INSPIRE

Infrastructure for Spatial Information in Europe

INSPIRE Good Practices

1. SDMX for Human Health and Population Distribution
2. OGC API – Features
3. OGC SensorThings API

Type	Document for information and discussion
Creator	EC and EEA INSPIRE Team
Date/status/version	19/11/2020/FINAL
Addressee	MIG
Identifier	**MIG/12/2020/DOC4**
Description	This document describes three INSPIRE good practices promoting: • The reuse of already existing statistical data provided in SDMX (ISO 17369:2013) • OGC API - Features as conformant service API for data download • OGC SensorThings API as conformant service API for data download
Actions:	MIG to: • Take note of the document. • Discuss and endorse at the 12th meeting of the MIG.

Contents

1. INSPIRE Good Practice: SDMX for Human Health and Population Distribution

Name of the GP

Statistical Data and Metadata eXchange (SDMX)

Description of the GP

SDMX, which stands for Statistical Data and Metadata eXchange, is an ISO standard (17369:2013). It is designed to describe statistical data and metadata, to normalise their exchange, and to enable them to be shared more efficiently among organisations. SDMX has three key components: I) an information model to describe data and metadata[1]; II) a standard for automated communication[2] and III) an IT architecture and set of tools for data and metadata exchange[3].

INSPIRE component(s)

Data, Metadata

References

Normative reference as defined in ISO standard, 17369:2013

Other references

Current technical specification of SDMX 2.1 – Consolidated Version 2013:
https://sdmx.org/?page_id=5008

Paper and presentation at the Joint UNECE/UNGGIM Europe Workshop on Integrating Geospatial and Statistical Standards:

- https://www.unece.org/fileadmin/DAM/stats/documents/ece/ces/ge.58/2017/mtg3/2017-UNECE-Standards-Workshop-INSPIRE-SDMX-paper-V2__1_.pdf
- https://www.unece.org/fileadmin/DAM/stats/documents/ece/ces/ge.58/2017/mtg3/S2_PETRI_CETL_2017-UNECE-Workshop-standards-SDMX-INSPIRE.pdf

Relevance & expected benefits

Statistical data are stored in a structured harmonized approach. Code lists are stored in dedicated registries. By using SDMX data directly for INSPIRE, several advantages are achieved such as usage of semantically harmonized data, storing and updating data only once and leaving data at its source

[1] https://ec.europa.eu/eurostat/web/sdmx-infospace/sdmx-explained/what-and-why/sdmx-information-model

[2] https://ec.europa.eu/eurostat/web/sdmx-infospace/sdmx-explained/what-and-why/content-oriented-guidelines

[3] https://ec.europa.eu/eurostat/web/sdmx-infospace/sdmx-explained/what-and-why/it-architecture-and-set-of-tools

avoidance of duplication of transformation, synchronization issues across datasets, publishing machine to machine readable data.

Intended Outcome

Reuse already existing statistical data provided in SDMX (ISO 17369:2013).

Evidence of implementation & support

Several reference implementations of SDMX are available for usage. Official sponsors and users of SDMX are the following organisations: Eurostat (the Statistical Office of the European Union); Bank for International Settlements (BIS); Organization for Economic Co-operation and Development (OECD); European Central Bank (ECB); International Monetary Fund (IMF); United Nations (UN) and The World Bank Group (WB). A document[4] describing (some of) the existing implementations is available.

A summary document[5] includes examples of running SDMX endpoints for different domains in production at the European Union Level. Eurostat maintains a series of endpoints[6] for SDMX with the SOAP and REST protocol.

Member States distribute data not only for human health and population distribution but also for a variety of domains[7]. Commercial[8] and open source implementations[9] are available. Statistical Office in Finland[10], Slovenia[11] and Netherlands[12] use it already for data dissemination and visualization in different software frameworks (e.g. oskari.org, Stage, Geoserver TJS extension).

Limitations

Any organization providing data using SDMX must map their internal data structure into the SDMX information model.

[4] https://sdmx.org/?page_id=81

[5] https://ec.europa.eu/eurostat/web/sdmx-infospace/sdmx-projects/dsd-availability

[6] https://ec.europa.eu/eurostat/web/sdmx-web-services

[7] https://sdmxcentral.imf.org/organisations/dataproviders.html

[8] e.g. https://metadatatechnology.com/index.php#solutions-official-stats

[9] https://ec.europa.eu/eurostat/web/sdmx-infospace/sdmx-it-tools

[10] https://kartta.paikkatietoikkuna.fi/?lang=en

[11] https://gis.stat.si/#lang=en

[12] http://www.nationaalgeoregister.nl/geonetwork/srv/dut/catalog.search#/metadata/12bb57cd-73e0-41ba-a1e9-6d986b9109d3, https://www.geonovum.nl/geo-standaarden/services

2. INSPIRE Good Practice: OGC API - Features

Name of the GP

OGC API - Features as an INSPIRE download service

Description of the GP

Several possible solutions for implementing download services are already endorsed by the INSPIRE Maintenance and Implementation (MIG) group. Technical guidelines documents are available that cover implementations based on ATOM, WFS 2.0, WCS and SOS. While all of these approaches use the Web for providing access to geospatial data, the new family of OGC API standards aim to be more developer friendly by requiring less up-front knowledge of the standard involved. The rapid emergence of Web APIs provides a flexible and easily understandable means for access to data, as recommended by the W3C Data on the Web Best Practices.

This good practice proposes an additional option for the implementation of INSPIRE download services. The draft guidelines for setting up an INSPIRE download service based on the OGC API - Features standard, together with implementation evidences, are available on GitHub.

In order to facilitate the use of off-the-shelf software implementing the OGC API - Features standard to meet the requirements in this document, INSPIRE-specific extensions are limited to the absolute minimum. Where several implementation options exist, this document guideline defines a specific way of application of the OGC API - Features and associated standards to meet the requirements of the INSPIRE Implementing Rules for download services.

INSPIRE component(s)

This Good Practice pertains to data encoding as well as to network (download) services, while greatly enabling the sharing of feature data in a modern and flexible manner.

References

- Draft specification for the use of the OGC API – Features as INSPIRE Download service
- Mandate of MIWP action 2020.1 on INSPIRE Download Services based on the OGC API – Features standard
- Discussion paper on Mapping the requirements from the INSPIRE IR's for Network Services with the OGC – API Features standard
- The OGC API – Features standard
- Video recording of the webinar "OGC API - Features as INSPIRE Download service" held on 6 November 2020

Relevance & expected benefits

The adoption of the OGC API - Features standard as an INSPIRE download service would provide a modern approach for the exposure of feature data that adheres to the recommendations of the W3C Data on the

Web Best Practices. Both implementers of INSPIRE and users of the data would benefit from the powerful, yet simple approach for data sharing.

Intended Outcome

- Technical Guidelines for setting up INSPIRE download services based on the OGC API - Features standard
- Abstract Test Suite for validating OGC API - Features instances as INSPIRE download services

Evidence of implementation & support

Evidence is available on GitHub from multiple Member States and for different INSPIRE data themes.

Limitations

Sharing of coverage data is out of the scope of this good practice. Executable tests and validation of OGC API - Features instances are also not covered in this good practice, as they will be dealt with within the context of the work on the INSPIRE Reference validator.

3. INSPIRE Good Practice: SensorThings API

Name of the GP

OGC SensorThings API as an INSPIRE download service

Description of the GP

To date, the OGC Sensor Observation Service (SOS) has been utilised for direct access to measurement data in INSPIRE. In the quest for simpler access methods, use of the OGC SensorThings API (STA) is proposed as an alternative, pertaining both to the data and service specifications. It is shown to be in full compliance with the data requirements ensuing from both the INSPIRE EF Theme as well as the underlying Observational Model from the GCM as described in a dedicated publication[13].

In order to show the practical applicability of a STA-based INSPIRE download service, several STA systems are deployed by MS. At present, STA endpoints have been created for multiple following environmental and related domains, thus showing the degree of flexibility available when utilizing STA. While initially designed to bridge the gap between the spatial and IoT domains, the potential for reuse far beyond sensors becomes apparent.

INSPIRE component(s)

This Good Practice pertains to data encoding as well as to network (download) services, while greatly enabling data sharing.

Pertaining to data encoding, the underlying STA data model, while isomorph to the OGC O&M data model upon which the INSPIRE observational models is built, does have some subtle differences, requiring reconfiguration of the O&M based INSPIRE data specifications. However, due to the isomorphism between these data models, the fact that the STA data model was derived from the O&M model, a lossless transposition of data can be assured.

Pertaining to network (download) service requirements, STA utilises a REST-based API approach modelled on the OData standard. In addition to fulfilling the core requirements laid down by INSPIRE pertaining to download services, the OData approach allows for the formulation of complex queries tailored to the complexity of the underlying data model, thus allowing users more direct access to the data they require than previously possible.

References

Normative reference

SensorThings API Part 1: Sensing

OGC SensorThings API Part 1: Sensing Version 1.1

[13] "Extending INSPIRE to the Internet of Things through SensorThings API": https://doi.org/10.3390/geosciences8060221

OGC 10-004r3 and ISO 19156:2011(E), OGC Abstract Specification Topic 20: Geographic information — Observations and Measurements

OASIS OData Version 4.0 Part 1: Protocol Plus Errata 02

OASIS OData Version 4.0 Part 2: URL Conventions Plus Errata 02

OASIS OData JSON Format Version 4.0 Plus Errata 02

OASIS OData ABNF Construction Rules Errata 02

Other references

- "Extending INSPIRE to the Internet of Things through SensorThings API" doi:10.3390/geosciences8060221
- STA as a INSPIRE Download Service
- API4INSPIRE
- Webinar "SensorThings API brings Dynamic Data to INSPIRE" held on 19 November 2020

Relevance & expected benefits

The adoption of the OGC SensorThings API standard as an INSPIRE download service would provide a modern approach for the exposure of dynamic geospatial data that adheres to the recommendations of the W3C Data on the Web Best Practices. Both implementers of INSPIRE and users of the data would benefit from the powerful, yet simple approach for data sharing.

In contrast to the previously utilised OGC Web services (OWS), deployment of STA is far easier and less resource intensive than SOS, while use of the JSON encoded data is far more in line with modern development paradigms.

Intended Outcome

- Technical Guideline for setting up INSPIRE download services based on the OGC SensorThings API standard
- Implementation evidences

Evidence of implementation & support

- Water:
    - Ground Water (FR): https://sensorthings.brgm-rec.fr/SensorThingsGroundWater/v1.0
    - Surface Water Quantity (FR): https://iddata.eaufrance.fr/api/stapiHydrometry/v1.1
    - Surface Water Quality (FR): https://sensorthings-wq.brgm-rec.fr/FROST-Server/v1.0
    - Water (DE): https://lubw.k8s.ilt-dmz.iosb.fraunhofer.de/v1.1

- Air Quality:
    - Near-real-time air quality across Europe, data from both national sources (harvested from AT SOS and WFS) and Europe (EEA): https://airquality-frost.k8s.ilt-dmz.iosb.fraunhofer.de/v1.1
- Smart Cities:
    - Urban Data Platform Hamburg: https://iot.hamburg.de/v1.0
- Demography:
    - Based on European NUTS regions, data from Eurostat: https://demography.k8s.ilt-dmz.iosb.fraunhofer.de/v1.1
- Covid Case Data:
    - harvested from various sources including Johns Hopkins and RKI: http://covidsta.hft-stuttgart.de/server/v1.1

Limitations

Seamless integration with OGC API - Features instances still work-in-progress, with issues arising due to the underlying service models, OData vs. Open API. This pertains to potential overlaps between the resources provided by the different API types, as in many use cases the same data resource must be exposed by both APIs. The OGC Interoperability Experiments ELFIE and SELFIE have provided a way forward, now being prototyped in the API4INSPIRE project.

Executable tests and validation of OGC SensorThings API instances are also not covered in this good practice as they will be dealt with within the context of the work on the INSPIRE Reference validator.