Check performed on AQ zone geometries

EEA, August 2017

Background

The purpose of the Air Quality Zones data flows (see http://rod.eionet.europa.eu/obligations/670 and http://rod.eionet.europa.eu/obligations/693) is to collect and republish geographical areas for Air Quality Zones. This includes quality control of zone geometries reported by countries.

The quality control should ensure that the zone geometries can be further used for all kinds of spatial related data visualisation and analysis by the EEA and third parties (end users), without issues at re-projecting, buffering, transferring between formats, etc.

This document describes briefly the checks performed on zone geometries in the EEA system as well as settings of FME processes which run geometry validation.

1. Preliminary checks

There are checks preceding the actual geometry validation. These are:

- presence of geometry data: check if data representing geometry (XML/GML or shapefile) is present in the envelope,
- completeness of shapefiles: check if shapefile contains all necessary sub-files,
- zone identifiers: check if the geometry has corresponding local ID and if it is stored in a field called “localid”; also – if the unique local IDs correspond to unique geometries.

2. Geometry validation

These checks are validating the correctness of delivered geometries:

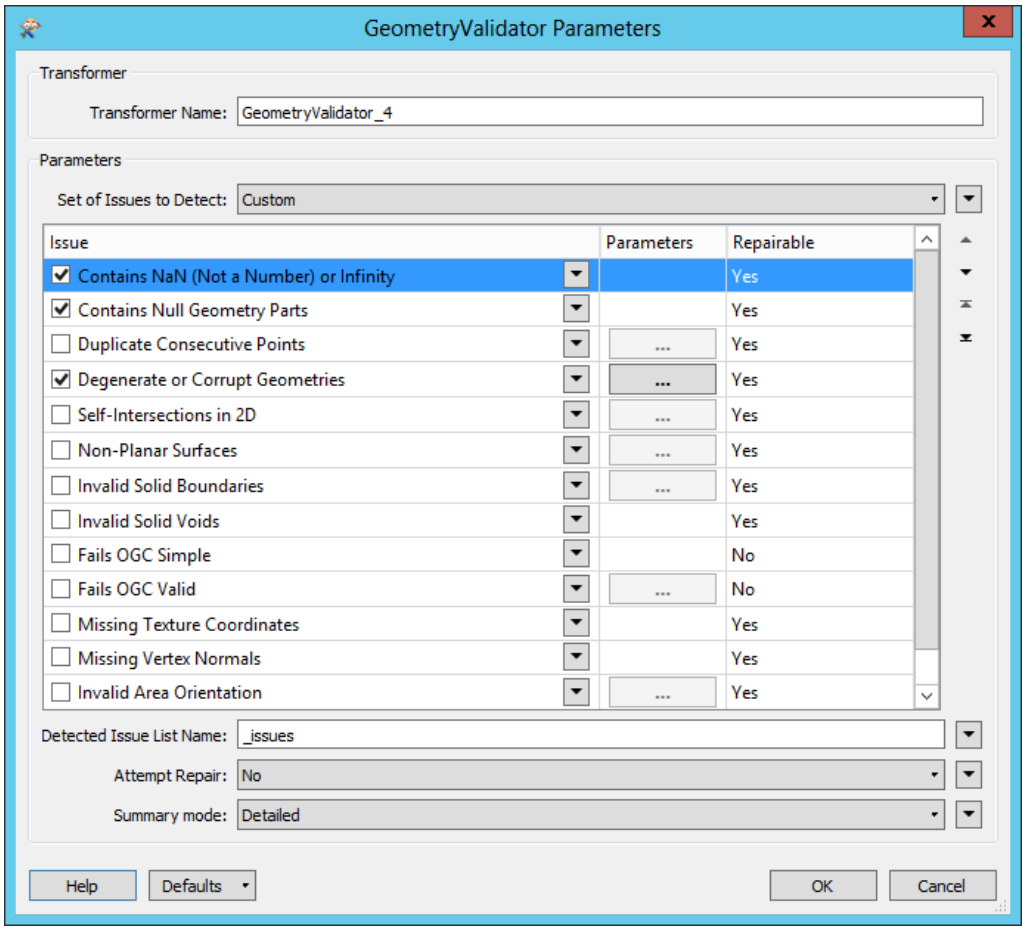
- geometry type: check if geometry is of type ”Polygon” or “Multipolygon”,
- 1st step geometry validation: 3 tests performed using transformer “GeometryValidator”: test for Degenerate or Corrupt Geometries, test for Null Geometry Parts, test for NaN (Not a Number) or Infinity, see FME settings in Picture 1.

Test for Degenerate or Corrupt Geometries

A degenerate geometry is one whose geometry type can be simplified. For example, a polygon that has 0 area is degenerate, and can be simplified to a line, point, or IFMENull. A corrupt geometry in contrast contains conflicts in the geometry definition, such as an arc whose angles and endpoints disagree.

Contains Null Geometry Parts

IFMENull parts will be detected. Note that an IFMENull by itself is not considered a “part”. Only IFMENulls that are the children of some aggregate will be considered “parts”.



Picture 1. Setting used in "GeometryValidator" for the 1st step geometry validation.

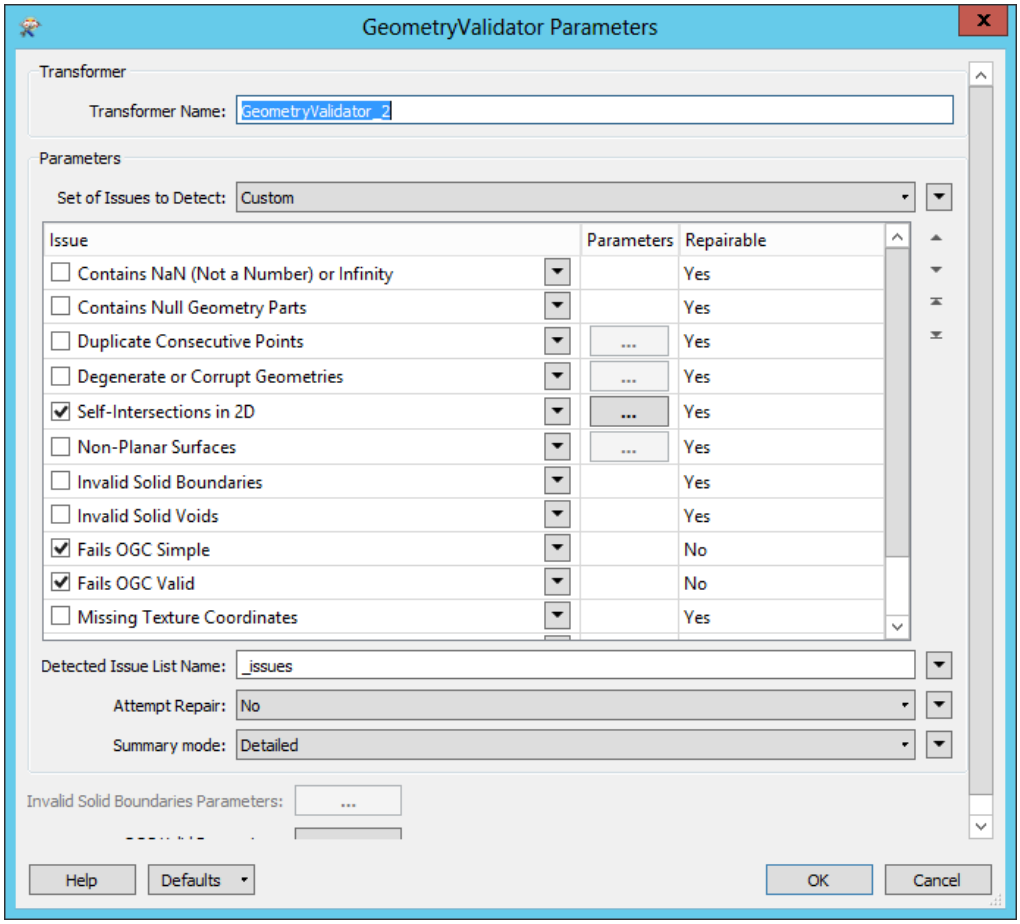
- 2nd step geometry validation: 3 tests performed using transformer "GeometryValidator": test for Self-Intersections in 2D, 2 tests evaluating geometries according to OGC standards, see FME settings in Picture 2.

Self-Intersections in 2D

Self-intersection points are detected. Duplicate coordinates (duplicate in x and y) are considered self-intersections and are reported as such. Duplicate consecutive coordinates are reported as a single self-intersection point.

Fails OGC Simple/Valid

The input geometry are evaluated according to OGC standards.
See http://www.opengeospatial.org/standards/sfa for more information.



Picture 2. Setting used in "GeometryValidator" for the 2nd step geometry validation.

3. *Checks on projection*

These checks are validating the projection of delivered geometries:

- declaration of projection: check if geometry has been stamped with a coordinate system and that coordinate system is recognized by FME (in case there is a valid coordinate system not recognized by FME, it is recorded and introduced into the local FME libraries) ,
- correctness of the projection: check if geometry intersects the bounding box of the coordinate system that is being used.

4. *Geometry validation after re-projection*

Geometries should remain valid after re-projection. At the EEA we are using EPSG 3857 in most of our viewers. Therefore we use re-projection to EPSG 3857 in this test:

- geometries must pass 2-step validation described in point 2 above after re-projection to EPSG 3857.

5. *Additional checks*

There is one additional test at the moment:

- correctness of location: geometry must intersect the country borders for the country it belongs to.