



ELF EUROPEAN
LOCATION
FRAMEWORK

ELF WP4 Geo-Tools

Presentation to: EG Technical Producers meeting 2015, Warsaw

Author: Dorus Kruse, WP4 leader

Date: 01-04-2015

WP 4: Implementation of Geo-tools

★ Implementation of the following Geo-tools for the use within NMCA's:

1. Transformation
2. Data Quality Validation
3. Generalisation
4. Edge Matching
5. Visualisation
6. Change Detection

★ Provide a Geo Product Finder tool for the public

Tool demo's:

★ Transformation Tools:

Go Publisher by Snowflake
HALE by Delft University

★ Data Quality Validation Tools:

1Validate by 1Spatial
ArcGIS Data reviewer by Esri
Pprepair by Delft University

★ Edge Matching Tools:

1Integrate by 1Spatial
ArcGIS Data reviewer by Esri
Pprepair by Delft University

★ Generalisation Tools:

Regional to Global by IGN-France

Transformation tools:

- ★ Delivery month 12.
- ★ The tool GO Publisher from Snowflake has been commented, tested, reviewed and delivered.
- ★ Used by IGN France, Kadaster Netherlands, IGN Belgium and BKG.
- ★ The tool HALE has been tested and configured on ELF specifications by Delft University.
- ★ Webinar on Transformation tools planned for May 2015.

European Global Map dataset - GO Publisher Interface

File Edit Tools Help

Project Settings SQL filters Desktop settings WFS settings

Project name: egm_project C:\PROJECTS\ELF\trunk\Data\BKGGermany\GP_projects\EGM_FINAL.gpp Format: GML 3.2

Database to XML mapping

Name	Enabled	DB type or const value	XML path	Type in XML	Required
Database	<input checked="" type="checkbox"/>		base:SpatialDataSet	base:SpatialDataSetType	Yes
id	<input checked="" type="checkbox"/>	#GENERATED_ID	@gml:id	xs:ID	No
Identifier	<input checked="" type="checkbox"/>	Column group	base:identifier/base:Identifier	base:IdentifierType	No
metadata	<input checked="" type="checkbox"/>	unknown	base:metadata/@gml:mlReason	gml:MLReasonType	No
road (formOfWay) AP030	<input checked="" type="checkbox"/>	Table	base:member/xtn:FormOfWay	xtn:FormOfWayType	No
road (RoadSurfaceCategory) AP030	<input checked="" type="checkbox"/>	Table	base:member/xtn:RoadSurfaceCategory	xtn:RoadSurfaceCategoryType	No
railrdc (RailwayNode) AQ125	<input checked="" type="checkbox"/>	Table	base:member/xtn:RailwayNode	xtn:RailwayNodeType	No
lakeresa (Reservoir) BH130	<input checked="" type="checkbox"/>	Table	base:member/xhy:StandingWater	xhy:StandingWaterType	No
lakeresa (lake/pond) BH80	<input checked="" type="checkbox"/>	Table	base:member/xhy:StandingWater	xhy:StandingWaterType	No
islanda (Island)	<input checked="" type="checkbox"/>	Table	base:member/xhy:Island	xhy:IslandType	No
coasta (Shore)	<input checked="" type="checkbox"/>	Table	base:member/xhy:Shore	xhy:ShoreType	No
polnda (AdministrativeUnitArea)	<input checked="" type="checkbox"/>	Table	base:member/xau:AdministrativeUnitArea	xau:AdministrativeUnitAreaType	No
polndi (AdministrativeBoundary)	<input checked="" type="checkbox"/>	Table	base:member/xau:AdministrativeBoundary	xau:AdministrativeBoundaryType	No
coastl (CoastLine ShoreLine) BA010	<input checked="" type="checkbox"/>	Table	base:member/xhy:LandWaterBoundary	xhy:LandWaterBoundaryType	No
coastl (Sealimit) XX500	<input checked="" type="checkbox"/>	Table	base:member/xhy:LandWaterBoundary	xhy:LandWaterBoundaryType	No
dami (Dam Or Weir) B1020	<input checked="" type="checkbox"/>	Table	base:member/xhy:DamOrWeir	xhy:DamOrWeirType	No
landicea (Glacier) B1030	<input checked="" type="checkbox"/>	Table	base:member/xhy:GlacierSnowfield	xhy:GlacierSnowfieldType	No
landicea (Snowfield/Icefield) B1100	<input checked="" type="checkbox"/>	Table	base:member/xhy:GlacierSnowfield	xhy:GlacierSnowfieldType	No
seaa (OceanRegion)	<input checked="" type="checkbox"/>	Table	base:member/xhy:OceanRegion	xhy:OceanRegionType	No
springc (SpringOrSeep)	<input checked="" type="checkbox"/>	Table	base:member/xhy:SpringOrSeep	xhy:SpringOrSeepType	No
springp (SpringOrSeep)	<input checked="" type="checkbox"/>	Table	base:member/xhy:SpringOrSeep	xhy:SpringOrSeepType	No
watrcrsa (waterCourse)	<input checked="" type="checkbox"/>	Table	base:member/xhy:Watercourse	xhy:WatercourseType	No
watrcrsi (waterCourse)	<input checked="" type="checkbox"/>	Table	base:member/xhy:Watercourse	xhy:WatercourseType	No
airfdp (AerodromeNode) GB005	<input checked="" type="checkbox"/>	Table	base:member/tn-a:AerodromeNode	tn-a:AerodromeNodeType	No
exitc (SchengenBorderPoint)	<input checked="" type="checkbox"/>	Table	base:member/xtn:SchengenBorderPoint	xtn:SchengenBorderPointType	No
ferryc (PortNode)	<input checked="" type="checkbox"/>	Table	base:member/xtn:PortNode	xtn:PortNodeType	No
ferryf (FerryCrossing)	<input checked="" type="checkbox"/>	Table	base:member/xtn:FerryCrossing	xtn:FerryCrossingType	No
railrdc (RailwayStationNode) AQ125	<input checked="" type="checkbox"/>	Table	base:member/xtn:RailwayStationNode	xtn:RailwayStationNodeType	No
railrdl (VerticalPosition) AN010	<input checked="" type="checkbox"/>	Table	base:member/xtn:VerticalPosition	xtn:VerticalPositionType	No
railrdl (Railway Link) AN010	<input checked="" type="checkbox"/>	Table	base:member/xtn:RailwayLink	xtn:RailwayLinkType	No
roadl (NetworkConnection) AP030	<input checked="" type="checkbox"/>	Table	base:member/xtn:NetworkConnection	xtn:NetworkConnectionType	No
roadl (Road Link) AP030	<input checked="" type="checkbox"/>	Table	base:member/xtn:RoadLink	xtn:RoadLinkType	No
builtupa (builtUpArea)	<input checked="" type="checkbox"/>	Table	base:member/xpop:BuiltUpArea	xpop:BuiltUpAreaType	No
builtupo (PopulatedPlace)	<input checked="" type="checkbox"/>	Table	base:member/xpop:PopulatedPlace	xpop:PopulatedPlaceType	No

Preview XML Preview Schema Execution View

```
<?xml version="1.0" encoding="UTF-8"?>
<!-- Created by GO Publisher. Snowflake Software Ltd. (http://www.snowflakesoftware.com). -->
<base:SpatialDataSet xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xmlns:xs="http://www.w3.org/2001/XMLSchema"
  <base:identifier>
    <base:Identifier>
      <base:localId>EGM</base:localId>
      <base:namespace>EUROGEO</base:namespace>
      <base:versionId>2013-08-09</base:versionId>
    </base:Identifier>
  </base:identifier>
```

Preview Sample Size: 3 Update Preview Validate Preview

XML preview generated after mapping process

Project Settings SQL filters Desktop settings WFS settings

Project name: egm_project C:\PROJECTS\ELF\trunk\Data\BKGGermany\GP_projects\EGM_FINAL.gpp Format: GML 3.2

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id	<input checked="" type="checkbox"/>	#GENERATED_ID	@gml:id	xs:ID	No
Identifier	<input checked="" type="checkbox"/>	Column group	base:identifier/base:Identifier	base:IdentifierType	No
metadata	<input checked="" type="checkbox"/>	unknown	base:metadata/@gml:nilReason	gml:nilReasonType	No
road (FormOfWay) AP030	<input checked="" type="checkbox"/>	Table	base:member/xtn:FormOfWay	xtn:FormOfWayType	No
road (RoadSurfaceCategory) AP030	<input checked="" type="checkbox"/>	Table	base:member/xtn:RoadSurfaceCategory	xtn:RoadSurfaceCategoryType	No
raildc (RailwayNode) AQ125	<input checked="" type="checkbox"/>	Table	base:member/xtn:RailwayNode	xtn:RailwayNodeType	No
lakeresa (Reservoir) RH130	<input checked="" type="checkbox"/>	Table	base:member/xhvy:StandingWater	xhvy:StandingWaterType	No

Preview XML Preview Schema Execution View

```
<?xml version="1.0" encoding="UTF-8"?>
<!-- Created by GO Publisher. Snowflake Software Ltd. (http://www.snowflakesoftware.com). -->
<base:SpatialDataSet xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xmlns:xs="http://www.w3.org/2001/XMLSchema"
  <base:identifier>
    <base:Identifier>
      <base:localId>EGM</base:localId>
      <base:namespace>EUROGEO</base:namespace>
      <base:versionId>2013-08-09</base:versionId>
    </base:Identifier>
  </base:identifier>
  <base:metadata nilReason="unknown" xsi:nil="true"/>
  <base:member>
    <xtn:FormOfWay gml:id="LOCAL_ID_1">
      <net:networkRef nilReason="unpopulated" xsi:nil="true"/>
      <net:inspireId>
        <base:Identifier>
          <base:localId>LOCAL_ID_2</base:localId>
          <base:namespace>unknown</base:namespace>
        </base:Identifier>
      </net:inspireId>
      <net:beginLifespanVersion nilReason="unpopulated" xsi:nil="true"/>
      <tn:validFrom nilReason="unpopulated" xsi:nil="true"/>
      <tn-ro:formOfWay>unpopulated</tn-ro:formOfWay>
    </xtn:FormOfWay>
  </base:member>
  <base:member>
    <xtn:FormOfWay gml:id="LOCAL_ID_3">
      <net:networkRef nilReason="unpopulated" xsi:nil="true"/>
      <net:inspireId>
        <base:Identifier>
          <base:localId>LOCAL ID 4</base:localId>
```

XML is well formed and valid

Project: egm_project C:\PROJECTS\ELF\trunk\Data\BKGGermany\GP_projects\EGM_FINAL.gpp Format: GML 3.2

Database to XML mapping

Name	Enabled	DB type or const value	XML path	Type in XML	Required
Database	<input checked="" type="checkbox"/>		base:SpatialDataSet	base:SpatialDataSetType	Yes
id	<input checked="" type="checkbox"/>	#GENERATED_ID	@gmlid	xs:ID	No
Identifier	<input checked="" type="checkbox"/>	Column group	base:identifier/base:Identifier	base:IdentifierType	No
metadata	<input checked="" type="checkbox"/>	unknown	base:metadata/@gml:nilReason	gml:nilReasonType	No
road (FormOfWay) AP030	<input checked="" type="checkbox"/>	Table	base:member/xtn:FormOfWay	xtn:FormOfWayType	No
road (RoadSurfaceCategory) AP030	<input checked="" type="checkbox"/>	Table	base:member/xtn:RoadSurfaceCategory	xtn:RoadSurfaceCategoryType	No
raildc (RailwayNode) AQ125	<input checked="" type="checkbox"/>	Table	base:member/xtn:RailwayNode	xtn:RailwayNodeType	No
lakearea (Reservoir) BH130	<input checked="" type="checkbox"/>	Table	base:member/xhv:StandingWater	xhv:StandingWaterType	No

Preview XML Preview Schema Execution View

```
<?xml version="1.0" encoding="UTF-8"?>
<!-- Created by GO Publisher, Snowflake Software Ltd. (http://www.snowflake.com) -->
<base:SpatialDataSet xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xmlns:xs="http://www.w3.org/2001/XMLSchema" >
  <base:Identifier>
    <base:Identifier>
      <base:localId>EGM</base:localId>
      <base:namespace>EUROGEO</base:namespace>
      <base:versionId>2013-08-09</base:versionId>
    </base:Identifier>
  </base:Identifier>
  <base:metadata nilReason="unknown" xsi:nil="true"/>
  <base:member>
    <xtn:FormOfWay gml:id="LOCAL_ID_1">
      <net:networkRef nilReason="unpopulated" xsi:nil="true"/>
      <net:inspireId>
        <base:Identifier>
          <base:localId>LOCAL_ID_2</base:localId>
          <base:namespace>unknown</base:namespace>
        </base:Identifier>
      </net:inspireId>
      <net:beginLifespanVersion nilReason="unpopulated" xsi:nil="true"/>
      <tn:validFrom nilReason="unpopulated" xsi:nil="true"/>
      <tn-ro:formOfWay>unpopulated</tn-ro:formOfWay>
    </xtn:FormOfWay>
  </base:member>
  <base:member>
    <xtn:FormOfWay gml:id="LOCAL_ID_3">
      <net:networkRef nilReason="unpopulated" xsi:nil="true"/>
      <net:inspireId>
        <base:Identifier>
          <base:localId>LOCAL_ID_4</base:localId>
        </base:Identifier>
      </net:inspireId>
    </xtn:FormOfWay>
  </base:member>
</base:SpatialDataSet>
```

XML is well formed and valid

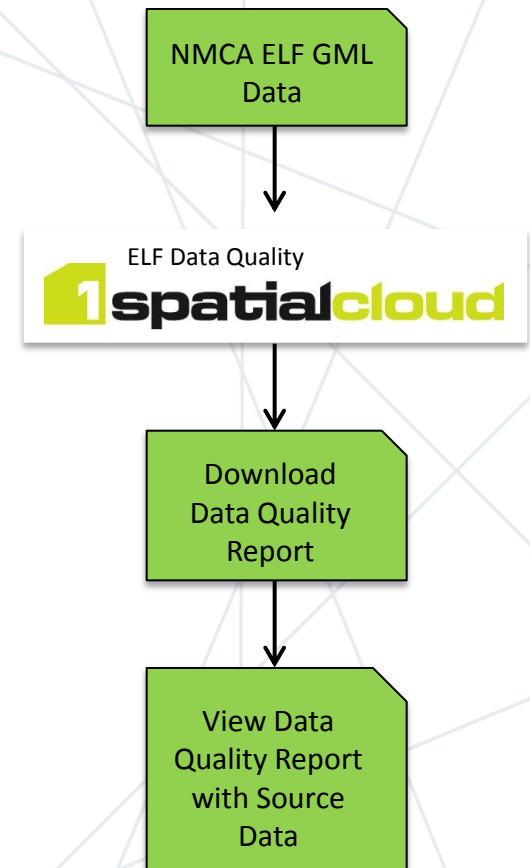
Preview Sample Size: 3 Update Preview Validate Preview

Data Quality Validation tool (1Spatial):

- ★ 1Spatial Cloud is an easy to use Commercial Off The Shelf (COTS) application in the cloud
- ★ Enables ELF partners to provide authoritative, accurate and harmonized data to the project
- ★ Preconfigured data quality tool to enable users to validate and accredited their data against the ELF data quality rules
- ★ No deployment, set-up or infrastructure costs
- ★ Compatible with ELF geotools exchange format

4 Easy Steps to Data Quality

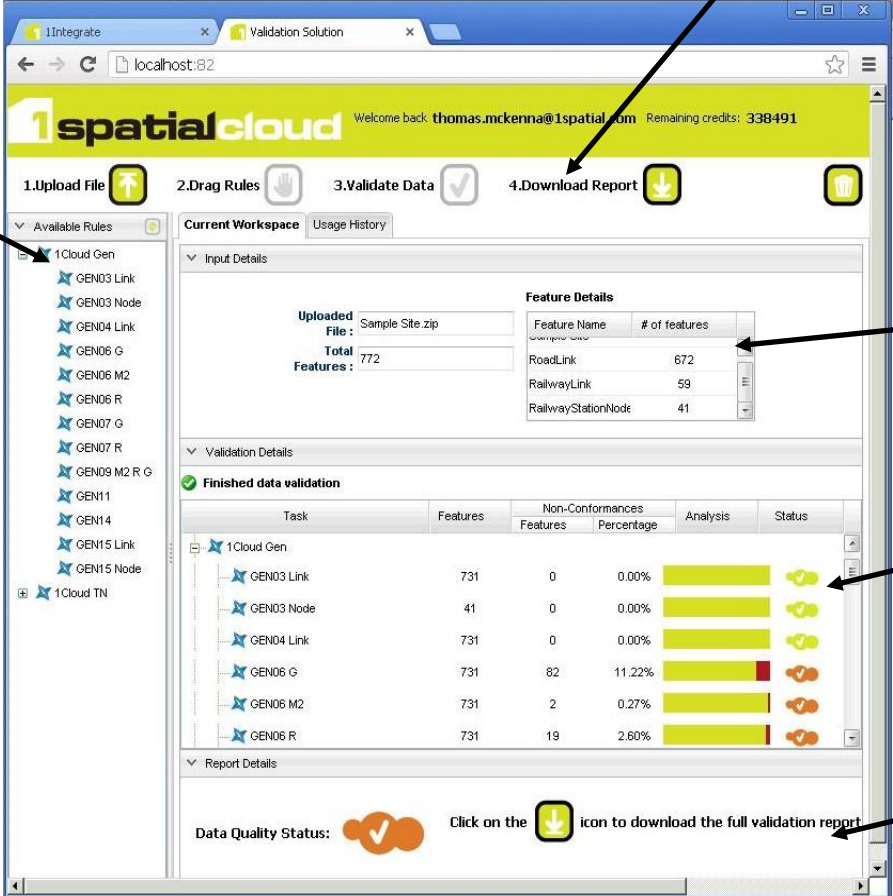
- ★ Uploads ELF compliant GML files
 - ★ Select the zipped GML files for importing and select upload
- ★ Start the validation
 - ★ Select the ELF Data Quality Rule-set and press Validate
- ★ Review Data Quality Report
 - ★ Quality metrics reported in progress panel
 - ★ Data Quality report available to download
- ★ Reviewing results using your chosen GIS editor/browser.



1SpatialCloud

★ The site has five main panels:

1. Action panel, has buttons that control the validation process
2. Available Rule panel, contains a tree of the available rules sets
3. Input Details panel, summarizes the data that is being validated
4. Progress panel, shows validation process progress and results
5. Report Details panel, allows user to download detailed results as a Shape file



The screenshot shows the 1SpatialCloud web application interface. The top navigation bar includes the 1SpatialCloud logo, a welcome message for 'thomas.mckenna@1spatial.com', and 'Remaining credits: 338491'. Below the navigation bar are five main panels, each with a numbered callout:

- 1. Action panel:** Contains buttons for '1.Upload File', '2.Drag Rules', '3.Validate Data', and '4.Download Report'.
- 2. Available Rule panel:** A tree view showing available rules sets, including '1Cloud Gen', 'GEN03 Link', 'GEN03 Node', 'GEN04 Link', 'GEN06 G', 'GEN06 M2', 'GEN06 R', 'GEN07 G', 'GEN07 R', 'GEN09 M2 R G', 'GEN11', 'GEN14', 'GEN15 Link', 'GEN15 Node', and '1Cloud TN'.
- 3. Input Details panel:** Displays 'Uploaded File: Sample Site.zip' and 'Total Features: 772'. It also includes a 'Feature Details' table:

Feature Name	# of features
RoadLink	672
RailwayLink	59
RailwayStationNode	41

- 4. Progress panel:** Shows 'Finished data validation' and a table of validation results:

Task	Features	Non-Conformances	Percentage	Analysis	Status
1Cloud Gen					
GEN03 Link	731	0	0.00%		✓
GEN03 Node	41	0	0.00%		✓
GEN04 Link	731	0	0.00%		✓
GEN06 G	731	82	11.22%		✓
GEN06 M2	731	2	0.27%		✓
GEN06 R	731	19	2.60%		✓

- 5. Report Details panel:** Displays 'Data Quality Status' with a green checkmark icon and a button to 'Click on the [Download icon] to download the full validation report'.

Data Quality Validation tool (ESRI):

- ★ Esri ELF software grant
- ★ Pre-configured quality checks for INSPIRE/ELF themes
 - ★ For ArcGIS Data Reviewer – main Esri quality tool.
 - ★ Based on WP2 RuleSpeak.

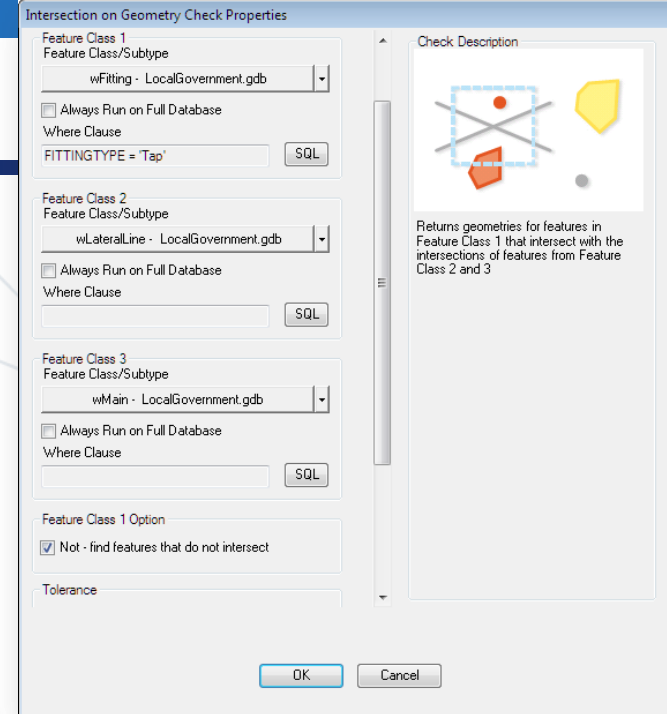
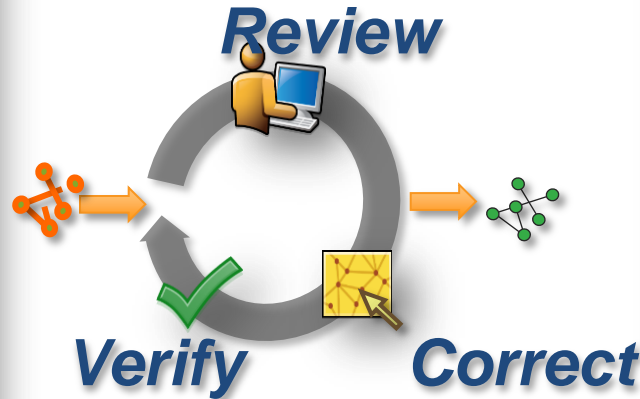
Paul Hardy | Business Development Consultant, Mapping & Cadastre
phardy@esri.com | esri.com | M +44 7525 907 252

esri ArcGIS Data Reviewer Checks



Checks configurable

Many Automated checks



Errors table Integrated

Server Dashboard

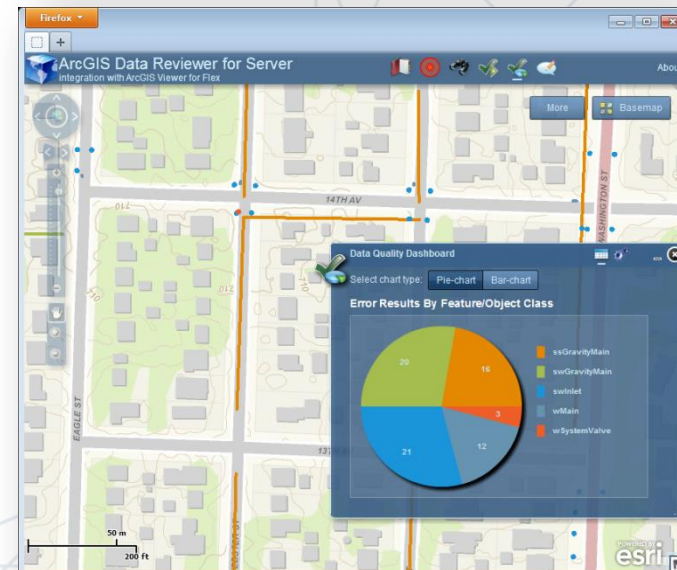
Reviewer Table

General

Drag a column header here to group by that column.

RECORDID	OBJECTID	SESSIONID	CHECKTITLE	ORIGINTABLE	ORIGINCHECK
27626	45622	2	Unique FacilityID Check	swGravityMain	Unique ID Check
27627	45623	2	Unique FacilityID Check	swGravityMain	Unique ID Check
27628	26532	2	Unique FacilityID Check	swGravityMain	Unique ID Check
27629	37445	2	Unique FacilityID Check	swGravityMain	Unique ID Check
27630	45707	2	Unique FacilityID Check	swGravityMain	Unique ID Check
27631	45708	2	Unique FacilityID Check	swGravityMain	Unique ID Check
27632	45709	2	Unique FacilityID Check	swGravityMain	Unique ID Check
27633	45721	2	Unique FacilityID Check	swGravityMain	Unique ID Check
27634	45722	2	Unique FacilityID Check	swGravityMain	Unique ID Check
27635	23491	2	Unique FacilityID Check	swGravityMain	Unique ID Check
27636	37439	2	Unique FacilityID Check	swGravityMain	Unique ID Check
27637	45657	2	Unique FacilityID Check	swGravityMain	Unique ID Check
27638	45658	2	Unique FacilityID Check	swGravityMain	Unique ID Check

27635

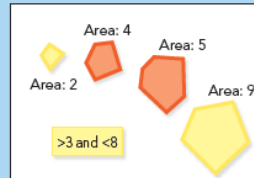


ArcGIS Data Reviewer Checks

Polygon Checks

Evaluate Polygon Perimeter and Area

Searches for polygon, part, ring, or segment features whose area or perimeter is within a specified range



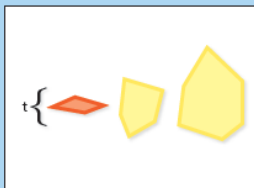
Invalid Hole Feature

Finds features that intersect polygon feature holes



Polygon Sliver

Finds polygons below a specified thinness ratio (t) and optionally whose area is within a specified threshold



Feature on Feature Checks

Geometry on Geometry

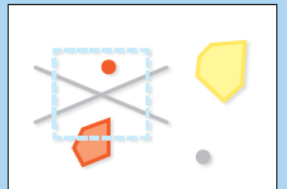
Searches for features from two different feature classes or within the same feature class that spatially interact (e.g., intersect) or are within a tolerance of each other

Comparison to Topology:
Line—Must not overlap, intersect, or overlap with
Polygon—Must not overlap, contain point, or overlap with



Intersection on Geometry

Returns geometries for features in Feature Class 1 that intersect with the intersections from features from Feature Class 2 and 3



Polygon Overlap/Gap Is Sliver

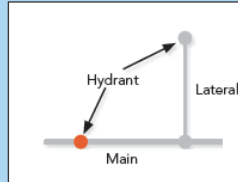
Returns overlap/gap geometries between polygon features from two feature classes that have a thinness ratio beneath a user-specified threshold; optionally requires that the overlap/gap polygons be beneath a maximum area threshold

Comparison to Topology:
Polygon must not have gaps




Database Validation Checks

Connectivity Rules Returns geometries for features that violate the geometric network connectivity rules

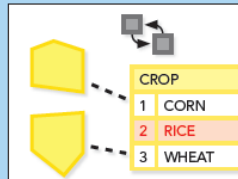


Domain Validates coded value and range domains to ensure that all values meet domain constraints

LAND USE	DESCRIPTION
000	UNCLASSIFIED
AGR	AGRICULTURE
SDP	PLAN
IND	INDUSTRIAL



Relationships Searches for records that are orphans or have improper cardinality in a relationship class



Subtype Searches for feature classes with improper or null subtypes

SUBTYPES	Subtype=0
1 HIGHWAYS	
2 MAJOR ROAD	
3 LOCAL STREETS	
4 ALLEY	


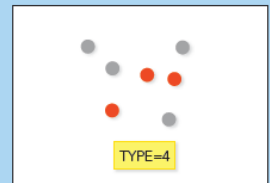


Table Checks

Execute SQL Finds features based on a SQL query WHERE clause



Regular Expression Finds features with attribute values that violate the regular expression

FIELD	REGULAR EXPRESSION	YEAR
YEAR	(19/20)\D\D	1805
		1972
		2005
		200A

Table to Table Attribute Returns rows whose attributes match those of a feature class or table and/or comply with a user-defined WHERE clause comparing the attributes between feature classes and/or tables

FEATURE	CLASS	SCALE
OID	SCALE	
1	10,000	20,000
2	20,000	30,000
3	10,000	
4	30,000	

Unique ID Checks the values of a set of fields across a set of tables and feature classes for uniqueness within a given workspace

FEATURE CLASS 1	FEATURE CLASS 2
7 25	
8 18	1 36
9 18	2 21
	3 18

Data Reviewer – Manually trigger checks

Italy_AdminUnits_PGH1.mxd - ArcMap

File Edit View Bookmarks Insert Selection Geoprocessing Customize Windows Help

Labeling Fast Editor

1:819

Data Reviewer

Data Reviewer Cutbacks Check (auAdmBoundaryL)

Browse Features

1 of 1

Write All

☒ Zoom to feature ☐ Flash feature

Layer
auAdmBoundaryL

Browse By Part

All of 11

Switch to Data Reviewer Results

Select All Clear All Refresh

Description
Feature from Map Selection

Reviewer Table

General

Drag a column header here to group by that column.

Phase	Status	Source	Source Subtype	ID	Check Title	Check Notes	Severity	Description	Created On	Created By	Corrected On	Correction Notes	Corrected By	Verified
	Reviewed	auAdmBoundaryL		359	Cutbacks Check (auAdmBoundaryL)		5	Cutback Error	21 November 2014 12:11:37	phardy	<Null>	<Null>	<Null>	<Null>
	Reviewed	auAdmBoundaryL		23988	Cutbacks Check (auAdmBoundaryL)		5	Cutback Error	21 November 2014 12:11:37	phardy	<Null>	<Null>	<Null>	<Null>

Notepad

Representation Drawing

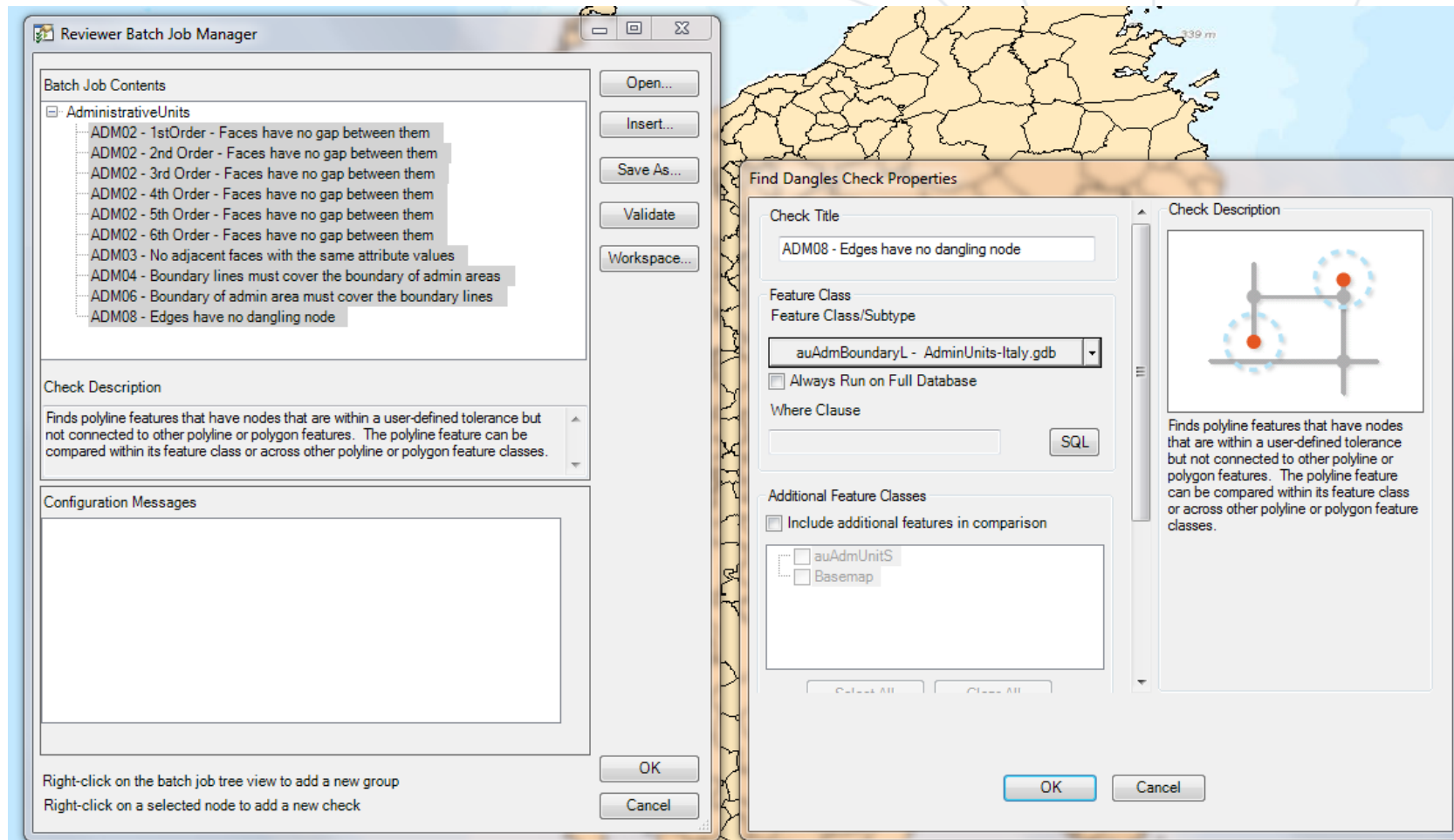
8.419 39.266 Decimal Degrees

RuleSpeak to Reviewer Check

Microsoft Excel - D2 3 6_Quality_RegionalGlobal_v0 1-sanitized.xls [Compatibility Mode]							
	A	B	C	D	E	F	G
1	RuleID	Quality Element	Feature type	RuleSpeak rule	DR Check/ ArcToolbox	Regional	Global
2	HYD01	completeness commission	Island	The area of a surface feature must be equal or greater than the target area size .	Evaluate Polygon Perimeter and Area	target area size = 0,4km²	Target area size = 3km²
3	HYD02	completeness commission	Wetland	The area of a surface feature must be equal or greater than the target area size .	Evaluate Polygon Perimeter and Area	target area size = 0,4km²	(not included in global)
4	HYD03	completeness commission	StandingWater	The area of a surface feature must be equal or greater than the target area size .	Evaluate Polygon Perimeter and Area	target area size = 0,4km²	Target area size = 0,5km²
5	HYD04	Completeness Omission	SeaArea, Shore, StandingWater LandWaterBoundary, DamOrWeir, Watercourse, Wetland, Island, WatercourseLink, HydroNode WatercourseLinkSequence	A feature type that is not voidable must be included in the data set.	Schema Compare Tool		(Feature type Wetland not included)
6	HYD05	Logical consistency topological consistency	HydrogeologicalObjectNatural (voidable), DamOrWeir, PumpingStation (voidable), Lock (voidable), Watercourse, WatercourseLink	A point feature must be connected to a Watercourse line feature or WatercourseLink	Geometry on Geometry		(Feature type Pumpingstation not included)
7	HYD06	Logical consistency conceptual consistency?	Watercourse	A surface feature must have a average width equal or larger than the minimum width	Execute SQL: [Width] ≥ 125m	the minimum width= 125m	the minimum width= 500m
8	HYD07	Logical consistency topological consistency	Lock, DamOrWeir Watercourse StandingWater	A line feature of Lock and DamOrWeir must lie on the boundary of a Watercourse surface feature or of StandingWater surface feature	Geometry on Geometry		(Feature type Lock not included)
9	HYD08	Logical consistency topological consistency	Lock, DamOrWeir Watercourse	A point feature of Lock and DamOrWeir must lie on the endpoint of a Watercourse line feature	Geometry on Geometry		(Feature type Lock not included)
10	HYD09	Logical consistency topological consistency	Watercourse WatercourseLink	A Watercourse surface feature must contain at least one WatercourseLink if all of the following are true: it has at least one ingoing watercourse it has at least one outgoing watercourse	Geometry on Geometry/Composite		
11	HYD10	Logical consistency topological consistency	StandingWater WatercourseLink	A StandingWater surface feature must contain at least one WatercourseLink if all of the following are true: it has at least one ingoing watercourse it has at least one outgoing watercourse	Geometry on Geometry/Composite		
12	HYD11	Logical consistency topological consistency	Wetland WatercourseLink	A Wetland surface feature must contain at least one WatercourseLink if all of the following are true: it has at least one ingoing watercourse it has at least one outgoing watercourse	Geometry on Geometry/Composite	(applies only to regional LoD)	(Feature type wetland not included)
13	HYD12	Logical consistency topological consistency	ShorelineConstruction (voidable), StandingWater, LandWaterBoundary, Falls (voidable), Embankment (voidable), DamOrWeir, PumpingStation (voidable), Watercourse, WatercourseLink, Crossing (voidable) WatercourseLinkSequence, WatercourseSeparateCrossing (voidable), Lock (voidable)	If two or more line features intersect or touch there must be a node	Topology Rules: Must Not Have Pseudo Nodes		(Feature type Falls, Embankment, PumpingStation, Crossing, Lock not included)
			HydrogeologicalObjectNatural (voidable), Falls (voidable), Embankment (voidable), DamOrWeir,	A point feature must not be inside one of the following: StandingWater			(Feature type Falls,

Data Reviewer - Batch Job Manager

- ★ Design Batch Jobs in Batch Job Manager
- ★ Run job manually or automatically



More information

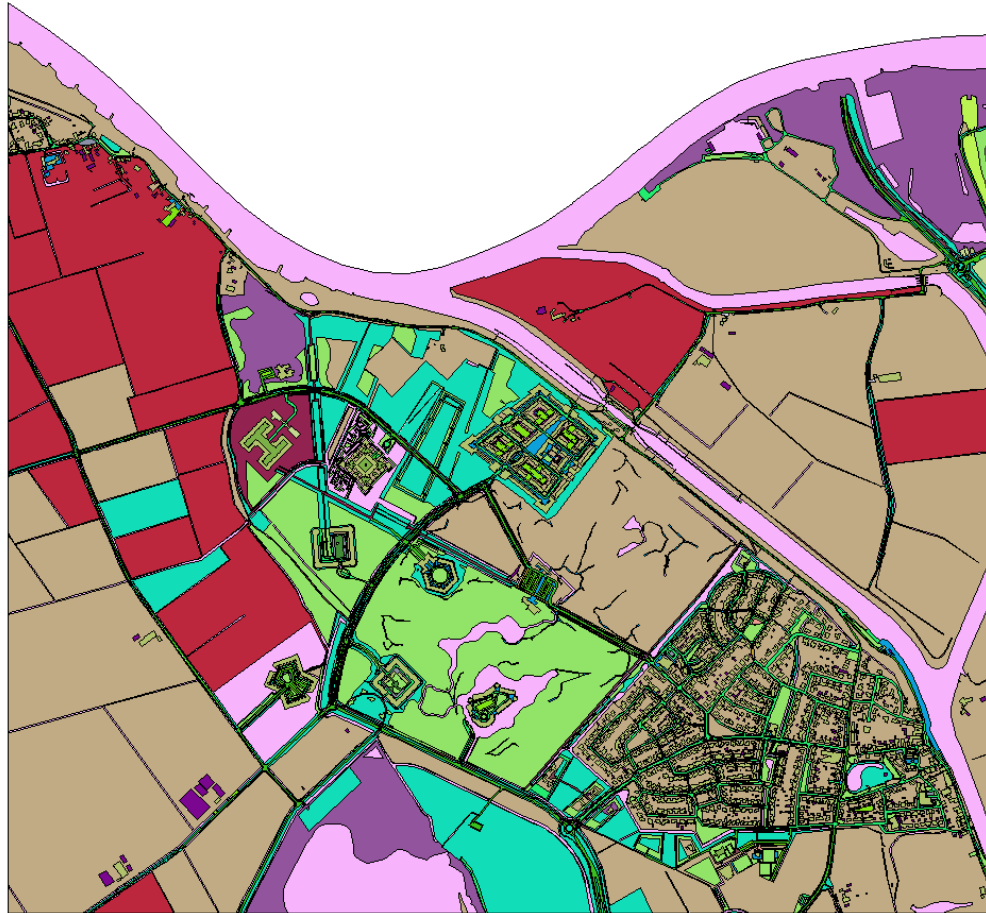
- ★ ArcGIS Data Reviewer pages
- ★ <http://www.esri.com/software/arcgis/extensions/arcgis-data-reviewer>
- ★ <http://www.esri.com/software/arcgis/extensions/arcgis-data-reviewer/key-features>
- ★ <http://desktop.arcgis.com/en/desktop/latest/guide-books/extensions/data-reviewer/what-is-data-reviewer.htm>
- ★ <http://desktop.arcgis.com/en/desktop/latest/guide-books/extensions/data-reviewer/a-quick-tour-of-data-reviewer.htm>
- ★ To take up the ELF Esri software grant, email Nick Land nland@esri.com.

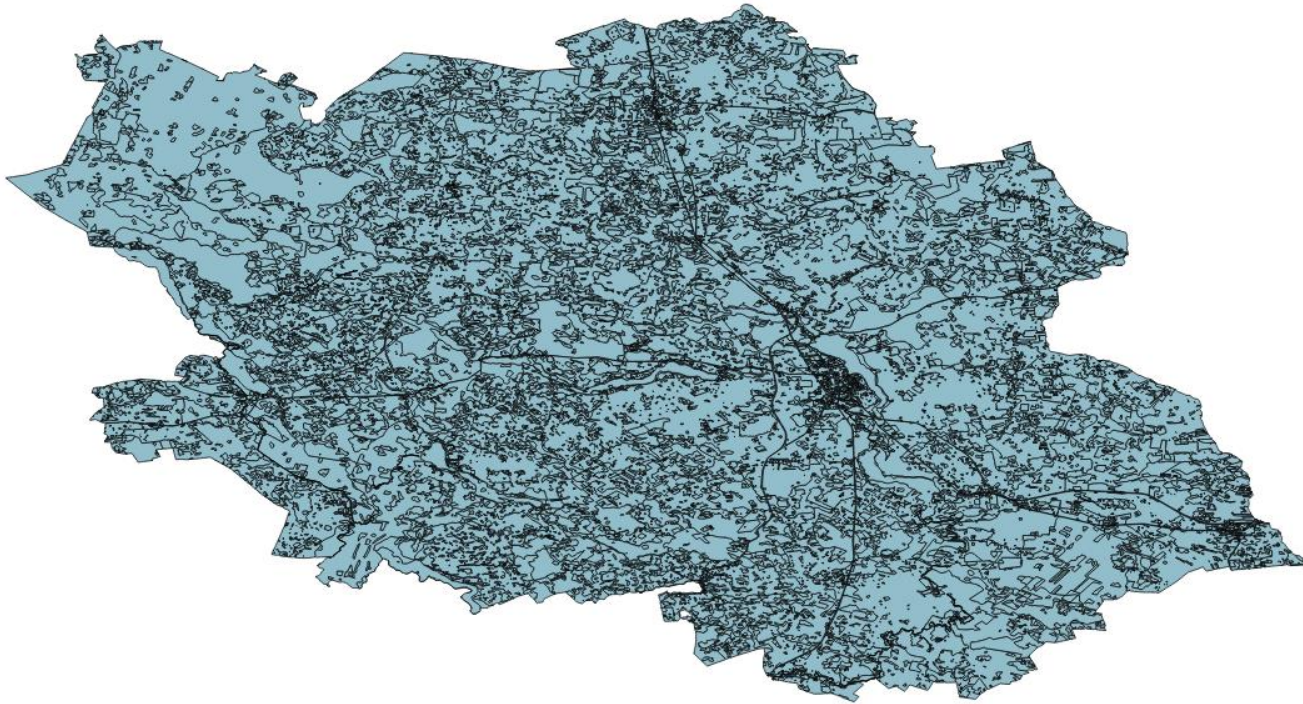
PPrepair: Geometric data quality & edge- matching



What does it do?

Gaps and overlaps in GIS datasets are detected and automatically repaired

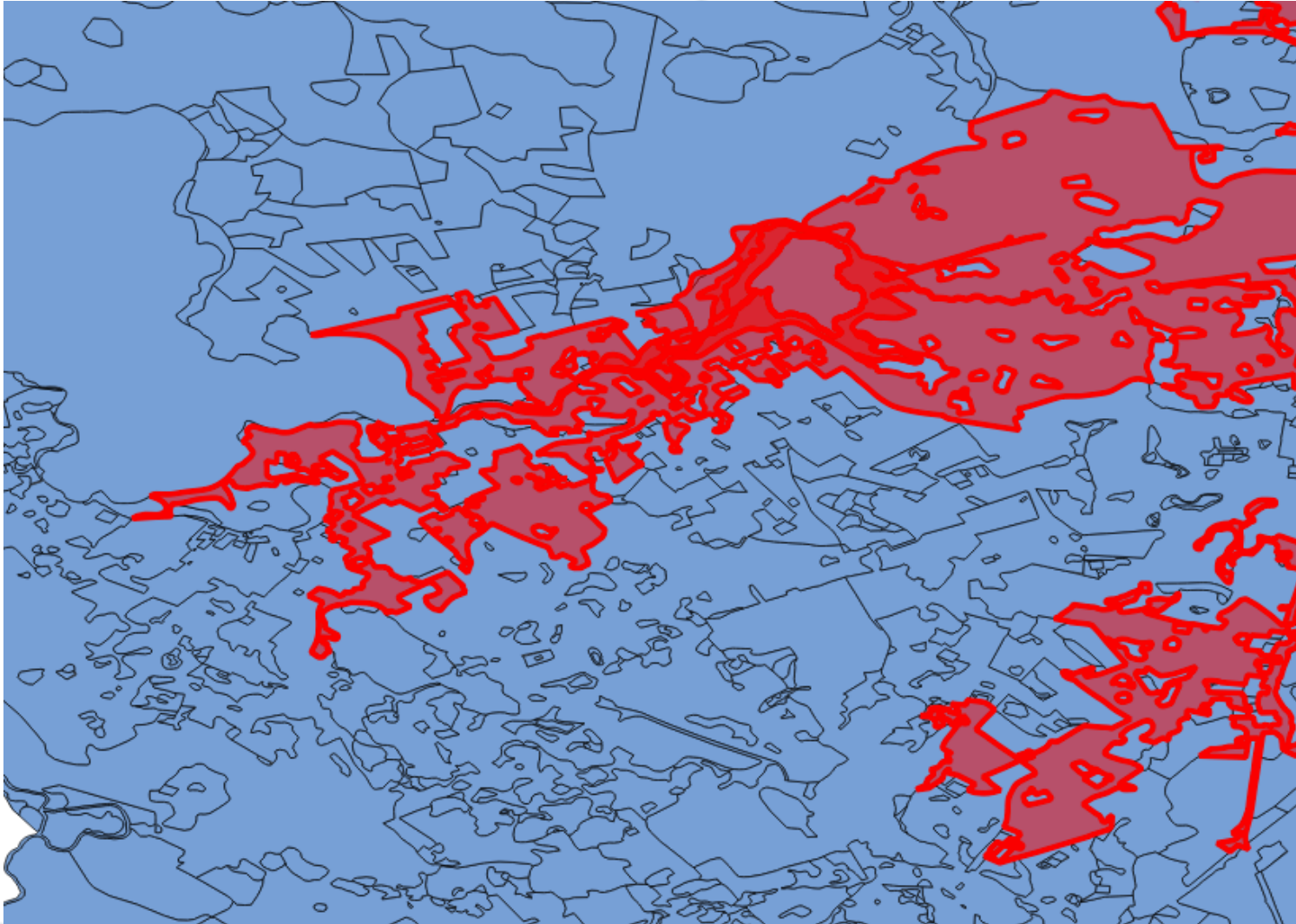




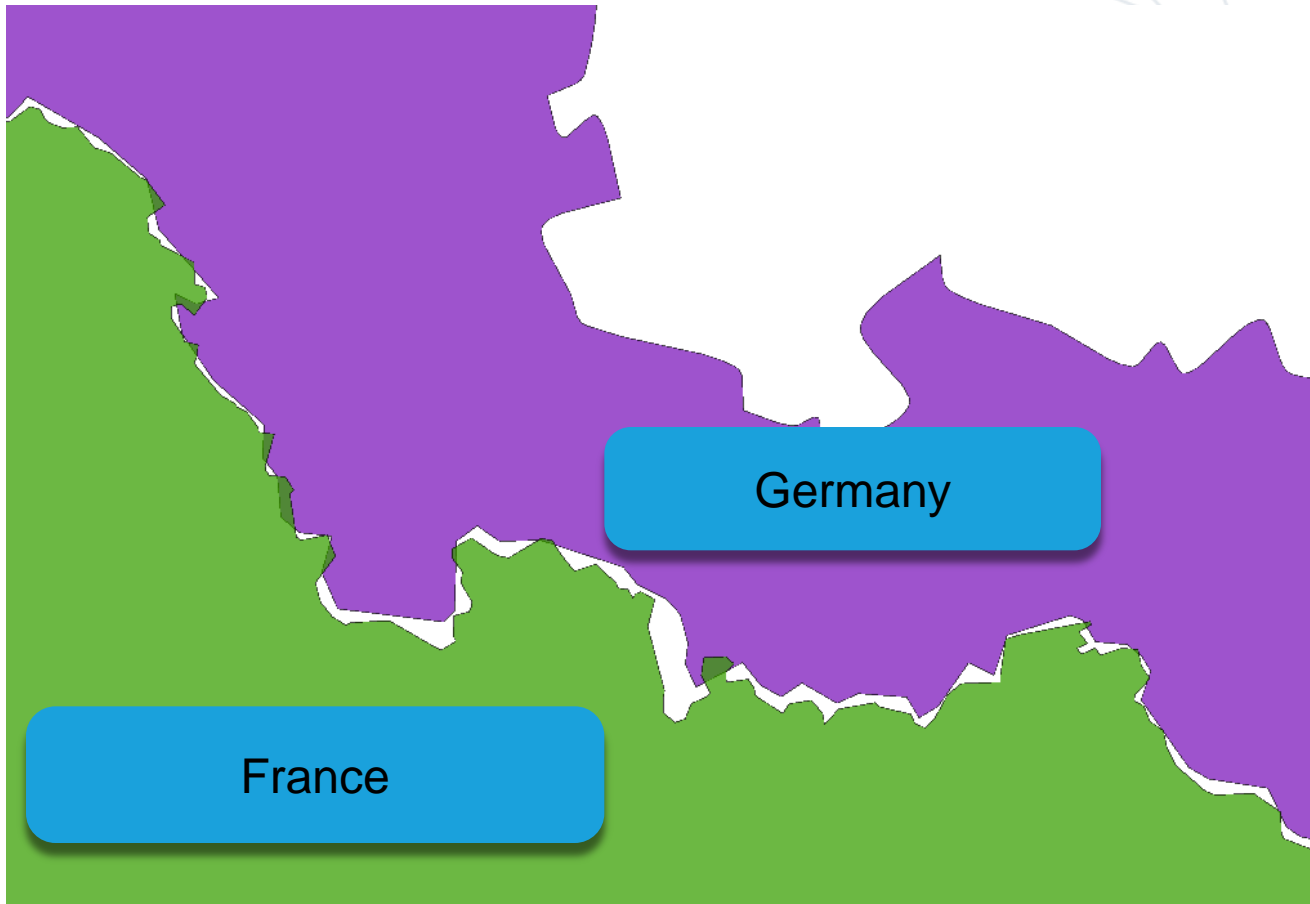
red = overlap between polygons



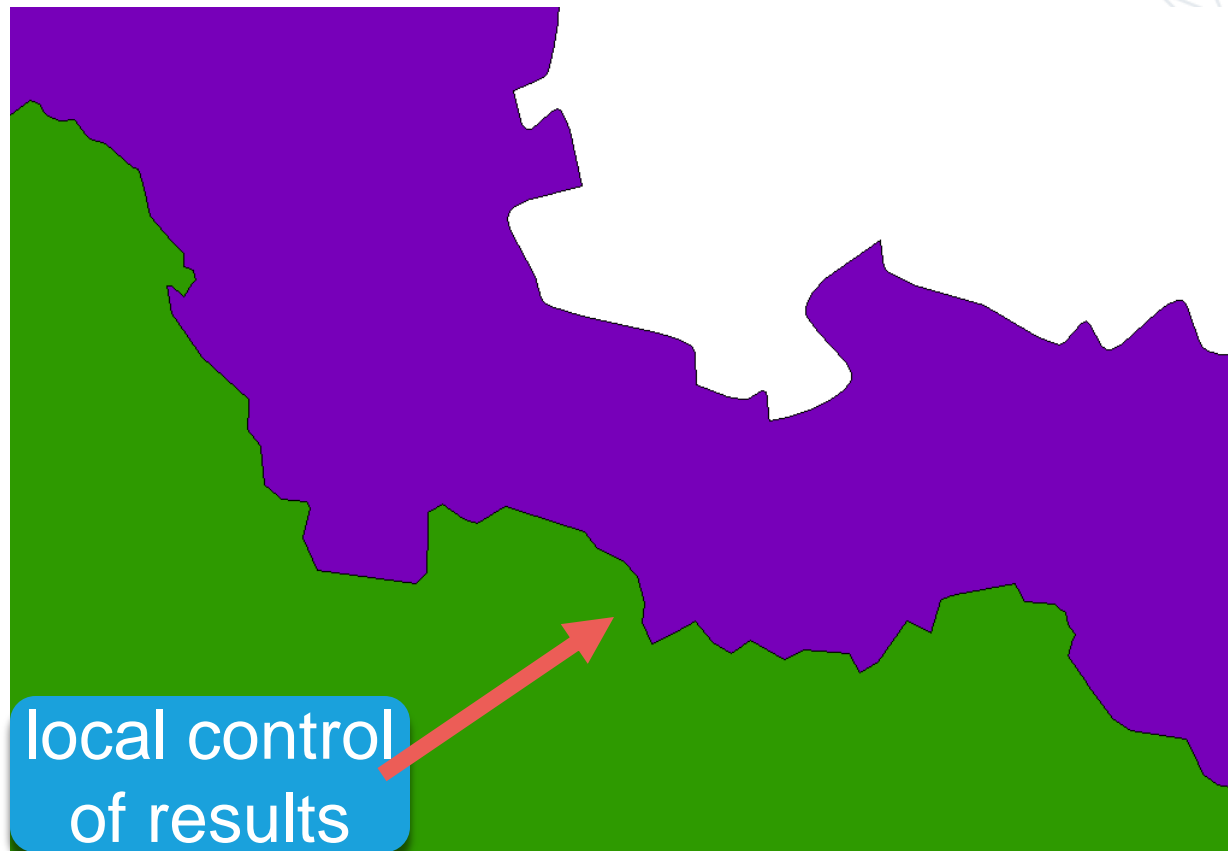
Tested with ELF dataset



Edge-matching uses same principle



Edge-matching uses same principle



More information and download PPrepair?

<https://github.com/tudelft3d/pprepair>

It is free and open-source software (GPLv3 licence)

- ★ Works with *shapefiles* and GML input (ELF data need more testing)
- ★ Windows app will be released soon (only Mac/Linux at this moment)

Edge matching tool (ESRI)

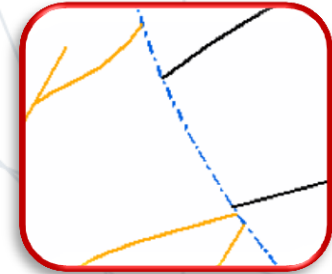
ESRI Conflation Tools for ELF

★ Conflation and edgematch toolset











- ★ New in ArcGIS 10.2.1 – better in 10.3 (now out)
- ★ Tools match two datasets

★ Edgematch tools

- ★ Will move one or both ends
- ★ Currently line features only



ArcToolbox

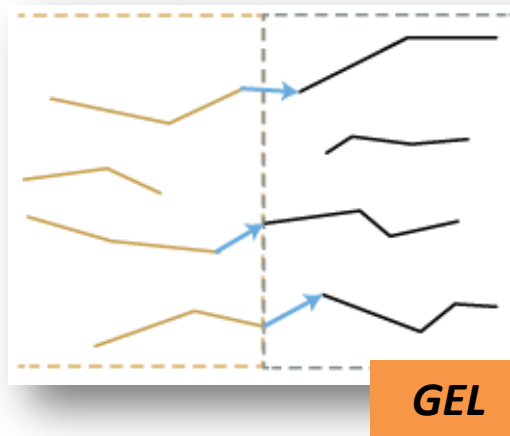
-  Data Management Tools
 -  Data Comparison
 -  Detect Feature Changes
-  Editing Tools
 -  Conflation
 -  Edgematch Features
 -  Generate Edgematch Links
 -  Generate Rubbersheet Links
 -  Rubbersheet Features
 -  Transfer Attributes

Edgematching of adjacent datasets

- ★ Based on proximity, topology, and continuity analysis, as well as attributes

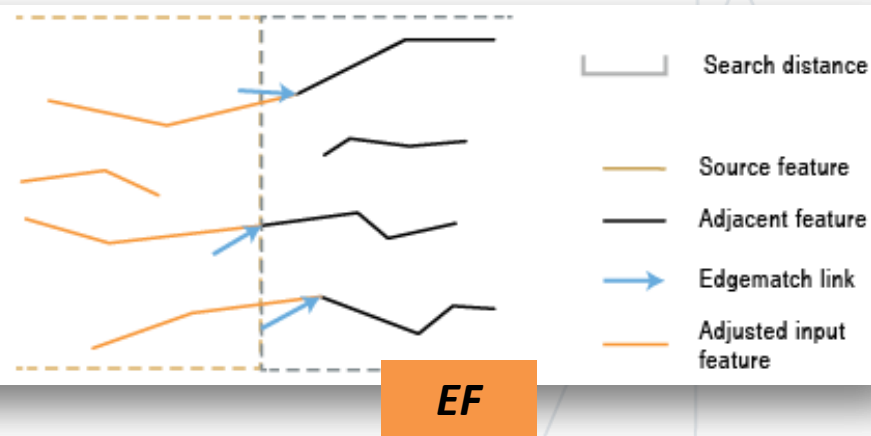
Generate Edgematch Links (GEL)

- ❖ From source features to adjacent features

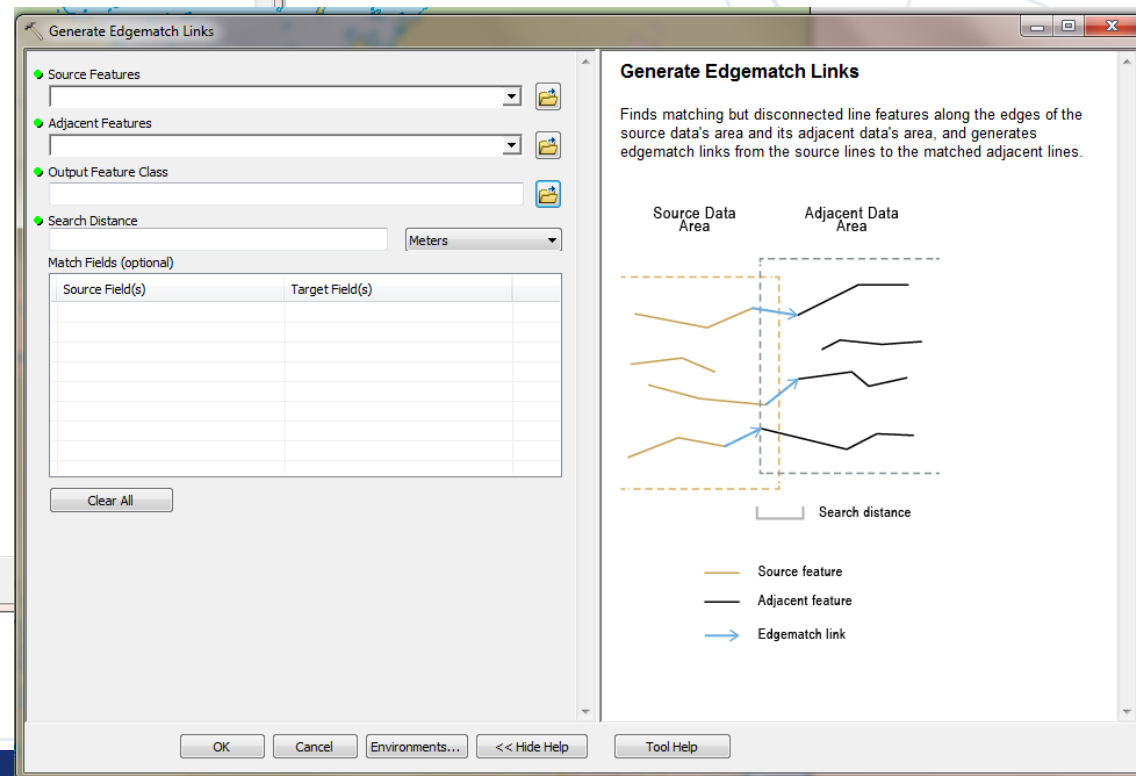
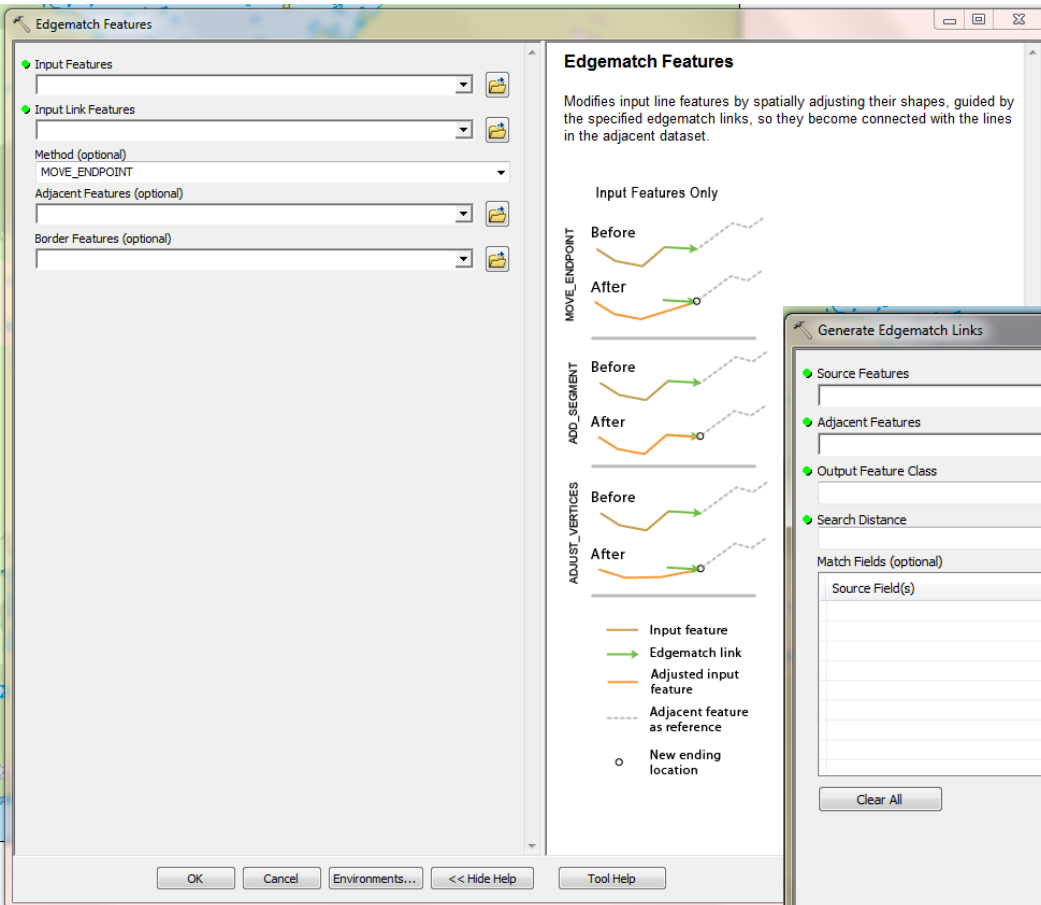


Followed by Edgematch Features (EF)

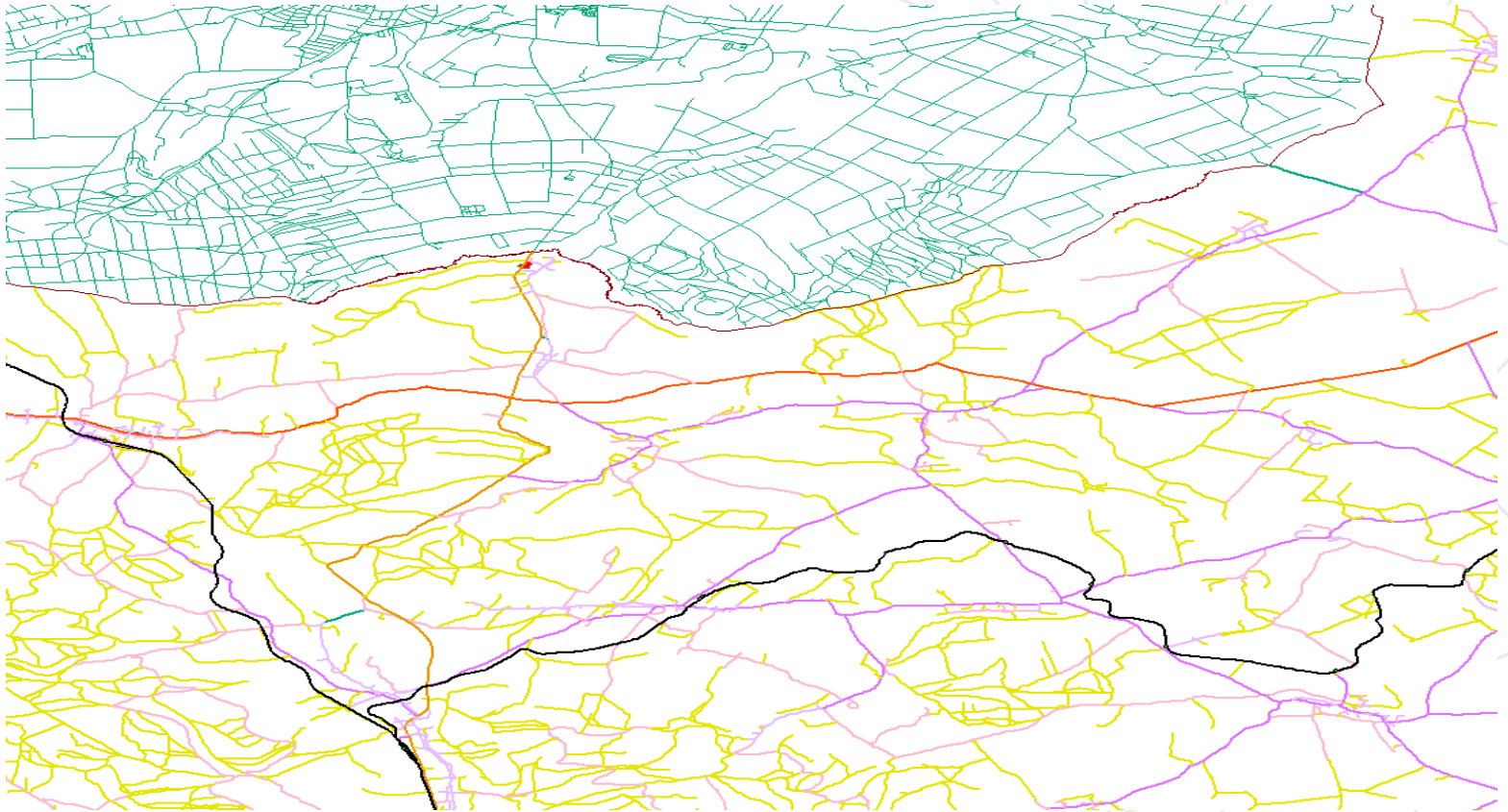
- ❖ Connects features guided by the established links



Edgematch geoprocessing tools



Initial Poland-Czech transport theme test



Norway-Sweden Tests

NO-SE_HY_ETRS89_PGH1.mxd - ArcMap

File Edit View Bookmarks Insert Selection Geoprocessing Customize Windows Help

1:765,347

Editor

Labeling

Fast

Add INSPIRE Layer

Snapping

Table

Results

Table Of Contents

GEL_NO_SE_2

OBJECTID	SHAPE	SRC_FID	TGT_FID	EM_CONF	SH
1	Polyline	102	4162	100	
2	Polyline	1184	4983	100	
3	Polyline	1427	7038	100	
4	Polyline	1645	15292	100	
5	Polyline	1726	5883	100	
6	Polyline	2150	6138	100	
7	Polyline	2225	752	100	
8	Polyline	2284	5943	100	
9	Polyline	2383	15194	100	
10	Polyline	2428	7842	100	
11	Polyline	2487	15540	100	
12	Polyline	2522	12145	100	
13	Polyline	2704	12616	100	
14	Polyline	2861	2340	100	
15	Polyline	2937	14798	100	
16	Polyline	2968	16181	100	
17	Polyline	3024	2974	100	
18	Polyline	3065	3308	100	
19	Polyline	3127	4071	100	
20	Polyline	3155	12870	100	
21	Polyline	3266	5893	100	

2 Gen Edgematch Links NO-SE

Model Edit Insert View Windows Help

SE_HY_ETR S89_WL

ERM_NO_H Y_ETRS89_WL

Links FC GEL_NO_SE_2

Delete

Delete succeed

Generate Edgematch Links

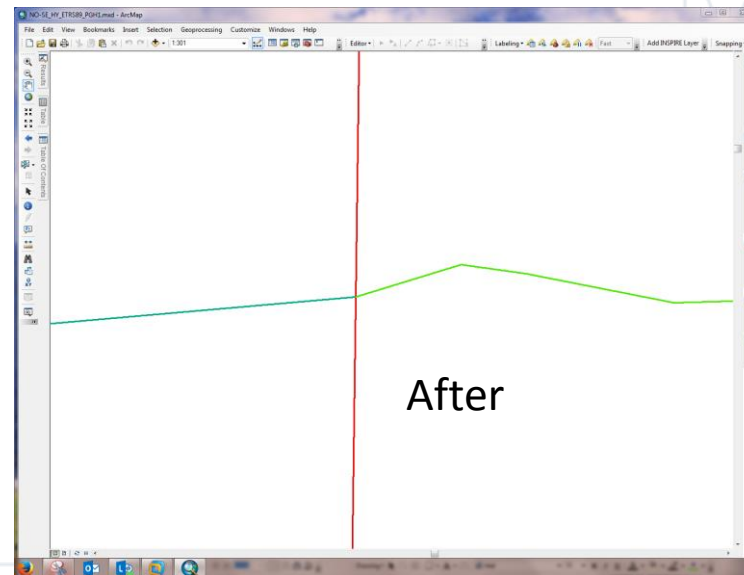
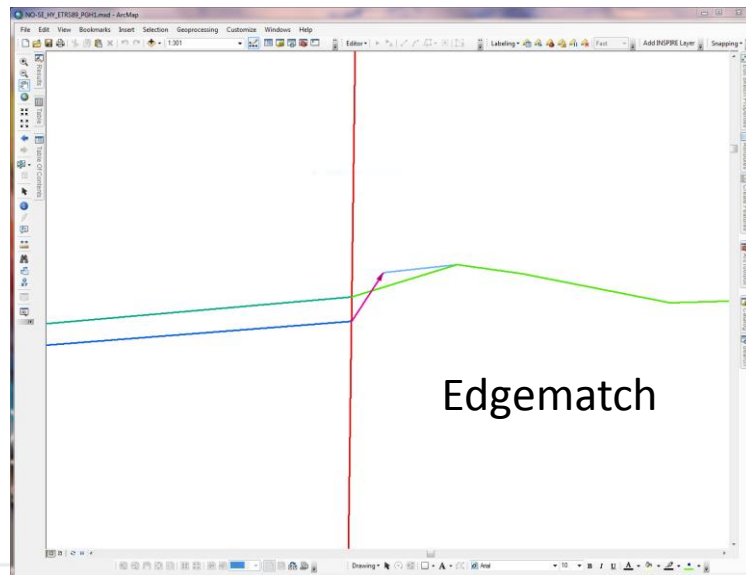
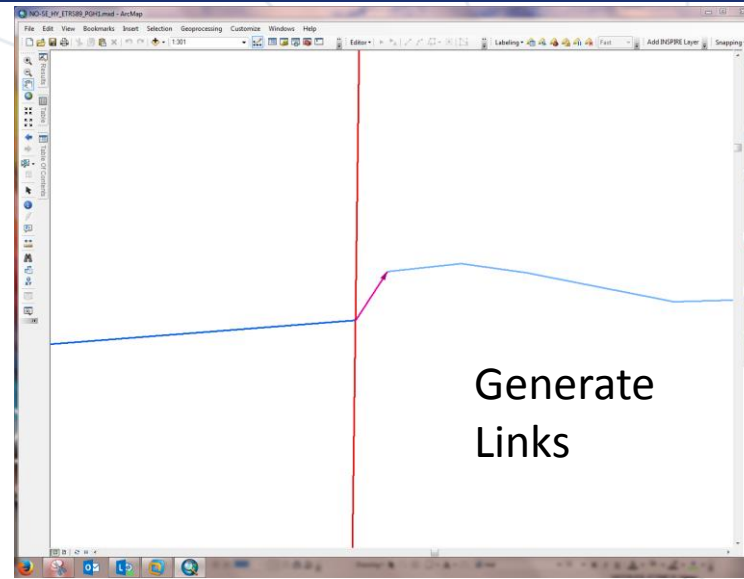
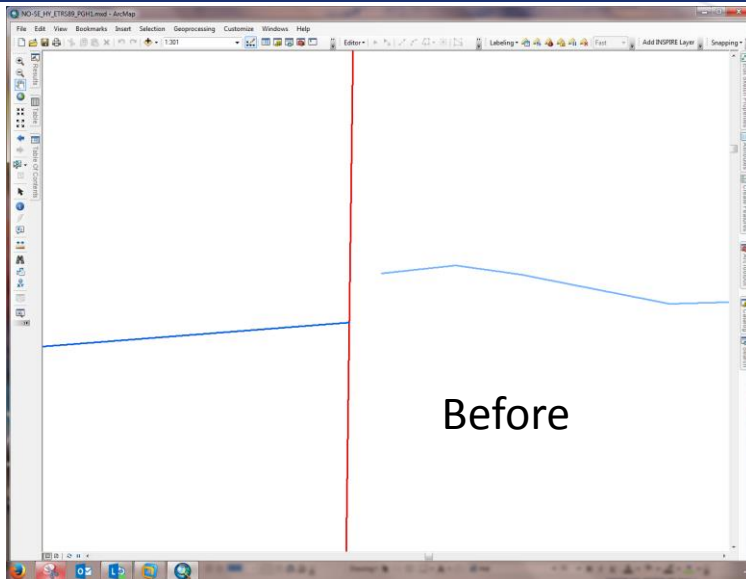
GEL_NO_SE_2

P

ArcToolbox

- 3D Analyst Tools
- Analysis Tools
- Cartography Tools
- Conversion Tools
- Coverage Tools
- Data Interoperability Tools
- Data Management Tools
- Data Reviewer Tools
- Edgematch_Nordic
 - 1 Copy Before Edgematch
 - 2 Gen Edgematch Links NO-SE
 - 3 Edgematch NO-SE
- Editing Tools
 - Conflation
 - Edgematch Features
 - Generate Edgematch Links
 - Generate Rubbersheet Links
 - Rubbersheet Features
 - Transfer Attributes
 - Densify
 - Erase Point
 - Extend Line
 - Flip Line
 - Generalize
 - Snap
 - Trim Line
- Geocoding Tools
- Geostatistical Analyst Tools
- Linear Referencing Tools
- Multidimension Tools
- Network Analyst Tools
- Parcel Fabric Tools
- Schematics Tools
- Server Tools
- Space Time Pattern Mining Tools
- Spatial Analyst Tools
- Spatial Statistics Tools
- Tracking Analyst Tools

Norway-Sweden Tests

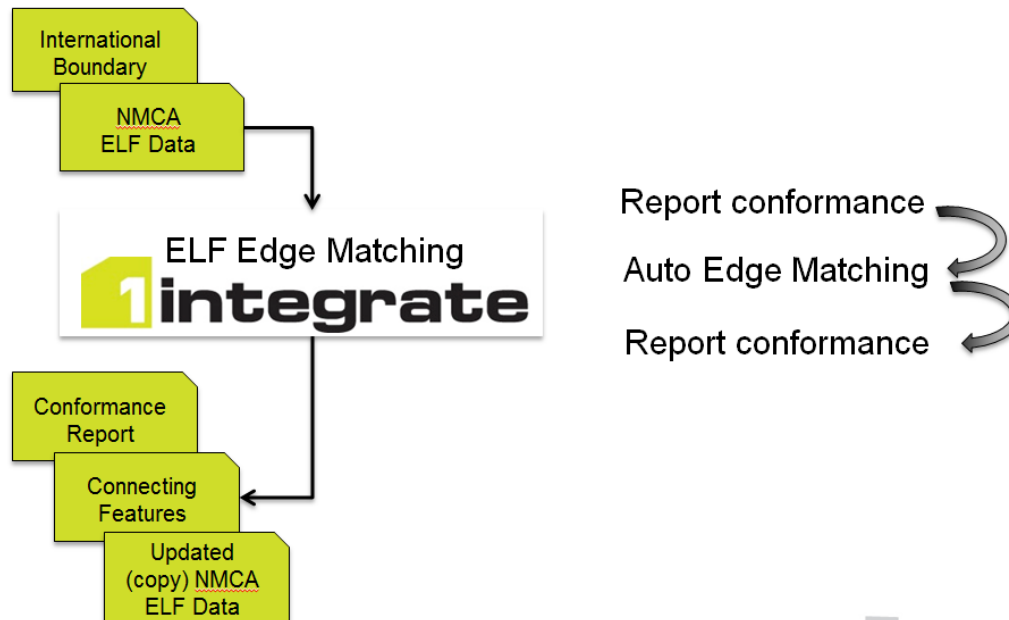


More information

- ★ <https://pro.arcgis.com/en/pro-app/tool-reference/editing/an-overview-of-the-conflation-toolset.htm>
- ★ <https://pro.arcgis.com/en/pro-app/tool-reference/editing/about-edgematching.htm>
- ★ <https://pro.arcgis.com/en/pro-app/tool-reference/editing/edgematch-features.htm>
- ★ To take up the ELF Esri software grant, email Nick Land nland@esri.com.

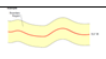
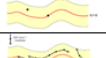

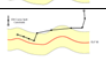
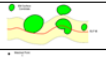
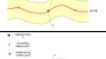


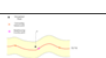
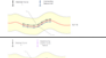



Edge Matching tool (1Spatial)

- ★ 1Spatial ELF Edge-Matching is provided via 1Integrate
- ★ 1Integrate is a Commercial Off The Shelf (COTS) product designed for automatic change update, data engineering, data migration or data transformation tasks.
- ★ Preconfigured ELF ruleset for each of the three edge-matching scenarios



Edge-Matching Rulesets

- ★ Preconfigured rules sets
- ★ The Edge-Matching evaluation rules check the conformance of the data along the international boundary
- ★ The ELF actions will automatically edge-match data and automatically create/modify the connecting features as defined in the requirements.

Evaluation Rules		Image
EM.Evaluation.1	A Boundary Region must be computed as a surface around the ELF IB with the following buffer width: Master LoD: 10 m; Regional LoD: 25 m.	
EM.Evaluation.2	An EM Point Feature must be considered an 'EM Point Candidate' if it intersects the Boundary Region.	
EM.Evaluation.3.1	An EM Curve Feature L must be considered an 'EM Curve 1 Candidate' if L is within the Boundary Region.	
EM.Evaluation.3.2	An EM Curve Feature L must be considered an 'EM Curve 2 Candidate' if all the following are true: The boundary of L intersects the Boundary Region The interior of L does not intersect the Boundary Region.	
EM.Evaluation.3.3	An EM Curve Feature L must be considered an 'EM Curve Split Candidate' if all the following are true: L intersects the Boundary Region, L is not an EM Curve 1 Candidate, L is not an EM Curve 2 Candidate.	
EM.Evaluation.4	An EM Surface Feature must be considered an 'EM Surface Candidate' if it intersects the Boundary Region.	
EM.Evaluation.5.1	An EM Point Candidate P must be considered a 'Matched Point 1' if all the following are true: P intersects a connecting feature point CP, CP.featureType contains the feature type of P.	
EM.Evaluation.5.2	An EM Point Candidate P must be considered a 'Matched Point 2' if all the following are true: P is not a Matched Point 1, P intersects the ELF IB, P intersects a Neighbouring Country point feature Q, Q has the same feature type as P.	
EM.Evaluation.5.3	An EM Point Candidate P must be considered a 'Matched Point 3' if all the following are true: P is not a Matched Point 1, P is not a Matched Point 2, P intersects the ELF IB, There is no Neighbouring Country point feature Q such that all the following are true: Q is within the following distance of P: Master LoD: 20 m, Regional LoD: 50 m, Q has the same type as P.	
EM.Evaluation.5.4	An EM Point Candidate P must be considered an 'Unmatched Point' if all the following are true: P is not a Matched Point 1, P is not a Matched Point 2, P is not a Matched Point 3.	
EM.Evaluation.6.1	An EM Curve 1 Candidate L must be considered a 'Matched Curve 1' if all the following are true: The geometry of L coincides with the geometry of a connecting feature line CL, CL.featureType contains the feature type of L.	
EM.Evaluation.6.2	An EM Curve 1 Candidate L must be considered a 'Matched Curve 2' if all the following are true: L is not a Matched Curve 1, L is within the ELF IB, The geometry of L coincides with the geometry of a Neighbouring Country curve feature Q, Q has the same feature type as L.	
EM.Evaluation.6.3	An EM Curve 1 Candidate L must be considered a 'Matched Curve 3' if all the following are true: L is not a Matched Curve 1, L is not a Matched Curve 2.	

Generalisation tools:

- ★ Delivery month 24.
- ★ Generalisation rules (together with WP 2) have been finished and configured in the tools.
- ★ Generalisation tool for Regional to Global has been developed by IGN France.
- ★ Generalisation tools for Master level 1 to 2 have been developed by Esri/Kadaster Netherlands and 1Spatial.
- ★ A cartographic generalisation tool has been developed by Delft University called Varioscale.

- ★ 1spatial has developed the tool 1Generalise.
- ★ Esri/Kadaster Netherlands have developed their Generalisation tool based on ArcGIS.

- ★ First versions of the Generalisation tools have been delivered. Next versions will follow after tests and use within NMCA's.

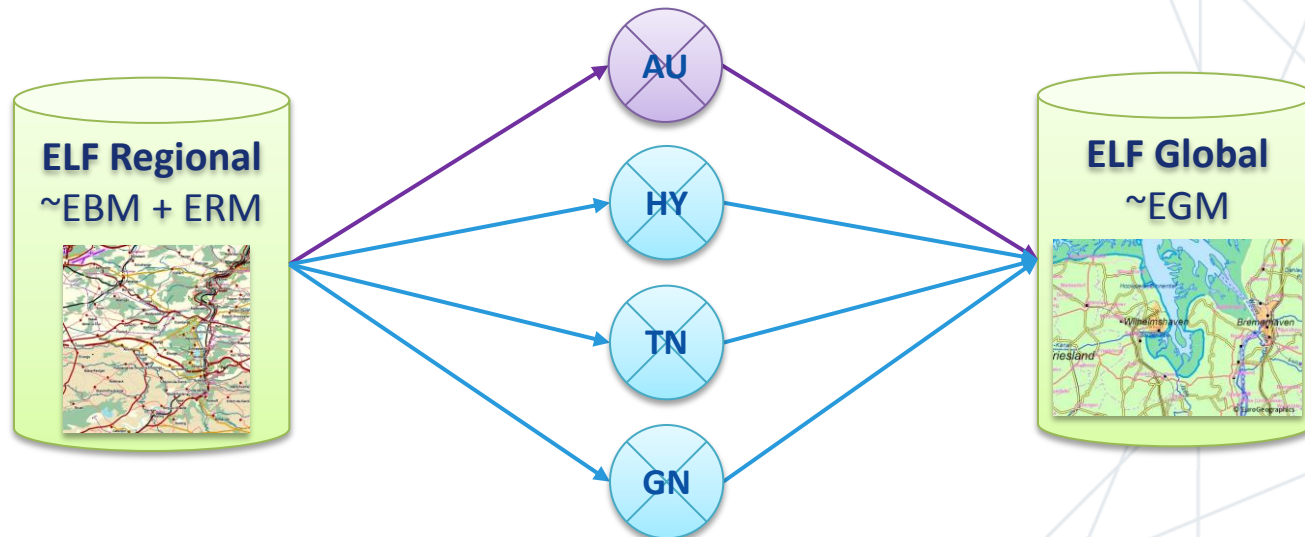
- ★ Webinars on Generalisation tools have to be planned.

Regional → Global generalization tool (IGN France)

★ **Purpose:** automatically generalize data from ELF Regional to Global level for:





- Administrative units
- Transport network
- Hydrography
- Geographical names (settlements)

★ One sub-tool for each theme:



Only the ELF feature/data types which correspond to existing EGM data are covered by the tools.

Technical characteristics of the tools for each theme

	AU tool	HY, TN and GN tools
Input/output data format	Shapefiles 	PostgreSQL database 
Implementation language	Python with ArcGis 	C++ with internal IGNF libraries 
Constraint	<p>Only input data in a flattened structure can be processed. The output data model will also be flat. Complex GML data cannot be used nor created.</p>	

NB: the difference in data formats and languages is due to the fact that the work in ELF was based on existing tools which had to answer to different technical constraints.

Overview of the generalization process

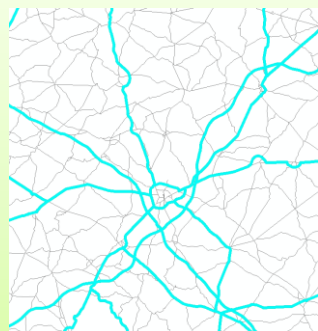
- ★ Parameters can be defined country by country for each of the 4 tools via xml or text files

```
63 <COUNTRY>
64   <PROCESSED>TRUE</PROCESSED>
65   <CODE>CH</CODE>
66   <SELECTION_SQL>
67     <SQL>(f_code = 'AP030' and rtt in (16,14,15,0)and tuc != 36)</SQL>
68   </SELECTION_SQL>
69   <SELECTION_SQL_2>
70     <SQL_2>rrc = 16 and exs != 6</SQL_2>
71   </SELECTION_SQL_2>
72   <SELECTION_SQL_3>
73     <SQL_3>tfc != 32 and tfc != 33 and tuc != 25</SQL_3>
74   </SELECTION_SQL_3>
75   <SELECTION_LENGTH>
76     <LENGTH>55000</LENGTH>
77   </SELECTION_LENGTH>
78   <SELECTION_GEOM_CONTINUITY>
79     <LENGTH>50000</LENGTH>
80     <ANGLE>35</ANGLE>
81   </SELECTION_GEOM_CONTINUITY>
82   <SELECTION_NUMBER_OF_INHABITANTS>
83     <NUMBER_OF_INHABITANTS>20000</NUMBER_OF_INHABITANTS>
84   </SELECTION_NUMBER_OF_INHABITANTS>
85 </COUNTRY>
```

- ★ The tools for each theme follow the same main steps.

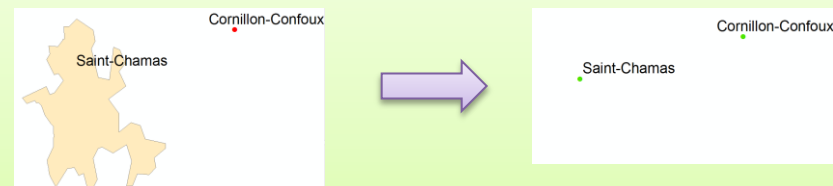
Step 1: Selection

- Semantic selection
- Geometric selection
- Topological criteria
- Network continuity within and between countries



Step 2: Model conversion

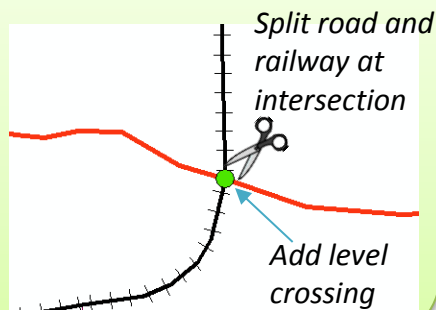
- Change of geometry type



- Attribute modifications

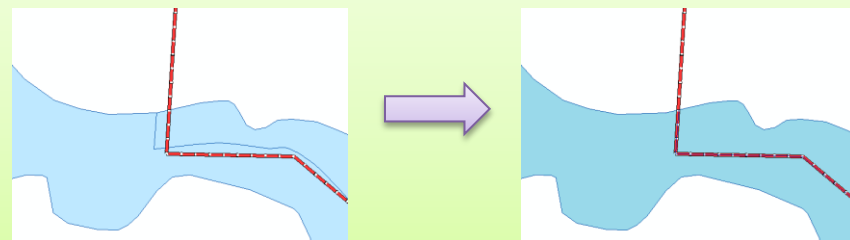
Step 3: Intra-theme consistency

- Ensure consistency between feature types from the same theme
- Add new feature types where needed



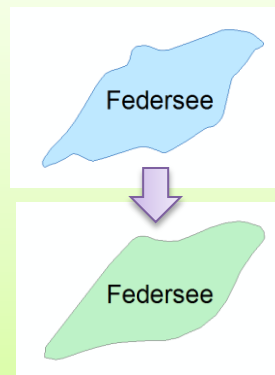
Step 4: Edge-matching

Ensure consistency of the selected (regional) data with the international boundaries from the target (global) dataset.



Step 5: Simplification

- Smaller objects merged with neighbours (attribute generalization)
- Geometrical simplification based on Douglas-Peucker algorithm with topological constraints.



Main functionalities proposed by the tools

- ★ Fully automated generalization process from Regional to Global levels
- ★ Extensive library of generalization-related functions, used within the different steps
 - Graph manipulation
 - Itinerary calculations and network continuity
 - Basic and advanced geometric functionalities
 - Advanced selection methods
 - Advanced edge-matching procedures with and without connecting features
 - Context-aware simplification tools (topological relationships between objects are preserved)
 - Etc.
- ★ Production follow-up for the user
 - Actions, errors, warnings, processing times are recorded in log files
 - Copies of the data are kept after each step for user checks
 - Production monitoring system to ensure that no step is processed without the previous ones having been successfully concluded.

Progress report

