

Linked Data Deployment for Spatial Data Infrastructure

Esa TIAINEN, National Land Survey of Finland

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Finland has initiated a program for a national spatial data platform, which is directed to connect data from different platforms and data sources. The work started with defining a master or overall architecture for some common reference data such as buildings, addresses and place names, land use plans and restrictions as well as satellite imagery and point cloud data together with the new topographic database. Connections to other data like INSPIRE data base on linked data principles and advanced semantic search capabilities so that data from different sources as well as INSPIRE data can be provided through the national spatial data platform.

Unique identifiers in HTTP URI format and their management methods (realisation of the linked data concept) form central parts of cross-administrative and more extensive interoperability. To this end the [national recommendation for unique identifiers](#) is taking a step further in interoperability and data integration introducing a framework for linked data infrastructure for spatial data and any other data, and within a scope of application wider than that of the INSPIRE Directive. The URI pattern in accordance with this recommendation must be applied to identification and linking of data within the entire field of public administration, and accordingly INSPIRE implementation is reviewed. This recommendation defines the structural model of URIs and practices for redirection in data retrieval.

In addition to the national infrastructure for spatial data, unique identifiers are also included in the geographic information reference architecture in the overall public administration architecture to enable linked data infrastructure and ecosystems regarding spatial data. To be live data links the simplest solution is to implement a RDF database which enables search by SPARQL as well as transformations to different popular formats like JSON-LD. Furthermore the national spatial data platform is targeting to enable and improve data combinations of spatial data and any other data deploying URIs of place names as well as OGC Table Joining Service (TJS) and towards nationwide linked data SDI.

Semantic search

The release of URIs for geographic feature types, i.e. concepts, in addition to geographic features enables an interface service in the infrastructure for spatial information to search for ontological concepts and their interrelations and, using concepts, for related geographic information. The concept source may be any vocabulary used by the data producer. For example, the vocabulary may be an ontology, data specification, schema, code list, taxonomy or thesaurus. This is the key to connect data from different platforms and data sources.

In order to be able to refer to concepts in a unique way, each concept included in the vocabulary must be provided with a unique URI. A redirection can be made from the URI of a

concept to, for example, the (national) Finnish Thesaurus and Ontology Service (finto.fi) or a catalogue service including schemas.

Semantic search is usually wording used for data search on concept level. However it is not very smart management of semantics being able to locate for instance buildings i.e. within certain geographic area or 3D description. The essential semantics of data can only be achieved on attribute level i.e. by linking code lists of data assets with schemas or as linked data (RDF). Then questions like “Buildings with more than 3 floors and without elevator in a certain area” can be responded directly. To enable this also INSPIRE Register federation (MIWP6) is planned to be implemented to manage code lists and data linking.

The URIs for spatial data are all minted in nationally centralized domain with redirections to URI-services (service interfaces) of data providers. As a first stage the infrastructure is established with INSPIRE data - a critical mass and stepping stone. URIs for spatial objects shall be delivered through a spatial data platform. Unique ids are also employed to establish a URI-based production of national core location data (National Topographic Database).

REFERENCES

INSPIRE Directive (2007/2/EC) and its implementation rules

Commission Regulation 1089 (2010) and its amendment 1253 (2013), cf. literature references Spatial Data Infrastructure Act (421/2009) and Spatial Data Infrastructure Decree (725/2009) Vocabulary of Geoinformatics, 3rd edition, Finnish Terminology Centre TSK, 2014. ISBN 978-952-9794-34-8

JHS 158 Metadata for the geographic information (<http://www.jhs-suositukset.fi/>)

JHS 162 Modelling of the geographic information for data transfer (<http://www.jhs-suositukset.fi/>)

JHS 177 Specification of a geographic data product (<http://www.jhs-suositukset.fi/>)

JHS 180 Content services for geographic information (<http://www.jhs-suositukset.fi/>)

JHS 193 Unique identifiers of geographic data (<http://jhs-suositukset.netum.fi/web/guest/jhs/recommendations/193>, <http://www.jhs-suositukset.fi/>)

- Annex 1: URI generation process [[HTML](#)] [[DOC](#)] [[PDF](#)] [[ODT](#)]
- Annex 2: Example of the technical implementation of the URI service of a data producer [[HTML](#)] [[DOC](#)] [[PDF](#)] [[ODT](#)]
- Annex 3: Generation of lifecycle rules for geographic features [[HTML](#)] [[DOC](#)] [[PDF](#)] [[ODT](#)]
- Annex 4: Use case examples [[HTML](#)] [[DOC](#)] [[PDF](#)] [[ODT](#)]
- Annex 5: Unique identifiers in INSPIRE data products [[HTML](#)] [[DOC](#)] [[PDF](#)] [[ODT](#)]

RFC 4122 A Universally Unique Identifier (UUID) URN Namespace

ISO 8601 Data elements and interchange formats –Information interchange –Representation of dates and times

ISO/IEC 8824-1:2008 Information technology –Abstract Syntax Notation One (ASN.1): Specification of basic notation

ISO 19148 Linear Referencing

CONTACTS

Senior advisor Esa Tiainen

- Leader of WG for the national recommendation “Unique identifiers of geographic data” and GEOREF-initiative

Finnish Geospatial Research Institute FGI, National Land Survey

Opastinsilta 12

Helsinki

FINLAND

Tel. +358 40 5570512

Email: esa.tiainen@nls.fi

Web site: www.nls.fi, www.fgi.fi

