Transforming Data with FME for Inspire

Ken Bragg @KenAtSafe
European Services Manager
Safe Software

INSPIRE KEN & EuroSDR
Schema Transformation Workshop
ENSG - Marne-La-Vallée – October 9th 2013
Agenda

- Introduction
- Format Transformation
- Schema Mapping with FME
- Validation of Output
- Web Services with FME Server
- Looking Ahead FME & Inspire
- Q&A
Agenda

- **Introduction**
  - Safe Software & FME
- **Format Transformation**
  - New GML writing in FME
- **Schema Mapping with FME**
  - Basic Schema related transformers
  - Schema Mapper
  - Success Stories
  - Inspire Solution Pack
- **Validation of Output**
  - XMLValidator transformer
  - Other FME Validation Tools
- **Web Services with FME Server**
  - WFS Service
  - WxS Services with FME
- **Looking Ahead FME & Inspire**
- **Q&A**
Safe Software Inc.

~100 exuberant employees

Located in Surrey, British Columbia, Canada

Partners World-Wide

Thousands of happy customers
FME – Feature Manipulation Engine

- FME Desktop
- FME Server
- FME Cloud
Powering the flow of data

Convert data from one format to another

Transform data into the precise model you need

Share data for use in other applications

Integrate data to use in your preferred system

Validate data to identify and fix quality issues

300+ supported formats
FME Workbench Workspace

- 400+ transformers give you unlimited flexibility

No Code!!
INSPIRE Data Harmonization
Supported by FME

Evaluation
Data assessment

Assembly
Reading & Join

Transformation
schema, geometry

Validation
QA, XSD, values

Publication
WxS, GML, PDF, KML

INSPIRE Clients
INSPIRE Reader
Format Transformation
300+ Supported Formats

Check for your format: safe.com/formats
New GML Writer in FME 2014

- GML writing using application schema (XSDs)
- Destination data model captured directly from the application schema
- No Longer a Template Based Approach

Import Feature Type in FME
New GML Writing in FME 2014

- Multiple Nested namespace support as defined by the application schema. For example in an INSPIRE watercourse element:

```
<hy-p:inspireId>
  <base:Identifier>
    <base:localId>3</base:localId>
    <base:namespace>_example</base:namespace>
  </base:Identifier>
</hy-p:inspireId>
```
New GML Writing

- We write GML Geometry directly from FME geometry just like any other format
- Multi-Geometry support with GeometryPropertySetter Transformer

Demo

C:\PS\InspireParis2013\CadastralParcels\1 INSPIREwriter_A1.CadastralParcelsStart.fmw
Geometry Property Setters and Aggregates in INSPIREwriter_A1.CadastralParcels.fmw
Schema Mapping with FME
INSPIRE - Challenge

- You want to meet INSPIRE data provision requirements, but your data is organized rather differently
Schema Mapping
Feature Type and Attribute Mapping

Feature Type Mapping in FME Workbench

Attribute Mapping in FME Workbench
### Value Mapping

- **Value Mapping**

Here we read the DGN file. We can see that the internal attributes are read as well.

Here we use the ValueMapper to perform a lookup based on the igds_style, and assign a corresponding value. This new value is called Type.

We’ve renamed our output dataset, and redefined our attribute names to something that makes sense. Then we connect the corresponding attributes.
Schema Mapping
FME’s SchemaMapper Transformer

FME Workspace

Name mapping

Name & value mapping
Other types of transformations

Geometric Transformations

for example multiple named geometries
Other Types of Transformations
Coordinate System Transformation

- Fast and easy projection conversion
  - > 50 projections
  - > 2000 predefined coordinate systems
- Support for user-defined systems (projection, datum, ellipsoid)
- Updated INSPIRE related coordinate system names to make the easier to find

<table>
<thead>
<tr>
<th>BritishNatGrid</th>
<th>LL WGS-84</th>
</tr>
</thead>
<tbody>
<tr>
<td>Belge72.Lambert72A</td>
<td>Italy-32</td>
</tr>
<tr>
<td>EPSG references</td>
<td>State plane</td>
</tr>
</tbody>
</table>

and many more...
Schema Mapping Demonstration

Also show 3 Filters&Ranges&MappersExample.fmw
Some Schema Mapping Success Stories
INSPIRE SDIs:
Implementations by Metria

June 2013
Overview

INSPIRE Projects in Sweden by Metria

- **Swedish EPA**: Protected Sites Harmonization
  - Data integration from HelComm, Natura and EPA
## Protected Sites Schema Mapping: NVR to INSPIRE

<table>
<thead>
<tr>
<th>FilterAttribute Value</th>
<th>SourceAttribute</th>
<th>Field_Inspire</th>
<th>DestinationAttributeValue</th>
<th>DestinationAttribute</th>
</tr>
</thead>
<tbody>
<tr>
<td>DID</td>
<td>INSPIRE_LOCALID</td>
<td></td>
<td>Full</td>
<td>INSPIRE_APPLICATIONSCHEMA</td>
</tr>
<tr>
<td>VALID_FROM_DATE</td>
<td>INSPIRE_LEGALFOUNDATIONDATE</td>
<td></td>
<td>SE</td>
<td>INSPIRE_NAMESPACE</td>
</tr>
<tr>
<td>DECISIONDATE</td>
<td>INSPIRE_DATE</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### IUNC_CATEGORY

<table>
<thead>
<tr>
<th>Value</th>
<th>Filter</th>
<th>Source</th>
<th>Field_Inspire</th>
<th>Destination</th>
<th>Destination</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td>Empty value</td>
<td>INSPIRE_DESIGNATION</td>
</tr>
<tr>
<td>Ia</td>
<td></td>
<td></td>
<td>strictNatureReserve</td>
<td>INSPIRE_DESIGNATION</td>
<td></td>
</tr>
<tr>
<td>Ib</td>
<td></td>
<td></td>
<td>wildernessArea</td>
<td>INSPIRE_DESIGNATION</td>
<td></td>
</tr>
<tr>
<td>II</td>
<td></td>
<td></td>
<td>nationalPark</td>
<td>INSPIRE_DESIGNATION</td>
<td></td>
</tr>
<tr>
<td>III</td>
<td></td>
<td></td>
<td>naturalMonument</td>
<td>INSPIRE_DESIGNATION</td>
<td></td>
</tr>
<tr>
<td>null</td>
<td></td>
<td></td>
<td>Empty value</td>
<td>INSPIRE_DESIGNATION</td>
<td></td>
</tr>
</tbody>
</table>

### OBJECTNAME

<table>
<thead>
<tr>
<th>Value</th>
<th>Filter</th>
<th>Source</th>
<th>Field_Inspire</th>
<th>Destination</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>INSPIRE_SITENAME</td>
<td></td>
</tr>
</tbody>
</table>

### PROTECTIONTYPE

<table>
<thead>
<tr>
<th>Value</th>
<th>Filter</th>
<th>Source</th>
<th>Field_Inspire</th>
<th>Destination</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>natureConservation</td>
<td>INSPIRE_PROTECTIONCLASSIFICATION</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>natureConservation</td>
<td>INSPIRE_PROTECTIONCLASSIFICATION</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Swedish Protected Sites Update

- Swedish Environmental Protection Agency
  - Production system for download services following on the successful pilot last year.

- Metria hosts the protected sites view services.

- Metria performs schema mapping for five protected sites source datasets to INSPIRE using FME Server.
Introduction

Pan-European reference datasets by EuroGeographics

**EuroBoundaryMap**
Reference dataset of all national administrative units at scale 1:100,000

**EuroRegionalMap**
Multi-functional topographic reference dataset at scale 1:250,000

**EuroGlobalMap**
Multi-functional topographic reference dataset at scale 1:1,000,000
### Development of 30 FME Workbenches

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Source data</th>
<th>Target data</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Data format</strong></td>
<td>ESRI File Geodatabase</td>
<td>ESRI File Geodatabase</td>
</tr>
<tr>
<td><strong>Amount of data</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EBM</td>
<td>350 MB</td>
<td>846 MB</td>
</tr>
<tr>
<td>ERM</td>
<td>1425 MB</td>
<td>6606 MB</td>
</tr>
<tr>
<td>EGM</td>
<td>205 MB</td>
<td>781 MB</td>
</tr>
<tr>
<td><strong>Processing</strong></td>
<td>ca. 14 days</td>
<td></td>
</tr>
</tbody>
</table>
FME Workbench for transformation
ERM WatcrsL into ELF hypSurfaceWaterL(PhysicalWaters)
ETL Workflow description

1. Import source data
2. Create destination schema
3. Import destination schema
4. Schema mapping
5. Load Data INSPIRE GDB

FME data import process

FME INSPIRE Solution Pack: Schema Mapping
Components of the FME INSPIRE Solution Pack

- **Additional INSPIRE information**
  - Tutorial workspace (complete sample mapping [AdminUnits])
  - Additional HTML Workbench Help (description of INSPIRE GDB data model)
  - Direct access to the INSPIRE data specification (link to specific themes)

- **Additional functionality**
  - Template workspaces (destination schema and predefined workspaces)
  - Destination data schema for all Annex 1 themes (INSPIRE GDB of ArcGIS for INSPIRE [http://resources.arcgis.com/de/content//arcgis-inspire/1.0/about](http://resources.arcgis.com/de/content//arcgis-inspire/1.0/about))
  - More than 100 additional INSPIRE transformers
    - INSPIRE specific value and attribute mapping (voidable values)
    - transformer for recurrent tasks (ID management, lifespan setter)
INSPRIE Transformers
(Attribute and Value Mapping)

- Automated filling of obligated attribute
  - legalStatus
  - legalStatus_void
- Possible values for obligated attributes (if not void)
  - agreed
  - notAgreed
- Predefined void value reasons (if void)
  - 0 = no reason given
  - 1 = reason: unknown
  - 2 = reason: unpopulated
- AttributeRenamer functionality
  - usable if attribute already existing

[String diagram and FMG interface with options: Transformer Name, Void attribute, Set value for legalStatus, Input Attribute, Help, Defaults, and Show AdminUnitsISP.fmw]
Validation of Output
Validation

INSPIRE schema validation (with .xsd)

Data integrity
- Unique IDs
- Geometric integrity
- Null values (nullable?)
- Valid values: ranges and domain codes
- Bounds

Custom validity rules specific to domain
AttributeClassifier, Tester etc
Validation Workspace

**Validate Syntax**
- Creator
  - CREATED
- XMLVal...or_Syntax
  - INPUT
  - PASSED
  - FAILED
- AttributeCreator
  - INPUT
  - OUTPUT
  - Logger
    - INPUT

**Validate Schema**
- XMLVal...Schema
  - INPUT
  - PASSED
  - FAILED
- AttributeCreator_2
  - INPUT
  - OUTPUT
  - Logger_2
    - INPUT

**Successful**
- AttributeCreator_3
  - INPUT
  - OUTPUT
  - Logger
    - OUTPUT

**Convert to HTML**
- XMLTemplater
  - ROOT
  - OUTPUT
  - StringConcatenator
    - INPUT
    - OUTPUT
  - StringReplacer
    - INPUT
    - OUTPUT
  - text_in...LINE
    - INPUT

**Write to CSV**
- AttributeCopier
  - INPUT
  - OUTPUT
  - Validate...[CSV]
    - INPUT

---

**Doces**


To validate use `<FME HOME>/xmlschemas/iso\19139\20070417\gmd\gmd.xsd`
<table>
<thead>
<tr>
<th>Error Message</th>
<th>Error File</th>
<th>Error Line</th>
<th>Error Column</th>
<th>Error Type</th>
<th>Error Description</th>
<th>File Length Characters</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bad xml syntax</td>
<td>iso19115_inspire_metadata_bad_sql</td>
<td>378</td>
<td>18</td>
<td>Fatal Error</td>
<td>input ended before all started tags were ended, last tag started is 'gmd:MDF_Metadata'</td>
<td>12975</td>
</tr>
</tbody>
</table>
Validation Report – Bad Schema

<table>
<thead>
<tr>
<th>Error Message</th>
<th>Error File</th>
<th>Error Line</th>
<th>Error Column</th>
<th>Error Type</th>
<th>Error Description</th>
<th>File Length Characters</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bad xml schema</td>
<td>iso19115_inspire_metadata_bad_schema.xml</td>
<td>66</td>
<td>32</td>
<td>Error</td>
<td>value '2007.12.03' does not match any member types of the union</td>
<td>12976</td>
</tr>
</tbody>
</table>
Validation Report – Good Metadata

<table>
<thead>
<tr>
<th>Error Message</th>
<th>Error File</th>
<th>Error Line</th>
<th>Error Column</th>
<th>Error Type</th>
<th>Error Description</th>
<th>File Length Characters</th>
</tr>
</thead>
<tbody>
<tr>
<td>Validation successful. Metadata loaded.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>12976</td>
</tr>
</tbody>
</table>
Other Validation Options

• Tester
  • Field names
  • Data types (numeric, date etc)
  • IDs

• CoordinateSystemExtractor
• GeometryFilter
• GeometryOGCValidator
• SpatialFilter (check extents)
Updating: XMLUpdater

Insert, Delete, Replace, Replace Contents

This data is for test purposes, please talk to Joe.
Web Services with FME Server
Web Service Request Response

All web services follow the same pattern

url request via get, post, put, delete

Response JSON, XML
Build any web service!
Any service is now a workspace away.
FME Data Streaming service delivers response.

Power of FME is Transformation

No Code!!
FME Workspace as Web Service Broker for WFS

GetCapabilities Request

FME WFS Workspace

Response XML

FME Server
FME Workspace as Web Service Broker for WFS

describeFeatureType Request

Response XML

FME WFS Workspace

FME Server
FME Workspace as Web Service Broker for WFS

getFeature Request

Response XML

FME WFS Workspace

FME Server
FME Workspace as Web Service Broker for WFS

GetCapabilities Request → Response XML → GetFeature Request → Response GML
Workspace Parameters from URL

- Service
- Request
- Version
- Feature Types
- Bounds
Messaging:
GetCapabilities, DescribeFeature
Data Stream: GetFeature Response
WFS with FME Server

Show:
GeoNamesWFSgml13.fmw
Looking Ahead
Looking Ahead
FME & INSPIRE

Annex II and III

- New FME GML writer makes it easier to import new destination schemas for future themes
- Support reading and writing of associated data types

3D: INSPIRE

- Built in support for 3D, AIXM etc.
- Tracking draft 3D schema development
- 3D reprojection (CSMapReprojector and gridshift)
Application Domain Extensions (ADE’s)

- FME Supports Application Domain Extensions (ADE’s) for CityGML (e.g. 3D IMGeo NL). INSPIRE ADE xsds for Annex III buildings without xml templates
Looking Ahead
FME & INSPIRE

- **WxS Webservice Framework**
  - to support any web service protocol (WFS, WPS, WMTS, SOS, ODATA, ...)

- **Real Time Services**
  - exploring how FME Server supports real time services for Annex III via our Notification Service

- **Sensor** support

- **HTML5 Web Socket** Server

- **Mobile** support: JSON, messaging protocols
INSPIRE Data Harmonization
Supported by FME

**Evaluation**
Data assessment

**Assembly**
Reading & Join

**Transformation**
schema, geometry

**Validation**
QA, XSD, values

**INSPIRE SDI**
Data Sharing

**Publication**
WxS, GML, PDF, KML

**GML Writer**

**INSPIRE Reader**
Get Involved!

fmeppedia.safe.com

@SafeSoftware

youtube.com/FMEChannel

blog.safe.com
Thank You!

- Ken Bragg
  - ken.bragg@safe.com
  - @KenAtSafe

- New to FME?
  - http://www.safe.com/fme/getting-started/

- More Questions?
  - Please see your local FME partner