

Examples of Data Transformation



Authors: Giacomo Martirano, Stefania Morrone, Fabio Vinci (EPSILON ITALIA). <u>www.epsilon-italia.it</u>



The material is provided under Creative Commons Attribution Share-Alike License

Introduction

This self-learning module provides an example of transformations of a source dataset into a dataset compliant to the technical requirements of the relevant Implementing Rules and Technical Guidelines of INSPIRE.

It shows, step by step, a schema transformation process, starting from the analysis of the source dataset and of its data model and the study of the applicable INSPIRE Data Specification.

The module shows the use of the mapping table as useful tool to document the mapping process between the elements of the source dataset and the INSPIRE data model elements and explains how to identify and solve some common mapping problems.

Through the use of a selected tool, the transformation process is practically explained, showing also the "live" validation of the mapping being performed against the relevant INSPIRE application schema. At the end, a demonstration is given of how to generate a harmonized GML dataset.



Learning outcomes:

After the module, the participant will be able to

- Identify and understand the source and target data models
- Fill in a mapping table
- Perform a data transformation from a non-harmonized source dataset
 into a harmonized dataset
- Export a harmonized dataset into a harmonized GML dataset file.

Intended Audience:

GIS and ICT professionals aiming to harmonize their datasets against INSPIRE Data Specifications.

Pre-requisites:

- Basic knowledge of INSPIRE Directive.
- Module "Procedures for Data and Metadata Harmonization".



Referenced files:

- 1. Com2011.shp: a sample dataset of Italian municipalities.
- 2. ID_table.csv: table associating dataset of municipalities to related boundaries.
- **3. AU_Mapping_Table.xls**: INSPIRE mapping table (extended and filled in).
- **4.** AdministrativeUnit.halez: Hale project covered by present training module. The *.halez* file contains the complete project i.e. source and target schemas, source data and alignment.
- **5. AdministrativeUnit.gml**: INSPIRE compliant gml dataset file, obtained by means of the data transformation described in this training module.

Referenced transformation tool:

 HUMBOLDT Alignment Editor (HALE) downloadable at <u>http://www.esdi-community.eu/projects/hale/files</u>



Summary

- Source Data Model
- Target Data Model
- Mapping table: instruction for use
- Common mapping problems
- Open source Hale transformation tool
- Data Transformation
- Data Validation
- Creation and validation of a harmonized GML dataset.



Source Data Model



Source Data Model

Here follows a list of the attributes of the dataset of Italian municipalities (com2011.shp) which represents our source data model.

Attributi dei Comuni: shapefile poligonale "com2011"

Campo	Definizione
COD_REG	Codice ISTAT della Regione
COD_PRO	Codice ISTAT della Provincia
PRO_COM	COD_PRO e COD_COM concatenati
NOME_COM	Denominazione del Comune
NOME_TED	Denominazione, in lingua tedesca, dei Comuni della Provincia autonoma di Bolzano/ <i>Bozen</i>



Summary

- Introduction
- Source Data Model
- Target Data Model
- Mapping table: instruction for use
- Common mapping problems
- Open source Hale transformation tool
- Data Transformation
- Data Validation
- Creation and validation of a harmonized GML dataset.

Target Data Model

Among the Data Themes identified by the INSPIRE Directive, the Administrative Units one is the most suitable for the transformation of a dataset of municipalities.

Our Target Data Model is described in the INSPIRE Data Specification for the spatial data theme Administrative Units and can be downloaded from the INSPIRE website.



Target Data Model

At the INSPIRE website the Data model is available in different formats: UML, HTML, Mapping table and GML Application schemas (XSD files).





Summary

- Introduction
- Source Data Model
- Target Data Model
- Mapping table: instruction for use
- Common mapping problems
- Open source Hale transformation tool
- Data Transformation
- Data Validation
- Creation and validation of a harmonized GML dataset.

Attributes of the com2011 shapefile shall now be mapped into corresponding attributes of the Administrative Unit Feature Type. In this process the use of mapping tables available at the INSPIRE website could be very handy.

In the case of our exercise we need to download the AdministrativeUnits Mapping Table.xml file, which contains a list of the feature types, data types and code lists associated to our target model and related attributes. Associations between feature types are described as well.

More detailed description of how to download mapping tables can be found in the module "Procedures for Data and Metadata Harmonization".



	Α	pplication Schem	a 'Administrative	Units' (version 3	.0)			
Туре	Documentation	Attribute Associa tion	Attribute / Association role /	Values / Enumerations	Multiplicity	Voidable / Non- Voidable		Туре
AdministrativeBoun	Name							
dary	administrative boundary Aline of demarcation	beginLifespanVersi	Name begin	DateTime	1	voidable		
	between administrative	country	Name country	CountryCode* BE*	1			
	units.	endLifespanVersio	Name end lifespan	DateTime	01	voidable		
		geometry	Name geometry	GM_Curve	1			
		inspireld	Name inspire id	Identifier	1			
		legalStatus	Name legal status	LegalStatusValue*	1	voidable		
		nationalLevel	Name national	AdministrativeHierarchyL	16			
		technicalStatus	Name technical	TechnicalStatusValue	1	voidable		
		admUnit	Name adm unit	AdministrativeUnit	1*	voidable		
AdministrativeUnit	Name							
	administrative unit Unit of administration	beginLifespanVersi	Name begin	DateTime	1	voidable	-	
	where a Member State	country	Name country	CountryCode* BE*	1			
	has and/or exercises jurisdictional rights, for	endLifespanVersio	Name end lifespan	DateTime	01	voidable	-	
	local, regional and	geometry	Name geometry	GM_MultiSurface	1			
	national governance.	inspireld	Name inspire id	Identifier	1			
		name	Name name	GeographicalName	1*			
		nationalCode	Name national	CharacterString	1			
		nationalLevel	Name national	AdministrativeHierarchyL	1			
		nationalLevelName	Name national level	LocalisedCharacterString	1*	voidable		
		residenceOfAuthori	Name residence of	ResidenceOfAuthority	1*	voidable		
		condominium	Name	Condominium	0*	voidable		
		boundary	Name boundary	AdministrativeBoundary	1*	voidable		
		lowerLevelUnit	Name Iower level	AdministrativeUnit	0*	voidable		



	Α	pplication Schem	a 'Administrative	Units' (version 3	.0)		
Туре	Documentation	Attribute Associa tion	Attribute / Association role /	Values / Enumerations	Multiplicity	Voidable / Non- Voidable	Туре
AdministrativeBoun	Name						
dary	administrative boundary Aline of demarcation	beginLifespanVersi	Name begin	DateTime	1	voidable	
	between administrative	country	Name country	CountryCode* BE*	1		
	dinto.	endLifespanVersio	Name end lifespan	DateTime	01	voidable	
		geometry	Name geometry	GM_Curve	1		
		inspireld	Name inspire id	Identifier	1		
		legalStatus	Name legal status	LegalStatusValue*	1	voidable	
		nationalLevel	Name national	AdministrativeHierarchyL	16		
		technical Status	Name technical	TechnicalStatusValue	1	voidable	
		admUnit	Name adm unit	AdministrativeUnit	1*	voidable	
AdministrativeUnit	Name						
	administrative unit Unit of administration	beginLifespanVersi	Name begin	DateTime	1	voidable	
	where a Member State	country	Name country	CountryCode* BE*	1		
	jurisdictional rights, for	endLifespanVersio	Name end lifespan	DateTime	01	voidable	
	local, regional and	geometry	Name geometry	GM_MultiSurface	1		
	national governance.	inspireld	Name inspire id	Identifier	1		
		name	Name name	Geographicalivarite	· · · ·		
		nationalCode	Name national	CharacterString	1		
		nationalLevel	Name national	AdministrativeHierarchyL	1		
		nationalLevelName	Name national level	LocalisedCharacterString	1*	voidable	
		residenceOfAuthori	Name residence of	ResidenceOfAuthority	1*	voidable	
		condominium	Name	Condominium	0*	voidable	
		boundary	Name boundary	AdministrativeBoundary	1*	voidable	
		lowerLevelUnit	Name Iower level	AdministrativeUnit	0*	voidable	



	Application Schema 'AdministrativeUnits' (version 3.0)												Sou
Feature Type / Data Type	Documentatio n	Attribute Association role Constraint	Attribute / Association role / Constraint documentation	Data Type / Values / Code List - Enumeration	Multi plicit y	Voidabl e / Non- Voidabl e	Data Type Attribute	Data Type Attribute documenta tion	Data Type / Values / Code Lists / Enumerations	Multi plicit y	Voidabl e / Non- Voidabl e	"File name" or URL	Name of attribute
Administrative	Name												
Unit	unit Unit of	country	Name country Two character	CountryCode* BE*	1								
	administration where a Member	beginLifespanVersion	Name begin lifespan version	DateTime	1	voidable							
	State has and/or exercises	endLifespanVersion	Name end	DateTime	01	voidable							
	jurisdictional	geometry	Name geometry	GM_MultiSurface	1							com2011.shp	shape
	rights, for local, regional and national		Name inspireld External object		1		localld	A local identifier,	CharacterString	1		com2011.shp	pro_com
	governance.	inspireld	identifier of the spatial object.NOTE An	ldentifier			namespace	Namespace uniquely	CharacterString	1			
			external object identifier is a unique object				versionld	The identifier of the	CharacterString	01	oidable		
		name	Name name	GeographicalName	1*			See Geograp	phical name data typ	e			
		nationalCode	Name national	CharacterString	1							com2011.shp	pro_com
		nationalLevel	Name national	AdministrativeHierarch	1								
			national administrative	2ndOrder*									
			administrative unit is	AthOrder* 5thOrder*									
		nationalLevelName	Name national	LocalisedCharacterStri	1*	voidable							
		residenceOfAuthority	Name residence	ResidenceOfAuthority	1*	voidable		See Residence	eOfAuthority data ty	pe			



		Appli	cation Schema '/	AdministrativeU	nits'	(versi	on 3.0)				
Feature Type / Data Type	Documentatio n	Attribute Association role Constraint	Attribute / Association role / Constraint documentation	Data Type / Values / Code List - Enumeration	Multi plicit y	Voidabl e / Non- Voidabl e	Data Type Attribute	Data Type Attribute documenta tion	Data Type / Values / Code Lists / Enumerations	Multi plicit y	Voidabl e / Non- Voidabl e
dministrative	Name										
nit	administrative unit Unit of	country	Name country	CountryCode* BE*	1						
	administration	begint ifespanVersion	Two character	BQ* C7* DK* DE* DateTime	4	voidable					
	where a Member	beginenespanversion	lifespan version	Daternine		VOIGADIC					
	State has and/or exercises	endLifespanVersion	Name end	DateTime	01	voidable					
	jurisdictional	geometry	Name geometry	GM_MultiSurface	1						
	rights, for local, regional and	inspireld	Name inspireld	Identifier	1		localld	A local	CharacterString	1	
	national		identifier of the spatial				namespace	Namespace	CharacterString	1	
	governance.		object.NOTE An				versionId	The identifier	CharacterString	0.1	voidable
	•	name	Name name	GeographicalName	1 *						
		name	Official national	Geographicalitatile	1			See Geograp	hical name data type		
	_	nationaleoue	Name Hadonar	onaraotorotning							
		nationalLevel	Name national	AdministrativeHierarch	1						
			level Level in the	yLevel* 1stOrder*							
			national administrative	2ndOrder*							
			hierarchy, at which the	3rdOrder*							
			administrative unit is	AthOrder* 5thOrder*							
		nationalLevelName	Name national	LocalisedCharacterStri	1*	voidable					
		residenceOfAuthority	Name residence	ResidenceOfAuthority	1*	voidable	:	See Residence	eOfAuthority data typ	be	
		condominium	Name	Condominium	0*	voidable		See condor	minium feature type		
		boundary	Name boundary The administrative	AdministrativeBoundar y	1*	voidable	Se	e Administrati	veboundary feature	type	
		lowerLevelUnit	Name lower level	AdministrativeUnit	0*	voidable		See Administr	ativeUnit feature typ	е	
		upperLevelUnit	Name upper level	AdministrativeUnit	01	voidable		See Administr	ativeUnit feature typ	е	
		administeredBy	Name	AdministrativeUnit	0*	voidable		See Administr	ativeUnit feature typ	е	
		coAdminister	Name co administer	AdministrativeUnit	0*	voidable		See Administr	ativeUnit feature typ	е	

A3		<i>f</i> ∗ Geograph	icalName										
A	В	С	D	E	F	G	Н	1	J	K	L	M N	0
		Ар	plication Sc	hema 'LandCov	/erVecto	or' (vers	ion 3.0)						Sou
Data Type	Documentati on	Data Type Attribute 7 Constraint	Data Type Attribute / Constraint	Data Type / Values / Code List -	Multiplic ity	Yoidab le / Non-	Data Type Attribute	Data Type Attribute	Data Type / Yalues / Code List -	Multi plicit	Yoidab le / Non-	"File name" or URL	Name o attribut
	Proper noun applied to a real world eptitu	grammaticalGender	documentati Class of nouns reflected in the behaujour of	Enumerations GrammaticalGenderV alue - common- feminine - masculine -	01	Voidable		documen	Enumerations		Yoidab		
	wond entity.	grammaticalNumbe r	Grammatical category of nouns that	GrammaticalNumberv alue - dual - plural - singular	01	voidable							1
		language	Language of the name, given as a three letters	CharacterString	1	voidable							
		nameStatus	Qualitative information enabling to	NameStatusValue - historical - official - other - standardised	1	voidable							
		nativeness	Information enabling to acknowledge if	NativenessValue - endonym -exonym	1				Observation Only				
GeographicalName		pronunciation	Proper, correct or standard (standard within	e e		voidable	pronunciationIPA		CharacterString	01	voidable	hp	m
			community concerned)				pronunciationSou ndLink			01	voidable		
		sourceUfName	Original data source from which the	CharacterString		voidable							
		spelling	A proper way of writing the geographical	SpellingUłName	1		test	Way the name is written.	CharacterString	1		hp	nome_c m
			name				transliterationSol	set or graphic symbols	CharacterString	1	voidable		<u> </u>
	<u> </u>						eme	used for the names	Characterstring	01	voidable		
	Database		1	1			1	1		_			
	representing the name and position of a	name	Name of the	GeographicalName	1								<u> </u>
ResidenceOfAuthority	residence of authority.	name geometre	residence of authority.	GM Point		uoidable	s	ee Geograph I	ical name data type				<u> </u>
		geometry	residence of authority.		ľ	Voldable							
	1												



Applica	tion Schem	a 'Administrative	Units' (vei	sion 3	.0)		S	ource Location o	of information	
Feature Type / Data Type	Documentation	Attribute Association role Constraint	Data Type Attribute	Multiplic ity	Voidabl e / Non- Voidabl e	'File name" or URL	Name of attribute	Example of one data source value	Example of one data target value	Void Rea
Administrative	Name									
Unit	administrative unit Unit of administration	country							http://inspire.ec.europa. eu/codelist/CountryCode	
	where a Member State has and/or	beginLifespanVersion							2013-11-20T14:12:20	
	exercises iurisdictional	endLifespanVersion				1			2015-11-20T14:12:20	
	rights, for local,	geometry				com2011.shp	shape			
	regional and national	inspireld	localld	1		com2011.shp	pro_com	78083	78083	
	governance.		namespace	1					AU.IT.ISTAT	
			versionId	01	voidable					
		name	See Geograph	nical name	data type			See Geographical na	me data type	
		nationalCode				com2011.shp	pro_com	78083	78083	
		nationalLevel							http://inspire.ec.europa. eu/codelist/Administrativ eHierarchyLevel/4thOrde r	
		nationalLevelName				1			Comune	
		residenceOfAuthority	See Resider	iceOfAutho	ority data					Unknown
		condominium	See condon	ninium feat	ure type	1				
		boundary	See Admir fea	iistrativebo iture type	oundary	com2011Boundary	nome_com + nome_com_ad	Morano Calabro + Rotonda	#Morano Calabro_Rotonda	
		lowerLevelUnit	See Admini	strativeUni	t feature	1				
		upperLevelUnit	See Admini	strativeUni type	t feature	1			#Provincia_78	
		administeredBy	See Admini	strativeUni	t feature					

19/51

SPIRF

ME

A3 🔻 💿	<i>f</i> _* Geographica	lName									
А	В	С	D	E	F	G H		J	K	L	М
Ар	plication Schema	'LandCo	verVector' (ver	sion 3.0)			Sourc	e location	of informa	tion	
Data Type	Data Type Attribute / Constraint	Multiplicity	Data Type Attribute	Data Type / Values / Code List - Enumerations	Multiplicity	"File name" or URL	Name of attribute	Example of one data source value	Example of one data target value	Void Reason	Remarks
GeographicalName	grammaticalGender	01							common		
	grammaticalNumber	01							singular		
	language	1							ita		
	nameStatus	1							official		
	nativeness	1							endonym		
	pronunciation	1	pronunciationIPA	CharacterString	01	com2011.shp	NOME_COM	Morano Calabro	Morano Calabro		
			pronunciation SoundLi nk	URI	01						
	sourceOfName	1								Unknown	
	spelling	1*	text	CharacterString	1	com2011.shp	NOME_COM	Morano Calabro	Morano Calabro		
			script	CharacterString	1				Latn		
			transliteration Scheme	CharacterString	01						
											_
ResidenceOfAuthority											
	name	1	See Geogr	aphical name data type							
	geometry	1									
Matching Table	Data Type										
	· · · · · · · · · · · · · · · · · · ·					and the second s					



Summary

- Introduction
- Source Data Model
- Target Data Model
- Mapping table: instruction for use
- Common mapping problems
- Open source Hale transformation tool
- Data Transformation
- Data Validation
- Creation and validation of a harmonized GML dataset.



Common Mapping problems

While filling in the mapping table we realise we are not able to map the association between the Administrative Unit feature type and the Administrative Boundary feature type, as we have no information in our source dataset (no shapefile nor table) linking municipalities to related boundaries.



Common Mapping problems

In the case of this example we created the dataset of boundaries using GIS tools capabilities on com2011.shp file (splitting the perimeter of the polygons into polylines). For convenience of use we also created a table to associate municipalities to their boundaries i.e. Administrative Unit Ids (PRO_COM field) to related boundaries IDs (ID_Boundary field).

А	В	С	D	E	F	G	Н	1	
N_ID_Boundary	PRO_COM	NOME_COM	ID_Boundary						
6	76070	Rotonda	Boundary_78083_76070						
3	78136	Saracena	Boundary_78083_78136						
7	76028	Chiaromonte	Boundary_78083_76028						
5	76097	Viggianello	Boundary_78083_76097						
1	78033	Castrovillari	Boundary_78083_78033						
4	78084	Mormanno	Boundary_78083_78084						
2	78111	San Basile	Boundary_78083_78111						
6	78083	Morano Calabro	Boundary_78083_76070						
3	78083	Morano Calabro	Boundary_78083_78136						
7	78083	Morano Calabro	Boundary_78083_76028						
5	78083	Morano Calabro	Boundary_78083_76097						
1	78083	Morano Calabro	Boundary_78083_78033						
4	78083	Morano Calabro	Boundary_78083_78084						
2	78083	Morano Calabro	Boundary_78083_78111						



Summary

- Introduction
- Source Data Model
- Target Data Model
- Mapping table: instruction for use
- Common mapping problems
- Open source Hale transformation tool
- Data Transformation
- Data Validation
- Creation and validation of a harmonized GML dataset.

HALE transformation tool

The mapping between source and target properties defined in the matching tables can now be used to set the encoding rules needed to obtain an harmonized dataset by means of a software transformation tool.

Among the many available software, in the case of this example focus has been given to open source tool HALE (HUMBOLDT Alignment Editor), to define and evaluate conceptual schema mapping and to transform geodata based on these mapping.

http://hale.igd.fraunhofer.de/2.8.0/help/index.jsp



HALE transformation tool

The general workflow for transforming source data according to target schema using the HALE tool is as follows:

- Load the schema of the source data
- Load the target schema
- Load the source dataset
- Operate the mapping
- Save the transformed data to a GML file.
- Validate harmonized GML dataset.



Set up the project in HALE

🖶 H	UMBOLDT Alignment Editor 2.8.0	-	_	And the Party of Concession, name	Contraction or other Designation of the local division of the loca
File	Transformation Edit Window Help				
	New Alignment Project		9 %	i	
Ê	New project from template	ł			
Ð	Open Alignment Project	-			۹۷ –
	Save Alignment Project	Ctrl+S) Та	arget	💷 🗷 🗟 🗞
8	Save Alignment Project as		t	ype filter text	
2	Import] [
4	Export				
Û	Clear	•			
	1 C:\AreTM32\AdministrativeUnits.hale				
	2 D:\Areashared\plus\WP3\EP09\EP09.hale				
	3 D:\Areashared\services\ESDB\omop.hale				
	Exit				



Import source and target schema

🖶 H	UMBOLDT Alignment Editor 2.8.0			COLUMN TWO IS NOT	High Squares and Streams & suggestions
File	Transformation Edit Window Help				
	New Alignment Project		1	S 🗟 🖓 🔷 🖗	
1	New project from template		⊢		←
B	Open Alignment Project		⊢		
	Save Alignment Project Ctr	rl+S	D	Target	🗉 🗷 🔕 🗞
8	Save Alignment Project as		1	type filter text	
2	Import	+		Source schema	
4	Export	•		Target schema	
m	Clear	+		Source data	
				Base alignment	
	C:\AreIM32\AdministrativeUnits.hale			Alignment	
	2 D: (Areashared)pius/WP3(EP09/EP09.naie		_	Code list	
	5 D:\Areashared\services\ESDB\omop.nale		a	Map styles	
	Exit			Project archive	
			_	Lookup table	



SPIRE

SME

H Import source schema	
Import location Value must be an existing file	2
From file From URL From preset From WFS From WFS From WFS From WFS From WFS URL Import as Use relative paths if possible.	Database (JDBC) Browse
< Back Next > Finish	Cancel



Import source data

🖶 Import source data	
Import location Value must be an existing file	Ľ
📄 From file 🥘 From URL 🔊 From WFS 📋 From Database (JDE	C)
Source file: com2011	Browse
Import as	-
Use relative paths if possible.	
< Back Next > Finish	Cancel



Import target schema

🖶 Import targe	t schema	
Import location	on source for the import	Ľ
From file	🎱 From URL 🕭 From preset 💿 From WFS 🧻 F	From Database (JDBC)
Source URL:	http://inspire.ec.europa.eu/schemas/au/3.0/Adm	ninistrativeUnits.xsd
Content type		🔹 🔗 Detect
Import as		*
	< Back Next > Finish	Cancel

The Hale Workbench: the Default perspective





The Hale Workbench: the Data perspective

🖶 HUMBOLDT Alignment Editor 2.8.0 - Admin	istrativeUnits - C:\Areashere	ed PCC6\HALE\HALE_AU_Proj	ect_finalversion_ETRS89-TM3	2\Administra	itiveUnits.hale		
File Transformation Edit Window Help							
1 🖆 🗁 🔛 🖳 🗠 🕶 🗹 🕶 💽	3 🕹 🕹 🕃 🖉 👳	🛃 🌆 🤹 😨					🖹 👄 Defasite 🔲 Data 🎯 Ma 🤇
🔒 Alignment 🛛 🗖 🗖	🔲 Source Data 🛛	(1 🕲 🔝	Report	List 🔲 Properties 🔲	Transformed Data 🛛	🔢 🗄 🗒 🔍 🖓 🖓 🗖
land a state of the state of t	◎ ?		⁰ 🗙 🚵 2 🗸	● ? ○ [○ \$	AdministrativeUnit	•	⁰ 🗙 🚵 2 🗸
Click to: Select cell X		1	2	Administra	and the late	1	2
	comzuli	1	2	Administr	ativeOnit	1	2
] com2011	▲ 1 com2011	+	+	ft Ad	ministrativeUnit	+	+
🖉 🛛 🖉 🖉 🖉 🖉	8 COD_PRO	76	78		location	no value	no value
[] ID_table	8 COD_REG	17	18		administeredBy	no value	no value
	filename	com2011	com2011	8	beginLifespanVersion	no value	no value
	NOME_COM	Rotonda	Saracena	00	boundary	+	+
	NOME_TED			000	boundedBy	no value	no value
	8 PRO_COM	76070	78136	000	coAdminister	no value	no value
	8 SHAPE_Area	4.29234227114E7	1.09152054859E8	000	condominium	no value	no value
	8 SHAPE_Leng	32682.1288	66506.6987676		country	+	+
	🕲 the_geom	{CRS=ED50_UTM_zone_32N	{CRS=ED50_UTM_zone_32N	=	description	no value	no value
	🔺 📄 Metadata	+	+		descriptionReference	no value	no value
	Identifier	18f4ac4e-b6c8-4d9a-873f-2	4929ad4b-1898-4b99-ad13-	8	endLifespanVersion	no value	no value
					geometry	+	+
				22	id	Comune 76070	Comune 78136
					identifier	no value	no value
					inspireId	+	+
					lowerl evell Init	no value	no value
				00	metaDataBronertu	no value	no value
				00	necabatarroperty	no value	no value
				-	name		
					name nationalCada	+ 76070	+ 79126
					nationalCode	76070	78130
					nationalLevel	4thOrder	4thOrder
					nationalLevelName	no value	no value
					NUTS	no value	no value
					residenceOfAuthority	no value	no value
					upperLevelUnit	no value	no value
					etadata	+	+
				🗹	Identifier	bfce1437-4a09-4fac-b42f-2b0c2	c fd692284-4341-4f43-ab9a-2dd3ae5
					SourceID	18f4ac4e-b6c8-4d9a-873f-29ce2	0 4929ad4b-1898-4b99-ad13-bd7b2





Summary

- Introduction
- Source Data Model
- Target Data Model
- Mapping table: instruction for use
- Common mapping problems
- Open source Hale transformation tool
- Data Transformation
- Data Validation
- Creation and validation of a harmonized GML dataset.



SME / SPIRE

Type Relations





The Join function

g⊮e Join		
Entity selection Assign entities for the function		
Source types 0 * T com2011 ×8 * T ID_table ×14 C Click to celect >	tiveUnit ×8	
	Join Join ID_table Please select join conditions for type I	D_table
Help < Back Next > Fini	type filter text T ID_table ×14 sh	type filter text Com2011 ×8
	Join type ID_table on:	= T com2 8 PRO_COM
	Help < Back	Next > Finish Cancel

Property Relations

LE SPIRE	Pro	perty R	Relatio	ns		38/51
HUMBOLDT Alignment Editor 2.8.0 - AdministrativeL File Transformation Edit Window Help File Transformation Edit Window Help Source Source ESchema Explorer S Source (type filter text COD_PRO (0.1) ×8 COD_PRO (0.1) ×8 Filename ×8 NOME_COM (0.1) ×8 Filename ×8 NOME_TED (0.1) ×8 SHAPE_Area (0.1) ×8 SHAPE_Leng (0.1) ×8 SHAPE_Leng (0.1) ×8 SHAPE_Leng (0.1) ×8 SHAPE_Leng (0.1) ×8 TID_table FID_Boundary ×14 NOME_COM ×14 PRO_COM ×14	Inits - C:\Areashered PCC6\ Target type filte	HALE\HALE_AU_Project_finalvers	ion_ETRS89-TM32\Adminis	strativeUnits.hale	Join X Join X S O Din E Rename E Rename E Rename E Rename E Rename Make Formatted string E Rename abe Formatted string E Rename abe Formatted string E Rename Assign Assign	
 Error Log & Properties Workspace Log type filter text Message i Initializing example project topics i Finished task 'Load project'. i No handler for external project file styles.sld i Starting task 'Load project' 	Plug-in eu.esdihumboldt.hale.do eu.esdihumboldt.hale.co f eu.esdihumboldt.hale.co eu.esdihumboldt.hale.co.	Date 13/05/2014 11:36 13/05/2014 11:36 13/05/2014 11:36 13/05/2014 11:36	J () () ()		ype hi ∫ f _X Functio ⊠ General Geometric Groovy Inspire Numeric XSLT	Report L 🔲 Transfor



Mapping the geometry property

HUMBOLDT Alignment Editor 2.8.0 - AdministrativeUnits - C	Areashered PCC6\HALE\HALE AL	Project finalversion ETRS89-TM32\Admi	inistrativeUnits.hale	
File Transformation Edit Window Help				
***	؇ 🐃 👼 🍒 🧠 🛛 🕐			🖺 👄 Default 🔲 Data 🏼 🚱 Ma 🌺
🔠 Schema Explorer 🕱		Sector 1	Alignment 🛛	# * * * * ■ ■
Source 💷 🗷 🛞	target	II 🛛 🛛 🗷 🗮	<multiple types=""></multiple>	Join X AdministrativeUnit ×8
type filter text	type filter text ▷	(01) Reference (01) Version (01)	T com2011	Co Sto Join
 ■ filename ×8 ■ NOME_COM (01) ×8 ■ NOME_TED (01) ×8 ■ PRO_COM (01) ×8 	Geometry Geometry actuate actuate actuate actuate actuate actuate actuate	0.1) 0.1)	D_Boundary	Image: Rename Image: boundary.href Image: Rename Image: mellingOfName.text Image: Rename Image: mellingOfName.text Image: Rename Image: mellingOfName.text
8 SHAPE_Area (0.1) ×8 8 SHAPE_Leng (0.1) ×8 3 the_geom (0.1) ×8 1 ID_table 1	MultiSu MultiSu mincese owns (0 mentes	face (01) ×8 II (02) .1) chema (01) ≡	NOME_COM	Inspire Identifier
■ II_Boundary ×14 ■ N_ID_Boundary ×14 ■ NOME_COM ×14 ■ PRO_COM ×14	show (0)) .1)) L)	8 PRO_COM var abe	Formatted string
	 ► Id vog ► identifier (0 ► inspireId va ► lowerLevelt ► metaDataPi 	.1) nit (0n) operty (0n)	/	Assign Country.Country Assign Assign Image: Assign Assign Image: Assign Assign Image: Assign Assign
	⊳ 🔳 name (0n)	•		
🕙 Error Log 🛛 🔲 Properties	J 🗊 🗐	🗽 🗶 📄 💣 🏱 🗖 🗋 🍃 Type hiera	archy f_x Functions 🔀 Report List 🔳	Transformed Data 🗢 Mapping 🛿 👘 🗖
Workspace Log				
type filter text		the_geor	m 📃 Re	ename 🛛 🗃metry.MultiSurface
Message Plug- i Initializing example project topics eu.es	in Date dihumboldt.hale.do 13/05/2014	11:36		



The INSPIRE Identifier

						_ 0 ~
HUMBOLDT Alignment Editor 2.8.0 - Admini:	strativeUnits - C:\Areas	hered PCC6\HALE\HALE_AU_Project_finalver:	ion_ETRS89-TM32\Administ	trativeUnits.hale		
File Transformation Edit Window Help						
° 🖆 🗁 🔒 🗟 🔤 🕶 🍊 🕶 🕨 💽] 👶 🎄 🕃 🛛 🖉	🌭 🛃 🌆 🍫 🛛 🔞				🖹 🛑 Default 🔲 Data 🛛 🎯 Ma 🏻
🗄 Schema Explorer 🛛			4 - D	🖶 Alignment 🖾		
Source	II 🛛 🖉	Target	🔲 🗷 🗶 🏭	<multiple types=""></multiple>	Join 🔀	ft AdministrativeUnit ×8
type filter text		type filter text				
T com2011 3 8 COD_PRO (01) ×8		ecountry ×8 description (01)		T com2011types T ID_tabletypes	🛛 🖓 Join	ft AdministrativeUnit
8 COD_REG (01) ×8		descriptionReference (01)		ID_Boundary	듣 Rename	📒 boundary.href
NOME_COM (0.1) ×8		id v8			E Rename	ipellingOfName.text
8 PRO_COM (0.1) ×8		identifier (01)			E Rename	Ee.pronunciationIPA
8 SHAPE_Area (01) ×8 8 SHAPE_Leng (01) ×8		inspireId ×8			🔀 Inspire Identifier	inspireId
O the_geom (0.1) ×8	1 Inspire Identifie	r		NOME_COM	abe Formatted string	🗕 🔚 boundary.title
T ID_table ×14	Inspire Identifie	r			III Rename	ationalCode
ID_boundary 14	Configure the co	ntent of your INSPIRE identifer urn.		8 PRO_COM	abe Formatted string	id
PRO_COM ×14	Namespace namespace The	namespace is constructed from the following	information:	the_geom	E Rename	Commetry.MultiSurface
	Country® IT				Assign	country.Country
	Provider® IST	AT			Assign	🗎ry.Country.codeList
	Product [®] cor	n2011			Assign	🗎untry.codeListValue
	Local ID					- IXI I
🕙 Error Log 😫 🔲 Properties	localId com2011.	NOME_COM		Functions Report List	🔲 Transformed Data	Aapping 🛛 🗖 🗖
Workspace Log	Marrier					
type filter text	Version			No.	pire Identifier	and inspireId
Message	versionia					
i Initializing example project topics	nilReason unk	nown	•	-		
i Finished task 'Load project'.						
i No handler for external project file st	y .					
i Starting task 'Load project'	-					
Finished task 'Load project'. No handler for external project file d	Help	< Back Next >	inish Cancel			
i Starting task 'Load project'						
	-					



Mapping the association between municipality and its boundaries

To map the association between the Administrative Unit feature type and the Administrative Boundary feature type (i.e. to link each municipality to its boundaries) we have to link the *href* attribute of the *boundary* element in the Administrative Unit feature type to the ID of the boundary contained in the ID_table.





Mapping the association between municipality and its boundaries

HUMBOLDT Alignment Editor 2.8.0 - AdministrativeU	nits - C:\Areashered PCC6\HALE\HALE_AU_Pro	oject_finalversion_ETRS89-TM32\Admini	istrativeUnits.hale	
File Transformation Edit Window Help				
🕆 🖆 🗁 🔛 🖳 🚵 🕶 🕶 🕶 🕨 💽 🔀 👶 d	0 🔹 🌾 🏹 🖓 🖗			🖹 👄 Default 🔲 Data 🛛 🛞 Ma 🎽
🕾 Schema Explorer 🛛			😫 Alignment 🛿	ᅟ品 ཕ ● 🗎 🗶 🕈 ▽ 🗖 🗖
Source	Target	🗏 🛛 🔀	<multiple types=""></multiple>	AdministrativeUnit ×8
type filter text	type filter text		T com2011	
T com2011 (0) 8 COD_PRO (0.1) ×8	ft AdministrativeBour ft AdministrativeUnit	ndary	T ID_table	ft AdministrativeUnit
8 COD_REG (01) ×8 filename ×8	tocation (0.1)	(0n)	ID_Boundary	boundary.href
NOME_COM (0.1) ×8 NOME TED (0.1) ×8	8 beginLifespanVe	×14 (8)	I⊒ Rename	📑pellingOfName.text
 8 PRO_COM (0.1) ×8 8 SHAPE Area (0.1) ×8 	actuate (0.1))	E Rename	■e.pronunciationIPA
8 SHAPE_Leng (01) ×8	🔚 href (01) ×1	.4	NOME_COM	inspireId
the_geom (0.1) ×8	Groovy script		NOME_COM abe Formatted string) 🗎 boundary.title
■ ID_Boundary ×14	📰 Regex Analysis		🗮 Rename —	📑 nationalCode
N_ID_Boundary ×14	E Rename		8 PRO COM	id 1
PRO COM ×14	Assign		E -	MultiSurface
	abc Formatted string			
	Augustations		Assign	country.Country
	Augmentations		Assign	📑ry.Country.codeList
	id Generate sequential ID	-	Assign	🗎untry.codeListValue
🥺 Error Log 🕱 🔲 Properties	, I I I - E	🗙 🗎 💣 🍸 🗖 🗖 🍃 Type hierar	chy $\int f_{f X}$ Functions $igodol{\mathbb{R}}$ Report List $igodol{\mathbb{R}}$ Transformed D	ata 👄 Mapping 🛛 👘 🗖
Workspace Log				& ⊿ ‡ [×]
type filter text		ID_Bounda	ary 🔚 Rename	📜 boundary.href
Message	Plug-in Date			
i Initializing example project topics	eu.esdihumboldt.hale.do 13/05/2014 11:30	5		
i Finished task 'Load project'.	eu.esdihumboldt.hale.co 13/05/2014 11:30	5		
i No handler for external project file styles.sld f	eu.esdihumboldt.hale.co 13/05/2014 11:30	5		
Charting tack 'I and project'	au asdihumhaldt hala sa 12/05/201/11/2/			

Roundary field manning in the Data View

Indexector data of data - daministrated of a construction of the data and a construction		Bound	lary field map	ping in the	Data View	43/51
COLPAD Source Det: COLPAD FOLCOM-7003 FOLCOM-7003 COLPAD FOLCOM-7003 COLPAD FOLCOM-7003 COLPAD FOLCOM-7003 COLPAD FOLCOM-7003 FOLCOM-700		HUMBOLDI Alignment Editor 2.8.0 - Adm	hinistrativeUnits - C:\Areashered PCCb\HALE\HALE_AU_Proje	ct_finalversion_ETRS89-TM32\AdministrativeUnits.hale		
Image:						
Source Les :			🖾 👶 🥇 🤗 🖄 👘 🖓		E 👄 🛙	efault 🔲 Data 🥹 Ma "
Image: constant in the second sec	100	🔲 Source Data 🔀	🔝 🚛 🛛 🥥 🗢 🗖	🔲 Properties 🔲 Transformed Data 💥] 🗄 🗒 🛛 🖓 🖓 🖓 🖬
Image: Control in the second secon	*****	● ? com2011 ▼ PRO COM=78083	⁰ 🖌 🖓	● ? ○ □ AdministrativeUnit ▼ id='Comun	e 78083'	⁰ 🖌 2 –
Central 1 Administrative/lot Central 1 Control 1<						
Administrativeluit Image: Construct of the second sec		com2011	1	AdministrativeUnit	1	•
Image: Coop Paid 78 Image: Coop Paid	7	T com2011	+	A ft AdministrativeUnit	+	
B COD_RSG 18 B Interne COM Morano Galako B NOME_COM Morano Galako Contraty C NOME_COM NOME_TO Read B SHAPL_Leng D SHAPL_Leng D<	COOPERATION	8 COD_PRO	78	Incation	no value	
Image: com201 > 0 beging (Haps/Varian) NOME_COM Merano Clabrico INDME_TO Test Status INDECOM Test Status </th <th></th> <th>8 COD_REG</th> <th>18</th> <th>administeredBy</th> <th>no value</th> <th></th>		8 COD_REG	18	administeredBy	no value	
Image: Nother Cold Monano Calabro Image: Nother Cold 7883 Image: Noth		🔳 filename	com2011	b eginLifespanVersion	pe value	
Noting TD Return to the geom (CR5+E059, UTM_zone_32N) MULTPOLVSON (III) Index of the geom (CR5+E059, UTM_zone_32N) Inde		NOME_COM	Morano Calabro	a 👶 boundary	(+ (1 of 7)	1 -
B PHOP_COM B PHOP_CAree 1125331321218 B PHoP B		NOME_TED		📜 actuate	no value	
Image: Signed Processing Signed		8 PRO_COM	78083	📜 arcrole	no value	2
B 5449E_Leng 3387/497264 M the geom (CK5=ESD_UTM_zone_32N) MULTPOLVGON ((IL) M Medada		8 SHAPE_Area	1.16254331821E8	🔚 href	Boundary_78083_76028	3
Med.geom (CRS=EDSU_UTM_cone_32N) MULTPOLYGON ((11) Med.ada		8 SHAPE_Leng	53967.4937264	🗎 nilReason	no value	4
Metadata + no value 7 Metadata + no value no value Metadata 106 no value no value Metadata 106 no value no value Metadata 106 no value 106 Non no value 106 no value Metadata 106 no value 106 Non no value 106 106 106 Non no value 106 106 106 Non no value 106 106 106 Non 106 106 106 106 106 Non 106 10		🔕 the_geom	{CRS=ED50_UTM_zone_32N} MULTIPOLYGON (((11	i owns	no value	6
Identifier P035ces-361-466-9654-cab217.0662 Imovalue Imovalue Imovalue Imovalue Imovalue Imovalue Imovalue Imovalue Imovalue Imovalue Imovalu		📃 Metadata	+	remoteSchema	no value	7
index index		🛃 Identifier	703f5cea-5a61-4f86-965f-cab9217d0662	i role	no value	=
Image: State of the state				i show	no value	
Image: Speed of the second				title 🗮	limiteComunale_Morano Calabro	
Alignment 3 CodeministrativeUnit ×8 CographicalName CographicalName				type	no value	
Alignment % Alignment % Condministret Condministret<				b boundedBy	no value	
				COAdminister	no value	
(multiple types> Join E Rename E ename En					no value	
				b end country	+	
Image: Second					no value	
id Comune_72083 id Comune_72083 id Comune_72083 id id ispired id				R endl ifespanVersion	no value	
Image: Second Secon					+	
Image: State of the				id	Comune 78083	
Image: Second Secon				b identifier	no value	
Image: Second Secon				inspireId	+	
Image: Second and Second				IowerLevelUnit	no value	
Image: Second State				> metaDataProperty	no value	
Image: State of the state				name	no value	
Alignment GeographicalName Alignment GeographicalName Alignment GeographicalName Alignment GeographicalName Alignment GeographicalName Control Co				a 📑 name	+	
Alignment X Image: Alignment X <				GeographicalName	+	-
Alignment X Image: Alignment X <					70000	
<multiple types=""> Join Ift AdministrativeUnit ×8 Instance validation 10:56 2014-05-15 Instance validation 10:57.00 Inspire Identifier Image: Inspire Identifier Image: Image:</multiple>		😸 Alignment 🖾		A ceport List 🛛		→ → → → → → → → → → → → → → → → → → →
Instance validation 10:57.12 Image: D_Boundary Image: Rename Image: D_Boundary Image: Rename Image: Rename Image: Rename Ima		< multiple types>	loin 😭 🕅 AdministrativeUnit ×8	陷 10:56 2014-05-15		*
 ✓ Instance transformation 10:57.09 ✓ Load data into database ✓ CSV file import ✓ CSV file import ✓ CSV file import ✓ Load data into database ✓ CSV file import ✓ CSV file import ✓ Load data into database ✓ CSV file import ✓ Load data into database ✓ CSV file import ✓ Load data into database ✓ CSV file import ✓ Load data into database ✓ CSV file import ✓ CSV file import ✓ Load data into database ✓ CSV file import ✓ Load data into database ✓ CSV file import ✓ Load data into database ✓ CSV file import ✓ Load data into database ✓ CSV file import ✓ Load data into database ✓ CSV file import ✓ Shapefile import 				Instance validation	10:5	.12
Image: Second ary second				Instance transformation	10:5	/.09
Image: Second		ID_Boundary	E Rename boundary.hre	et 🗸 🖌 🗸 🗸 🗸 🗸	10:53	/.00 ≡
✓ CSV file import 10:56.59 Load data into database 10:56.55 Shapefile import 10:56.55 Shapefile import 10:56.55 Shapefile import 10:56.53 Shapefile import 10:56.53			E Rename	e.text	10:5	.00
Image: Inspire Identifier Image:				CSV file import	10:50	1.59
■ NOME_COM ▼ Shapefile import 10:56.55 ■ NOME_COM ▼ Shapefile import 10:56.53 ▼ Shapefile import 10:56.51 ▼			📃 🔚 Rename 📃 📰e.pronunciatio	nIPA V Load data into database	10:50	.55
Compretention (10:56.53)			Inspire Identifier	Shapefile import	10:50	1.00
				Snaperile import	10:50	51 -



Complete Hale project





Summary

- Introduction
- Source Data Model
- Target Data Model
- Mapping table: instruction for use
- Common mapping problems
- Open source Hale transformation tool
- Data Transformation
- Data Validation
- Creation and validation of a harmonized GML dataset.

Data Validation in Hale

When targeting a specific schema, HALE verifies that your transformation result follows the target schema's structure (i.e. performs a schema validation). Moreover HALE checks whether your mapping follows some of the constraints defined by the schema, like mandatory properties and restrictions on property values.

Validation of instances in HALE is currently supported for XML based schemas and can be performed:

 \succ on the transformed instances available in the mapping phase ('live' validation)

> on the exported transformation result (validation of 'exported data')





Summary

- Introduction
- Source Data Model
- Target Data Model
- Mapping table: instruction for use
- Common mapping problems
- Open source Hale transformation tool
- Data Transformation
- Data Validation
- Creation and validation of a harmonized GML dataset.

Export transformed data into a GML dataset file





Validate GML dataset file

SpatialDataSet configuration Please configure the data set INSPIRE identifier and optionally included metadata Please specify the local ID and the namespace as part of the INSPIRE identifier of the Spatial Data Set: localId = AU.Italy namespace = AU.Italy. You can include metadata in the Spatial Data Set from a XML file with a MD_Metadata element: ISO Geographic MetaData XML Browse	
Please specify the local ID and the namespace as part of the INSPIRE identifier of the Spatial Data Set: localId AU.Italy namespace AU.Italy.Comuni You can include metadata in the Spatial Data Set from a XML file with a MD_Metadata element: ISO Geographic MetaData XML Browse	
localld = AU.Italy namespace = AU.Italy.Comuni You can include metadata in the Spatial Data Set from a XML file with a MD_Metadata element: ISO Geographic MetaData XML	
namespace = AU.Italy.Comuni You can include metadata in the Spatial Data Set from a XML file with a MD_Metadata element: ISO Geographic MetaData XML Browse	
You can include metadata in the Spatial Data Set from a XML file with a MD_Metadata element: ISO Geographic MetaData XML Browse	
ISO Geographic MetaData XML Browse	
< Back Next > Finish Cancel	
	_
Information	×
The XML file is valid	
ОК	

