SAFE SOFTWARE

# INSPIRE Helsinki Workshop

## Building web and mobile friendly applications on top of INSPIRE data services combined with real time data streams


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# Hello!

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Consultant & Developer

# Agenda: 9:00 – 10:30

FME & INSPIRE Overview

- Schema, Geometry Transformation & Validation
- Writing INSPIRE GML
- Consuming INSPIRE data

Con terra ISP for FME

What's New for INSPIRE – FME 2019+

- Alternative encodings, Open API: GeoJSON, WFS3
- Updated support for GML3.x, CityGML3
- FME Server Automations

Workshop Intro and Setup

- Exercise 1: Data extraction and loading - basemap, impact layers
- Exercise 2: Live data feed to geopackage - dynamic data

# Agenda: 11:00 – 12:30

Implementing INSPIRE: Challenges

- Finding data – locating and accessing
- Schema simplification
- Geometry simplification

Troubleshooting

Hands-on Part II

- Exercise 2: Live data feed to geopackage - dynamic data - continued
- Exercise 3: Data Processing, Publication and App Deploy

Wrap-up

- Demos (Safe and volunteers)
- Lessons learned
- QnA

# Setup – Getting Started

**Wifi p/w: DigitallyDriven**

**Exercises:**

https://knowledge.safe.com/articles/100678/inspire-flood-warning-assistant-tutorial.html

https://knowledge.safe.com/index.html KB Search: ‘inspire flood warning assistant’

**FME Virtual Machines:**

(ask for url)

Use you email address

VM User: Administrator, password: ___

C:\ FMEData2019\ Resources\ Inspire\ exercise1

**Alternative - Local Install:** FME Installers, licenses, exercizes .zip

# Where is INSPIRE?

Implementation deadline 2021:

- Spatial data infrastructures (SDIs)
- Open data portals
- OGC Services

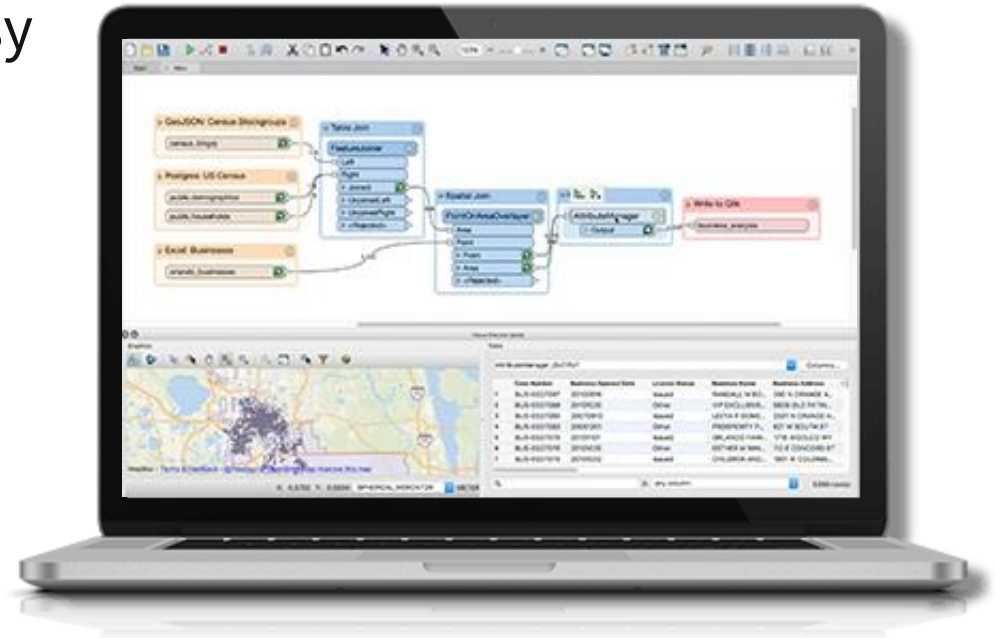
Ongoing Implementation Challenges:

- Management awareness?
- Developer friendly?
- Public accessibility?


[1] https://inspire.ec.europa.eu/about-inspire/563

# What is FME?

- Data Integration Made Easy
- Spatial ETL
- Rapid prototyping
- Automation



### Connect Your Applications

Integrate and convert information across 400+ applications.

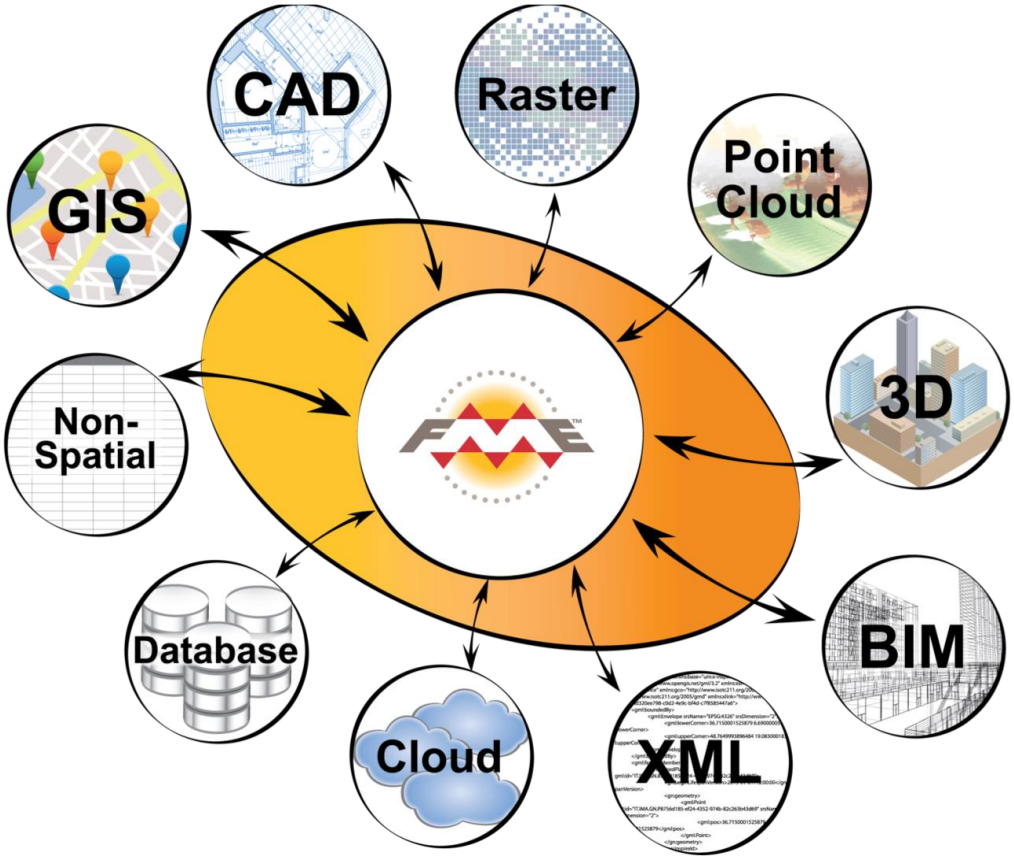
### Transform Your Data

Library of transformers
safe.com/transformers |
hub.safe.com

### Automate Your Workflows

Build event-based workflows in a visual interface.

# Connections



# FME Bridges the Gap

## Proprietary






## Open Source

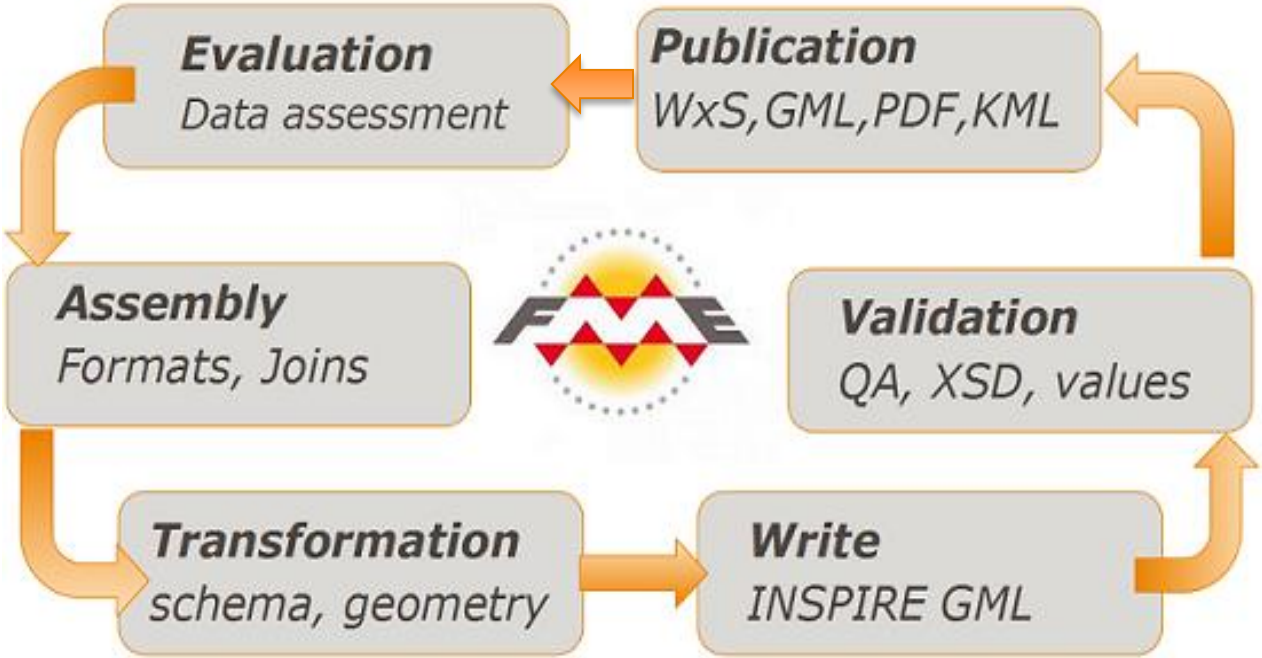


## Open Standards

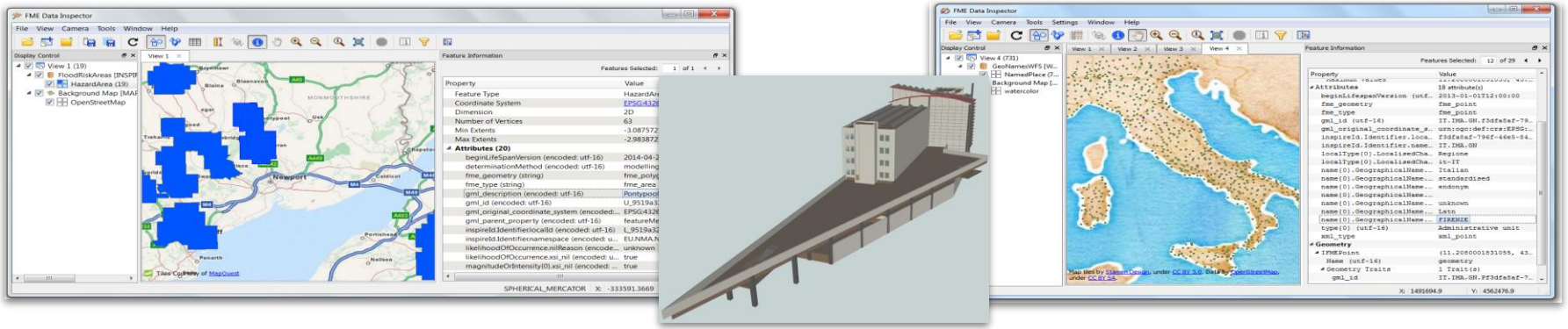


# Web Services & API's: What's Possible

# FME & INSPIRE - Life Cycle Support



# Your INSPIRE Viewer: Data Inspector

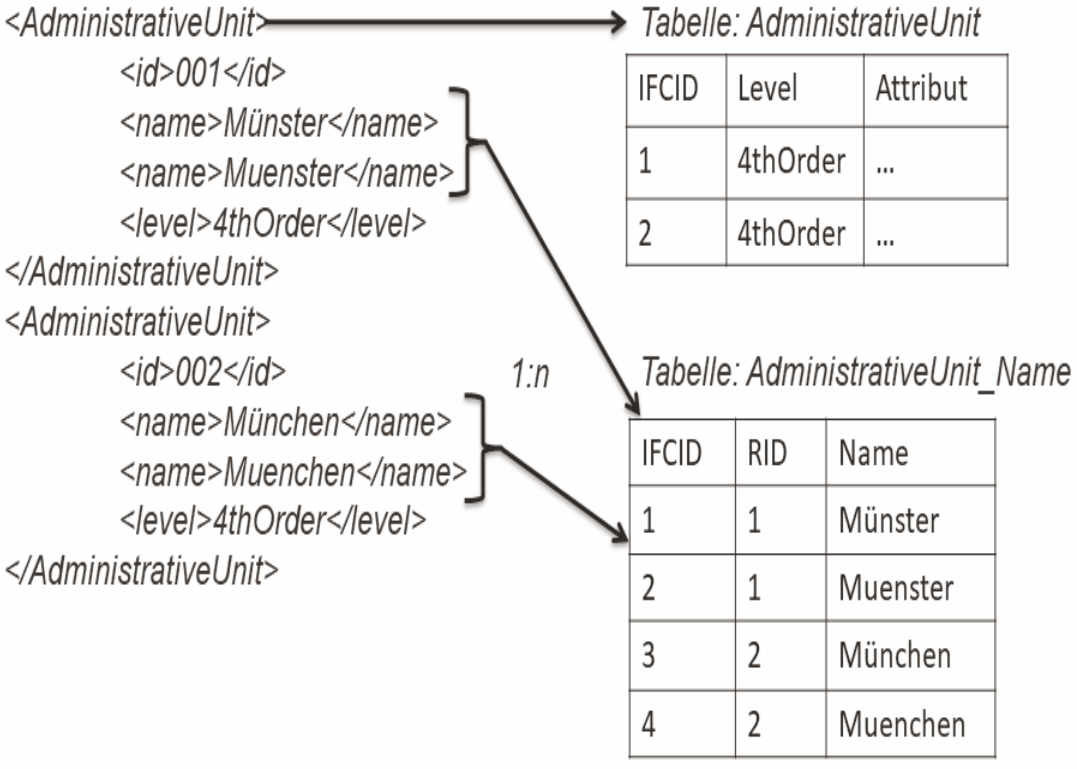



## *Read any GML*

# Schema, Geometry Transformation

# Transforming your data to INSPIRE: Key Challenges

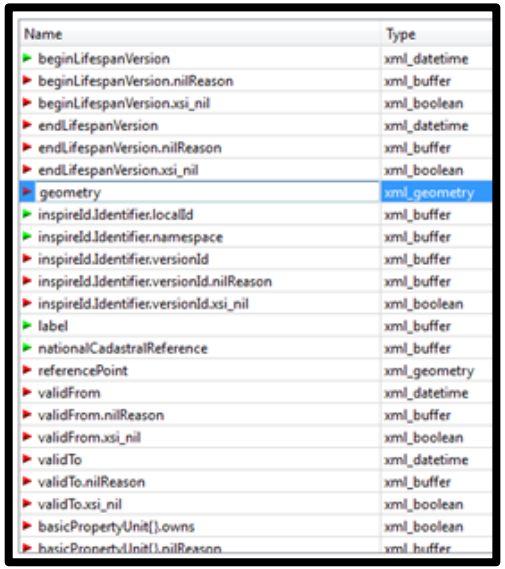
- Data **joins** from diverse sources
- **Nested**, object model vs relational (GIS)
- Spatial **reference**
- Complex, multi-**geometries**
- **Series** / lists
- **Presets** (codelists, namespaces)
- Business **rules**



# Transforming your data to INSPIRE

- **Application schema** based reader / writer
  - Populate required attribute and geometry schema
  - Reconcile **relational to object**
  - **Parent.child** field names, ids
- **All annexes** supported
- **All geometry** models: 2,2.5 & 3D
- Raster, Point clouds, Coverages

*No need to be an XML expert (XMLTemplater)*

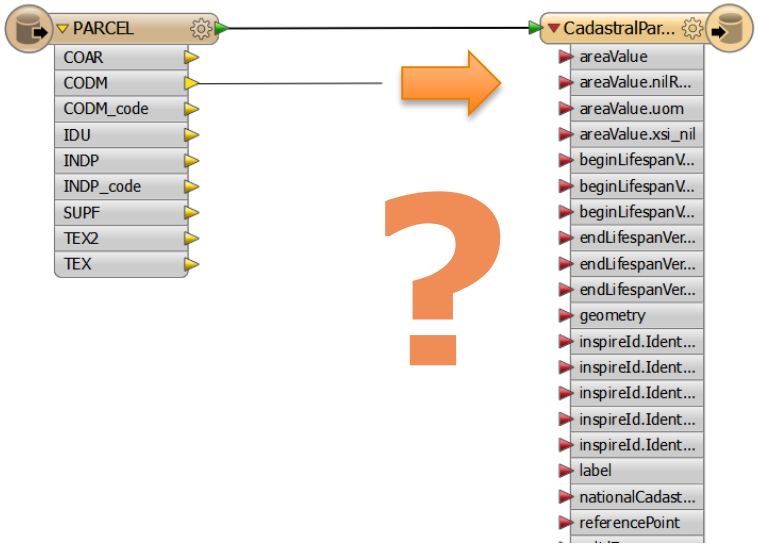


| Name | Type |
|---|---|
| beginLifespanVersion | xml_datetime |
| beginLifespanVersion.nilReason | xml_buffer |
| beginLifespanVersion.xsi_nil | xml_boolean |
| endLifespanVersion | xml_datetime |
| endLifespanVersion.nilReason | xml_buffer |
| endLifespanVersion.xsi_nil | xml_boolean |
| geometry | xml_geometry |
| inspireId.Identifier.localId | xml_buffer |
| inspireId.Identifier.namespace | xml_buffer |
| inspireId.Identifier.versionId | xml_buffer |
| inspireId.Identifier.versionId.nilReason | xml_buffer |
| inspireId.Identifier.versionId.xsi_nil | xml_boolean |
| label | xml_buffer |
| nationalCadastralReference | xml_buffer |
| referencePoint | xml_geometry |
| validFrom | xml_datetime |
| validFrom.nilReason | xml_buffer |
| validFrom.xsi_nil | xml_boolean |
| validTo | xml_datetime |
| validTo.nilReason | xml_buffer |
| validTo.xsi_nil | xml_boolean |
| basicPropertyUnit[].owns | xml_boolean |
| basicPropertyUnit[].nilReason | xml_buffer |

# Schema Mapping Tools for INSPIRE

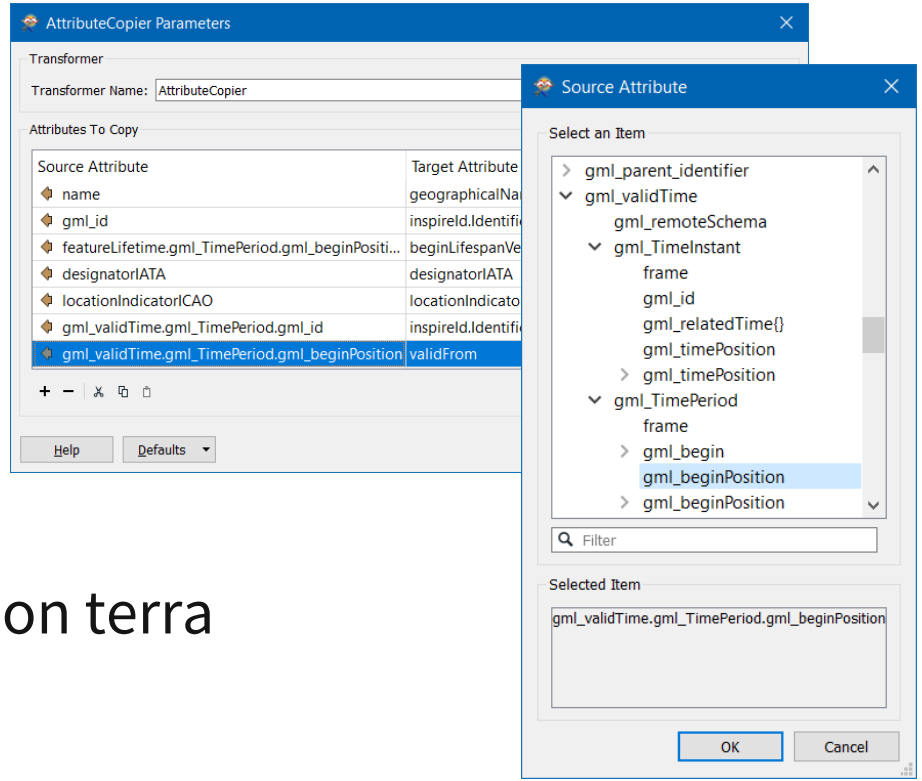
## The challenge:

- Map and transform your data and attributes into the INSPIRE schema.

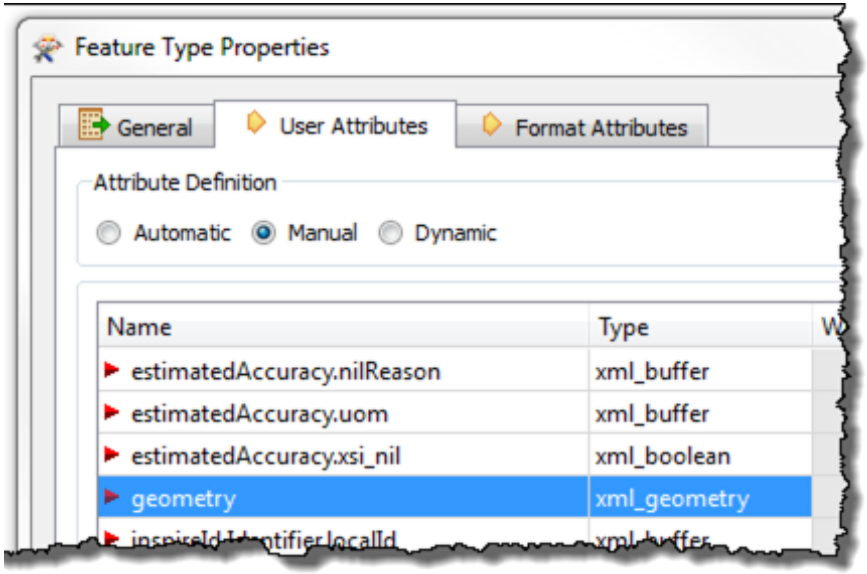


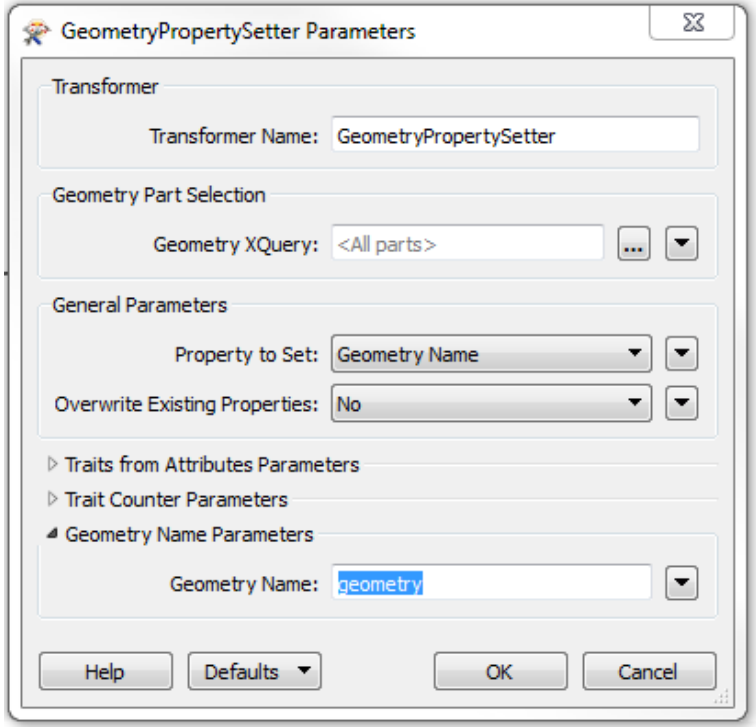
# Schema Mapping Tools for INSPIRE

- Feature type mapping
- Attribute name mapping
- Attribute value mapping
- SchemaMapper
- INSPIRE Solution Pack from con terra



# GML Complex Geometry Support

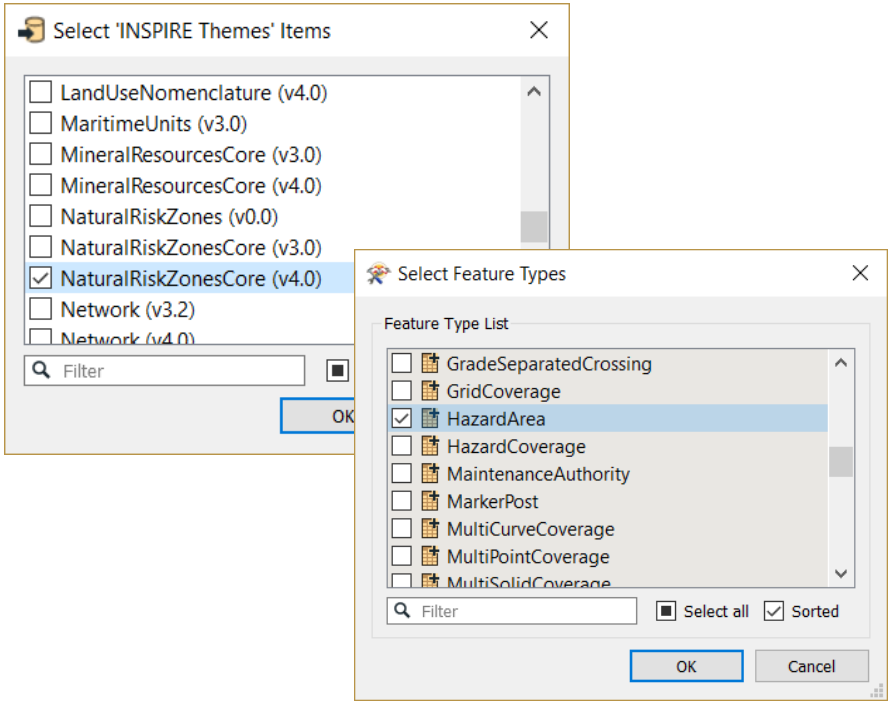


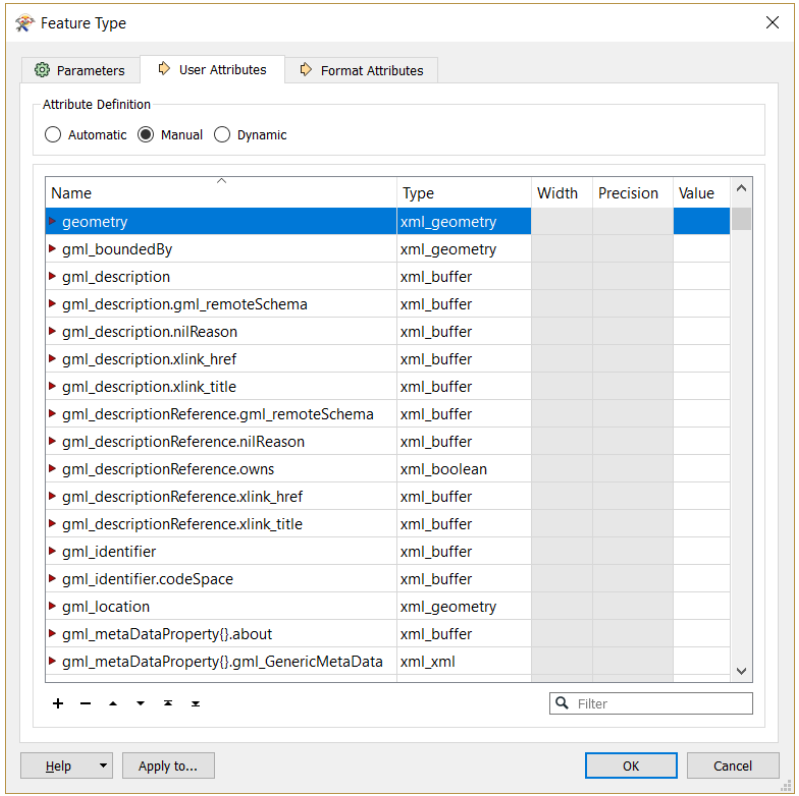



# Natural Risk Zones: Flood Hazard Areas

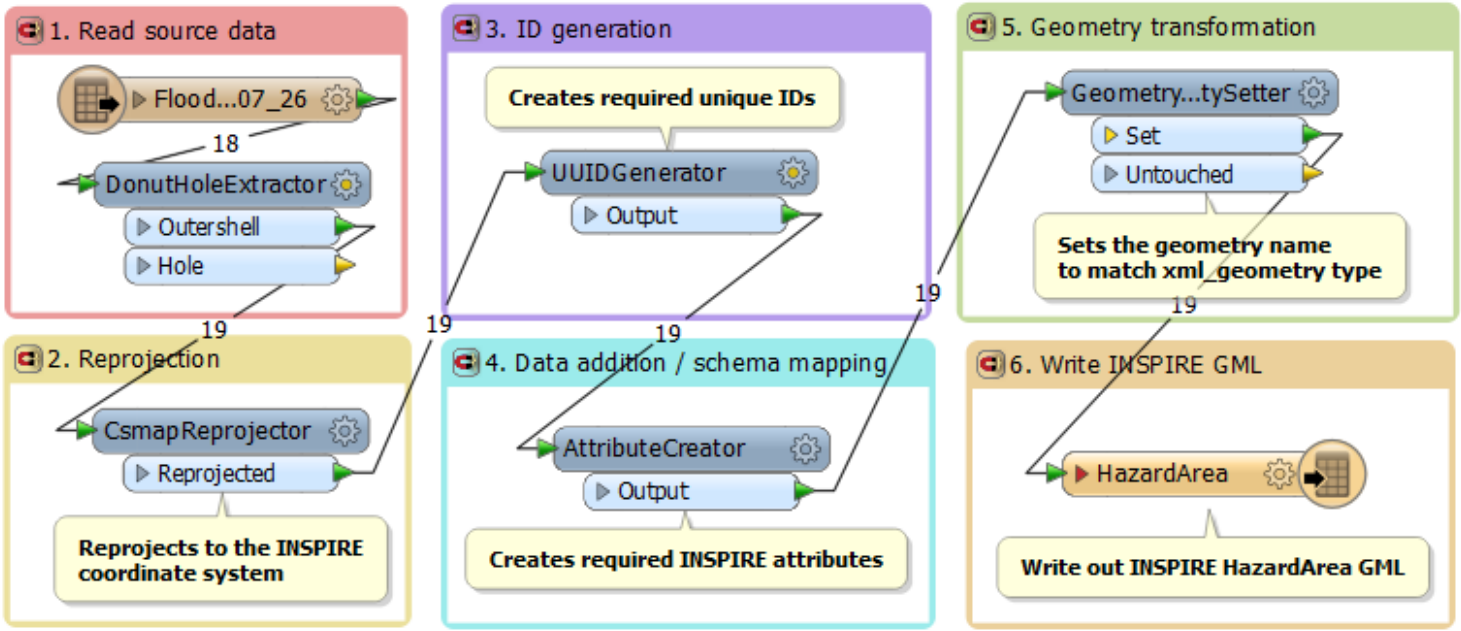
1. Read source data UK EA flood risk areas
2. Simplify the geometry
3. Reproject BNG to INSPIRE crs: ETRS89
4. ID generation: gml_id, localId, inspire ID
5. Addition of required fields and schema mapping
6. Write & validate INSPIRE GML

# Natural Risk Zones: Add Writer



# UK EA Flood Data to INSPIRE Natural Hazards: FME Workspace




knowledge.safe.com/articles/1359/inspire-natural-risk-zones-demo-annex-iii.html

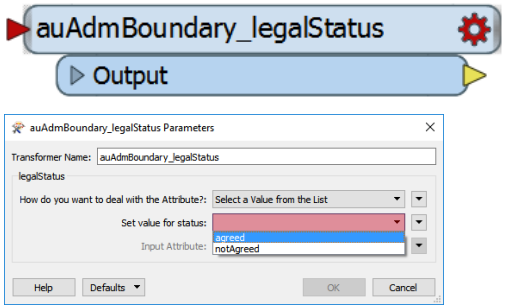
# Writing Considerations

- Unique IDs
- Feature relationships - parent / child ids
- Code lists
- Geometry names
- Required fields: ids, nilReason, lifespan, nspace
  - inspireId.Identifier.namespace
  - inspireId.Identifier.localId
- Start with a FME knowledge base tutorial
- Iteratively test validation of a few features

# INSPIRE Solution Pack for FME

# INSPIRE Solution Pack for FME

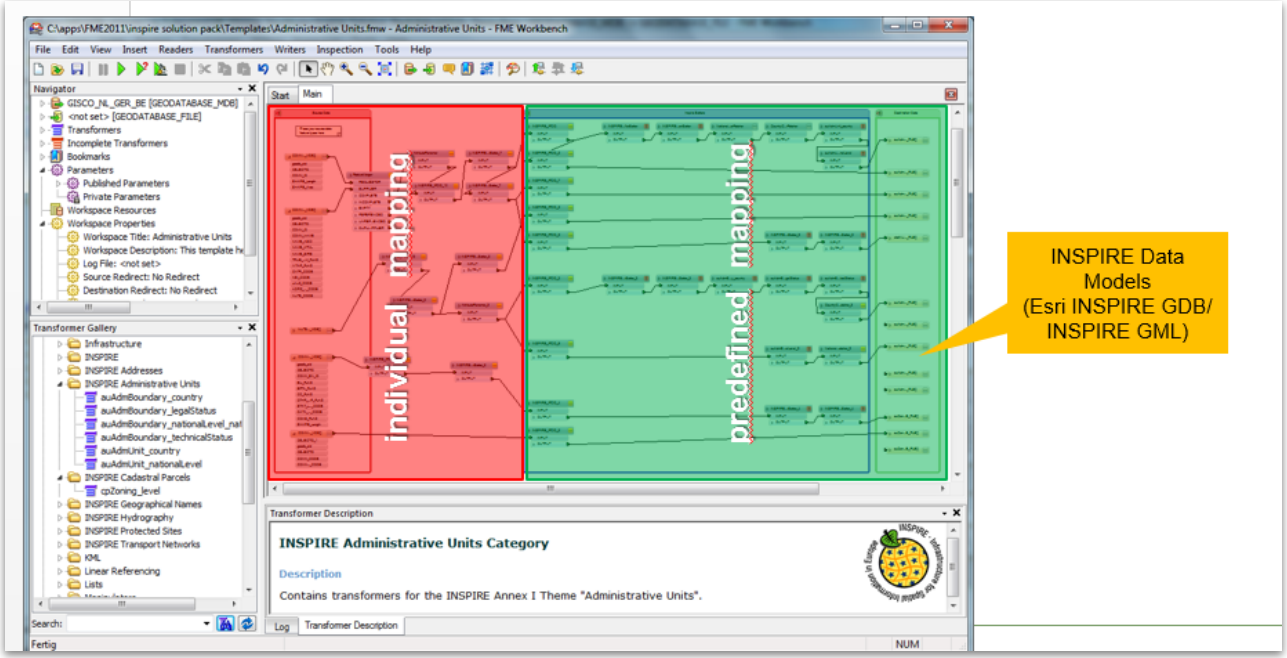
- Transformers incl. transformer help
- INSPIRE code lists
- Tutorials (GML and GDB template)



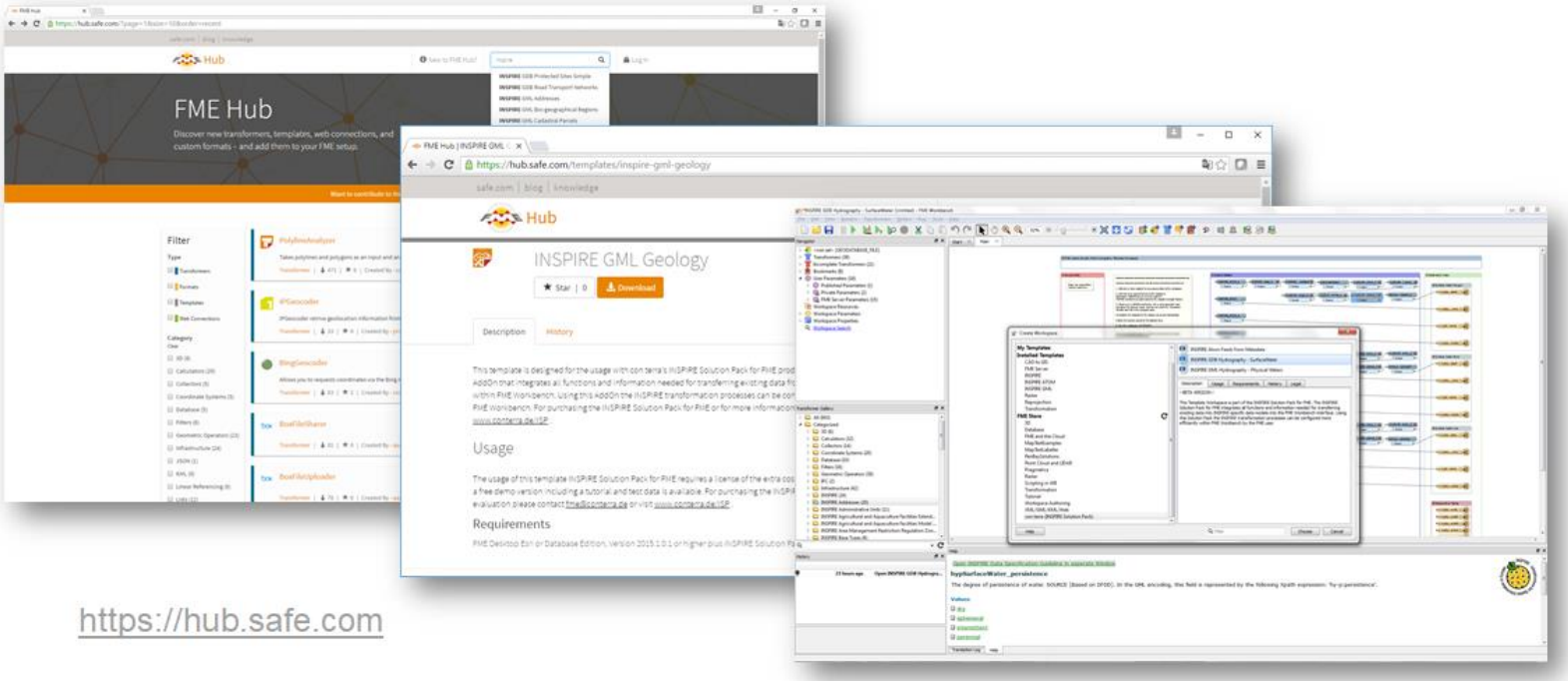

- Workspace templates
  - Esri GDB and INSPIRE GML
  - FME Hub
- Workspace template ATOM Feeds

# INSPIRE Solution Pack for FME
# by con terra

FME Workbench
“INSPIRE Template
Workspaces”



# INSPIRE Solution Pack Templates

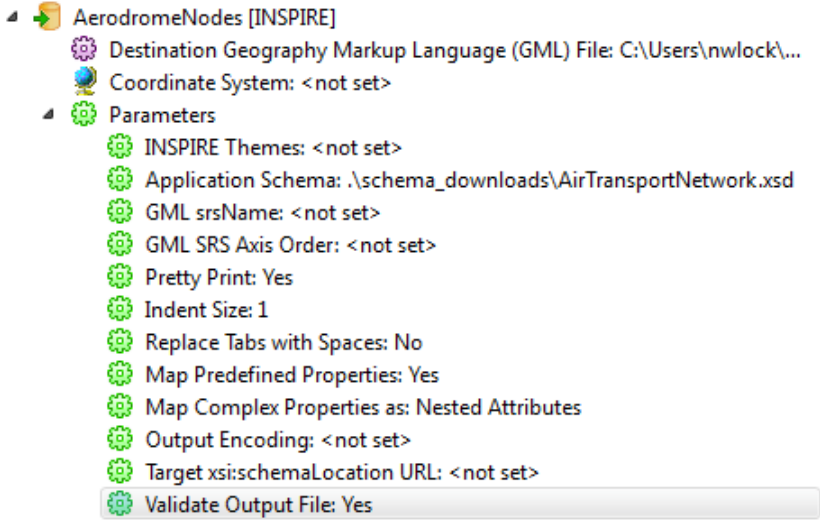



https://hub.safe.com

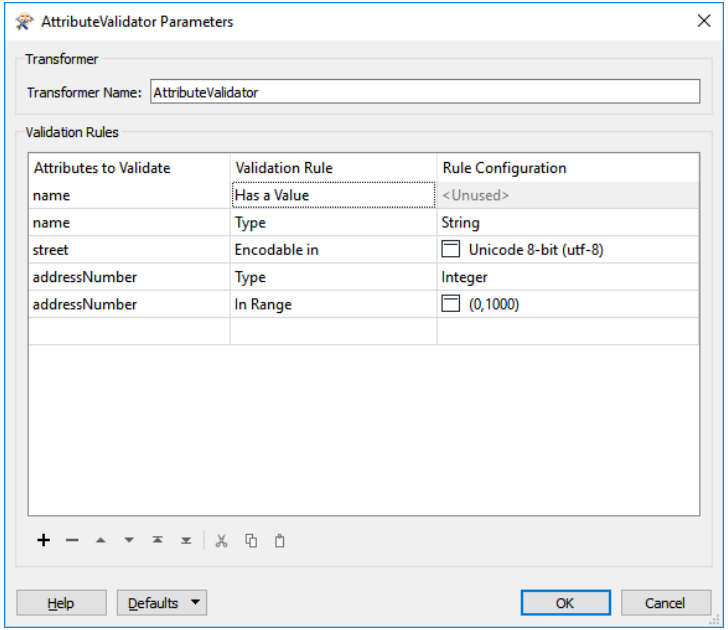
# Data Validation

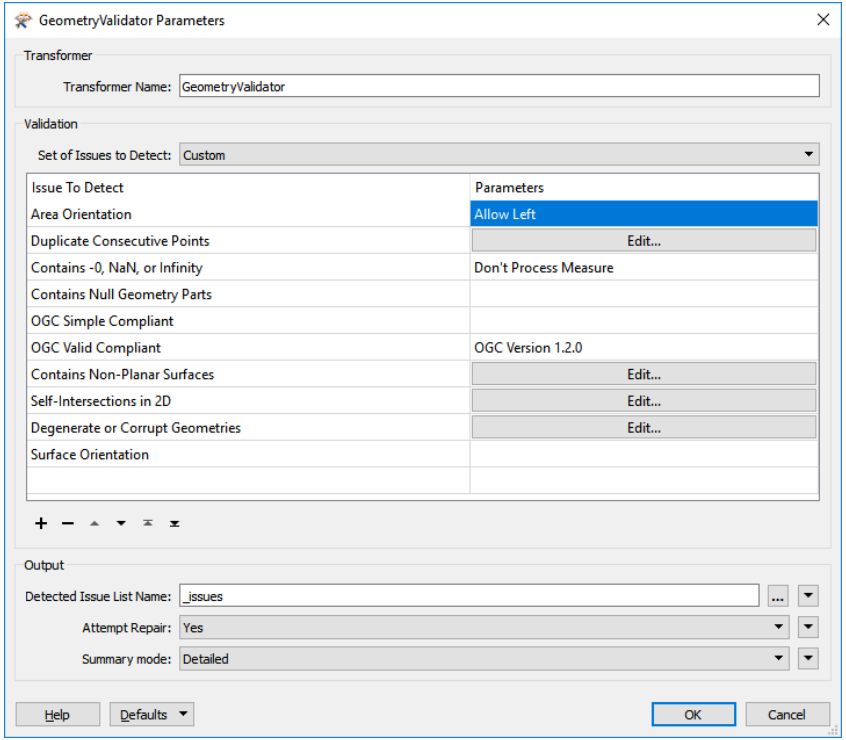
# FME for Validation

- XML application schema
- Geometry & Attribute
- Business rules
  - ETF WebApp



# Attribute & Geometry Validator

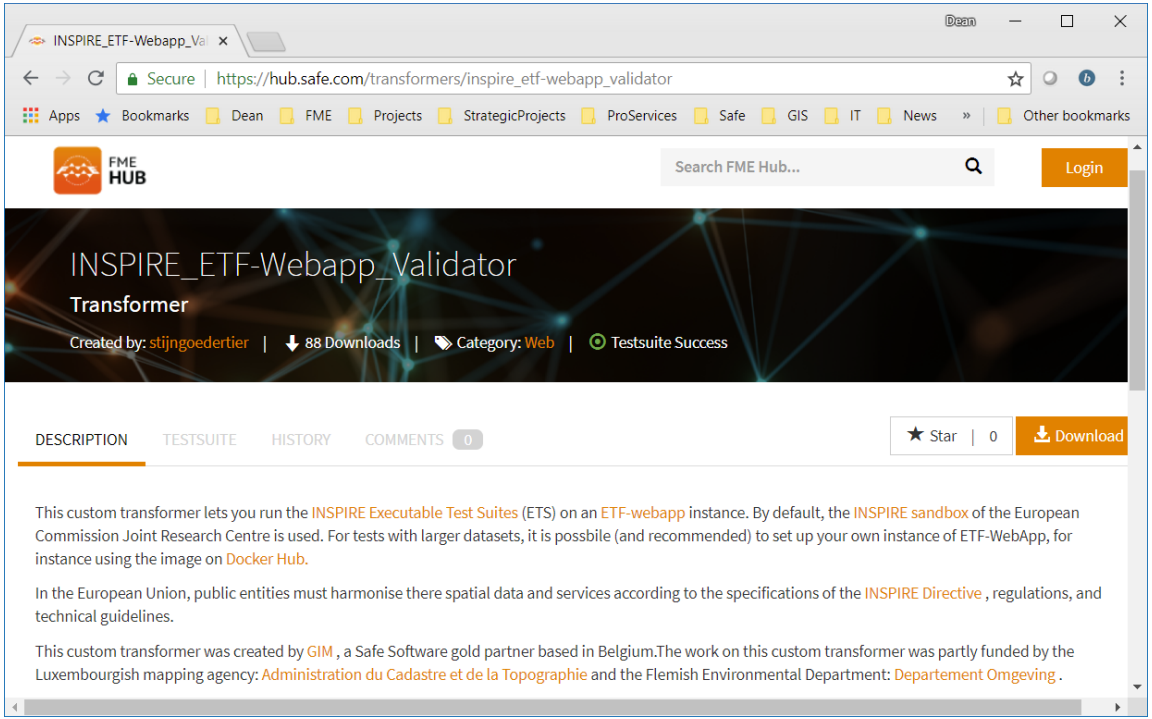


# INSPIRE ETF Validator

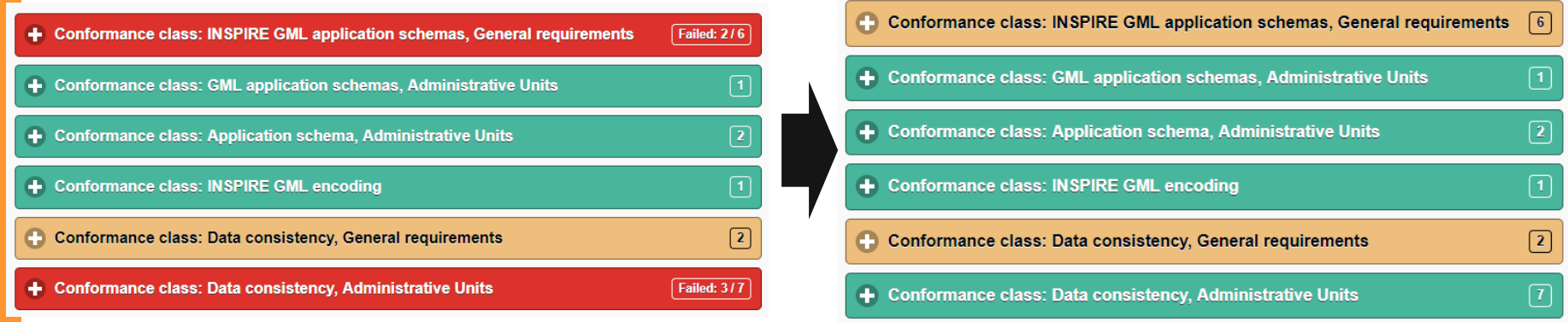
ETF = Executable Test Framework

https://hub.safe.com/transformers/inspire_etf-webapp_validator



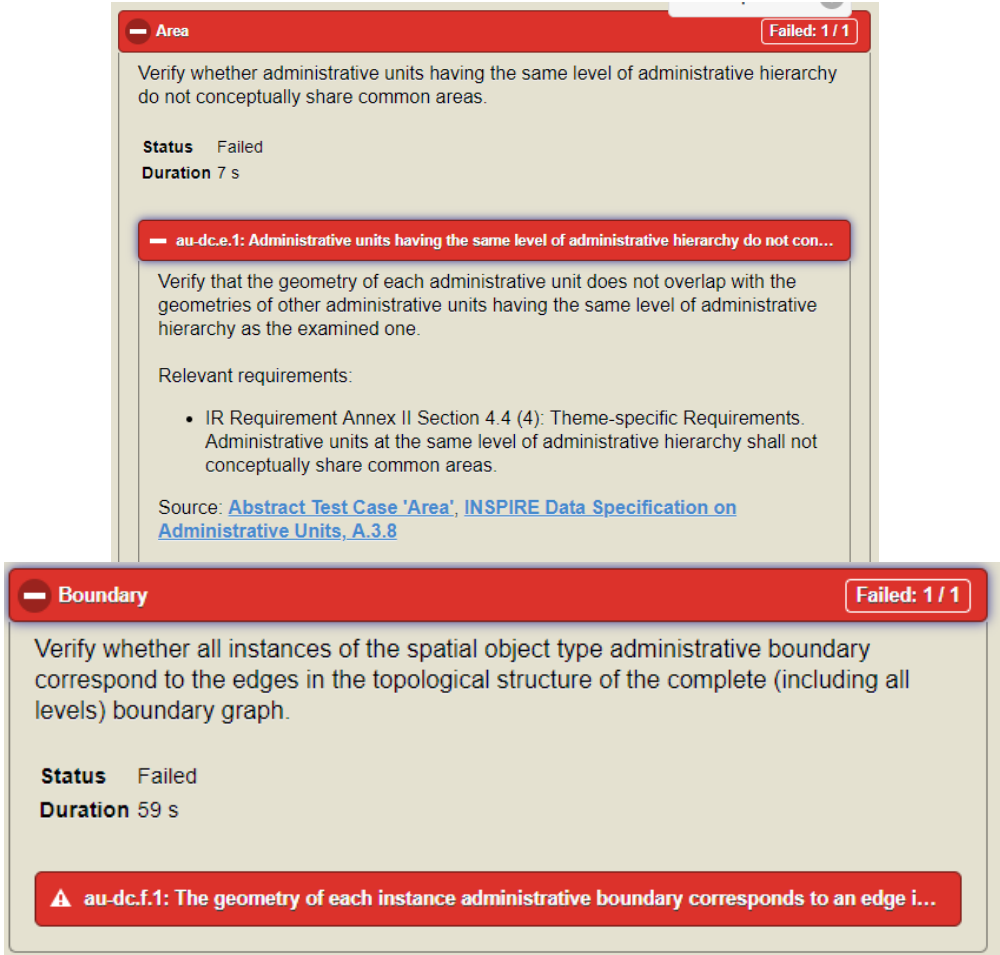
# Troubleshooting Validation Problems

- Administrative Units
  - Using the ETF-Validator
  - http://etf-validator.net/



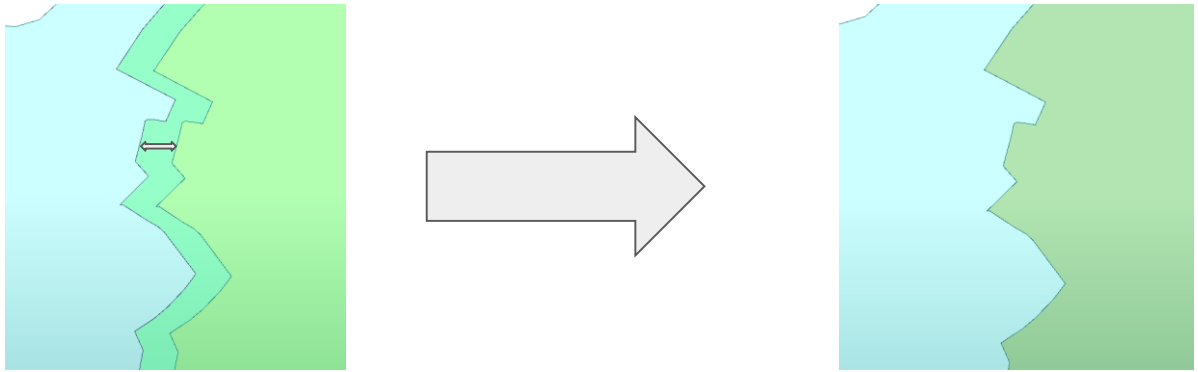
# Validation Example Admin Units

- Areas of same level may not overlap
- Boundaries need to match topological structure of Areas



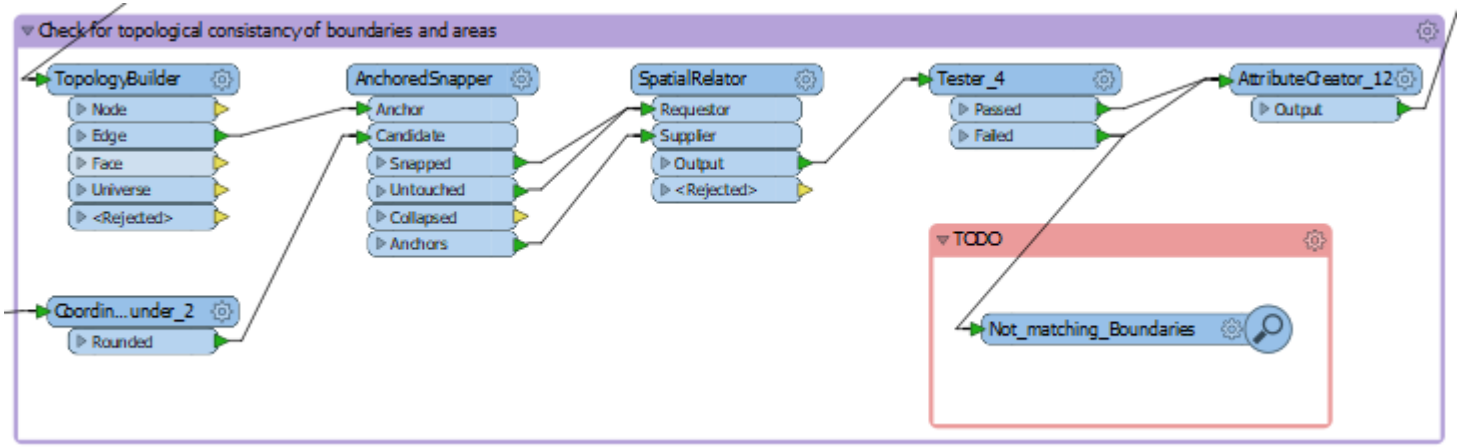
# Validation Example Admin Units

Snapping the Administrative Units Boundaries will remove the overlap

# Validation Example Admin Units

Use TopologyBuilder, AnchoredSnapper and SpatialRelator to detect and fix Boundaries



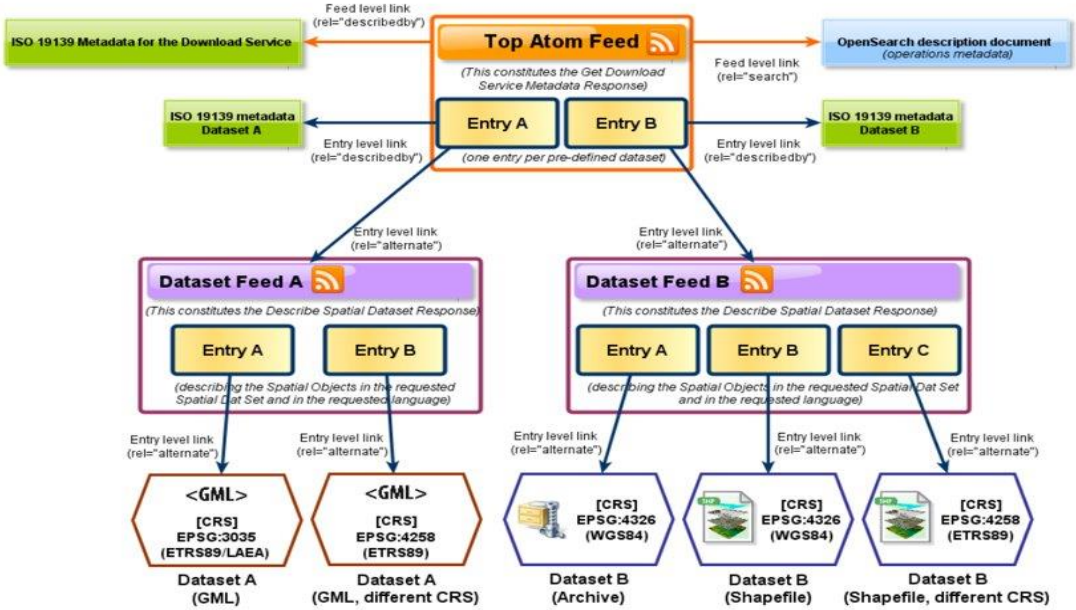
# Validation Summary

- FME is a powerful tool for all kinds of validation
- Geometry
- Attributes
- Business Rules (ETF Validator)
- It can help you to detect and **fix** errors

# Creating INSPIRE GML & ATOM Feeds

# ATOM Feeds

- Alternative way of providing data for INSPIRE
- XML based



# Leverage the cloud for INSPIRE

# FME Cloud:

# 6 Reasons

- Data In Cloud
- Innovate Faster
- Focus Resources
- Maximize Uptime
- Strengthen Security
- Save Money

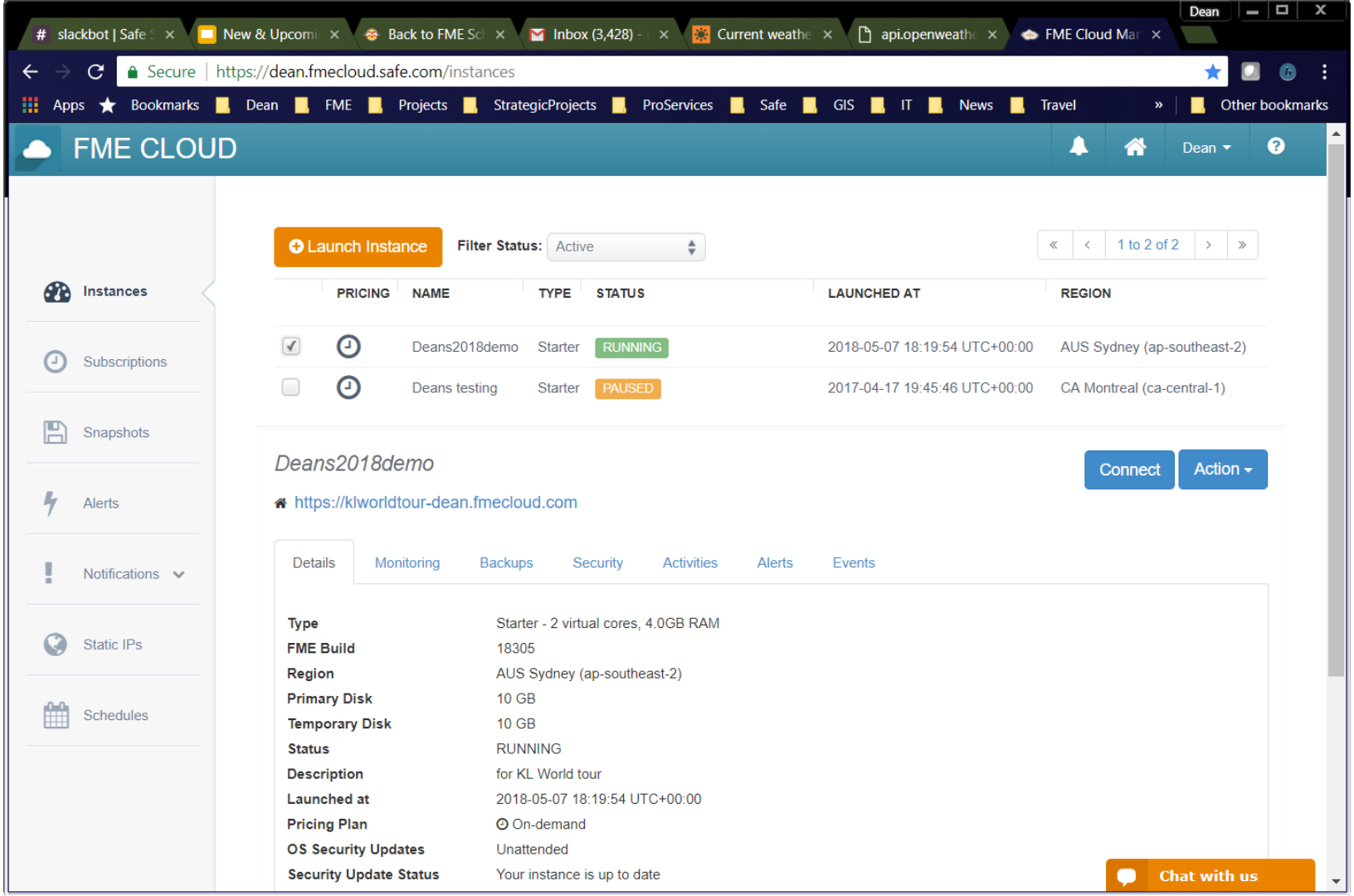
## Install FME Server Yourself

1. Build Integration workflow
2. Download FME Server
3. Acquire hardware to run FME Server
4. Configure server
    1. Install/Configure OS
    2. Install FME Server
    3. Configure network security
    4. Install SSL certificates
    5. Setup DNS
5. Plan for security updates
6. Plan for disaster recovery
7. Publish integration workflow

## Use FME Cloud

1. Build Integration workflow
2. Signup to FME Cloud
3. Click “Launch Instance” and make some configuration choices.
4. Wait 8 minutes and publish integration workflow.

# Steps to Initialize FME Server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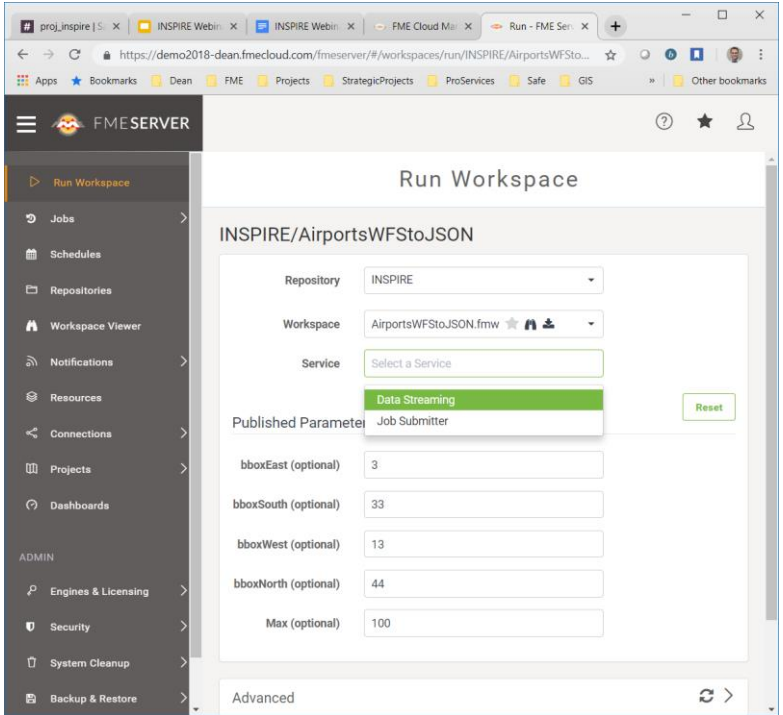
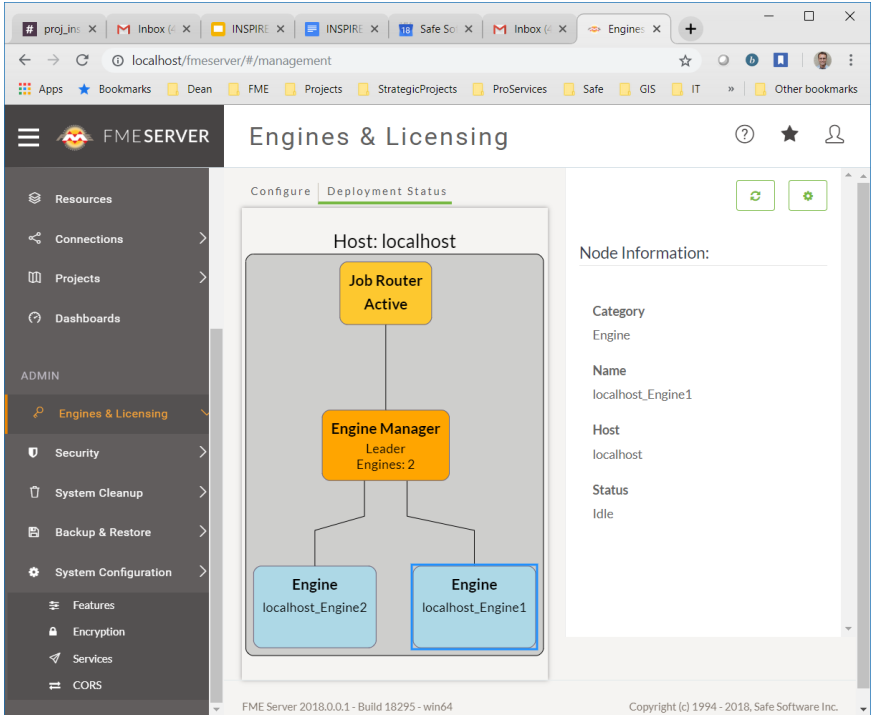
New & Upcomi
Back to FME Sc
Inbox (3,428) -
Current weathe
api.openweathe
FME Cloud Mar
Dean
Secure
https://dean.fmecloud.safe.com/instances
Apps
Bookmarks
Dean
FME
Projects
StrategicProjects
ProServices
Safe
GIS
IT
News
Travel
Other bookmarks
FME CLOUD
Dean
Launch Instance
Filter Status:
Active
1 to 2 of 2
Instances
Subscriptions
Snapshots
Alerts
Notifications
Static IPs
Schedules
PRICING
NAME
TYPE
STATUS
LAUNCHED AT
REGION
Deans2018demo
Starter
RUNNING
2018-05-07 18:19:54 UTC+00:00
AUS Sydney (ap-southeast-2)
Deans testing
Starter
PAUSED
2017-04-17 19:45:46 UTC+00:00
CA Montreal (ca-central-1)
Deans2018demo
https://klworldtour-dean.fmecloud.com
Connect
Action
Details
Monitoring
Backups
Security
Activities
Alerts
Events
Type
Starter - 2 virtual cores, 4.0GB RAM
FME Build
18305
Region
AUS Sydney (ap-southeast-2)
Primary Disk
10 GB
Temporary Disk
10 GB
Status
RUNNING
Description
for KL World tour
Launched at
2018-05-07 18:19:54 UTC+00:00
Pricing Plan
On-demand
OS Security Updates
Unattended
Security Update Status
Your instance is up to date
Chat with us

# FME Cloud is FME Server

- Easy way to publish a workspace as a web service usable by anyone from a web browser or app - no code
- Schedule jobs, download, stream, notifications & other services (REST API)

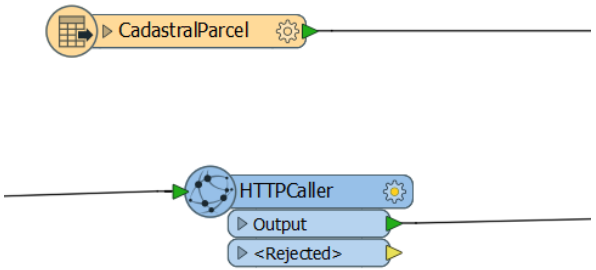


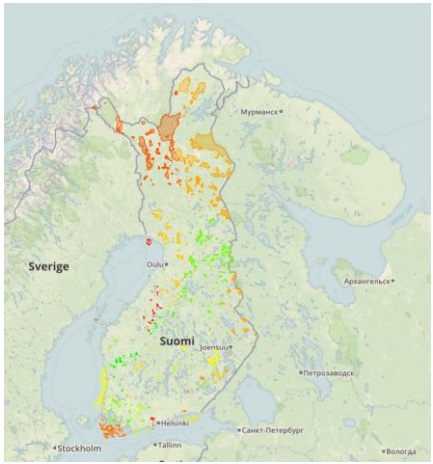



# Connecting Web Services & APIs

# Leveraging INSPIRE Data Using FME

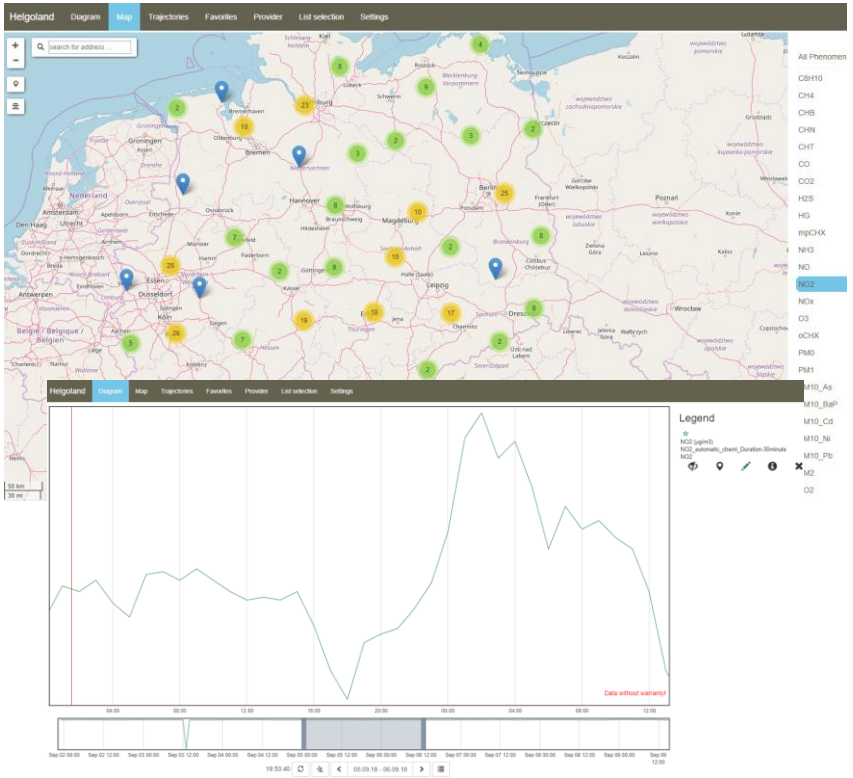
- FME Readers (INSPIRE GML, ATOM, WFS, WMS, WCS etc.)
- FME HTTPCaller (any web service)
- Data Inspector



# Air Quality Data

- Load data & automate updates
- Endpoints
  - Stations (INSPIRE Data)
  - Sensor Data (52north SOS)
    - Series REST API
    - SOS endpoint




Umwelt Bundesamt

52north exploring horizons

con terra

# Connecting Services & APIs

## Demo Combining Data for Finland:

1. Finnish Environment Institute (SYKE)
   ATOM Feed Protected Areas
2. Real-time Air Quality Index
3. European Environment Agency
   Air Quality Time Series

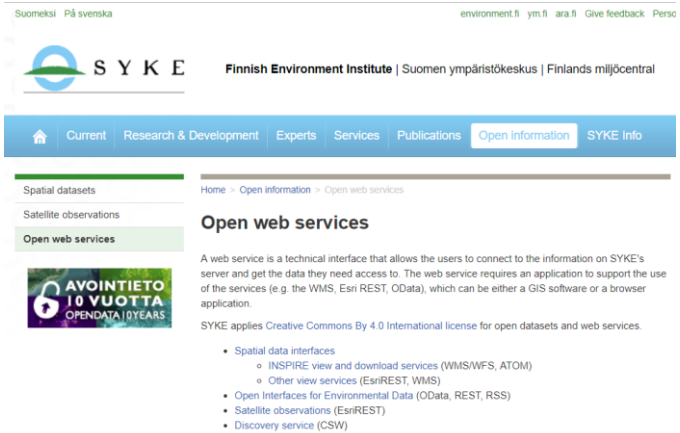
Visualize air quality in Finnish protected areas: real-time and historically

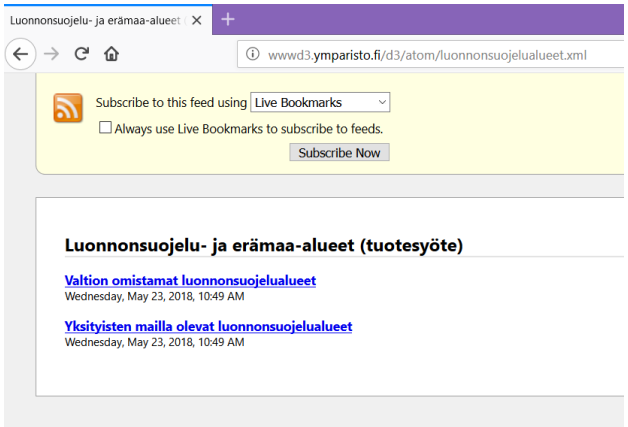
# Connecting Services & APIs

## Data Source 1

Finnish Environment Institute (SYKE)

*ATOM Feed: Nature conservation and wilderness areas*



# Summary: Leveraging INSPIRE

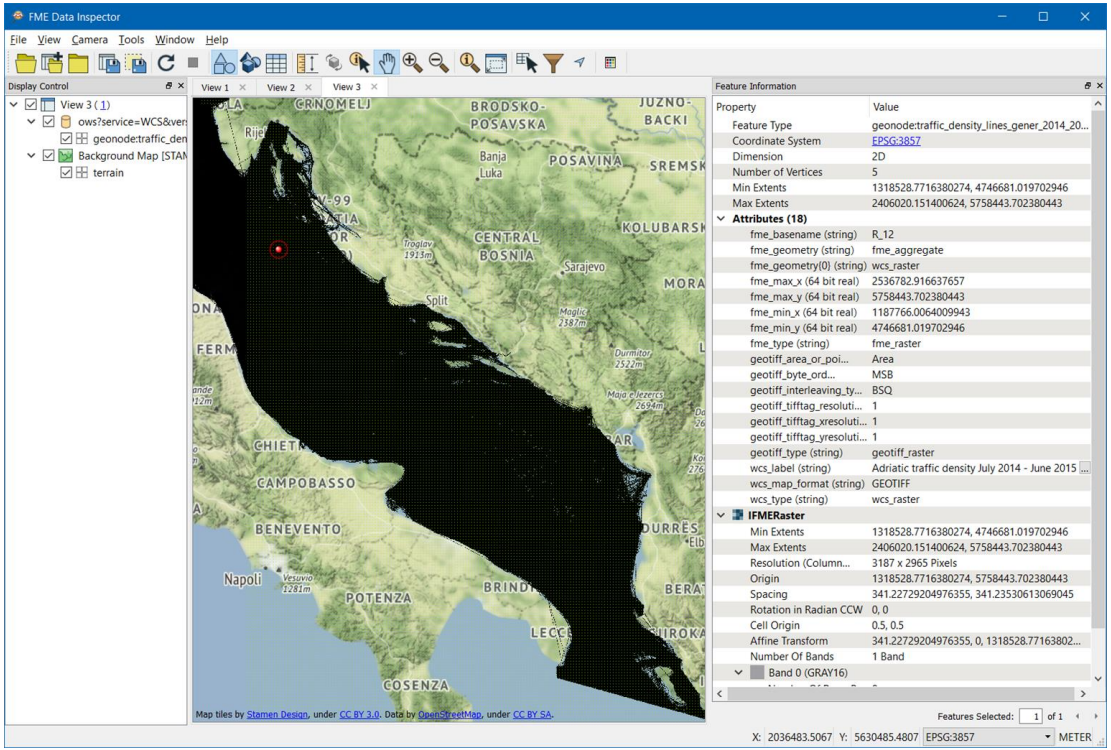
- Read INSPIRE Services and combine with your in-house data using FME
- Connect to other services and APIs with FME HTTPCaller
- Mash up!

# FME Enhancements

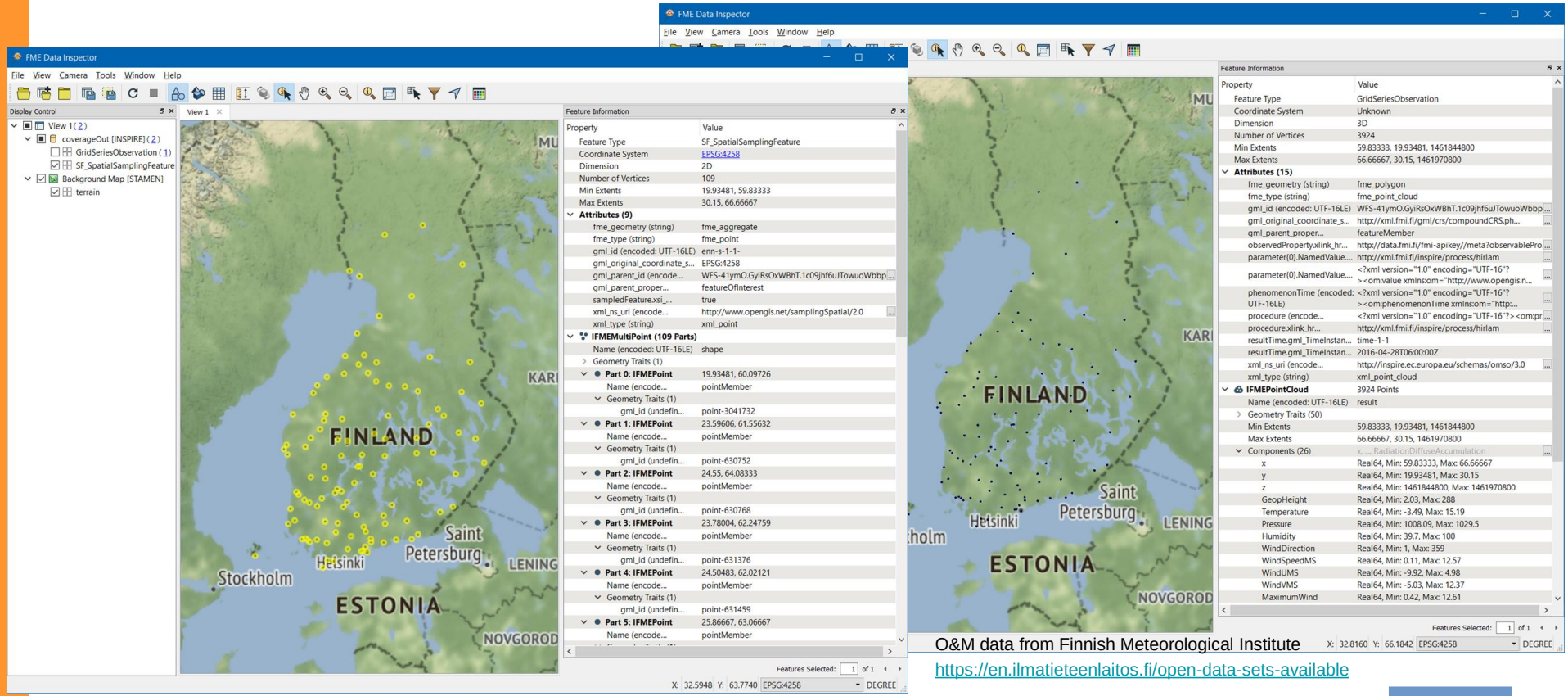
# FME: Recent / Upcoming Enhancements

- XML/GML/JSON
  - XML application schema R/W
  - Improved performance
  - Web connections / API’s
- OGC / INSPIRE
  - GML 3.2.2, GML 3.3
  - WFS3, WCS Readers
  - GML: coverage, schema
- Partial runs, Library & schema updates

# OGC WCS Reader: FME 2019



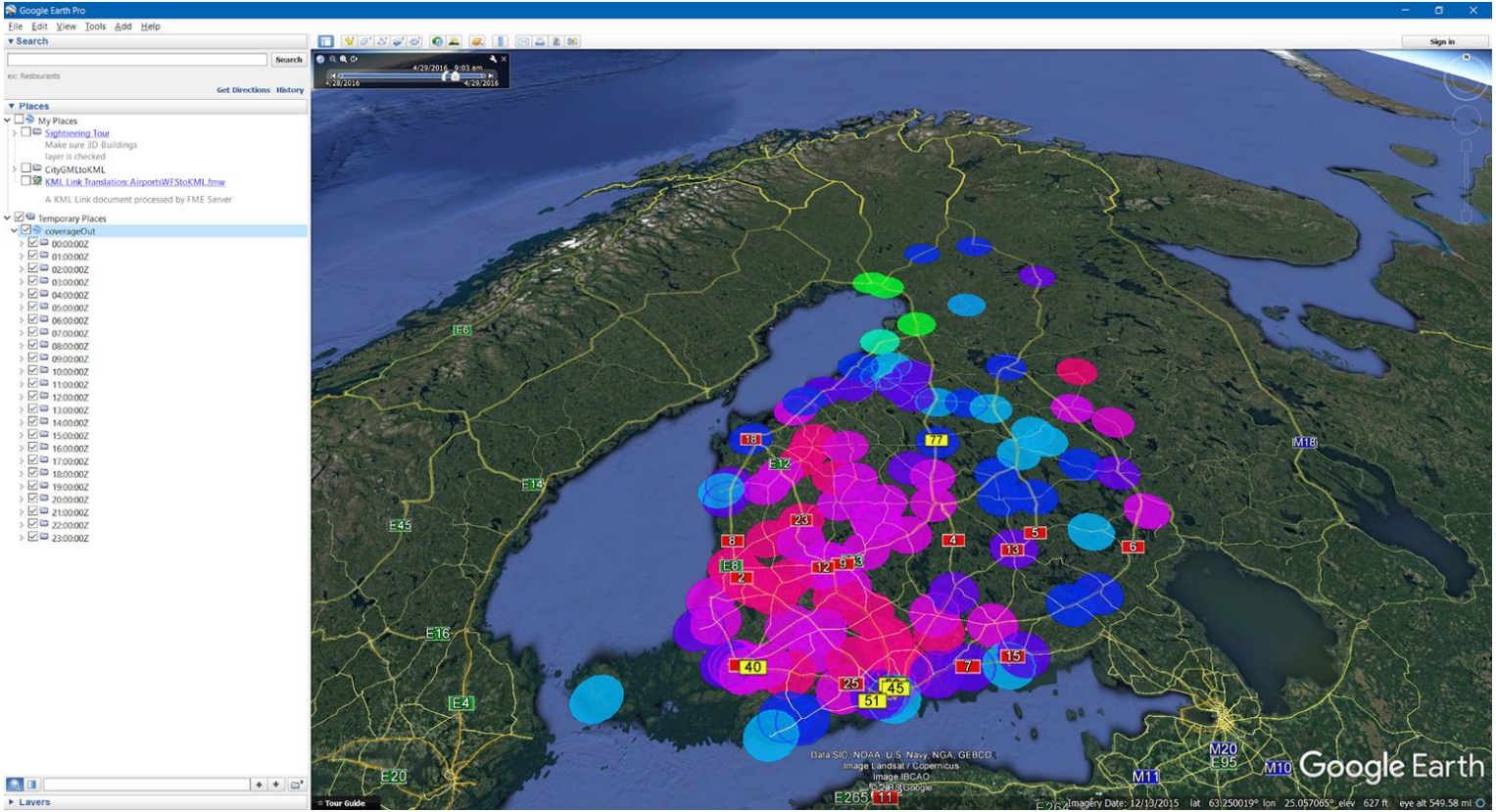
# Coverages: Specialised Observations




O&M data from Finnish Meteorological Institute

https://en.ilmatieteenlaitos.fi/open-data-sets-available

# Coverages: Specialised Observations

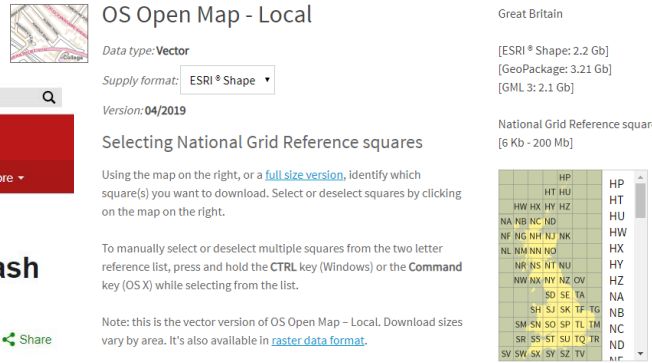


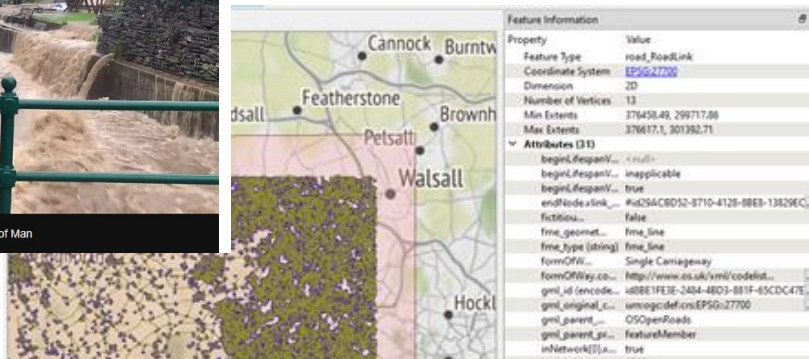
# Workshop Exercises: Flood Warning Assistant

- Exercise 1 Data extraction and loader
- Exercise 2 Flood warning REST service querier and database updater
- Exercise 3 Flood and impact HTML report generator

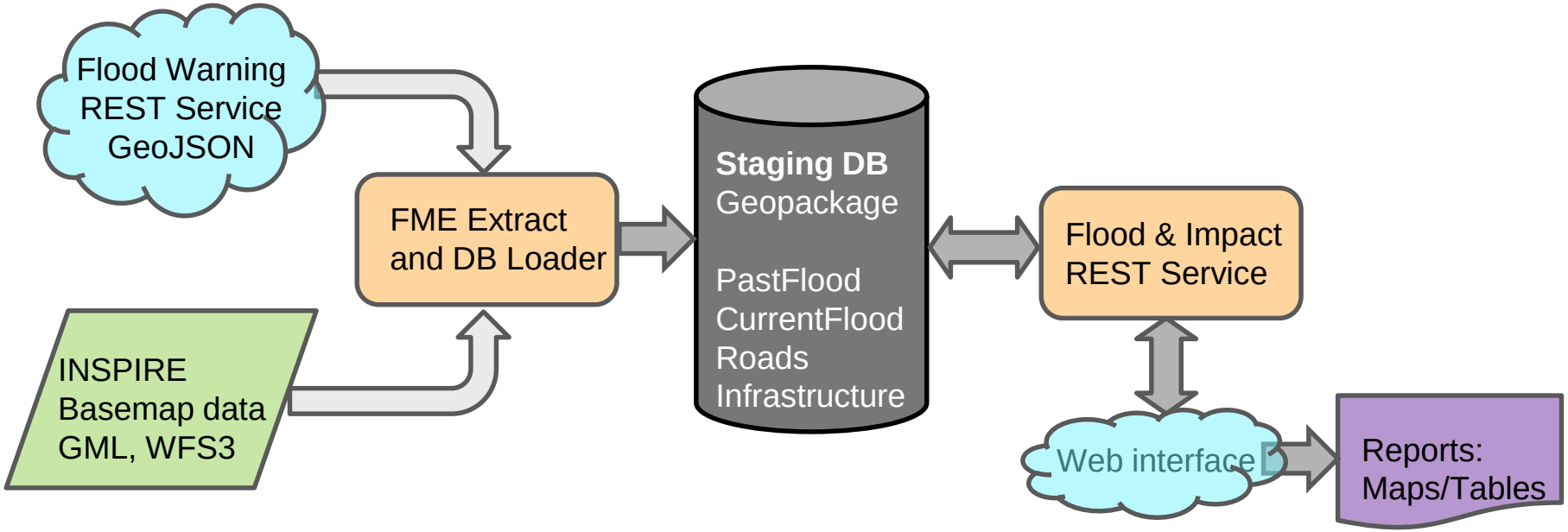
# Team Safe: Flood Warning Assistant

- Climate change impacts increases risk of natural hazards such as floods
- Leverage INSPIRE basemap info combined with real time data
- Generate results easily accessible to public via web and mobile

# Flood Warning Assistant: Architecture



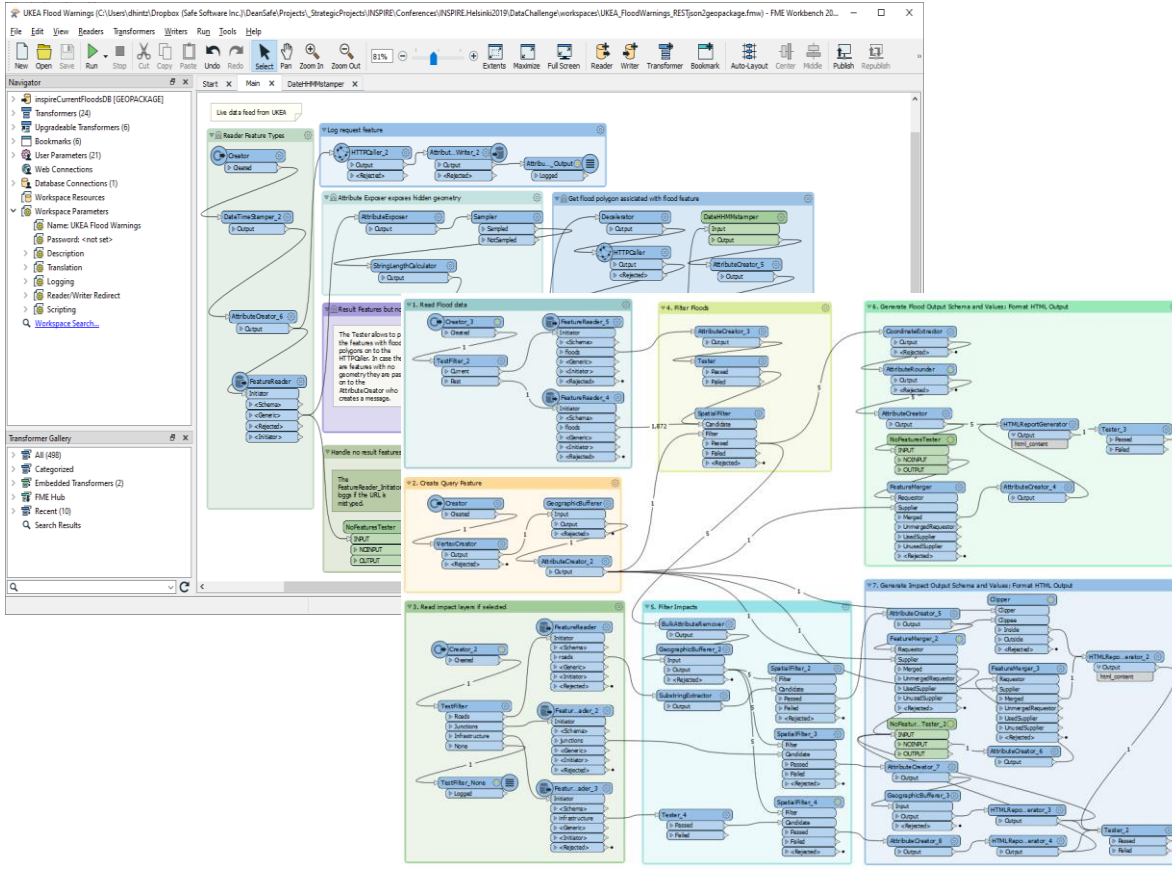

- Extract/loader reads from flood warning service & basemap datasets then loads database – flood info updated hourly
- Flood and Impact Service accepts requests from web form and generate HTML reports

# Flood Warning and Potential Impact: FME Workspaces

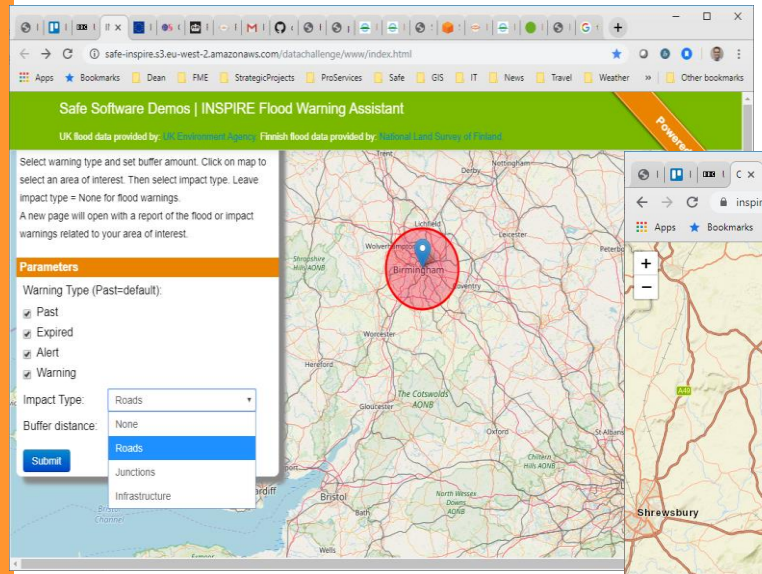
1. Data Extract/Loaders read GML/WFS3 basemaps, flood data GeoJSON, load into staging database tables on geopackage

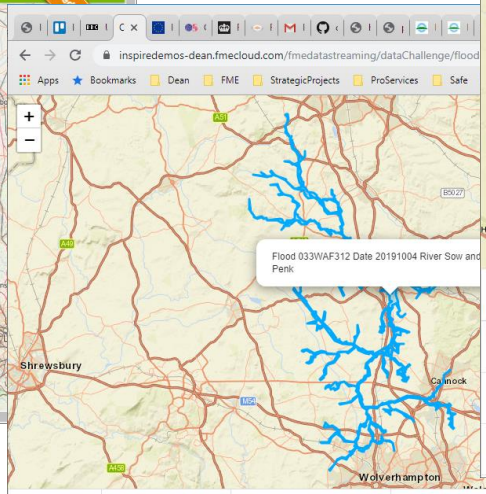
2. Flood warning loader queries REST service, parses JSON response, calls feature service and converts GeoJSON response to feature records for geopackage

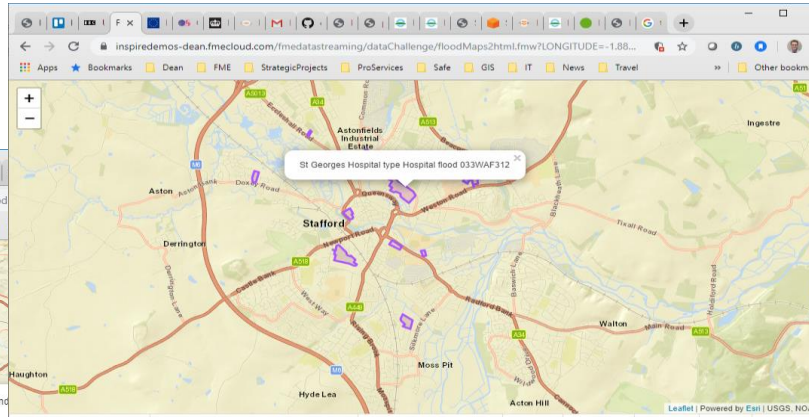
3. Flood and Impact reporter takes web form area of interest REST calls, queries staging database, and generates flood detail and impact assessment reports (HTML)



# Flood Warning & Potential Impact: Web form & Reports




| Infrastructure id | Name | Classification | Site theme | Flood area ID | Flood severity | Flood severity level | Flood descriptio |
|---|---|---|---|---|---|---|---|
| id023D282A-BCF3-4C31-A189-025B5AF2531E | Blessed William Howard Catholic High School | Further Education,Secondary Education | Education | 033WAF312 | Flood Alert | 3 | River Sow and River Penk |
| id9EED728D-25FD-4492-BEE5-ACDF67B3E0B0 | St Leonard's Primary School | Primary Education | Education | 033WAF312 | Flood Alert | 3 | River Sow and River Penk |
| id1D093AC3-BC4A-45FE-9592-B7362FC466E3 | St Joseph's Convent Nursing Home | Medical Care Accommodation | Medical Care | 033WAF312 | Flood Alert | 3 | River Sow and River Penk |

| Flood area ID | Flood warning date | Flood description | Severity | Severity level | Longitude | Latitude | Time loaded |
|---|---|---|---|---|---|---|---|
| 033WAF312 | 20191004 | River Sow and River Penk | Flood Alert | 3 | 52.977 | -2.283 | 20191004 |
| 033WAF306 | 20191004 | Lower Tame | Warning no longer in force | 4 | 52.646 | -1.72 | 20191004 |

1. Select area of interest
2. Select flood warning type / time
3. Choose to display flood warnings or associated impacts
4. View warnings or impacts displayed on web map and table

# Hands-on Part I – Extract and Load to Database

- Exercise 1: Data extraction and loading - basemap, impact layers
- Exercise 2: Live data feed to geopackage - dynamic data

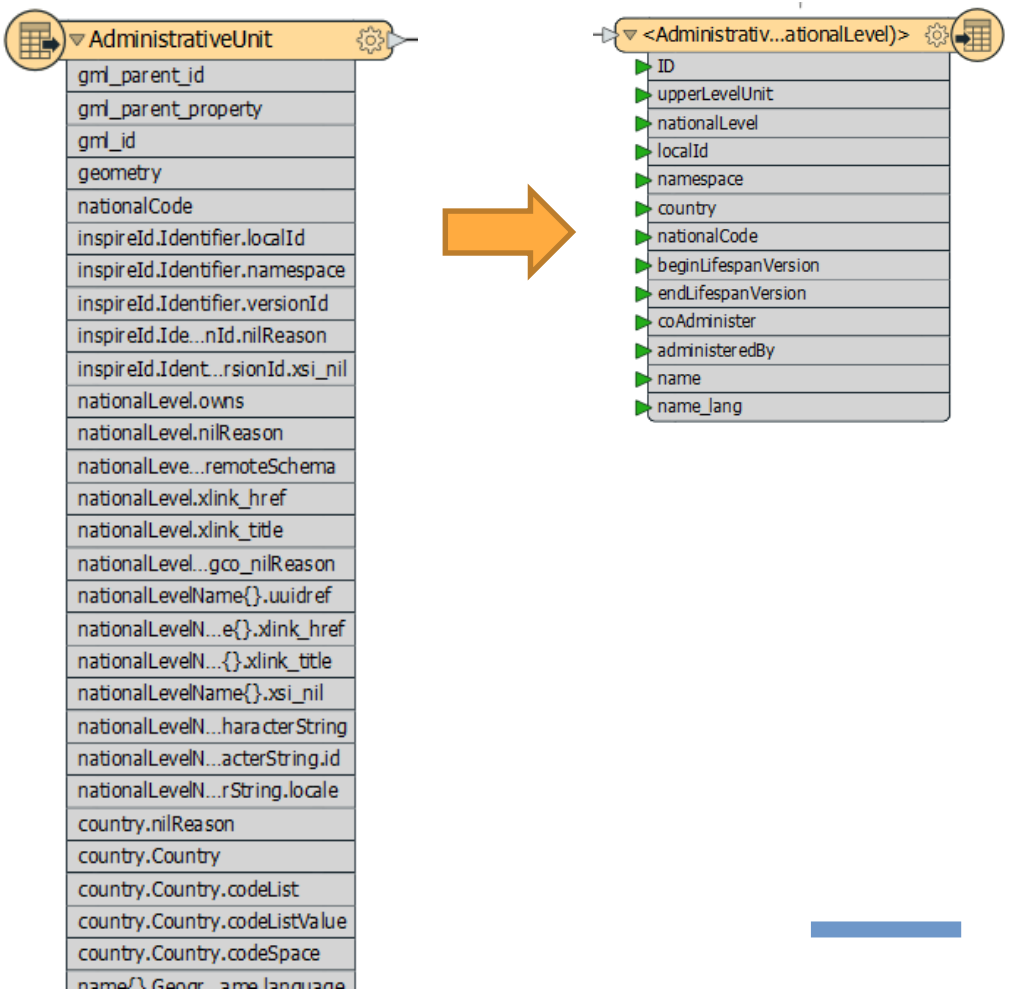
# Implementation Challenges

# INSPIRE Implementation Challenges

- Finding data - data problems - alternative data sources? - E.g. Eionet - Reporting Obligations Database (ROD)
- Schema - model transformations to simplifiy data model from complex INSPIRE schema
- Geometry simplification
- Troubleshooting: INSPIRE GML, WFS, logs, debug mode

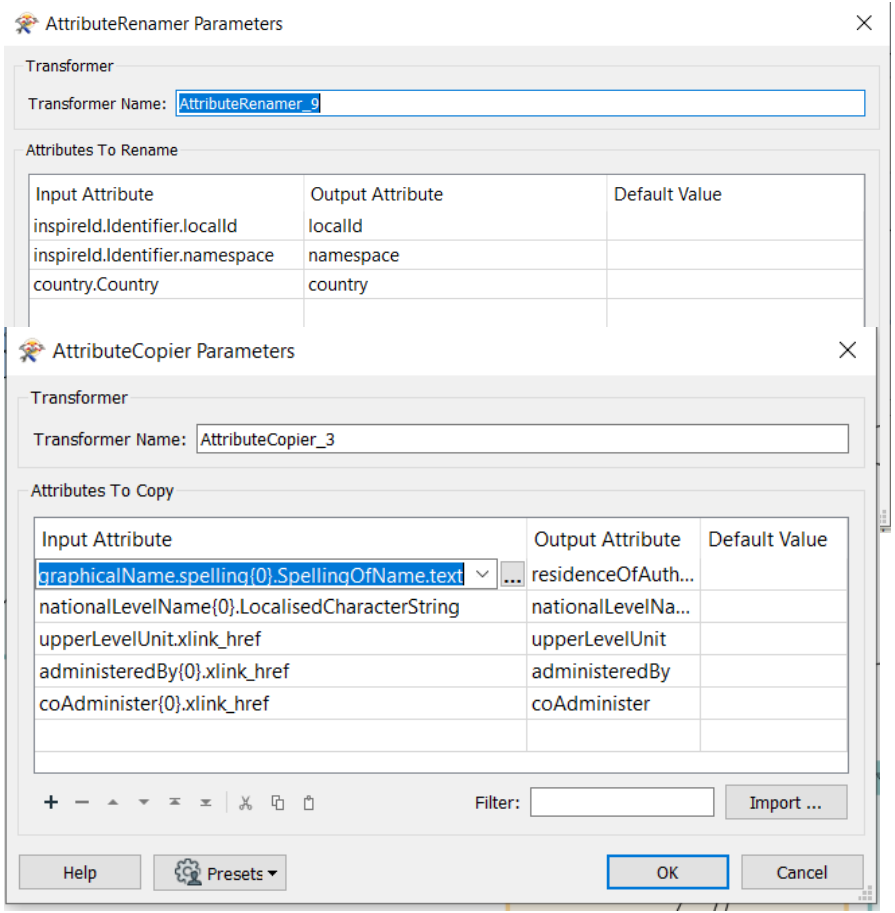
# Schema simplification

- Different purposes
  - Make use of data in other applications
  - Storage in relational Database Systems
  - Use of  Alternative Encodings



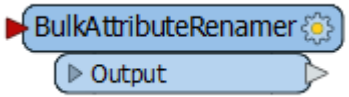
# Schema simplification

- Different purposes
  - Make use of dara in other applications
  - Storage in relational Database Systems
  - Use of  implementation or of Alternative Encodings

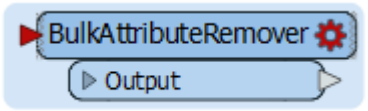


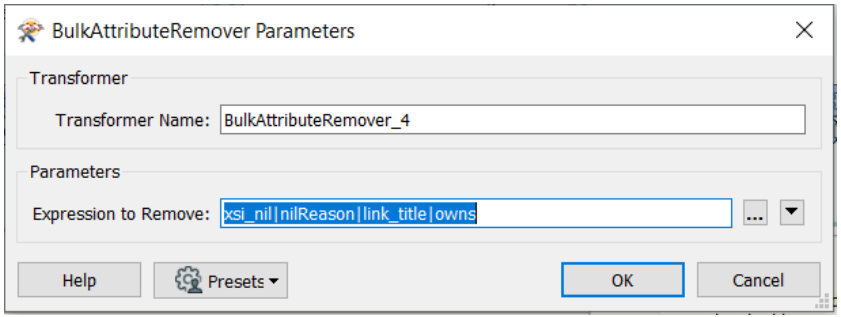
# Schema simplification

- BulkAttributeRenamer

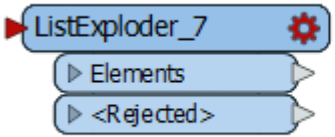


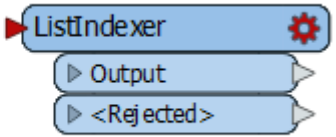

- BulkAttributeRemover



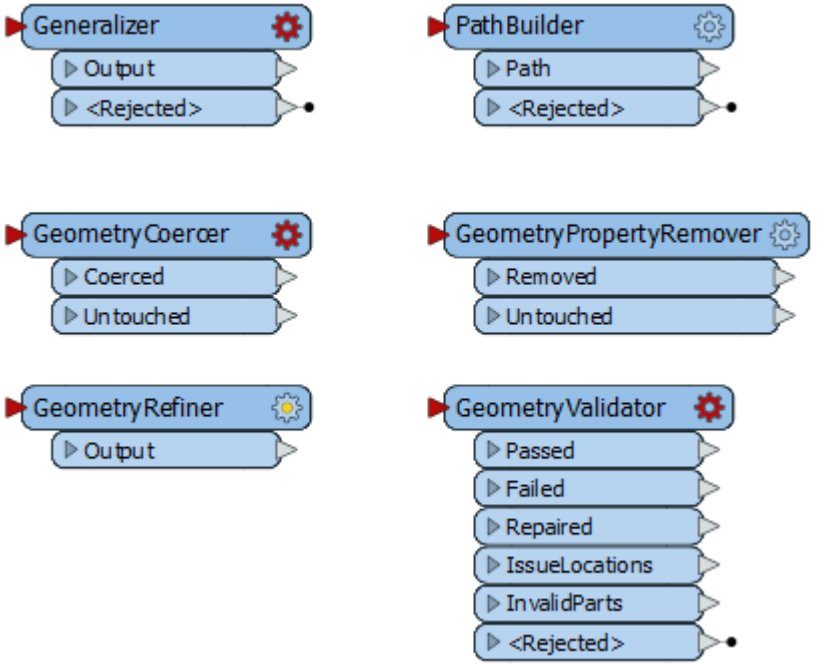

- ListTransformers



# Geometry Simplification

- Remove vertices – Douglas, Thin, Deveau, Wang, etc
- Coerce to simpler geometry
- Build paths from aggregates
- Refine geometry
- Remove unwanted geometries
- Validate and repair geometries



# TroubleShooting

- GML
- INSPIRE GML (3.2.2)
- WFS
    - urls from FME log -> browser
    - Check describeFeatureType, namespaces
- debug mode – WFS POST

# Hands-on Part II - Data Processing & Publication

- Exercise 2: Live flood warning data feed to database
- Exercise 3: Query database and generate flood and impact reports
- Wrap-up / QnA (demo some more refined version - flood etc)

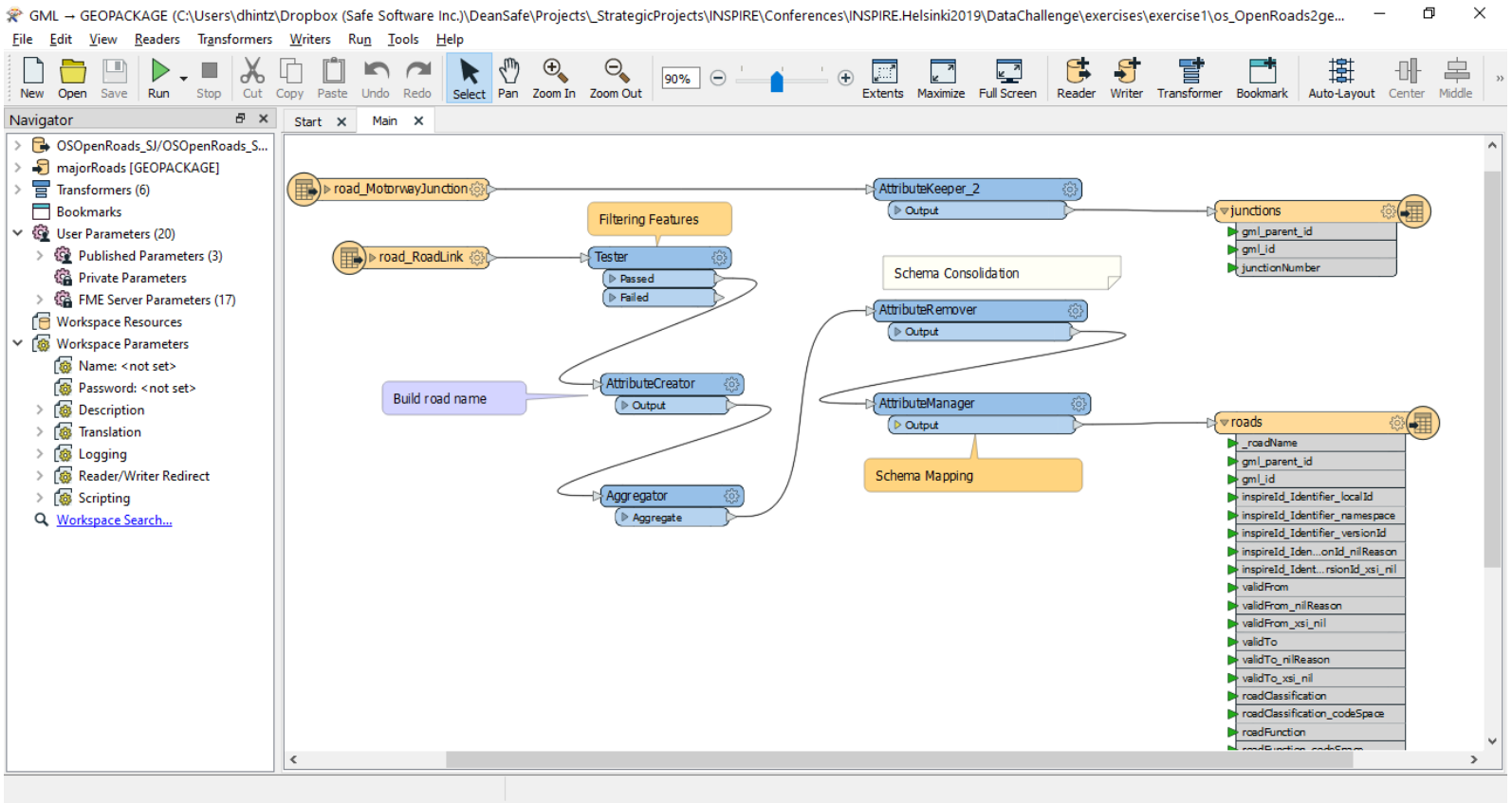
**Demo:** https://playground.fmeserver.com/demos/

**FME Server Cloud:** https://inspiredemos-dean.fmecloud.com

- Users: Students0-4, pass:
- Please sign up – 1 user per student#

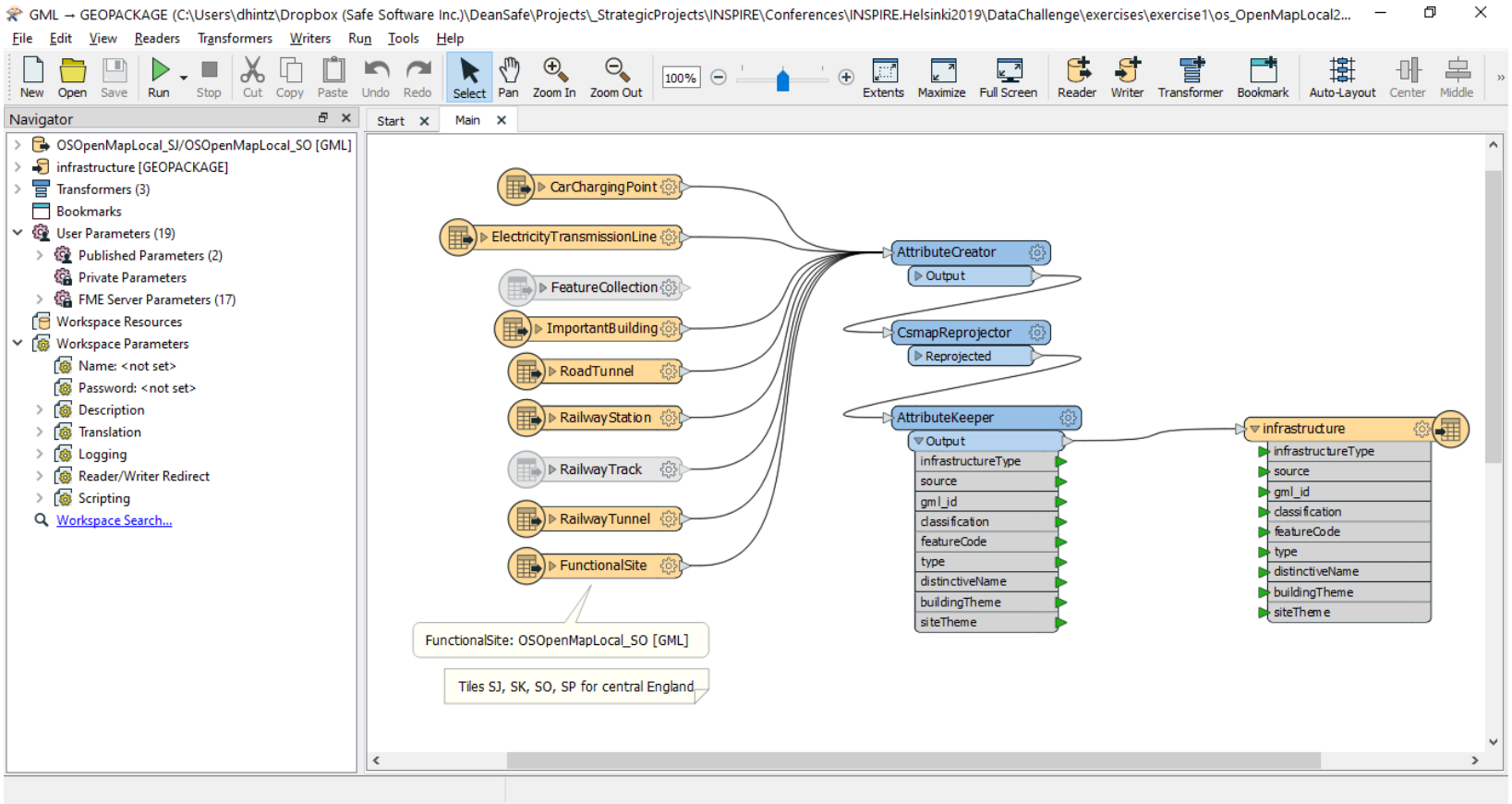
# Wrap - Up

# OS Open Roads GML Extract and Load to Geopackage



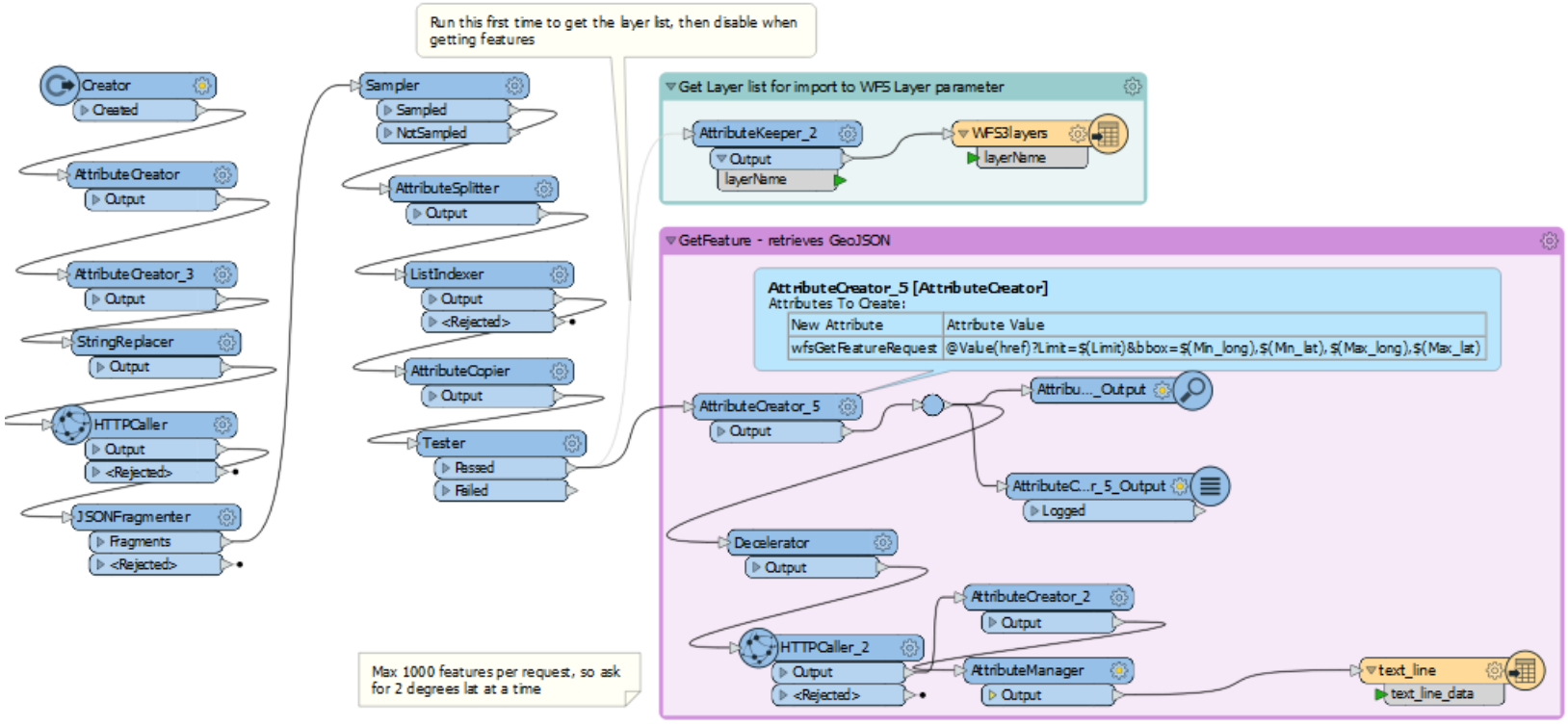

Extract from INSPIRE+ GML basemaps and load into staging database tables on geopackage

# OS Open Map Local GML Extract and Load to Geopackage



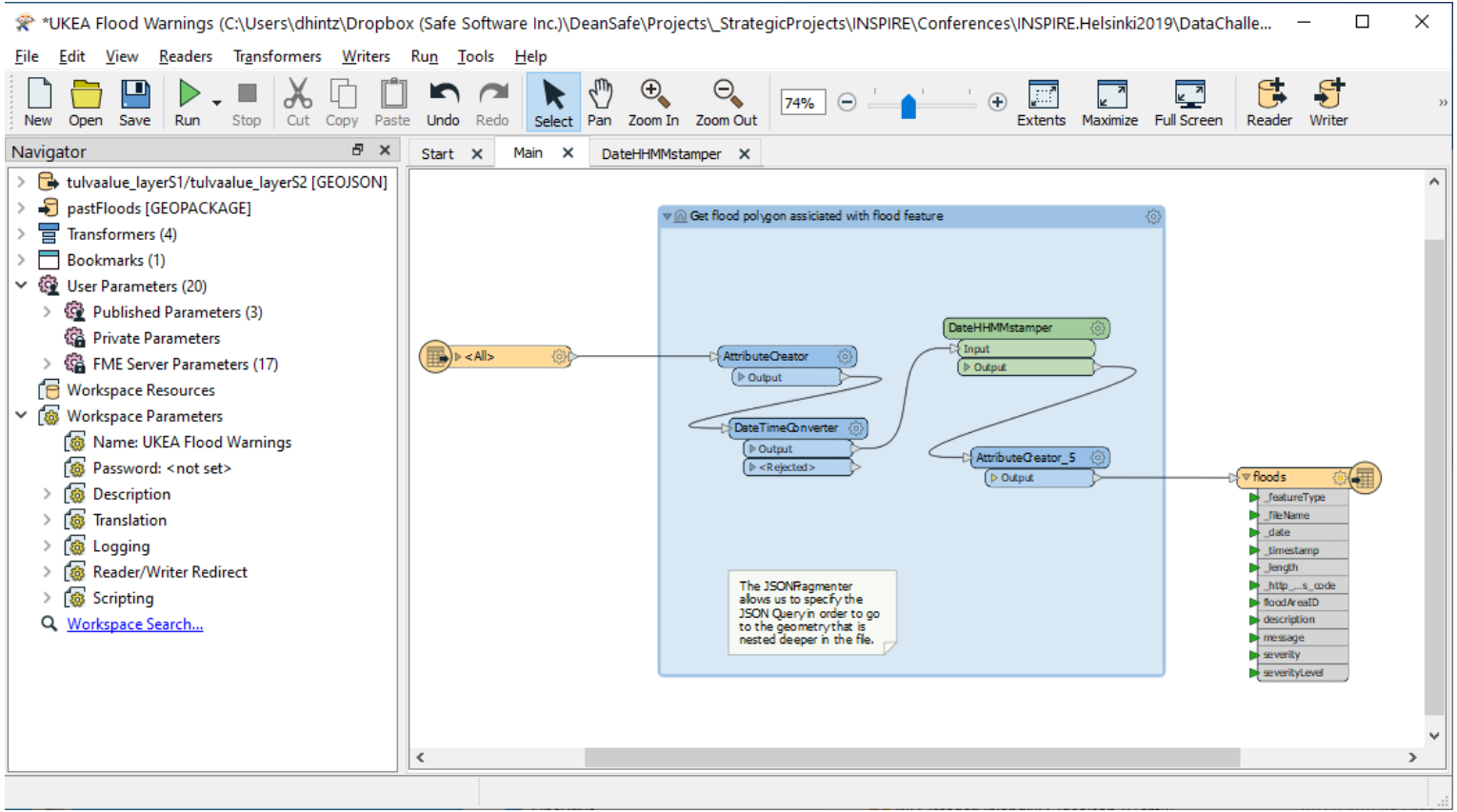

Extract from INSPIRE+ GML basemaps, and loads into staging database tables on geopackage

# NLSF WFS3 Extract and Transform to GeoJSON



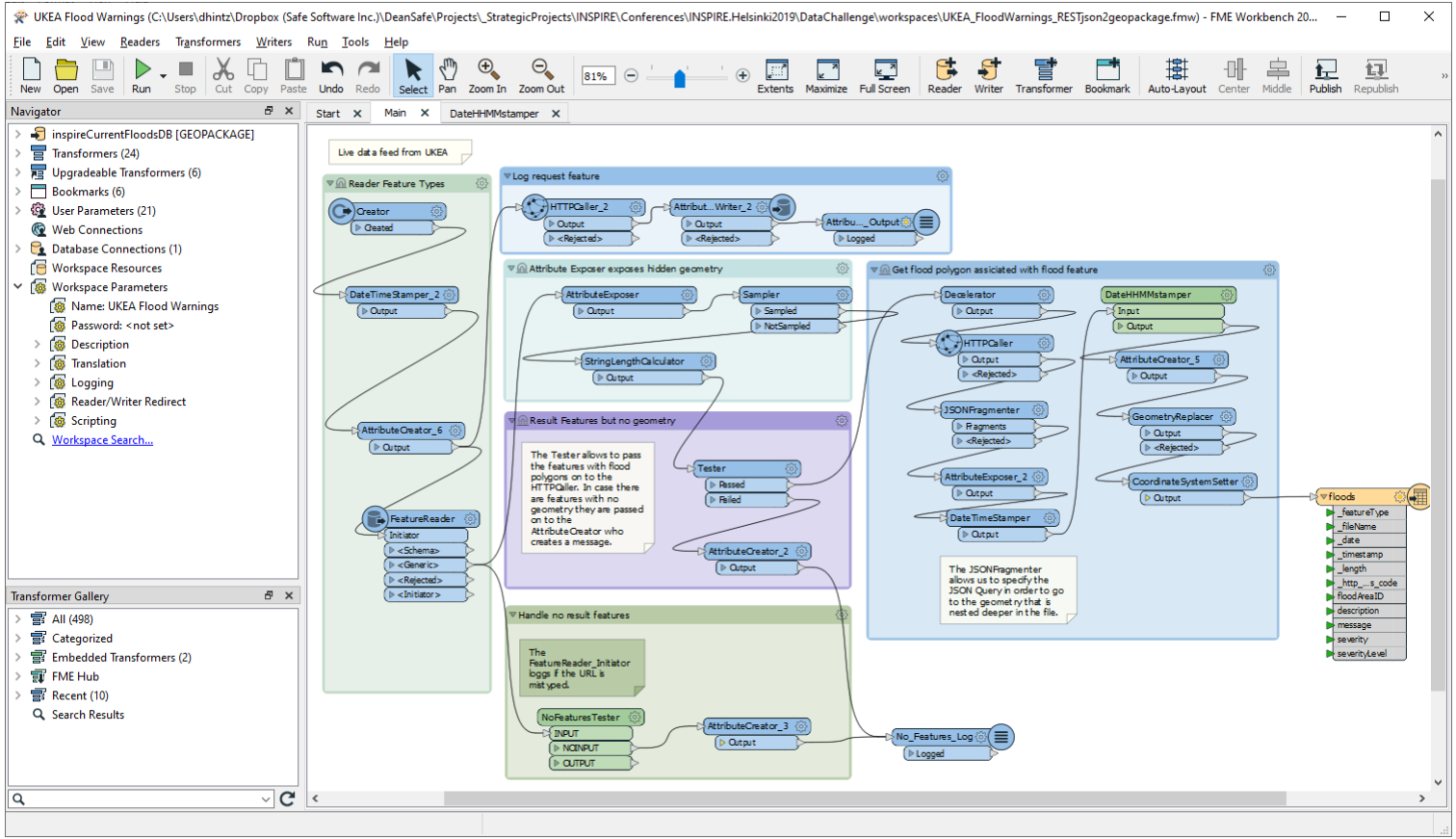

Read past FI floods from NLSF WFS3, and load into staging database tables on geopackage

# NLSF WFS3 GeoJSON Load to Geopackage




Read past FI floods from NLSF WFS3 GeoJSON, and load into staging database tables on geopackage

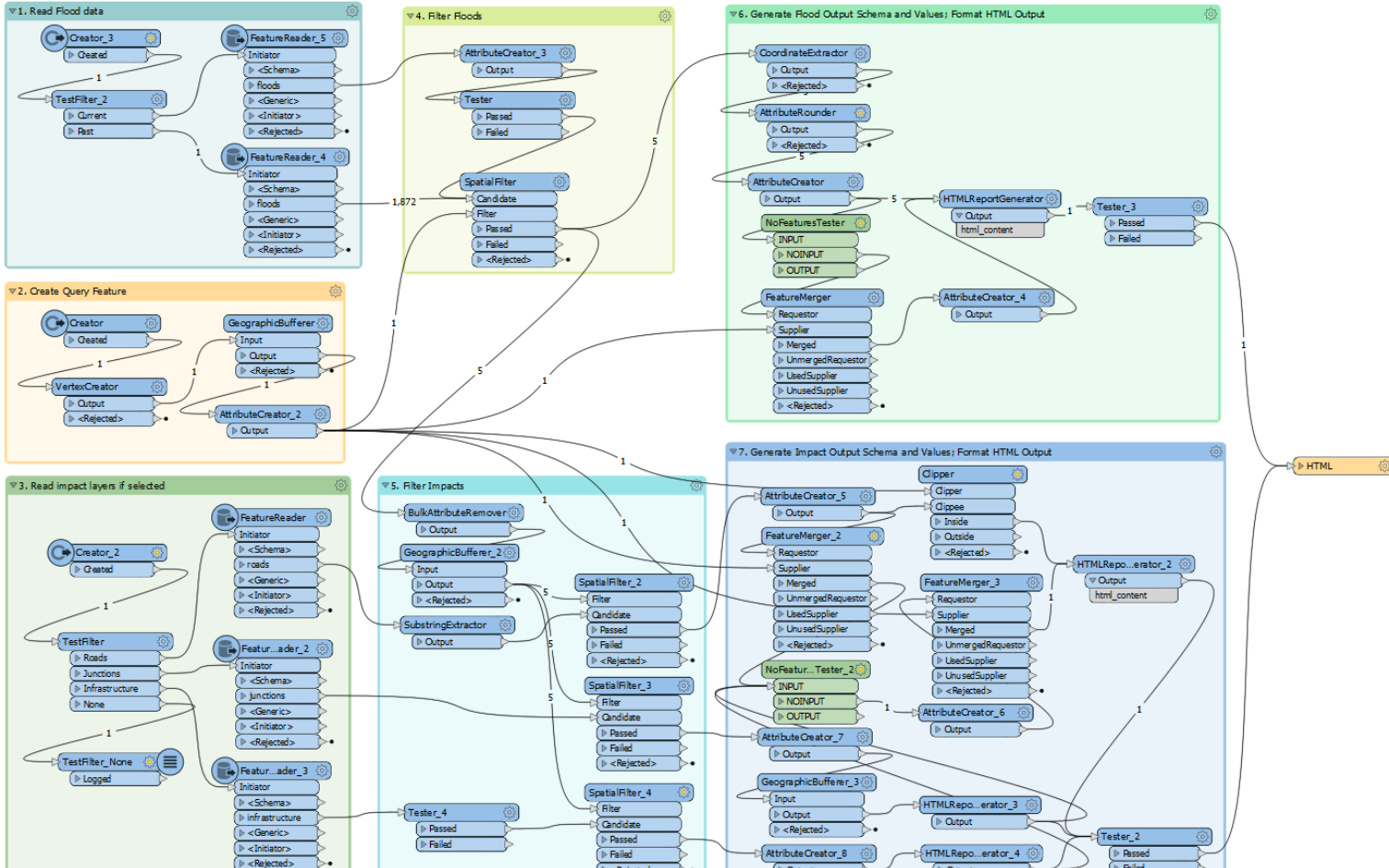
# Flood Warning: Data Extract and Load to Geopackage




queries REST service, parses JSON response, calls feature service, loads into staging database geoPackage

# Flood Warning and Potential Impact: FME Workspaces

Flood and Impact reporter takes web form area of interest REST calls, queries staging database, and generates flood detail and impact assessment reports (HTML) with inset map and tables



# Conclusions

# Keys to Success with FME & INSPIRE

- Support domain expert collaboration
- Both consume and produce = better implementations
- Balance between flexibility and usability
- Integrate with existing workflows
- Rapid prototyping = easy wins early
- Automate and future-proof

# Key Take-aways: FME and INSPIRE

- FME simplifies INSPIRE compliance - without any coding
- **Prepare data** for INSPIRE through data extraction, transformation and schema mapping
- **Write & Validate INSPIRE GML** using schemas and validators to ensure compliance
- **Share INSPIRE** data using FME Server's web services
- **Leverage INSPIRE** data and services - integrate with in-house data to support existing workflows and enable new

# INSPIRE is just the start, not the destination

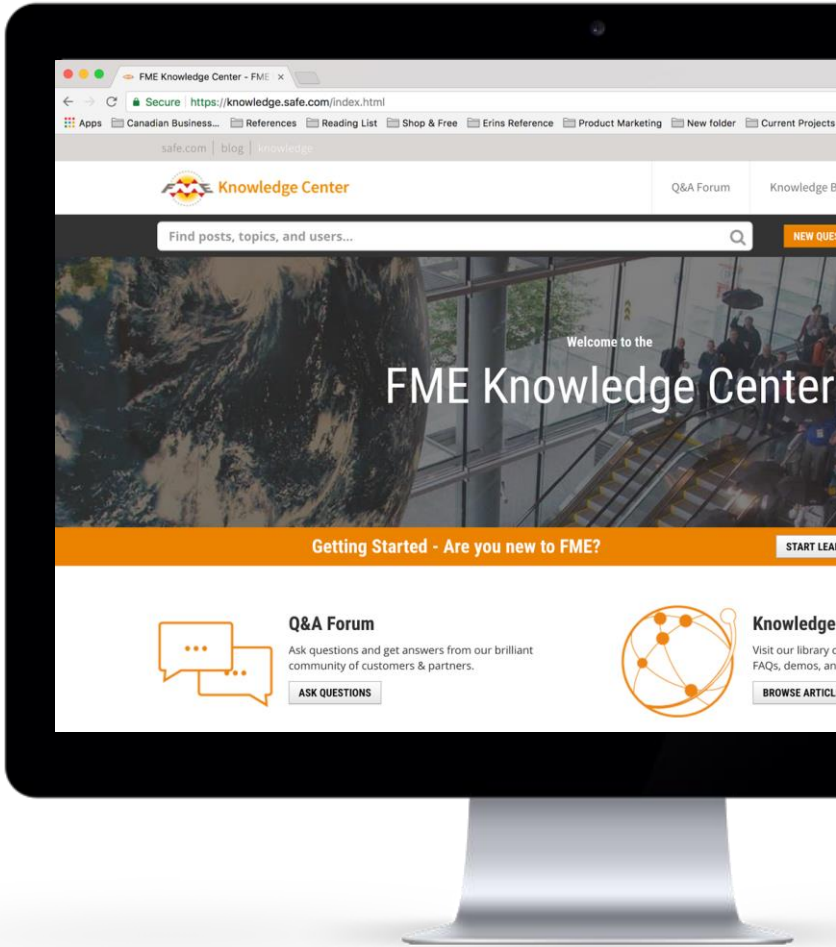
- ➔ Harmonize INSPIRE data
- ➔ Consume INSPIRE data
- ➔ Learn one tool for all your integration needs
- ➔ Easily document and share workflows

# FME Partners Providing INSPIRE Solutions

- **Spatialworld**, Finland (National Land Survey)
- **con terra** (> 100 implementations across Europe)
- **SWECO**, KMD Denmark, SGU Sweden
- **Metria**, Swedish EPA
- **GeoData**, Norwegian National GeoPortal
- **1-Spatial & Dotted Eyes**, UK
- **GIM,** Belgium
- **ISOGeo,** France (SDI Platform)
- **AED Sicad** (NAS to INSPIRE conversions)
- **Veremes,** France

# Get started with free resources at safe.com

- Free FME Trial / Home / Edu
- ✓ Free Online Training
- ✓ Free Tutorials
- ✓ Free Webinars
- ✓ Free Knowledge Center



# INSPIRE-Specific Resources

**Knowledge Center**

search ‘eu inspire tutorial’

other tutorials: XML, GML, JSON, 3D

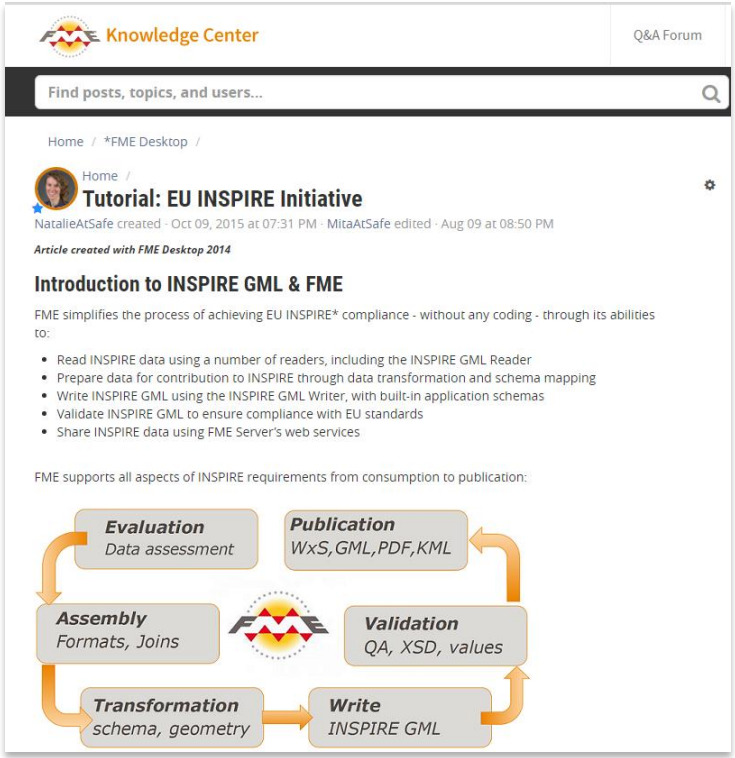
**FME Community, FME Hub**

search ‘inspire’

search ‘fmeserver playground’

**safe.com/inspire**

**conterra.de/ISP**



SAFE SOFTWARE

# Thank you!

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