

Using FME leveraged by ArcGIS for INSPIRE Directive Projects in Romania

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Agenda



About Esri Romania

Our Projects that use FME integrated in ArcGIS INSPIRE Directive Implementation in Romania

Some KPIs Reaching INSPIRE Directive targets



Our Solution – ArcGIS for INSPIRE

A Complete Solution for INSPIRE

Data Harmonization Stage - Key Challenge



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A journey into Spatial Transformations using FME integrated in ArcGIS

Transport Network: The National Company for Road Infrastructure Administration (CNAIR) & The Romanian Air Traffic Services Administration (ROMATSA);

Administrative Units, Transport & Hydro Network, Geographical Names, Cadastral parcels, Buildings: National Agency for Cadaster and Land Registration, ANCPI

Hydrographic Network & more: "Romanian Waters" National Administration, NAWR

What's next?

Outlook & Key Success Factors of FME in ArcGIS for INSPIRE Projects



Esri Romania

Esri Inc

Founded in 1969. Leader on the GIS market with the ArcGIS mapping platform, +600 000 enterprise organizations as customers & +4000 employees. Having a Global Network of partners in different areas of applications.

Esri Romania

Founded in 1993. Esri Inc Distributor in Romania, having customers in different industries: Cadaster, Defense, Environment, Administration, Education, etc., + 6000 licenses & + 4000 trained students. Active involvement in INSPIRE implementation.

"Safe Software sets the standard for spatial data interoperability, so it was an obvious choice to use their FME technology for Esri's ArcGIS Data Interoperability Extension."

- Jack Dangermond, Esri President



ArcGIS Platform





Our Projects that use FME integrated in ArcGIS

Projects related to **INSPIRE Directive Implementation** - transposed into the national legislation - **OG 04/2010**

INSPIRE Geoportal in Romania - Supported by ANCPI (National Agency for Cadaster and Land Registration) – LMO in INSPIRE
Supports the INIS Council (19 organizations);
HG 579/2015 - reporting responsibilities of public bodies holding spatial information related to the environment;

Existing INSPIRE Political & Technical Challenges

- Requires the most efficient **Tools &Technologies** to streamline and simplify the reporting, updating and maintaining data;
- Collaboration between stakeholders;
- Data Harmonization requires technical knowledge of INSPIRE, ETL practices/FME and input data from different domains;

INSPIRE Directive



- other means (see Art. 7(3) of the INSPIRE Directive)
- ² With the exception of newly collected and extensively restructured Annex I data sets, which already have to be compliant with the IR-ISDSS by 23/11/2012

Some KPIs

A Complete Solution to implement INSPIRE workflow, with **pre packed frameworks for Data Harmonization**, successfully validated in developed projects at national level – predictability – a key success factor

Transport Network (Road and Air) datasets & services, in collaboration with The National Company for Road Infrastructure Administration (CNAIR) & The Romanian Air Traffic Services Administration (ROMATSA).

Hydrographic Network and other Annex II and III datasets & services, in collaboration with "Romanian Waters" National Administration.

Administrative Units, Transport Network, Hydro Network, Geographical Names, Cadastral Parcels, Buildings datasets & services, in collaboration with the National Agency for Cadaster and Land Registration, ANCPI– one of the 1st projects in INSPIRE.

Natural risk zones datasets & services, in collaboration with the Romanian General Inspectorate for Emergency Situations, IGSU and a consortium of partners.



SEARCH BROWSE COORDINATE TRANSFORMATION

Search



Clear

WHERE

Anywhere Intersecting Fully within



1	Geoportalul ANAR
-0	Retea transport aerian
-0	Zone de risc natural
-	Rețeaua de transport ruțier
2	Limita intravilanului TOPRO5
-	Acoperirea terenului TOPRO5
-	Hidrografie TOPRO5
-	Rețele de transport TOPRO5
-	Denumiri geografice TOPRO5
	Denumiri geografice TOPRO5 Serviciu de vizualizare pentru tema zone de risc natural

API: GEORSS ATOM HTML FRAGMENT KML JSON



ArcGIS for INSPIRE

A Component of the ArcGIS Platform for a **Complete INSPIRE Directive Implementation**

INSPIRE Geodatabase Schema Templates & Frameworks for implementing Spatial ETL tools for Data Transformation – ArcGIS Data Interoperability, integrating FME & Documentation.

02 INSPIRE View and Download Services configured and published through ArcGIS for INSPIRE – ArcGIS for Desktop, ArcGIS for Server.

 Disseminating and consuming INSPIRE Network Services in the Romanian INSPIRE Geoportal & other apps – Map Viewers,
 Geoportal Server, http://geoportal.gov.ro.



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Data Harmonization Stage – the Key Challenge

Schema Mapping

Requires technical knowledge of **Input Data Models & INSPIRE UMLs** for the specific Theme; Collaboration with Stakeholders; New data generation based on the existing information.

Spatial ETL Tools

Implement the Schema Mapping for New INSPIRE Data Model Generation in one step;

Implement QaQc & new data generation

to ensure *Topological Consistency* and *Data Completeness*.

Technology

ArcGIS Data Interoperability Extension of ArcGIS Platform, which includes FME Desktop – Spatial ETL Tools for QaQc and Data Transformation to INSPIRE Schema; Ensures a streamlined, re-usable process, packing the best validated practices.



Spatial ETL for HY

High complexity, including serial and parallel transformations that not only migrate data, but generate data relationships and in the end, a new data model.

Standard and Custom INSPIRE Transformers Embedded that implement **complex relational Data Model**, with multi-geometries;

- Key Challenges in automating schema Mapping:
- Unique IDs INSPIRE and thematic;

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- Spatial or field based Relationships between objects, built from scratch sometimes;
- Generate new required fields (Namespace, voidable, lifespan);
- New geometries generation based on existing data;
- Trade off between customization and reusability;



Solution Pack for INSPIRE ETLs

Preconfigured Embedded Transformers Reusable

in any INSPIRE Theme (one ETL per theme):

- INSIRE_IFCID generates an unique IFCID for each object
- **INSPIRE_voidable** generates the voidable fields to be used accordingly
- INSPIRE_IdentifierSetter sets the value for id_namespace, id_localID (parameters)
- INSPIRE_LifeSpanSetter generates the value for begin and EndLifespanVersion fields

Preconfigured Workspace Templates & Training

Allows ETLs updates at no cost, by simply editing the parameters of the transformers:

- Reuse the same Embedded transformer in multiple operations or different ETLs;
- Efficient Maintenance through centralized updates;



Typical ETL operations reusable for INSPIRE

How to implement INSPIRE RID needed in any INSPIRE Theme for related tables

HY_netElement_RID – an embedded

transformer that implement the relationship using a parallel group by operation to generate new IDs. Same logic is applied in different calculations in INSPIRE Networks.

IFCIDUnique INSPIRE ID for object/tablelinkIFCID of watercourseRIDReference to IFCID from netElement table which contains the WaterLinkSequence	INSPIRE Field	Description
linkIFCID of watercourseRIDReference to IFCID from netElement table which contains the WaterLinkSequence	IFCID	Unique INSPIRE ID for object/table
RID Reference to IFCID from netElement table which contains the WaterLinkSequence WaterLinkSequence	link	IFCID of watercourse
	RID	Reference to IFCID from netElement table which contains the WaterLinkSequence

Groups watercourses segments in an instance without geometry, based on a particular thematic ID or characteristic, building the relationship as required by INSPIRE





A live, extensible and reusable framework for Data transformation



INSPIRE Air Transport Network

Romanian Air Traffic Services Administration (ROMATSA)

Air Transport Network - Romanian Air Traffic Services Administration

one of the most complex data model

Phase 1

Use ArcGIS Tools to Create AIS Gdb & Import AIXM 4.5 to AIS Gdb. Migrates all the data in a Spatial data model – more flexible.

Phase 2

Optimize AIS.gdb for INSPIRE: ReconstructGeometries (Runways Geometry from Threshold & Surface Area); QaQc for Airspace Geometry Validate AXM Rules Topological Consistency

Phase 3

Develop Spatial ETL in Data Interoperability to transform the data between AIS.gdb and ArcGIS for INSPIRE gdb Template for Air Transport Network



A simple Geoprocessing tool in ArcGIS for the end user

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Transport Network - The National Company for Road Infrastructure Administration (CNAIR)



Transport Network – Spatial Transformations for INSPIRE

Usual transformers used, but high complexity in parallel transformations caused by spatial filters and operations that generates new data based on the existing





HOME SEARCH BROWSE COORDINATE TRANSFORMATION

SEARCH

SITE NAVIGATION

About INSPIRE Legislation INSPIRE RoadMap INSPIRE Geoportal INIS Council About GeoPortal GeoCatalog Documents

FUNCTIONALITY

- Discovery Viewer Metadata Editor Metadata Validation
- PARTICIPATE

We believe the active involvement of a people interested in NSDI helps enrich the portal and aggregate important national spatial data information. <u>How to get</u> <u>involved...</u>

Welcome to Romanian INSPIRE Geoportal

In Europe a major recent development has been the entering in force of the INSPIRE Directive in May 2007, establishing an infrastructure for spatial information in Europe to support Community environmental policies, and policies or activities which may have an impact on the environment. INSPIRE is based on the infrastructures for spatial information established and operated by the 27 Member States of the European Union.

The Directive addresses <u>34 spatial data themes</u> needed for environmental applications, with key components specified through technical implementing rules. This makes INSPIRE a unique example of a legislative "regional" approach...

In this context, **INIS Geoportal** is ensureing interoperability and expanding the acces to spatial data, metadata, web services and applications as part of the romanian national spatial infrastructure...<u>find out more</u>.





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• NEWS | EVENTS

17-04-2019 Limite administrative actualizate -15-04-2019 Limite administrative actualizate -25-03-2019 Limite administrative actualizate – v74 18-03-2019 Limite administrative actualizate -14-03-2019 Limite administrative actualizate -05-03-2019 Limite administrative actualizate -22-02-2019 Limite administrative actualizate -18-02-2019 Limite administrative actualizate v69 12-02-2019 Limite administrative actualizate v66,v67,v68 21-12-2018 Limite administrative actualizate -11-12-2018 Limite administrative actualizate -23-11-2018 Limite administrative actualizate v62 și v63 07-11-2018 Limite

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About | View

National Agency for Cadaster and Land Registration, **ANCPI**

- Administrative Units
- Transport & Hydro Network
- Geographical Names, Cadastral parcels, Buildings:
- Cadastral parcels, Buildings, etc

Same stages for each project

- Schema Mapping & Spatial ETL for each Theme, with built in QaQc;
- Configuring INSPIRE Network Services;
- Disseminating the services in the Romanian INSPIRE Geoportal: <u>http://geoportal.gov.ro</u>

Transport Network - CNAIR Enterprise GIS

Internal Portal with Maps & Apps solving specific problems and Continuous INSPIRE updates



Hydrographic Network - "Romanian Waters" National Administration

Spatial ETLs for QaQc and INSPIRE

- Completing extra fields based on available data: IDs, elevation using PointOnRasterValueExtractor transformer; Direction of digitization for segment within a sequence;
- Generating Hydro nodes and classifying nodes in INSPIRE categories;
- **Building HY Network** and all the relationships between data required, in the ETL;

Any operation is possible through the right mix of transformations that implement the logic





Hydrographic Network – Spatial Transformation Module

Calculating Direction of digitization for a segment (hy-n:WatercourseLink) within a sequence (tn-w:WaterLinkSequence)



Hydrographic Network – Spatial Transformation Module

Calculating Direction of digitization for a segment (hy-n:WatercourseLink) within a sequence (tn-w:WaterLinkSequence)



Hydrographic Network "Romanian Waters" National Administration



INSPIRE HY Network Services in the Romanian INSPIRE Geoportal

Next Step in INSPIRE Projects

- Configuring View and Download Services for INSPIRE Compliant Datasets;
- Dissemination of Network
 Services for INSPIRE in the Romanian INSPIRE Geoportal;
- Building Enterprise GIS that value INSPIRE Data and support users engagement, collaboration, analytics and better decision making;

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http://inspire.rowater.ro/inspire/rest/services



Key Success Factors of FME in ArcGIS in our INSPIRE Projects

Solves any data transformation problem for users – flexible and adaptable to any user existing workflow, interfacing file Geodatabase templates or GMLs for INSPIRE

Graphical interface of the entire transformation process – facilitate data experts and institutions collaboration, easy to update, flexible, scalable, extensible

Ensure data validation and checks within the transformation process – many testing transformers also for spatial data, ensures a built in QaQc process

Easily documented and sharable workflows – one single tool documents the transformations and facilitates a transparent audit process

What's next?

Giving INSPIRE Data a purpose by **Building Enterprise GIS Systems** that maximize the value of data, meet the real organizational needs and better ROI for users and organizations

• Foster user engagement, collaborations, better decision making & making use of the AI, cloud, big data and new emerging technologies impact

Shift the focus to communities and help them benefit from the innovation and digital transformation

• Building apps and maps that integrate different sources of **data and users**, solving actual real problems

Integrate ArcGIS Data Interoperability Extension (including FME) with users

existing workflows (INSPIRE & operations) for:

- Producing and consuming the data
- Supporting subject matter experts & institutions collaboration
- Streamline and automate processes



INSPIRE is just a start, not the final destination. GIS Is Advancing Rapidly. Integrating and Leveraging many Innovations. But Data will inspire and fuel any digital transformation

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Our Platform Is Advancing

Solution Products Machine Learning Augmented Reality **Industry Solutions** Urban **Oriented Imagery** IoT **Situational Awareness** Image Exploration SaaS **Volumetric Data Big Data Real-Time** Spatiotemporal BIM **Parcel Management** Indoor Mapping Integrated Analytic Systems **Terrain Editing** Stakeholder Engagement **3D** Cities **Gaming Engine GeoAnalytics Predictive Analysis Dynamic Analysis** Containerization **Smart Mapping**

. . . Continued Focus on Quality, Performance, and Innovation



Thank you!

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