EuroSDR

AMSTERDAM INSTITUTE FOR ADVANCED METROPOLITAN SOLUTIONS

TU Delft 3Dgeoinfo

GeoBIM benchmark 2019

# Options for conversion: IFC to CityGML & CityGML to IFC


Nebras Salheb

# Presentation Outline

- Task Description
- Results template
- IFC Data
- CityGML Data
- Results (submissions)
- Results (observations)
- Discussion

# WHY CONVERSIONS?

# WHY CONVERSIONS?

- Updating CityGML models with data from BIM.
- Giving context for BIM projects using CityGML models.
- GeoBIM integration.

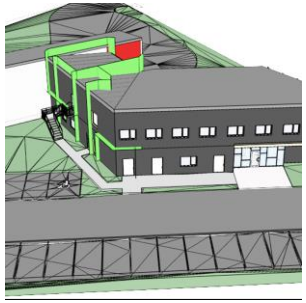
# TASK DESCRIPTION

- The participants applied IFC to CityGML conversion and CityGML to IFC conversion on the provided data.
- The workflow is described including all the steps and settings.
- The results are submitted and the results templates are filled.

# RESULTS TEMPLATE

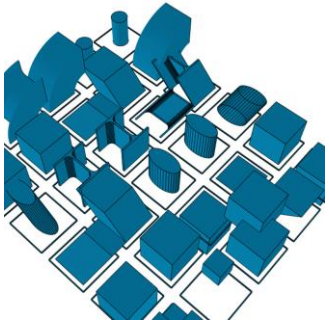
- Section 1 - Participant information
- Section 2 - Tested software/tool
- Section 3 - Computer hardware
- Section 4 - The Task (asking the description of the performed conversion)
- Section 5 - Finalization (further information or comments).

# IFC DATA



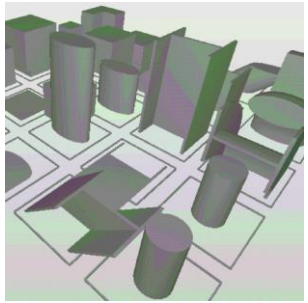
Myran

Savigliano



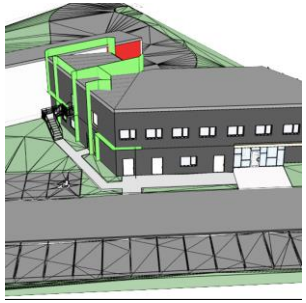
IFC (2x3) geometries

Up:Town



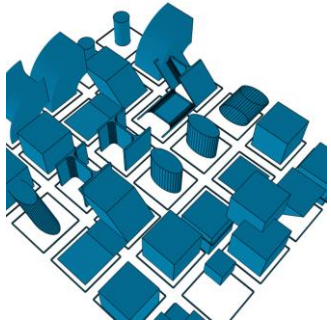
IFC 4 geometries

# IFC DATA



Myran

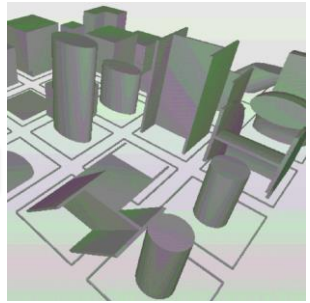
Savigliano



IFC (2x3) geometries

Up:Town

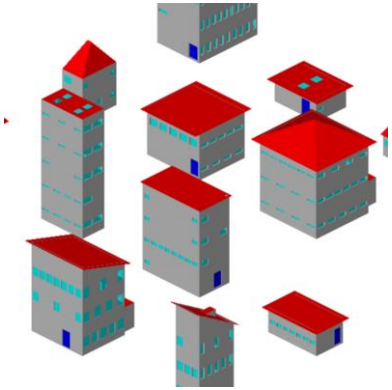
CityGML



IFC 4 geometries

# CITYGML DATA

Amsterdam (LoD 1)



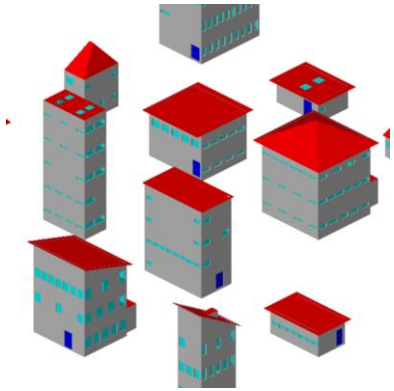
Buildings (LoD 3)

Rotterdam (LoD 1 and 2)

# CityGML Data

Amsterdam (LoD 1)

Rotterdam (LoD 1 and 2)



Buildings (LoD 3)

IFC 4

# RESULTS - submissions

- 15 Participants
- 43 submissions (1 form per dataset).

# RESULTS - Software

Off shelf software:

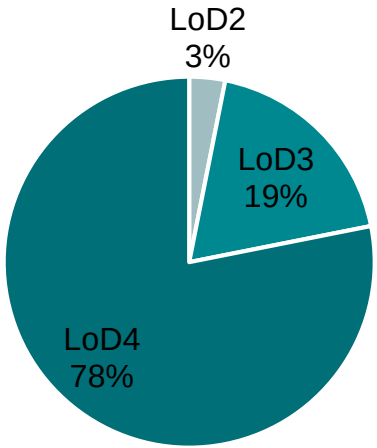
- FME
- FME Quick Translator
- FZK Viewer
- ArcGIS Pro (Data Interoperability extension)

not commercial, bespoke piece of software:

- IFC2CityGML

# RESULTS - observations

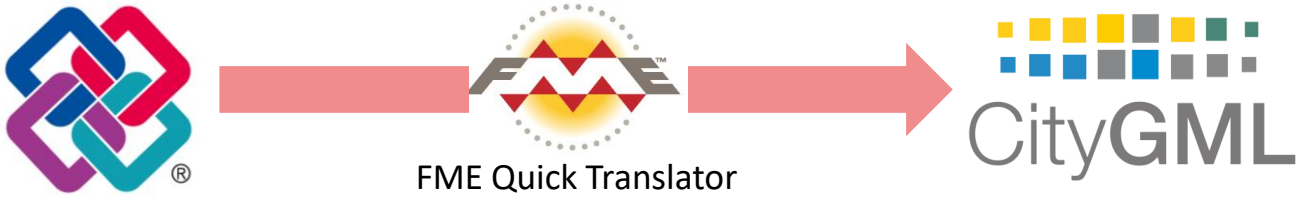
- The resulting CityGML are mainly LoD 4



# RESULTS - observations

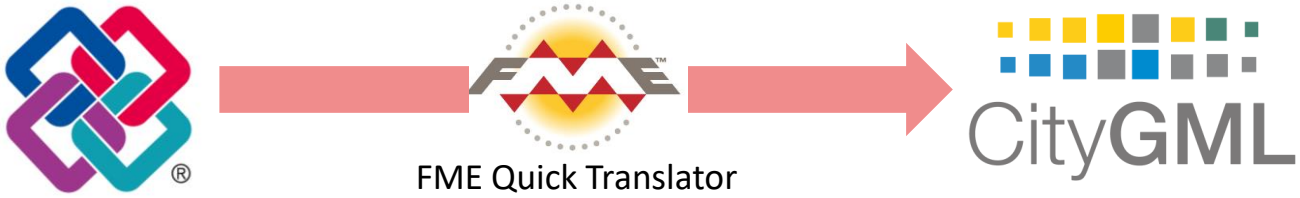

- Certain elements like the roofs were lost during the conversion.
- Certain surfaces are inverted.
- Most missing elements seem to be IfcClosedShell objects.
- Addition of spaces in the IFC model would have improved the quality of the output.

# RESULTS - observations




- All of the transformed objects are GenericCityObject with different Geometry Type.
- Slab elements of same floor are converted while adjacent one aren't.
- Roof and Window features are missing after transformation.

# RESULTS - observations




- Visualization of converted CityGML file is different among software.
- FME Data Inspector doesn't render geometries of Wall Surface and Slabs as FZK Viewer.
- Many geometries are not transformed.
- Solids maybe; too complex, not closed or not orientable.
- Some solids maybe missing traits, appearance, measure or attributes.

# RESULTS - observations


- When the IFC file is opened, the software does not support some solids, which are not converted to CityGML.
- LOD2.
- Roof and Window features are missing after transformation.
- Visualization of converted CityGML file is different among software.
- FME Data Inspector doesn’t render geometries of Wall Surface and Slabs as FZK Viewer.

# RESULTS - observations


- Many geometries are not transformed.
- Solids maybe too complex… etc..
- Solids maybe missing information …etc.
- Relations are missing between individual glass screens (windows) and steel frames.
- Could be improved be using Corrected or cleaned georeference. Volumetric or surface property for entities.

# RESULTS - observations


Data Interoperability extension

- LOD3/LOD4
- IfcBooleanClippingResult_1 missing.

# RESULTS - observations

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- When Multiple LoD existed; visualization of IFC was not possible.
- Can be fixed by exporting multiple IFC files with different LoDs based on LoDs of CityGML.
- You have to explicitly add extension .ifc to exported file.

# RESULTS - observations


- Results in LOD 200
- Exports IFC dataset with empty hierarchy. No semantic (attributes) or geometrical information can be visualized in software.
- Only top hierarchy level information (building entity) with guid information is available.
- Similar results on different datasets shows that FME Quick Translator is not compatible for CityGML to IFC conversion.

# RESULTS - preliminary analysis

- Every software creates different output
- Conversion procedures often create LoD4 types, which have bad support on the GIS side, including in our validation software.
- FME seems to be able to process the most IFC types, but looking at results many result in empty or invalid geometries.
- ArcGIS seems to output objects with geometry only.
- FZKViewer seems to produce the most complete results for conversions from CityGML to IFC

# RESULTS - preliminary analysis

- Ground truth?
  We will have to figure out what the ideal output should look like since there's no ground truth to compare with.

- LoD = LoD (LoG) + LoI ?
  Level of Development [LoD]
  Level of Detail [LoD]
  Level of Geometry [LoG]
  Level of Information [LoI]

- Not absolute conclusions, but patterns and evidence to reason on.

# Time for Discussion..


Nebras Salheb

+31-616418216

N.Salheb@Hotmail.com

# Questions & comments?


Nebras Salheb

+31-616418216

N.Salheb@Hotmail.com