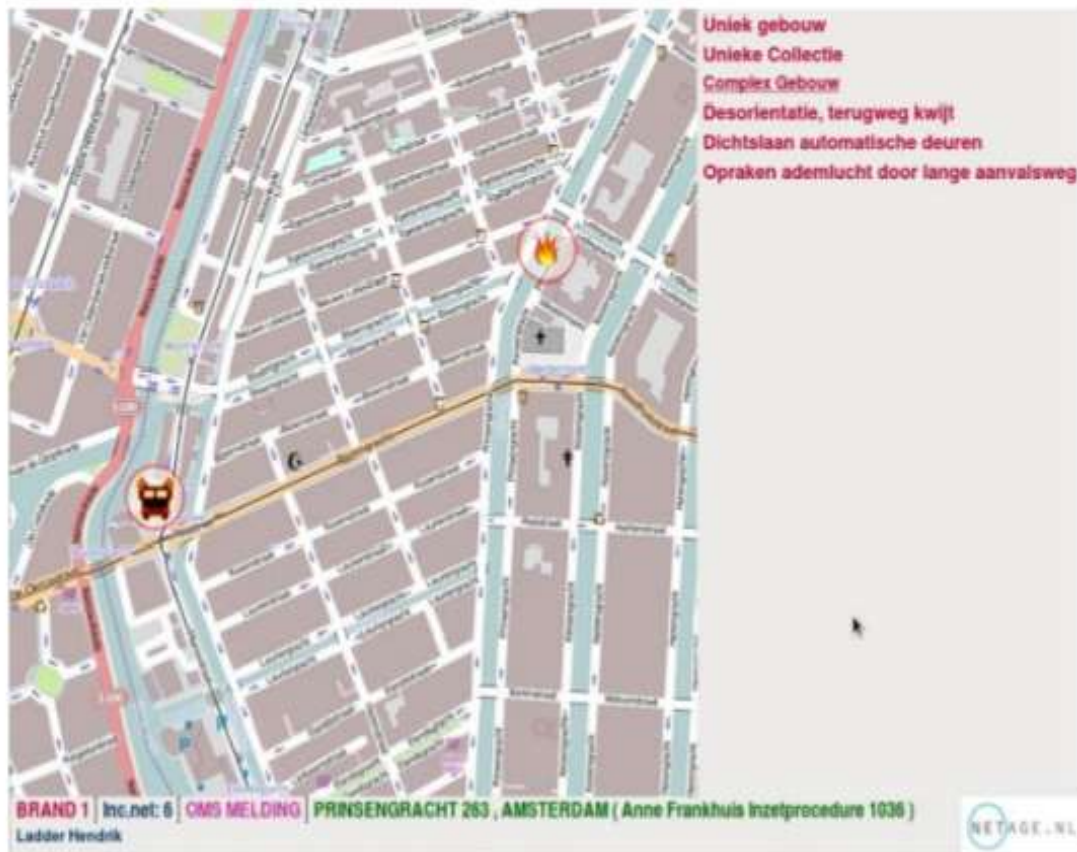
- Applications
 - Use case: Monuments
 - Use case: Everything from your house
- Providing data
 - Architecture
 - Implementation (publishing triples and interlinking)
- Technique and Standards
 - Linked Data and other standards
 - Semantic web technologies
 - Publishing tools
 - Presentation and use of Linked Data
 - URI strategy
 - Gecombineerd gebruik talen

Status

- Group of 80 persons from all kind of backgrounds
 - Using Wiki, LinkedIn, Dropbox, etc to interact
 - Conceptual Fridays @ Geonovum
 - Regular plenary sessions
- Stage 1: Awareness and Knowledge about LOD is know available. Much effort on explanation and getting knowledge level on higher level (how to courses)
- Stage 2: Publishing and linking the data for the test areas based on the use cases (and fun)
- Stage 3: Making applications which shows the added value and working of LOD
- Stage 2 is in progress!

Fire application based on different RDF sources

Updated station monitor



More information

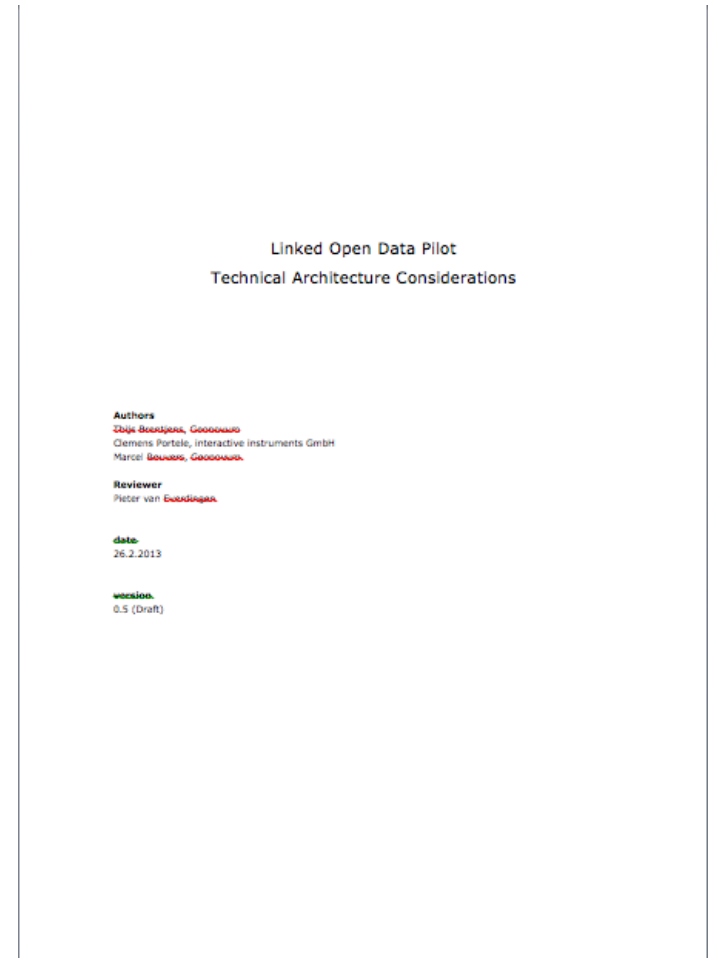
- **LinkedIn**  group LOD Nederland
<http://www.linkedin.com/groups/LOD-Nederland-4662786>
and subgroups
- Wiki
<http://www.pilod.nl>
- 
#lodnl

URI Strategy

- Develop draft URI strategy for Dutch e-government information as part of the pilot
- Test the draft URI strategy within the pilot
- Clear, uniform identifiers for eGovernment resources in the Netherlands
- For linked data in a broad sense: not only RDF, not limited to open data
- Consistent template
`http://{domein}/{URI-type}/{register}/{lokaal-id}[{.ext}]`
- Example
`http://locatie.data.overheid.nl/doc/inspire-top10nl/transportnetwork/roadarea-36290203.gml`

Technical Architecture Considerations

- An attempt at documenting key technical aspects related to Linked Open (Spatial) Data in a single, but brief document
- Data formats (Representations)
 - Suitability of a format
 - General purpose data formats
 - Documents
 - Images and graphics
 - Geographic information
 - Metadata
- HTTP and URI
 - HTTP URIs to identify things on the web
 - Identifiers
 - Closer look at URIs
 - URI as a reference to a description
 - Technology for resolving HTTP URIs
 - APIs for accessing resources
- Linking data: provide context to data
 - Links to discover more
 - Information about links



Thank you



Clemens Portele

Managing Director

📍 Trierer Strasse 70-72, 53115 Bonn, Germany

📞 +49 228 91410 73

✉️ portele@interactive-instruments.de