



NLS
NATIONAL
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OF FINLAND

Alternative Encodings – from XML to the future?

GDI-DE4EU

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Good Practice Library

INSPIRE UML-to-GeoJSON encoding rule

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INSPIRE Good Practice: GeoPackage encoding of INSPIRE datasets

[🔗 Name of the GP](#)

GeoPackage encoding of INSPIRE datasets

Description of the GP

This Good Practice (GP) describes a mechanism to create INSPIRE data sets encoded using the OGC GeoPackage encoding standard. These data sets will be compliant with the INSPIRE Implementing Rules (IR), and technical compliance can be shown through transformation to the default encoding (GML). In this perspective, the GeoPackage can be used both as an additional and an alternative encoding for INSPIRE data sets.

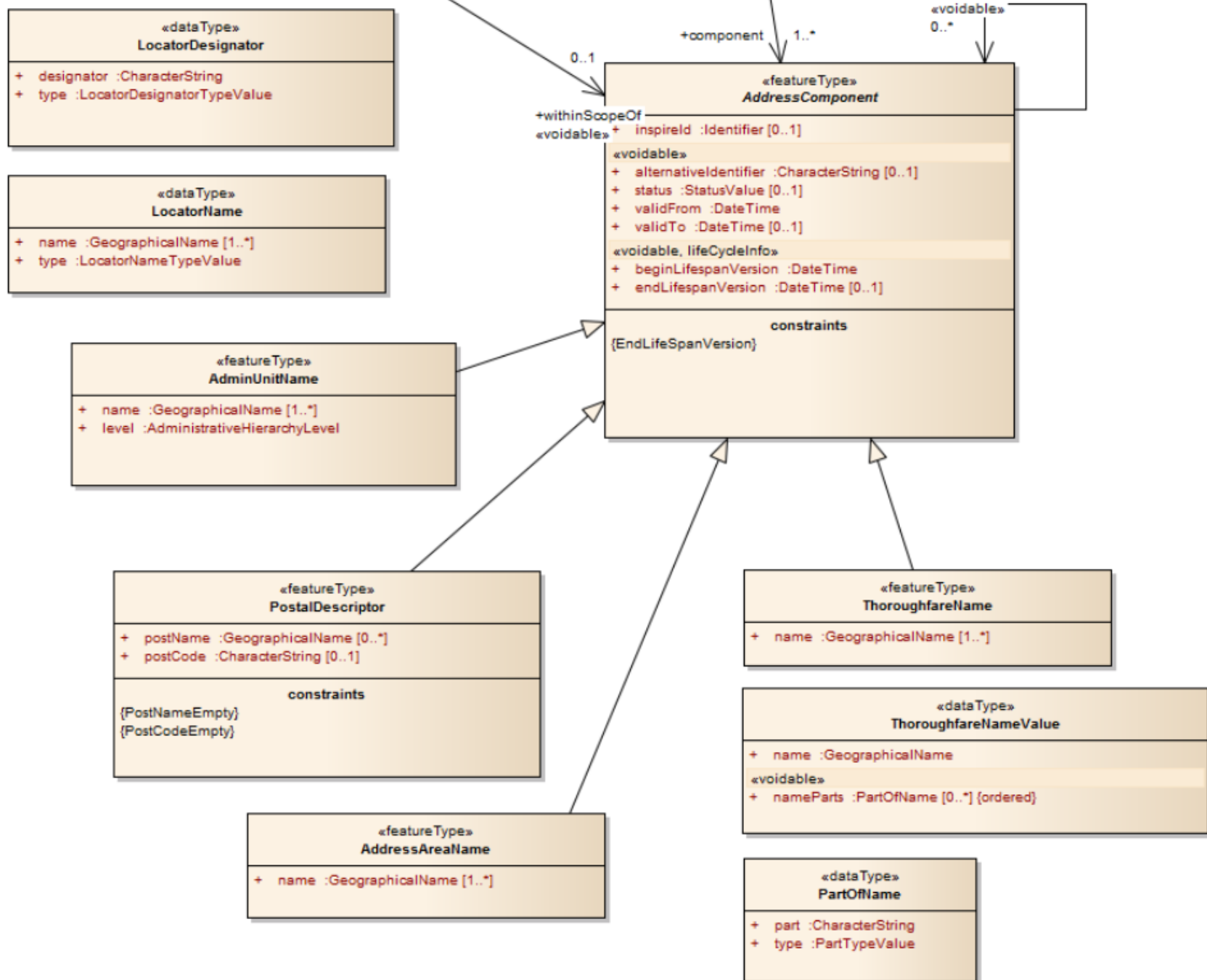
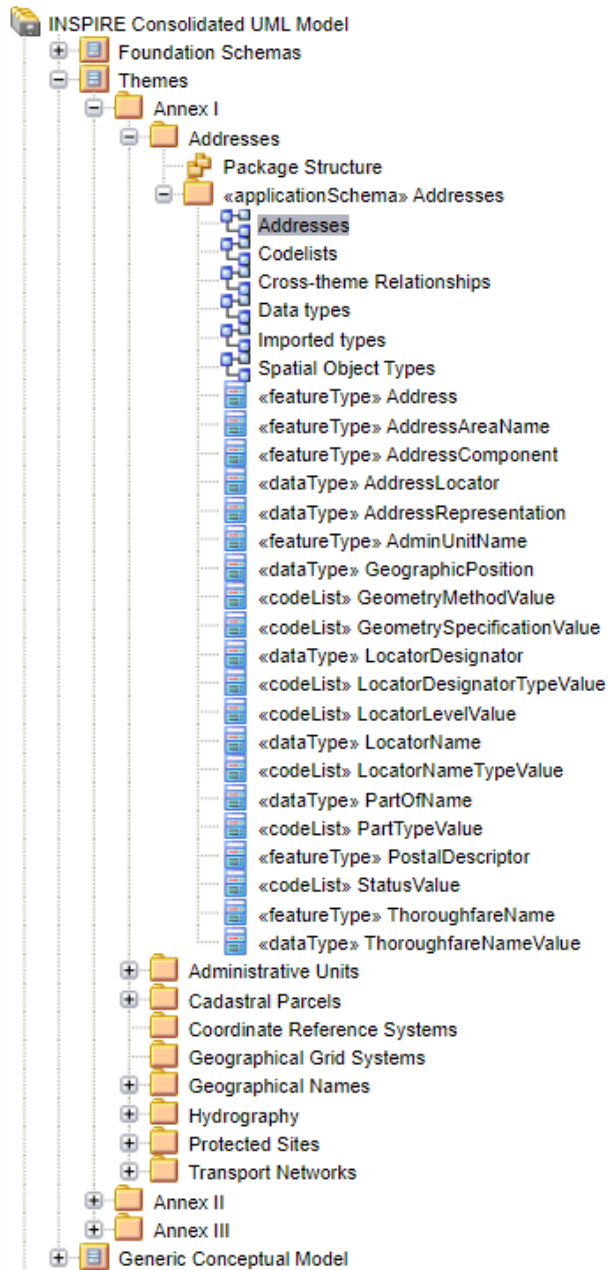
The process underpinning this GP focuses on creating GeoPackage models optimised for usability in GIS environments. It is recognised that GeoPackage is much faster (compared to other encodings such as GML and GeoJSON) in traditional reading, writing and processing operations performed in GIS environments. It can be used on core INSPIRE data specifications, or on extensions, and can also be use-case specific. This means that even for one INSPIRE theme, multiple logical schemas could, over time, become available.

Use case

INSPIRE Addresses (AD)



INSPIRE Consolidated UML Model



”Traditional” INSPIRE AD

- WFS
- ”Main” query + 4 stored queries
- In other words, 5 queries to get
 - Street number
 - Street name
 - City name
 - Postal code
 - Country

```

▼<wfs:member>
▼<ad:Address xmlns:ad="http://inspire.ec.europa.eu/schemas/ad/4.0" gml:id="AD_ADDRESS_100000005L1">
▼<ad:inspireId>
▼<base:Identifiier xmlns:base="http://inspire.ec.europa.eu/schemas/base/3.3">
<base:localId>100000005L1</base:localId>
<base:namespace>http://paikkatiedot.fi/so/1001073/ad/Address</base:namespace>
</base:Identifiier>
</ad:inspireId>
<ad:beginLifespanVersion>2014-11-10T14:21:19</ad:beginLifespanVersion>
<ad:validFrom xsi:nil="true" nilReason="unpopulated"/>
▼<ad:position>
▼<ad:GeographicPosition>
▼<ad:geometry>
▼<gml:Point gml:id="AD_ADDRESS_100000005L1_AD_POSITION" srsName="EPSG:3067">
<gml:pos>303681.000 6987507.000</gml:pos>
</gml:Point>
</ad:geometry>
<ad:specification xmlns:xlink="http://www.w3.org/1999/xlink"
xlink:href="http://inspire.ec.europa.eu/codelist/GeometrySpecificationValue/building"/>
<ad:method xmlns:xlink="http://www.w3.org/1999/xlink" xlink:href="http://inspire.ec.europa.eu/codelist/GeometryMethodValue/byOtherParty"/>
<ad:default>true</ad:default>
</ad:GeographicPosition>
</ad:position>
▼<ad:locator>
▼<ad:AddressLocator>
▼<ad:designator>
▼<ad:LocatorDesignator>
<ad:designator>58</ad:designator>
<ad:type xmlns:xlink="http://www.w3.org/1999/xlink"
xlink:href="http://inspire.ec.europa.eu/codelist/LocatorDesignatorTypeValue/addressIdentifierGeneral"/>
</ad:LocatorDesignator>
</ad:designator>
<ad:level xmlns:xlink="http://www.w3.org/1999/xlink" xlink:href="http://inspire.ec.europa.eu/codelist/LocatorLevelValue/siteLevel"/>
</ad:AddressLocator>
</ad:locator>
<ad:parcel xmlns:xlink="http://www.w3.org/1999/xlink" xlink:href="http://www.paikkatiedot.fi/1001077/cp/CadastralParcel/40840200080213"/>
<ad:building xmlns:xlink="http://www.w3.org/1999/xlink" xlink:href="http://www.paikkatiedot.fi/1001076/bu/Building/100000005L1"/>
<ad:component xmlns:xlink="http://www.w3.org/1999/xlink" xlink:href="https://inspire-wfs.maanmittauslaitos.fi/inspire-wfs/ad?
SERVICE=WFS&VERSION=2.0.0&REQUEST=GetFeature&OUTPUTFORMAT=application%2Fgml%2Bxml%3B+version%3D3.2&STOREDQUERY_ID=urn:ogc:def:query:OGC-
WFS::GetFeatureById&ID=AD_ADMINUNITNAME_1000#AD_ADMINUNITNAME_1000"/>
<ad:component xmlns:xlink="http://www.w3.org/1999/xlink" xlink:href="https://inspire-wfs.maanmittauslaitos.fi/inspire-wfs/ad?
SERVICE=WFS&VERSION=2.0.0&REQUEST=GetFeature&OUTPUTFORMAT=application%2Fgml%2Bxml%3B+version%3D3.2&STOREDQUERY_ID=urn:ogc:def:query:OGC-
WFS::GetFeatureById&ID=AD_ADMINUNITNAME_408#AD_ADMINUNITNAME_408"/>
<ad:component xmlns:xlink="http://www.w3.org/1999/xlink" xlink:href="https://inspire-wfs.maanmittauslaitos.fi/inspire-wfs/ad?
SERVICE=WFS&VERSION=2.0.0&REQUEST=GetFeature&OUTPUTFORMAT=application%2Fgml%2Bxml%3B+version%3D3.2&STOREDQUERY_ID=urn:ogc:def:query:OGC-
WFS::GetFeatureById&ID=AD_POSTALDESCRIPTOR_62160#AD_POSTALDESCRIPTOR_62160"/>
<ad:component xmlns:xlink="http://www.w3.org/1999/xlink" xlink:href="https://inspire-wfs.maanmittauslaitos.fi/inspire-wfs/ad?
SERVICE=WFS&VERSION=2.0.0&REQUEST=GetFeature&OUTPUTFORMAT=application%2Fgml%2Bxml%3B+version%3D3.2&STOREDQUERY_ID=urn:ogc:def:query:OGC-
WFS::GetFeatureById&ID=AD_THOROUGHFARENAME_100000005L1#AD_THOROUGHFARENAME_100000005L1"/>
</ad:Address>
</wfs:member>
</wfs:FeatureCollection>

```

Street number

Stored queries

```
▼<ad:AdminUnitName xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xmlns:ad="http://inspire.ec.europa.eu/schemas/ad/4.0"
xmlns:gml="http://www.opengis.net/gml/3.2" xsi:schemaLocation="http://www.opengis.net/wfs/2.0 http://schemas.opengis.net/wfs/2.0/wfs.xsd
http://www.opengis.net/gml/3.2 http://schemas.opengis.net/gml/3.2.1/gml.xsd http://inspire.ec.europa.eu/schemas/ad/4.0 https://inspire-
wfs.maanmittauslaitos.fi/inspire-wfs/ad?SERVICE=WFS&VERSION=2.0.0&REQUEST=DescribeFeatureType&OUTPUTFORMAT=application%2Fgml%2Bxml%3B+version%3D3.2"
gml:id="AD_ADMINUNITNAME_1000">
  <ad:beginLifespanVersion xsi:nil="true" nilReason="unpopulated"/>
  <ad:validFrom xsi:nil="true" nilReason="unpopulated"/>
  ▼<ad:name>
    ▼<gn:GeographicalName xmlns:gn="http://inspire.ec.europa.eu/schemas/gn/4.0">
      <gn:language>fin</gn:language>
      <gn:nativeness xmlns:xlink="http://www.w3.org/1999/xlink" xlink:href="http://inspire.ec.europa.eu/codelist/NativenessValue/endonym"/>
      <gn:nameStatus xmlns:xlink="http://www.w3.org/1999/xlink" xlink:href="http://inspire.ec.europa.eu/codelist/NameStatusValue/official"/>
      <gn:sourceOfName>VRK</gn:sourceOfName>
      <gn:pronunciation xsi:nil="true" nilReason="unpopulated"/>
      ▼<gn:spelling>
        ▼<gn:SpellingOfName>
          <gn:text>Suomi</gn:text>
          <gn:script>Latn</gn:script>
        </gn:SpellingOfName>
      </gn:spelling>
    </gn:GeographicalName>
    ▼<gn:GeographicalName xmlns:gn="http://inspire.ec.europa.eu/schemas/gn/4.0">
      <gn:language>swe</gn:language>
      <gn:nativeness xmlns:xlink="http://www.w3.org/1999/xlink" xlink:href="http://inspire.ec.europa.eu/codelist/NativenessValue/endonym"/>
      <gn:nameStatus xmlns:xlink="http://www.w3.org/1999/xlink" xlink:href="http://inspire.ec.europa.eu/codelist/NameStatusValue/official"/>
      <gn:sourceOfName>VRK</gn:sourceOfName>
      <gn:pronunciation xsi:nil="true" nilReason="unpopulated"/>
      ▼<gn:spelling>
        ▼<gn:SpellingOfName>
          <gn:text>Finland</gn:text>
          <gn:script>Latn</gn:script>
        </gn:SpellingOfName>
      </gn:spelling>
    </gn:GeographicalName>
  </ad:name>
  <ad:level xmlns:xlink="http://www.w3.org/1999/xlink" xlink:href="http://inspire.ec.europa.eu/codelist/AdministrativeHierarchyLevel/1stOrder"/>
  <ad:adminUnit xsi:nil="true"/>
</ad:AdminUnitName>
```

Country

```
▼<ad:AdminUnitName xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xmlns:ad="http://inspire.ec.europa.eu/schemas/ad/4.0"
xmlns:gml="http://www.opengis.net/gml/3.2" xsi:schemaLocation="http://www.opengis.net/wfs/2.0 http://schemas.opengis.net/wfs/2.0/wfs.xsd
http://www.opengis.net/gml/3.2 http://schemas.opengis.net/gml/3.2.1/gml.xsd http://inspire.ec.europa.eu/schemas/ad/4.0 https://inspire-
wfs.maanmittauslaitos.fi/inspire-wfs/ad?SERVICE=WFS&VERSION=2.0.0&REQUEST=DescribeFeatureType&OUTPUTFORMAT=application%2Fgml%2Bxml%3B+version%3D3.
gml:id="AD_ADMINUNITNAME_408">
  <ad:beginLifespanVersion xsi:nil="true" nilReason="unpopulated"/>
  <ad:validFrom xsi:nil="true" nilReason="unpopulated"/>
▼<ad:name>
  ▼<gn:GeographicalName xmlns:gn="http://inspire.ec.europa.eu/schemas/gn/4.0">
    <gn:language>fin</gn:language>
    <gn:nativeness xmlns:xlink="http://www.w3.org/1999/xlink" xlink:href="http://inspire.ec.europa.eu/codelist/NativenessValue/endonym"/>
    <gn:nameStatus xmlns:xlink="http://www.w3.org/1999/xlink" xlink:href="http://inspire.ec.europa.eu/codelist/NameStatusValue/official"/>
    <gn:sourceOfName>VRK</gn:sourceOfName>
    <gn:pronunciation xsi:nil="true" nilReason="unpopulated"/>
    ▼<gn:spelling>
      ▼<gn:SpellingOfName>
        <gn:text>Lapua</gn:text>
        <gn:script>Latn</gn:script>
      </gn:SpellingOfName>
    </gn:spelling>
  </gn:GeographicalName>
  ▼<gn:GeographicalName xmlns:gn="http://inspire.ec.europa.eu/schemas/gn/4.0">
    <gn:language>swe</gn:language>
    <gn:nativeness xmlns:xlink="http://www.w3.org/1999/xlink" xlink:href="http://inspire.ec.europa.eu/codelist/NativenessValue/endonym"/>
    <gn:nameStatus xmlns:xlink="http://www.w3.org/1999/xlink" xlink:href="http://inspire.ec.europa.eu/codelist/NameStatusValue/official"/>
    <gn:sourceOfName>VRK</gn:sourceOfName>
    <gn:pronunciation xsi:nil="true" nilReason="unpopulated"/>
    ▼<gn:spelling>
      ▼<gn:SpellingOfName>
        <gn:text>Lappo</gn:text>
        <gn:script>Latn</gn:script>
      </gn:SpellingOfName>
    </gn:spelling>
  </gn:GeographicalName>
</ad:name>
<ad:level xmlns:xlink="http://www.w3.org/1999/xlink" xlink:href="http://inspire.ec.europa.eu/codelist/AdministrativeHierarchyLevel/4thOrder"/>
<ad:adminUnit xsi:nil="true"/>
</ad:AdminUnitName>
```

Municipality

```
▼ <ad:PostalDescriptor xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xmlns:ad="http://inspire.ec.europa.eu/schemas/ad/4.0"
xmlns:gml="http://www.opengis.net/gml/3.2" xsi:schemaLocation="http://www.opengis.net/wfs/2.0 http://schemas.opengis.net/wfs/2.0/wfs.xsd
http://www.opengis.net/gml/3.2 http://schemas.opengis.net/gml/3.2.1/gml.xsd http://inspire.ec.europa.eu/schemas/ad/4.0 https://inspire-
wfs.maanmittauslaitos.fi/inspire-wfs/ad?SERVICE=WFS&VERSION=2.0.0&REQUEST=DescribeFeatureType&OUTPUTFORMAT=application%2Fgml%2Bxml%3B+version%3D3.2"
gml:id="AD_POSTALDESCRIPTOR_62160">
  <ad:beginLifespanVersion xsi:nil="true" nilReason="unpopulated"/>
  <ad:validFrom xsi:nil="true" nilReason="unpopulated"/>
  <ad:postCode>62160</ad:postCode>
</ad:PostalDescriptor>
```

Postal code

```
<ad:ThoroughfareName xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xmlns:ad="http://inspire.ec.europa.eu/schemas/ad/4.0"
xmlns:gml="http://www.opengis.net/gml/3.2" xsi:schemaLocation="http://www.opengis.net/wfs/2.0 http://schemas.opengis.net/wfs/2.0/wfs.xsd
http://www.opengis.net/gml/3.2 http://schemas.opengis.net/gml/3.2.1/gml.xsd http://inspire.ec.europa.eu/schemas/ad/4.0 https://inspire-
wfs.maanmittauslaitos.fi/inspire-wfs/ad?SERVICE=WFS&VERSION=2.0.0&REQUEST=DescribeFeatureType&OUTPUTFORMAT=application%2Fgml%2Bxml%3B+version%3D3.2"
gml:id="AD_THOROUGHFARENAME_100000005L1">
  <ad:beginLifespanVersion xsi:nil="true" nilReason="unpopulated"/>
  <ad:validFrom xsi:nil="true" nilReason="unpopulated"/>
  <ad:name>
    <ad:ThoroughfareNameValue>
      <ad:name>
        <gn:GeographicalName xmlns:gn="http://inspire.ec.europa.eu/schemas/gn/4.0">
          <gn:language>fin</gn:language>
          <gn:nativeness xmlns:xlink="http://www.w3.org/1999/xlink" xlink:href="http://inspire.ec.europa.eu/codelist/NativenessValue/endonym"/>
          <gn:nameStatus xmlns:xlink="http://www.w3.org/1999/xlink" xlink:href="http://inspire.ec.europa.eu/codelist/NameStatusValue/other"/>
          <gn:sourceOfName>VRK</gn:sourceOfName>
          <gn:pronunciation xsi:nil="true" nilReason="unpopulated"/>
          <gn:spelling>
            <gn:SpellingOfName>
              <gn:text>Kurunsaarentie</gn:text>
              <gn:script>Latn</gn:script>
            </gn:SpellingOfName>
          </gn:spelling>
        </gn:GeographicalName>
      </ad:name>
    </ad:ThoroughfareNameValue>
  </ad:name>
</ad:ThoroughfareName>
```

Street name

An alternative way...

- OGC API Features
- Encoding
 - HTML
 - GeoJSON
 - JSON-FG
 - Geopackage (not for online use)

OGC API Features – Encoding in INSPIRE context

- OGC API Features *usually* supports GeoJSON and HTML. Mandatory encodings are not defined.
- MIG has endorsed interface (OGC API Features) as Good Practice
- GeoJSON/Geopackage as an encoding for Download Services
 - Relies on "[INSPIRE UML-to-GeoJSON encoding rule](#)" and "[Template for Alternate Encodings for INSPIRE Data](#)"
 - Follows principles as in "[Best practices for GeoPackage encodings](#)"
- NLS-FI has also implemented preliminary JSON-FG and Geopackage as an encoding

GeoJSON

```
▼ geometry:
  type: "Point"
  ▼ coordinates:
    0: 23.1272227
    1: 62.9639709
  ▼ properties:
    inspireId_localId: "Address_3"
    inspireId_namespace: "http://paikkatiedot.fi/so/1001073/ad/Address/"
    beginLifespanVersion: "2014-11-10T12:21:19Z"
    position_specification: "building"
    ▼ position_specification_href: "http://inspire.ec.europa.eu/codelist/GeometrySpecificationValue/building"
    position_method: "byOtherParty"
    ▼ position_method_href: "http://inspire.ec.europa.eu/codelist/GeometryMethodValue/byOtherParty"
    position_default: true
    locator_designator_addressIdentifierGeneral: "58"
    locator_level: "siteLevel"
    ▼ locator_level_href: "http://inspire.ec.europa.eu/codelist/LocatorLevelValue/siteLevel"
    building: "100000004K"
    parcel: "40840200080213"
    component_ThoroughfareName: "Kurunsaarentie"
    component_PostalDescriptor: "62160"
    component_AdminUnitName_1: "Suomi"
    component_AdminUnitName_4: "Lapua"
    timeStamp: "2020-06-04T09:26:40.591Z"
  ▼ links:
    ▼ 0:
      ▼ href: "https://beta-paikkatieto.maanmittauslaitos.fi/simple-addresses/features/v1/collections/address/items/Address_3"
```

OGC API Features – JSON-FG

<https://beta-paikkatieto.maanmittauslaitos.fi/inspire-addresses/features/v1/collections/addresses/items?f=jsonfg&bbox=24.928,60.151,24.957,60.172&bbox-crs=http://www.opengis.net/def/crs/OGC/1.3/CRS84&crs=http://www.opengis.net/def/crs/EPSSG/0/3067>

Geopackage via OGC API Features

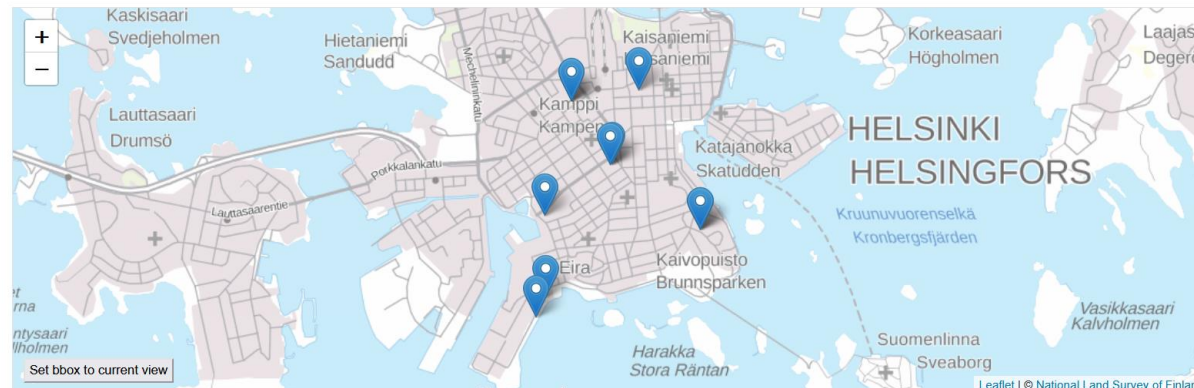
OGC API Features

[.../inspire-
addresses/features/v1/collections/addresses/items?bbox=24.928,60.
151,24.957,60.172&f=gpkg&limit=-1](https://inspire-addresses/features/v1/collections/addresses/items?bbox=24.928,60.151,24.957,60.172&f=gpkg&limit=-1)

Simple Addresses

Addresses of Finland's Buildings

Switch CRS: CRS84



Overview of JSON-FG

- Intentional limitations exist in GeoJSON:
 - Restricted to WGS 84 as Coordinate Reference System
 - Points, line strings and polygons – no support for solids or prisms
 - Supports spatial, but not temporal geometries
 - No feature type concept, no information about the schema
- Therefore, OGC Features and Geometries JSON standard (JSON-FG) addressing these limitations
 - Avoid edge cases, focus on capabilities that are useful for many spatial experts
 - Specify as a superset of GeoJSON: Valid GeoJSON is also valid JSON-FG and vice versa

JSON-FG backwards compatibility

Accept: application/vnd.ogc.fg+json; **compatibility=geojson**,
application/vnd.ogc.fg+json; q=0.9, application/geo+json; q=0.8

```
{
  ...,
  "coordRefSys": "http://www.opengis.net/def/crs/EPSSG/0/5555",
  "place": {
    "type": "Polyhedron",
    "coordinates": [
      [
        [ 479816.67, 5705861.672, 100 ], ...
        [ 479816.67, 5705861.672, 100 ]
      ]
    ], ...
  ],
  "geometry": {
    "type": "Polygon",
    "coordinates": [
      [
        [ 8.709204563652449, 51.50352856284526, 100 ], ...
        [ 8.709204563652449, 51.50352856284526, 100 ]
      ]
    ]
  },
  ...
}
```

a valid GeoJSON geometry in
"geometry"

DEMO

GeoPackage

C:\Users\JREINI\Downloads\addresses.gpkg

- User Data
 - addresses
 - gpkg_contents
 - gpkg_extensions
 - gpkg_geometry_columns
 - gpkg_spatial_ref_sys
 - rtree_addresses_geometry
 - rtree_addresses_geometry_node
 - rtree_addresses_geometry_parent
 - rtree_addresses_geometry_rowid
 - vgpkg_addresses

```
SELECT ROWID, "id", "geometry", "inspireId_localId", "inspireId_namespace", "position_specification", "position_specificat"
FROM "addresses"
ORDER BY ROWID
```

	ult	component_ThoroughfareName	component_PostalDescriptor	component_AdminUnitName_1	component_AdminUnitName_4	locator_designator_addressNumber
1	1	Hernesaarenranta	00150	Suomi	Helsinki	4
2	1	Vuorikatu	00100	Suomi	Helsinki	4
3	1	Hietalahdenranta	00150	Suomi	Helsinki	3
4	1	Hernesaarenranta	00150	Suomi	Helsinki	2
5	1	Simonkatu	00100	Suomi	Helsinki	7
6	1	Narinkka	00100	Suomi	Helsinki	4
7	1	Uudenmaankatu	00120	Suomi	Helsinki	4-6
8	1	Uudenmaankatu	00120	Suomi	Helsinki	4-6
9	1	Itäinen Puistotie	00140	Suomi	Helsinki	2
10	1	Myllytie	00140	Suomi	Helsinki	1
11	1	Huvilakuja	00150	Suomi	Helsinki	14
12	1	Huvilakuja	00150	Suomi	Helsinki	14
13	1	Kaivokatu	00100	Suomi	Helsinki	1a
14	1	Harakka	00140	Suomi	Helsinki	3
15	1	Harakka	00140	Suomi	Helsinki	5
16	1	Pohjoinen Uunisaari	00140	Suomi	Helsinki	2
17	1	Pohjoinen Uunisaari	00140	Suomi	Helsinki	2
18	1	Pohjoinen Uunisaari	00140	Suomi	Helsinki	3
19	1	Pohjoinen Uunisaari	00140	Suomi	Helsinki	2
20	1	Itäinen Puistotie	00140	Suomi	Helsinki	2
21	1	Myllytie	00140	Suomi	Helsinki	1

In QGIS

Feature	Value
▼ addresses [4]	
▼ inspireId_namespace	
▶ (Derived)	
▶ (Actions)	
id	281128
inspireId_localId	281128
inspireId_namespace	https://github.com/INSPIRE-MIF/2017.2/GeoJSON/ads/examples/
position_specification	building
position_specification_href	https://inspire.ec.europa.eu/codelist/GeometrySpecificationValue/building
position_method	byOtherParty
position_method_href	https://inspire.ec.europa.eu/codelist/GeometryMethodValue/byOtherParty
position_default	true
component_ThoroughfareName	Tehtaankatu
component_PostalDescriptor	00150
component_AdminUnitName_1	Suomi
component_AdminUnitName_4	Helsinki
locator_designator_addressNumber	21
locator_level	siteLevel
locator_level_href	https://inspire.ec.europa.eu/codelist/LocatorLevelValue/siteLevel
building	103103877H
parcel	09100701260021
▶ inspireId_namespace	
▶ inspireId_namespace	
▶ inspireId_namespace	

More to follow...

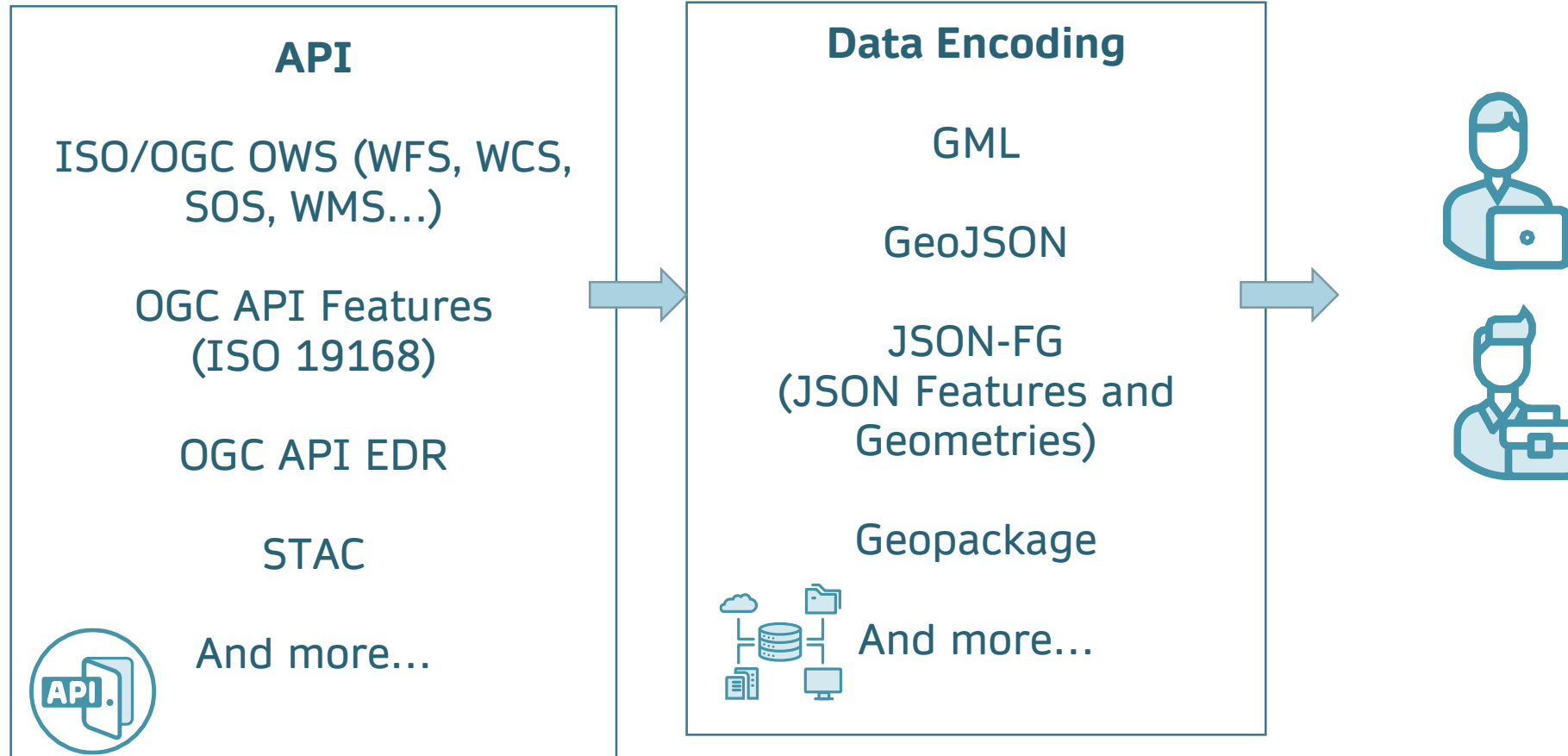
[GeoJSON encoding of INSPIRE datasets](#)

[GeoPackage encoding of INSPIRE datasets](#)

[Setting up an INSPIRE Download service based on the OGC API-Features standard](#)

[STAC as an INSPIRE predefined-access download service](#)

How to implement – we have options



Conclusions / discussions / questions?

- Different encodings - Fit for purpose
 - For some use cases very complex schemas/data models are needed – usually automated processes using them
 - 90% need just "basic" information
 - Easy to consume
 - ETL is there – and will be there also in the future

- **One can't fulfill all the requirements automatically**



Thank you!

 @JariReini

 <https://www.linkedin.com/in/reini/>



We know the Earth
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