

**FAIR Heritage**

Digital Methods, Scholarly Editing and  
Tools for Cultural and Natural Heritage



**LE STUDIUM**  
Loire Valley  
Institute for Advanced Studies



# The Coudenberg Heritage Building Information System

Roland Billen, 18/06/2020

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2. Coudenberg Heritage Building IS – Phase 1
  - Project description
  - Global approach
  - *User requirement analysis*
  - *Conceptual design level*
  - *Design and implementation level*
  - *Usability evaluation*
3. Perspectives - Phase 2
4. Conclusions

# Geomatics Unit

<http://geomatics.ulg.ac.be>

Faculty of Sciences / Dept. Geography /

~ 20 staff members

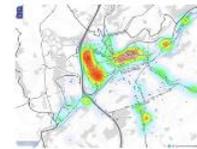


## Geomatics Unit

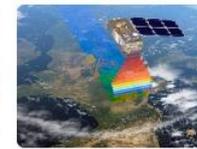
The Geomatics Unit brings together researchers and teachers in the field of geomatics. It is part of the Department of Geography (Faculty of Sciences) at the University of Liege. The Unit enjoys strong international recognition. It also plays an important role with Belgian institutions and professionals in the field

## Research fields

### Geographic Information Science



### Remote Sensing and Photogrammetry



### Global Navigation Satellite Systems



### 3D Terrestrial Data Acquisition



## Projects

### Erasmus, EnRHed



EORégions Sciences

### E04SIBS



### Terra Mosana



### Coudenberg SIA3D



## News

### La SPI engage "ANALYSTE SIG - Système d'Information Géographique"

#### La SPI engage



La SPI souhaite renforcer ses équipes par le profil suivant :

- ANALYSTE SIG - Système d'Information Géographique

<https://www.proselect.be/fr/nos-offres-d-emploi/2911/analyste-sig-liege.html>

ou

<http://www.spi.be/fr/news/view/1540/la-spi-engage>

## Twitter

### Tweets by @Geomatics\_Unit

#### Geomatics Unit

@Geomatics\_Unit

Florent Poux et Roland Billen, lauréats du prix Jack Dangermond 2019 [geographie.uliege.be/cms/c\\_5724437/...](http://geographie.uliege.be/cms/c_5724437/) via @universiteliege



Florent Poux et Roland Billen, lauréats du prix Jack ...  
Ce prix récompense une publication scientifique de très haute qualité dans le domaine des sciences géo-spatiales. [geographie.uliege.be](http://geographie.uliege.be)

Mai 14, 2020

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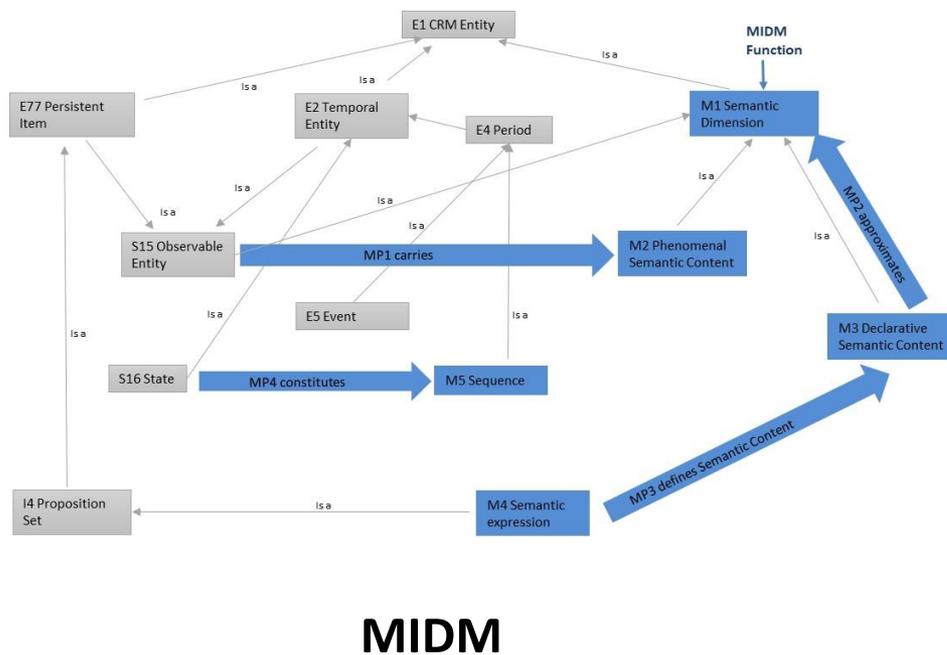
## Contact us

[geomatics@uliege.be](mailto:geomatics@uliege.be)  
Tel: +32 (0)4 366 57 42

## Address

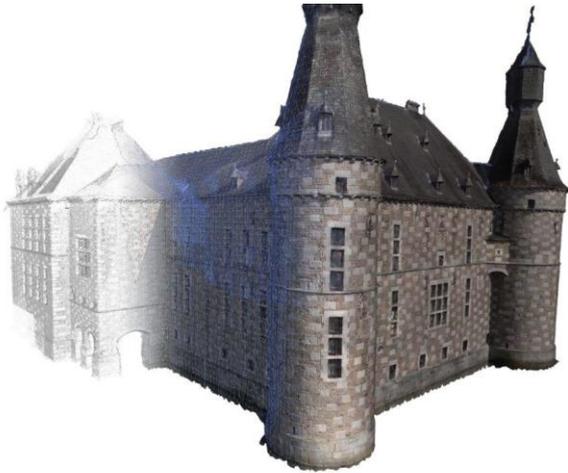
Campus ULg Sart-Tilman  
Batiment B3a  
Quartier Agora

- 10 years of interaction with archaeologists



Germany – Smart Point Cloud

Jehay 4D

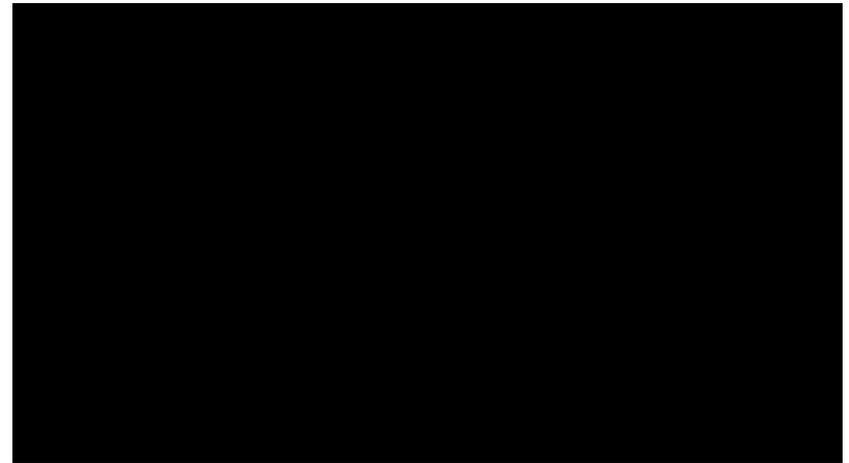


**TERRA  
MOSANA**

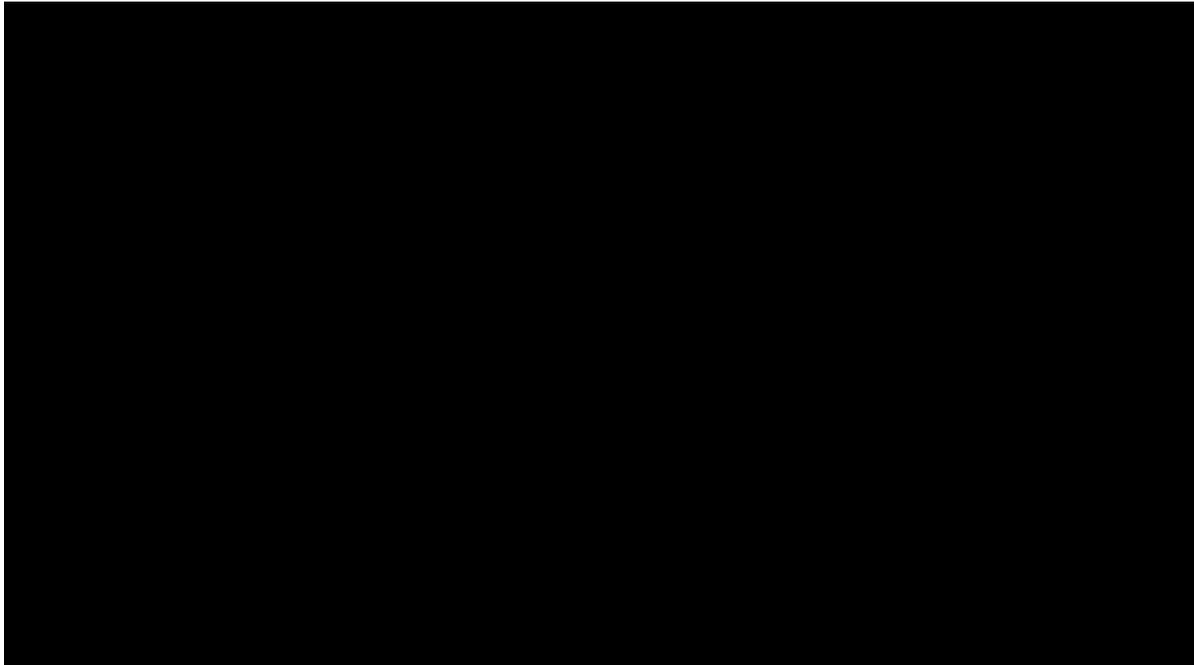
**Interreg**  
Euregio Meuse-Rhin  
Fonds Européen de Développement Régional



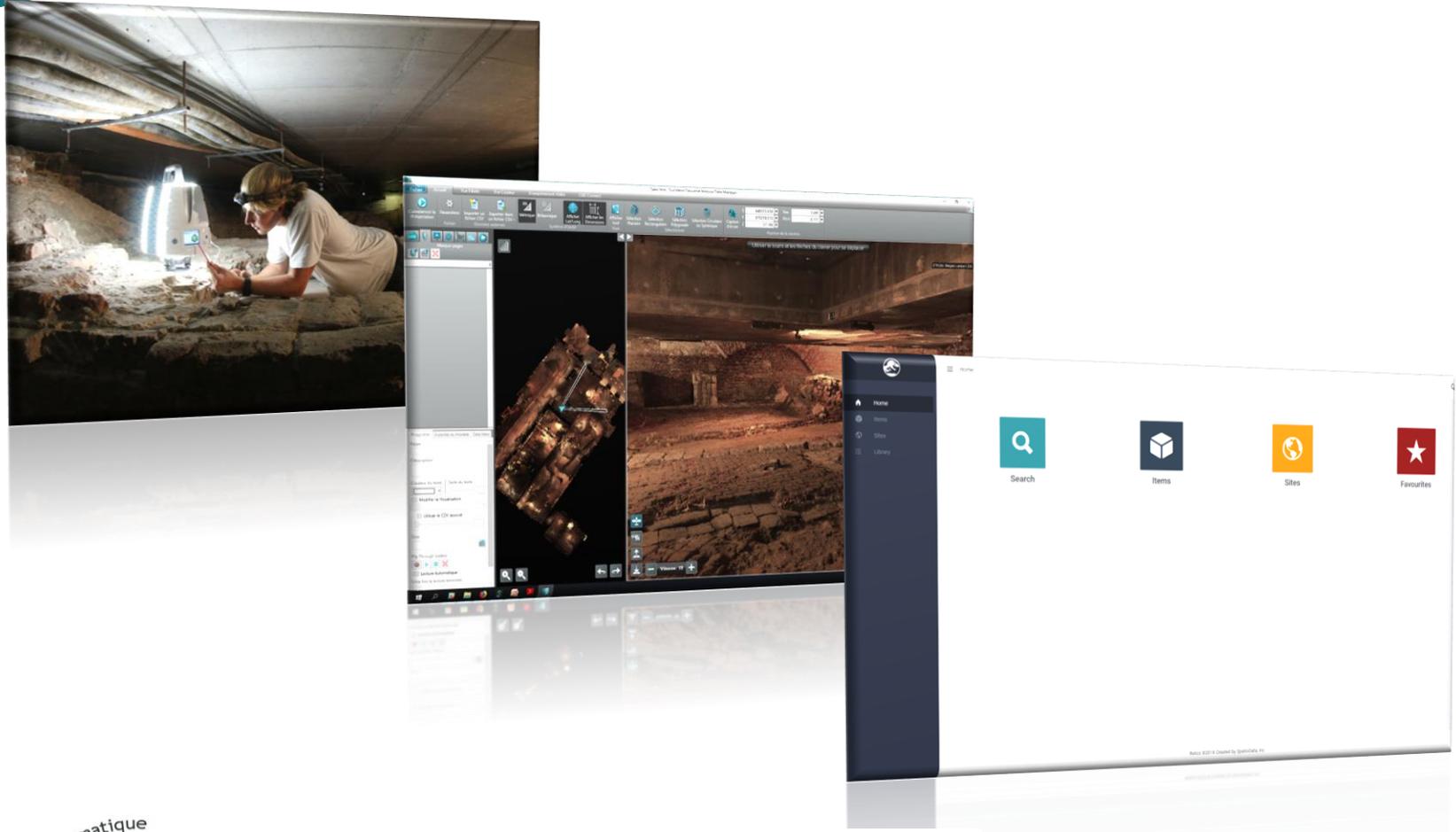
[www.terramosana.org](http://www.terramosana.org)



## e-thesaurus – médiation holographique 3D – Pierre Hallot



# Coudenberg HeBIS - Phase 1



[www.coudenberg.brussels](http://www.coudenberg.brussels)

The Coudenberg archaeological site presents the remains of the palace of the Dukes of Brabant, destroyed by a fire in 1731 during the reign of Marie-Elisabeth of Austria, the Governess of the Netherlands



# Call for tender

- COUD 2017-01
  - Get an accurate 3D model of the site
  - Manage archeological information in an Archeological Information System (AIS)
  - Link between the 3D model and the AIS

*Exiguous spaces  
/ dark places*



*heterogeneous  
set of data*



*Duration*



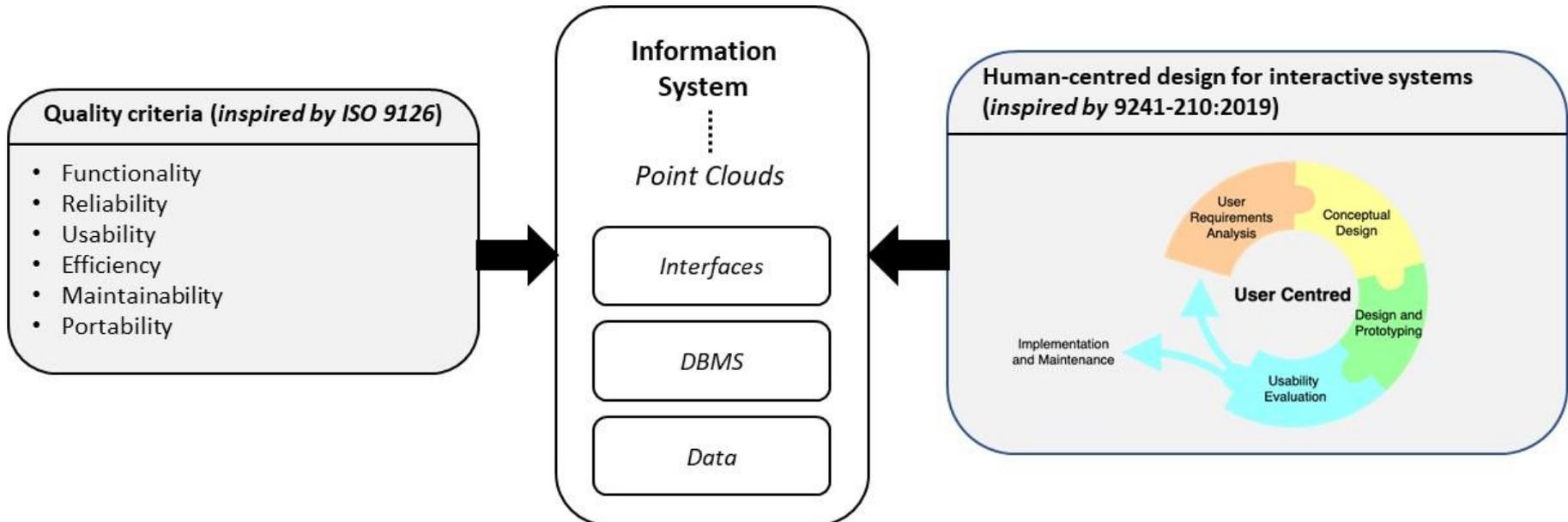
5 months  
June 18 – Oct. 18

# Phase 1



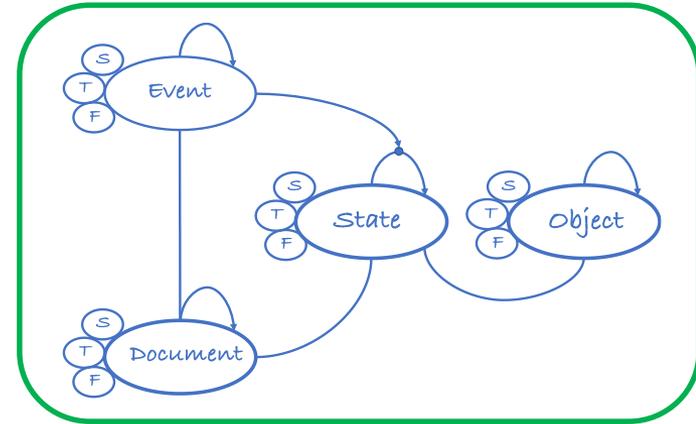
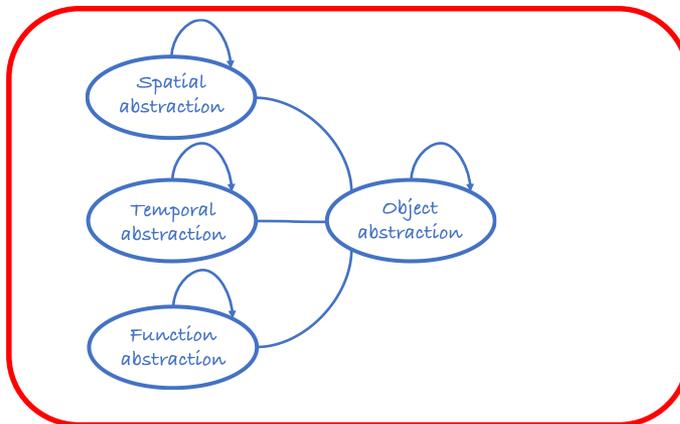
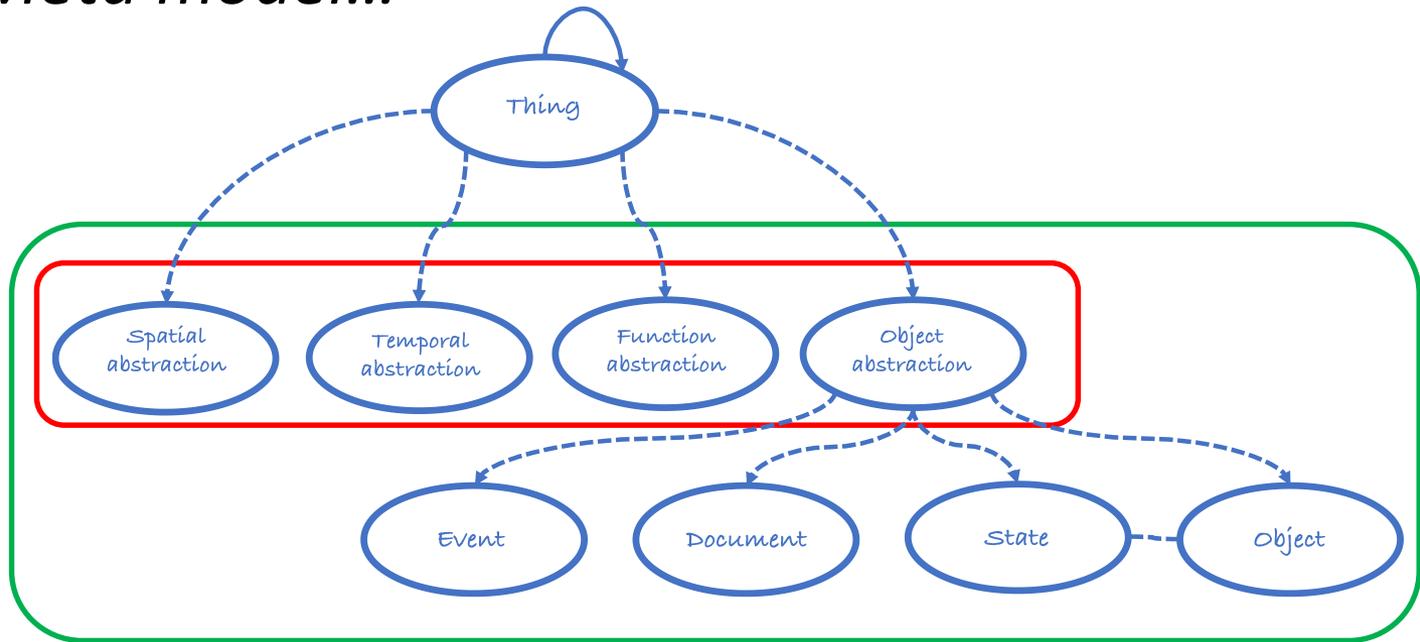
# Global Approach

- *A methodology...*

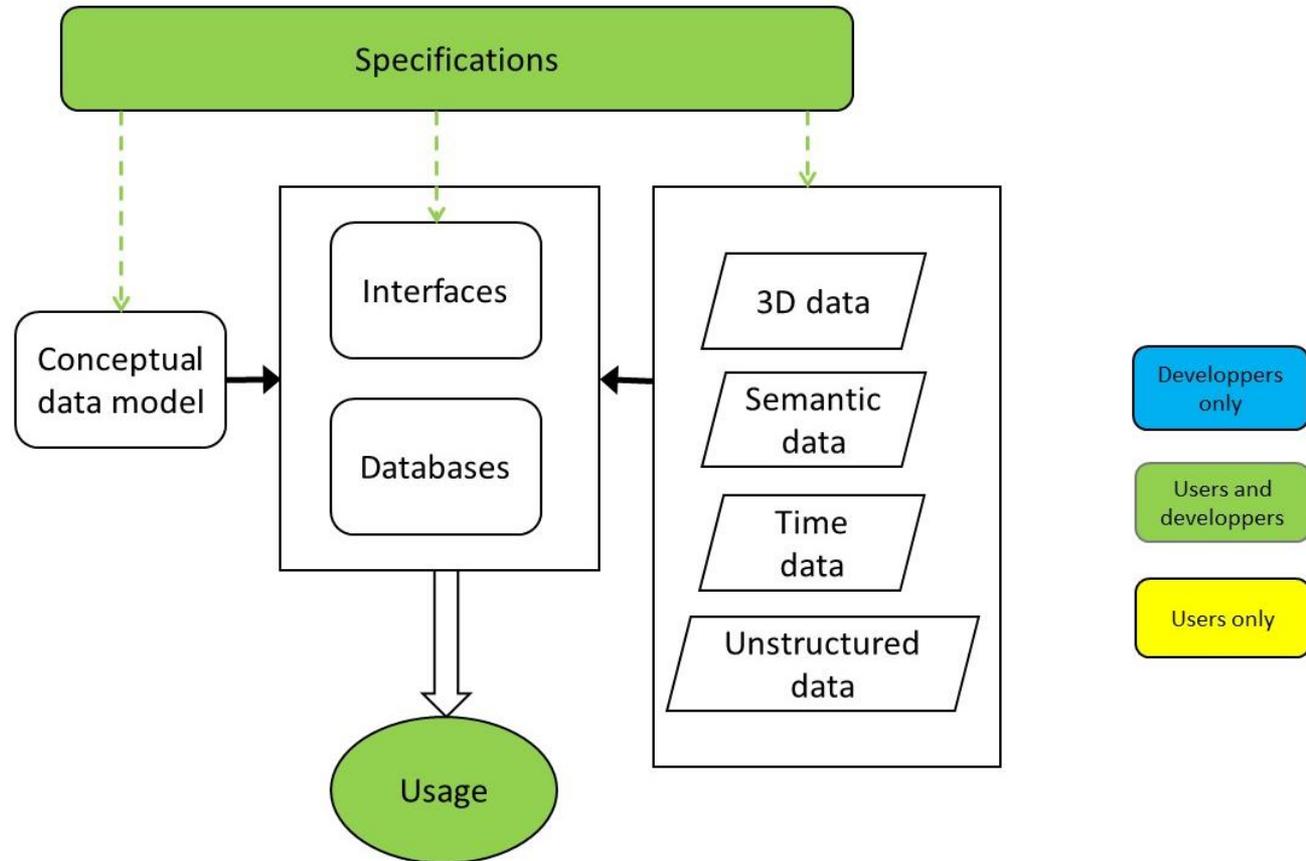


# Global Approach

- *A Meta model...*

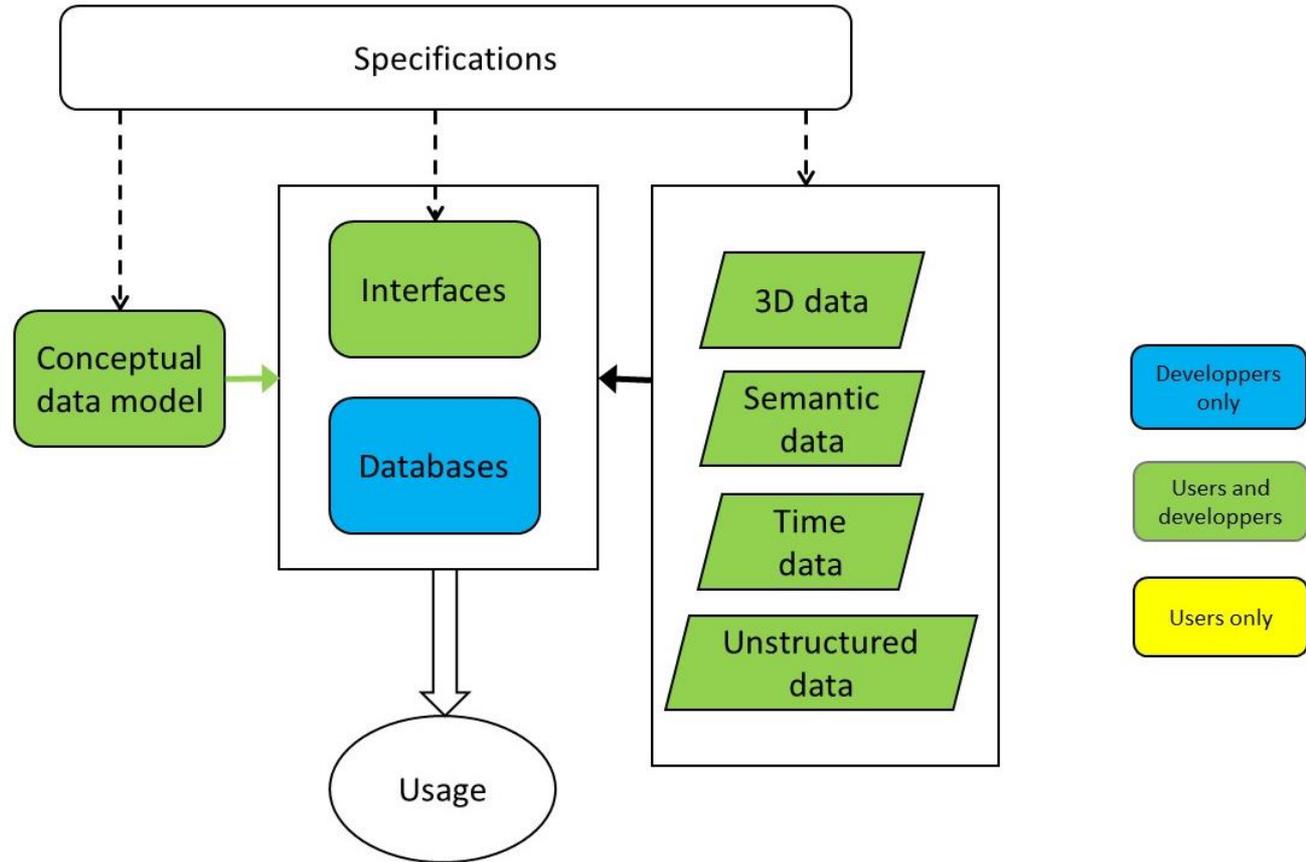


# User requirements Analysis

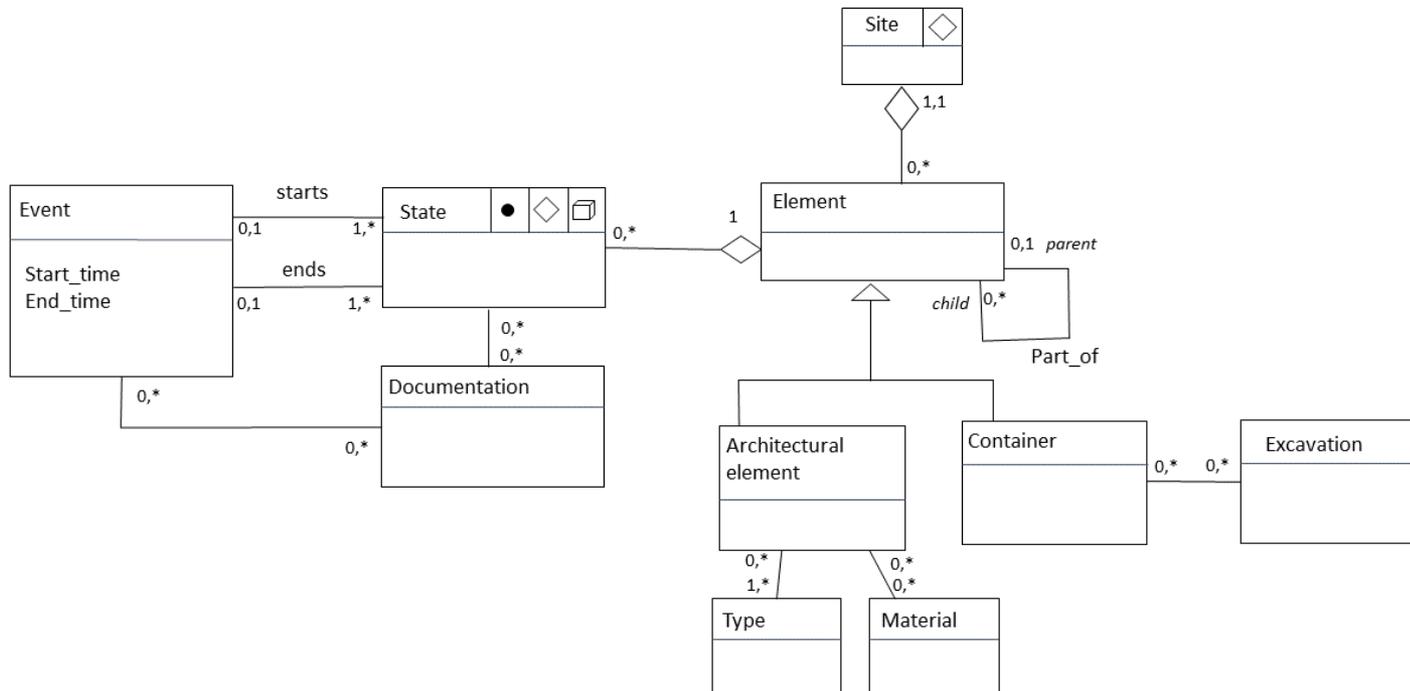
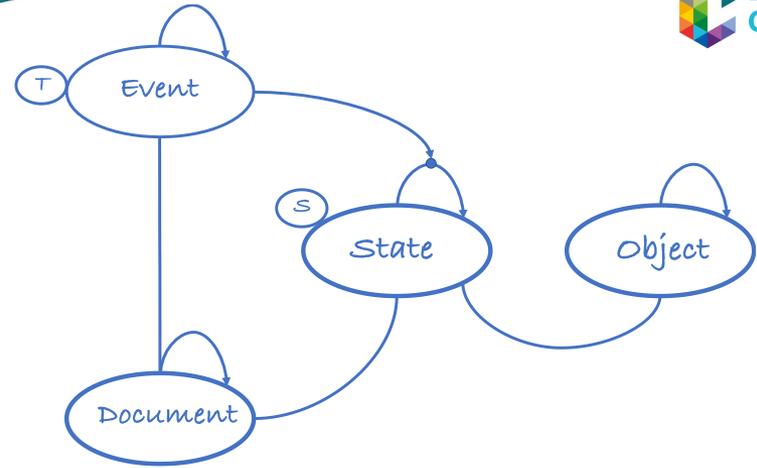


→ Detailed specifications (functionalities and data)

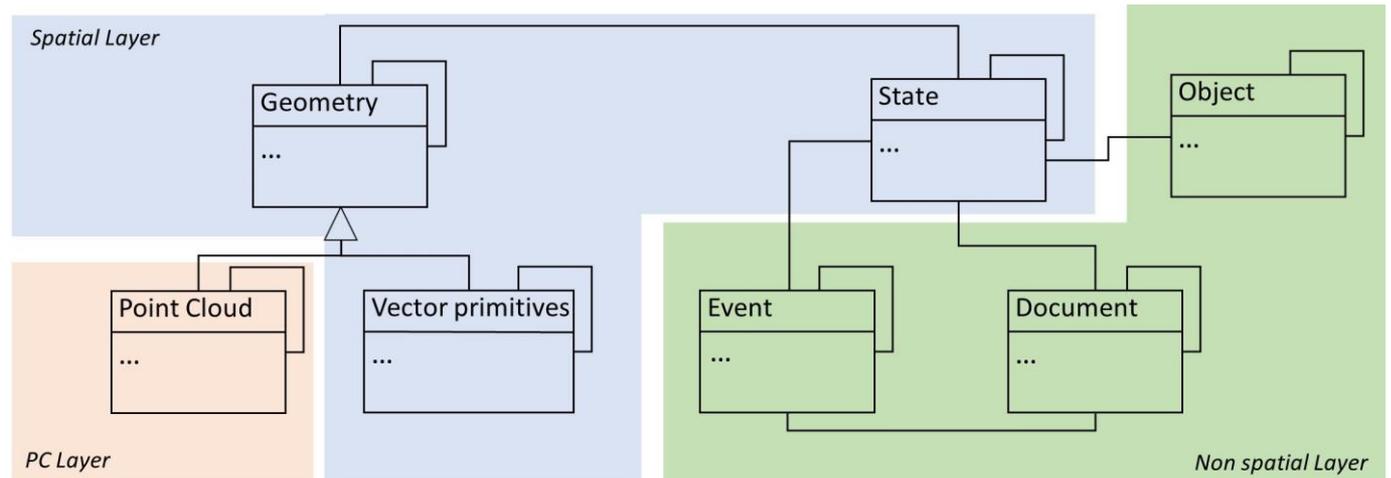
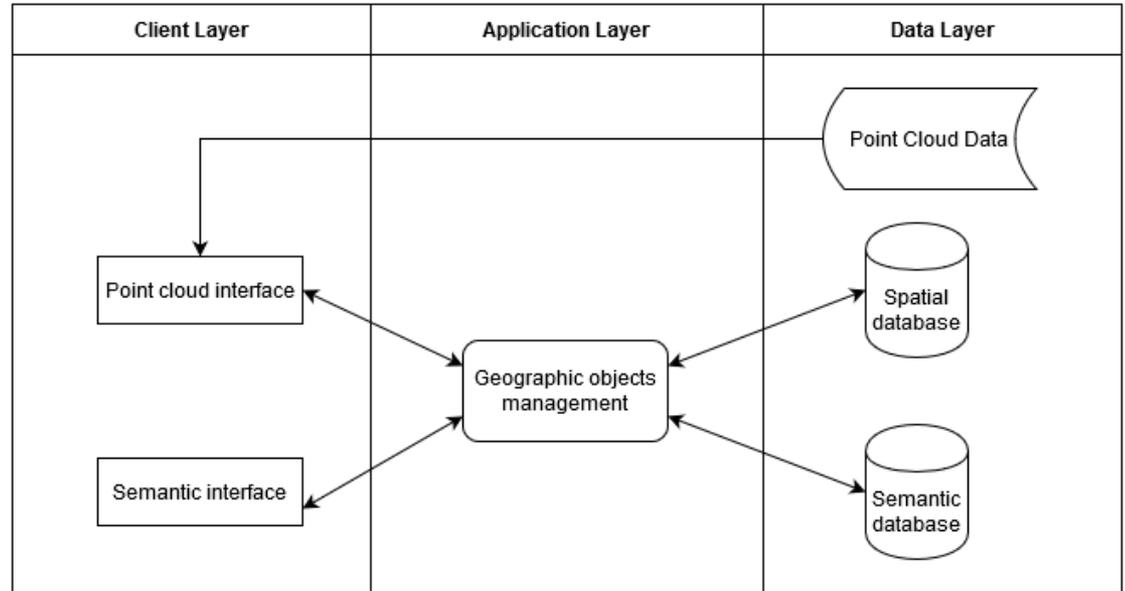
# Conceptual design level



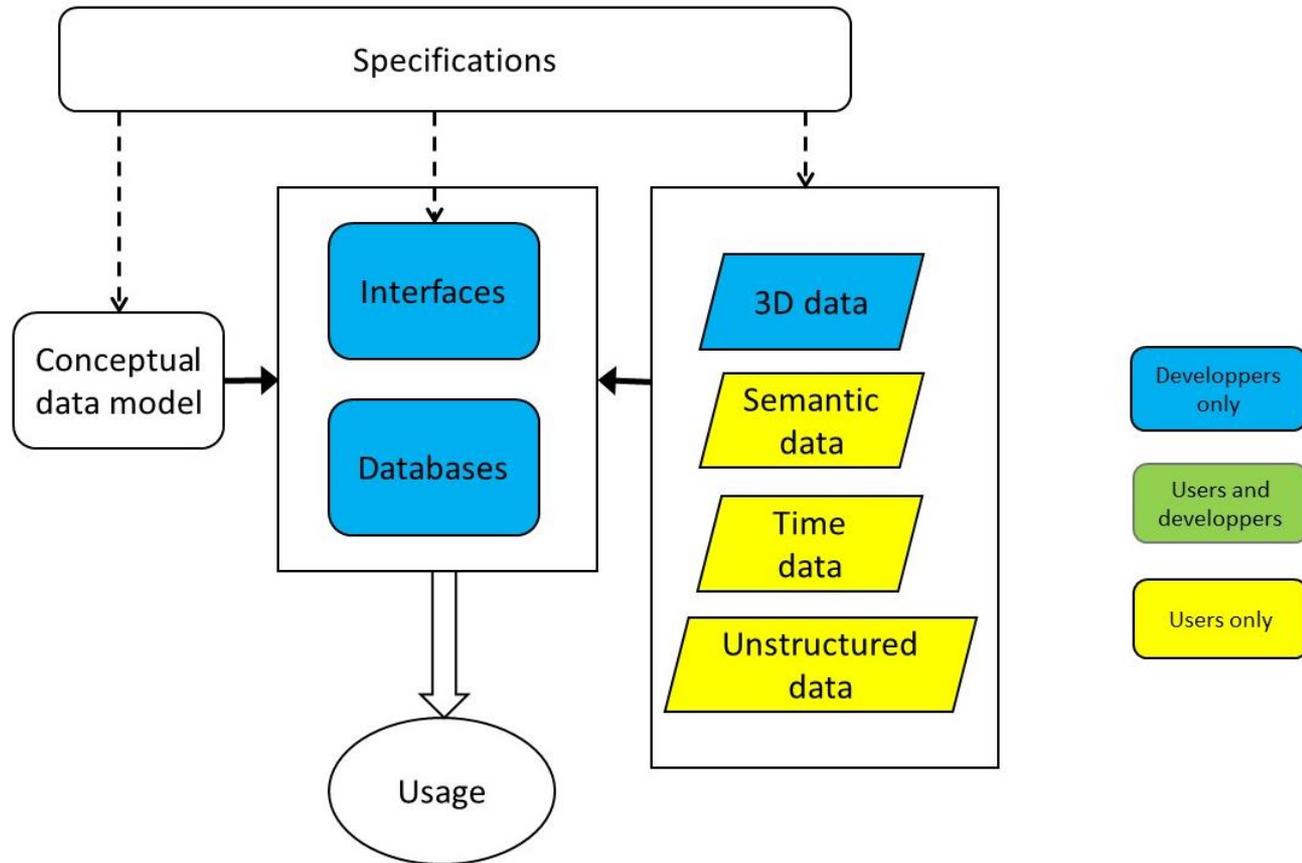
## Conceptual Data Model



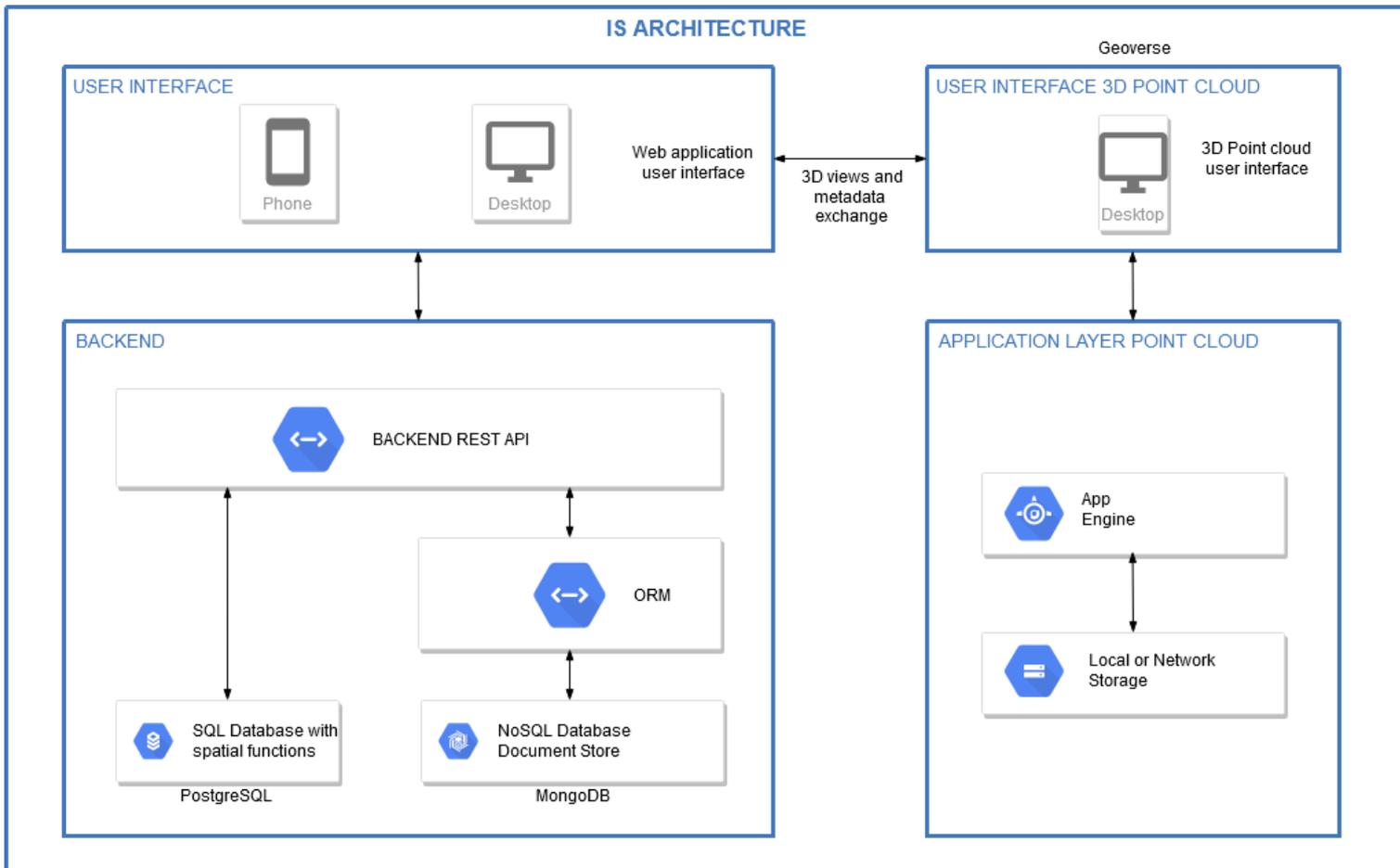
## Information System Structure



# Design and implementation level

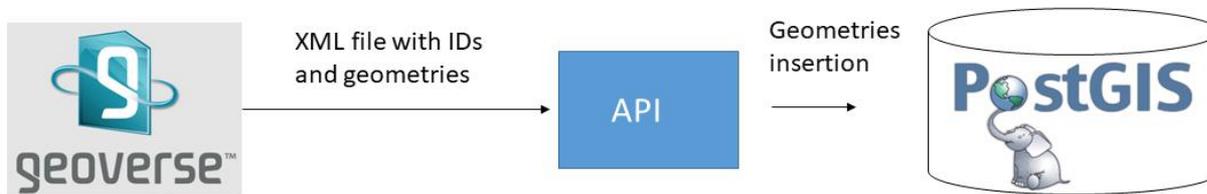


## Information System Architecture

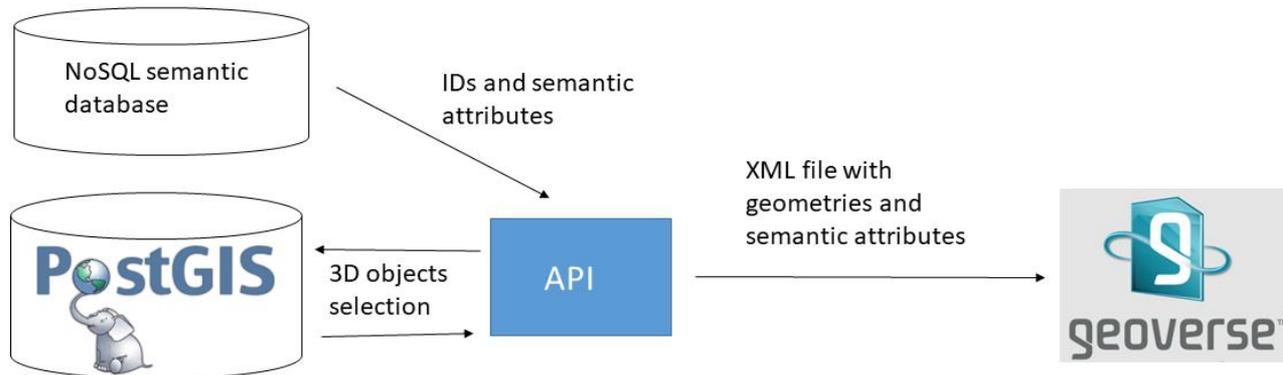


- Linking 3D models and DBs

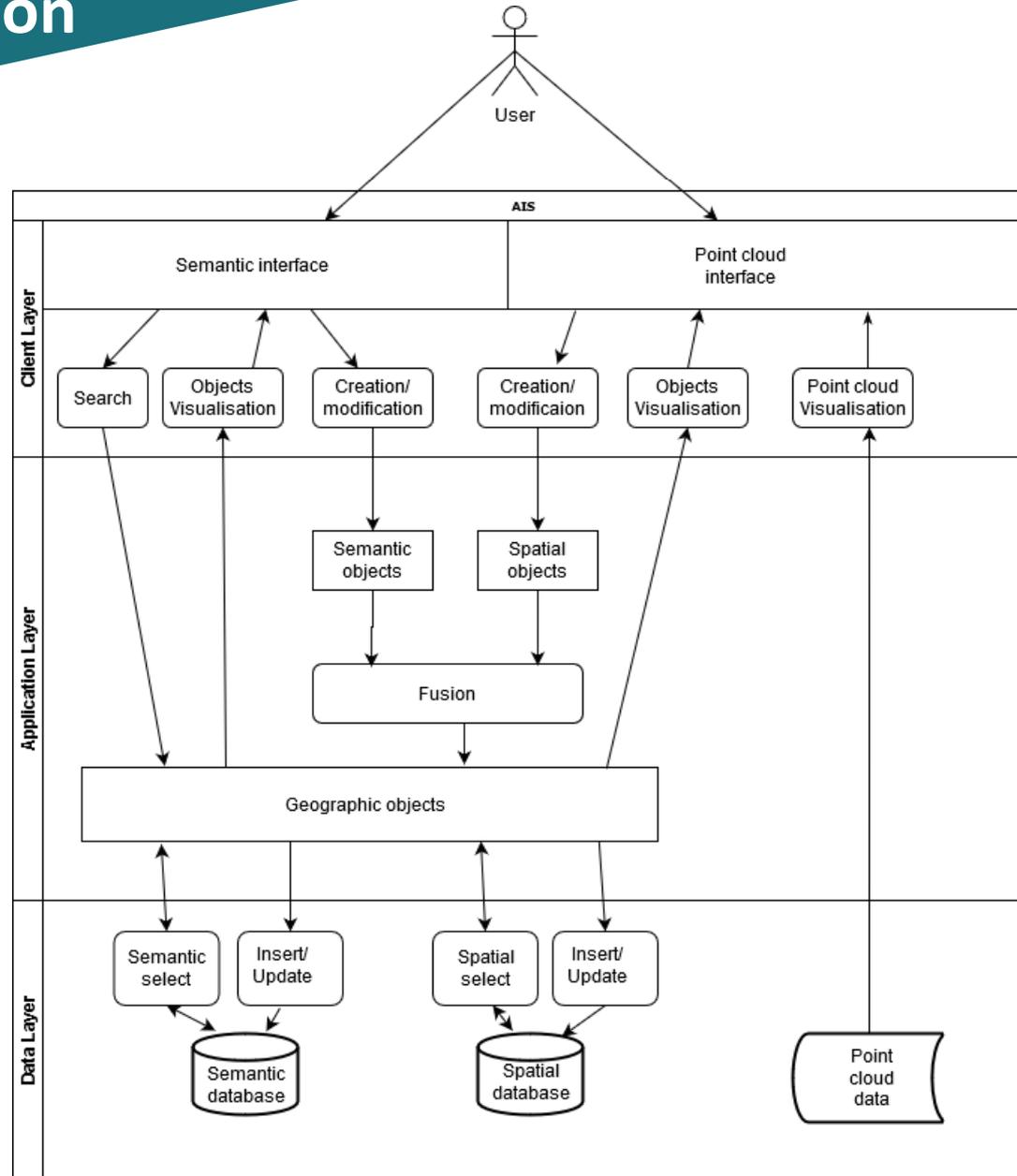
## A) Geoverse2PostGIS



## B) PostGIS2Geoverse

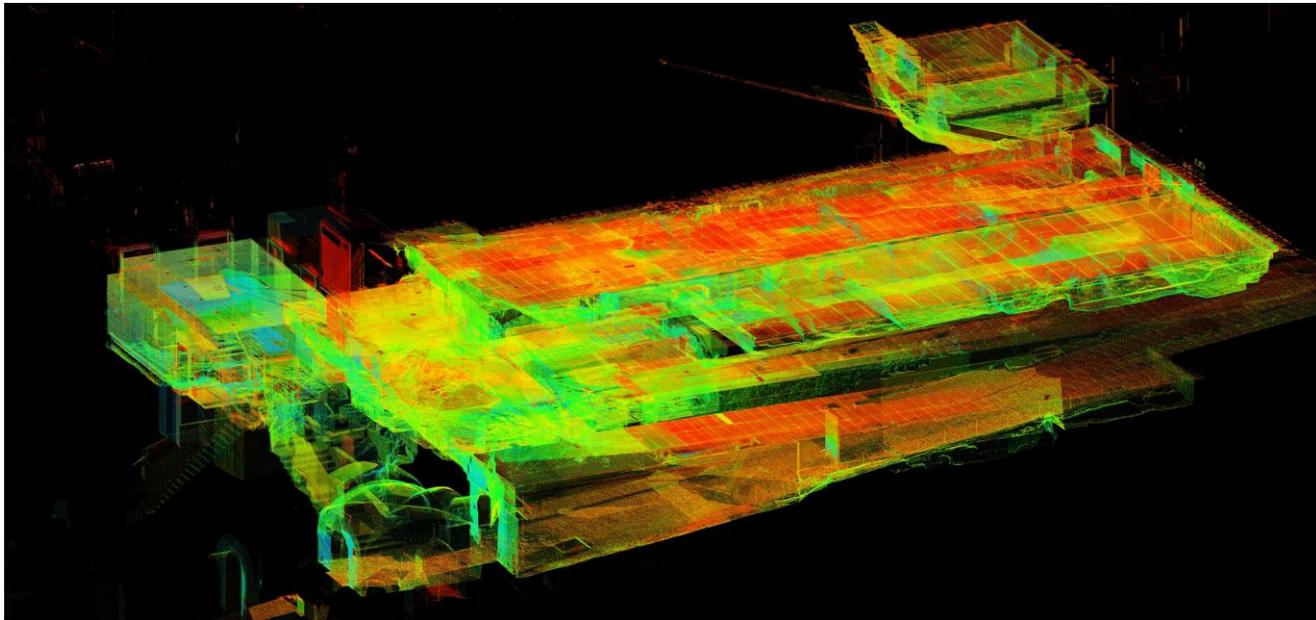


# Design and implementation level



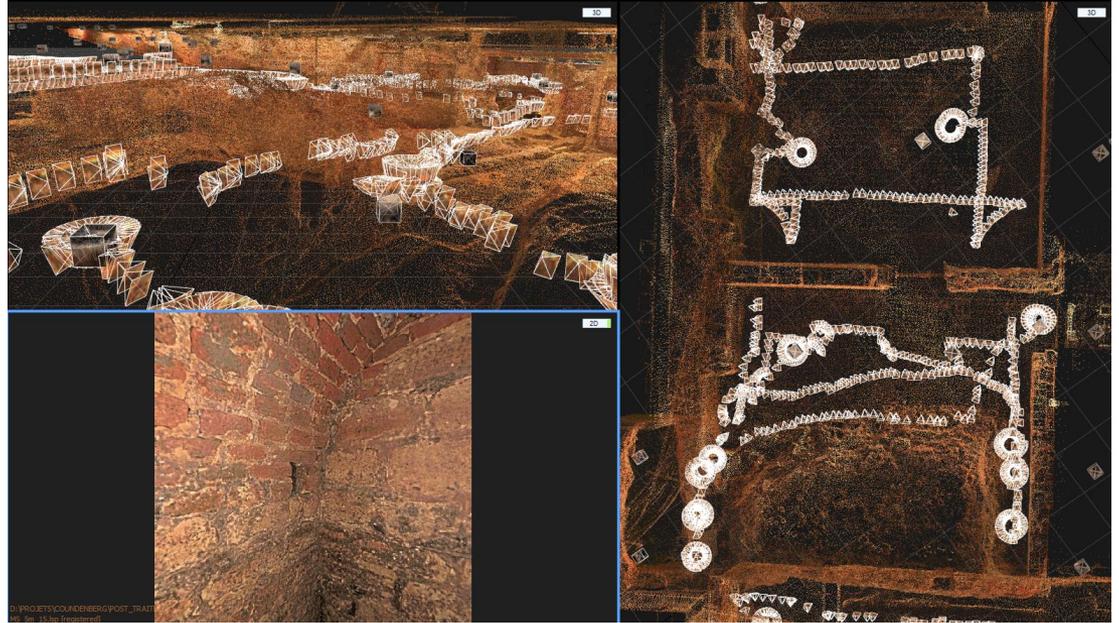
## Data acquisition

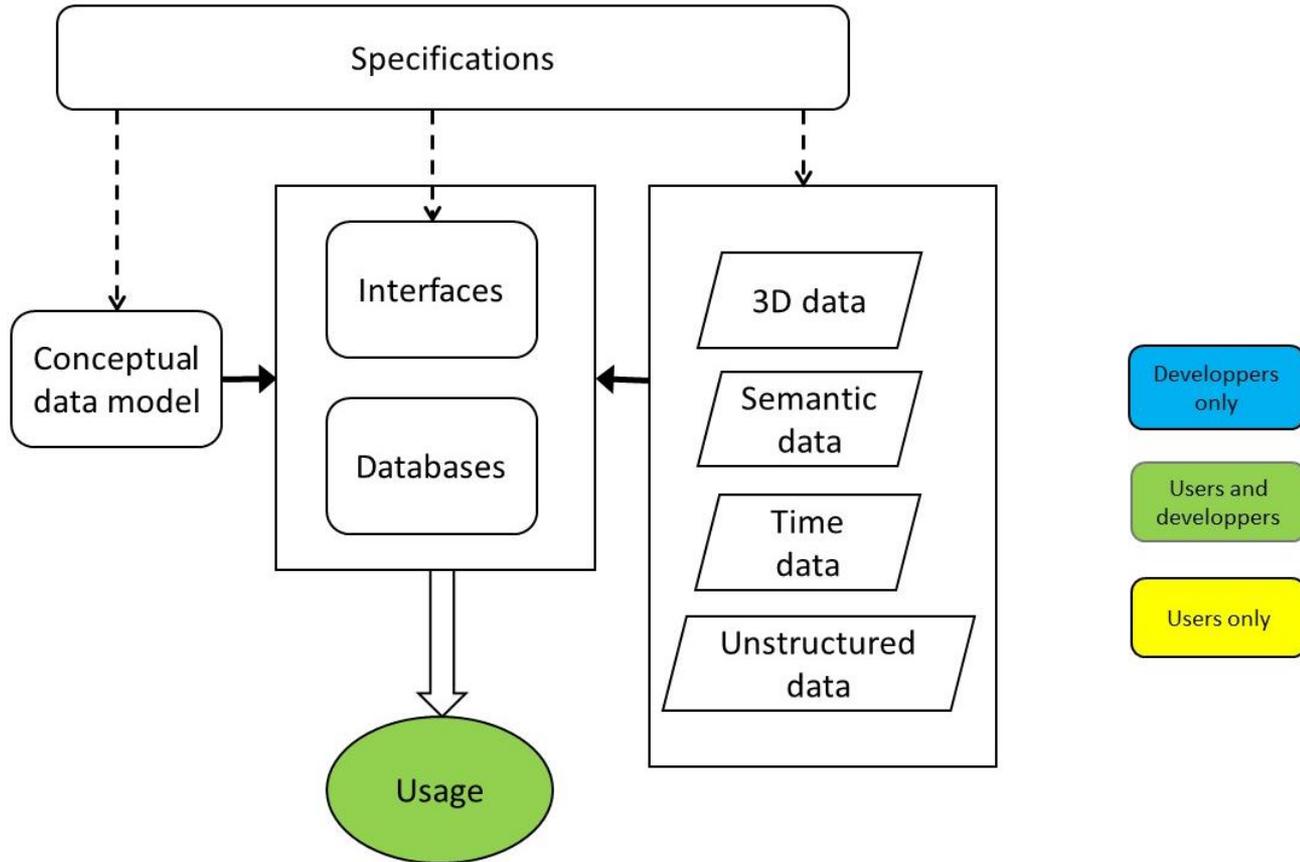
- 24 315 758 526 points / 12000 photos / 17 stations / 110 scans (25 min/scan)
- 34 man-day (acquisition)



# Design and implementation level

## Data acquisition





- Training sessions / feedback

- Semantic Interface

The screenshot displays a web-based Semantic Interface for a digital heritage application. The interface is organized into several key sections:

- Navigation:** A dark sidebar on the left contains icons and labels for Home, Items, Sites, and Library. The top right corner features a search icon and a user profile icon labeled 'DF'.
- Breadcrumbs:** The top navigation bar shows the path: Items / Palais du Coudenberg (Cou) / Cou3000 / Cou3200 / CouEsc3221.
- Contextual Tabs:** A row of tabs includes 'Generic' (selected), 'Files', 'Location', 'Relations', and 'Geometry'.
- Form Fields:** The main content area is titled 'Item Info' and contains several input fields:
  - Name:** A text input field containing 'CouEsc3221'.
  - Material Group:** A dropdown menu currently showing 'Material Group'.
  - Item ID:** A text input field containing the UUID '5cd3e8e77f4394001b5a9907'.
  - System:** A dropdown menu currently showing 'Aula Magna'.
  - Parent Item:** A dropdown menu currently showing 'Cou3200'.
  - Function:** A dropdown menu currently showing 'Escalier'.
  - Description:** A text area with the placeholder text 'Description'.
  - Other Info:** A text area with the placeholder text 'Other Info'.
- Media:** A section labeled 'Cover Image' contains a photograph of a stone staircase in a historical setting. Below the image is a red button labeled 'Remove Image'.

- 3D Interface



# Usability evaluation

# Usability evaluation

- Semantic Interface
- Point cloud Interface
- 3D data
- Other data
- Coudenberg IT issues

USERS



DESIGNERS

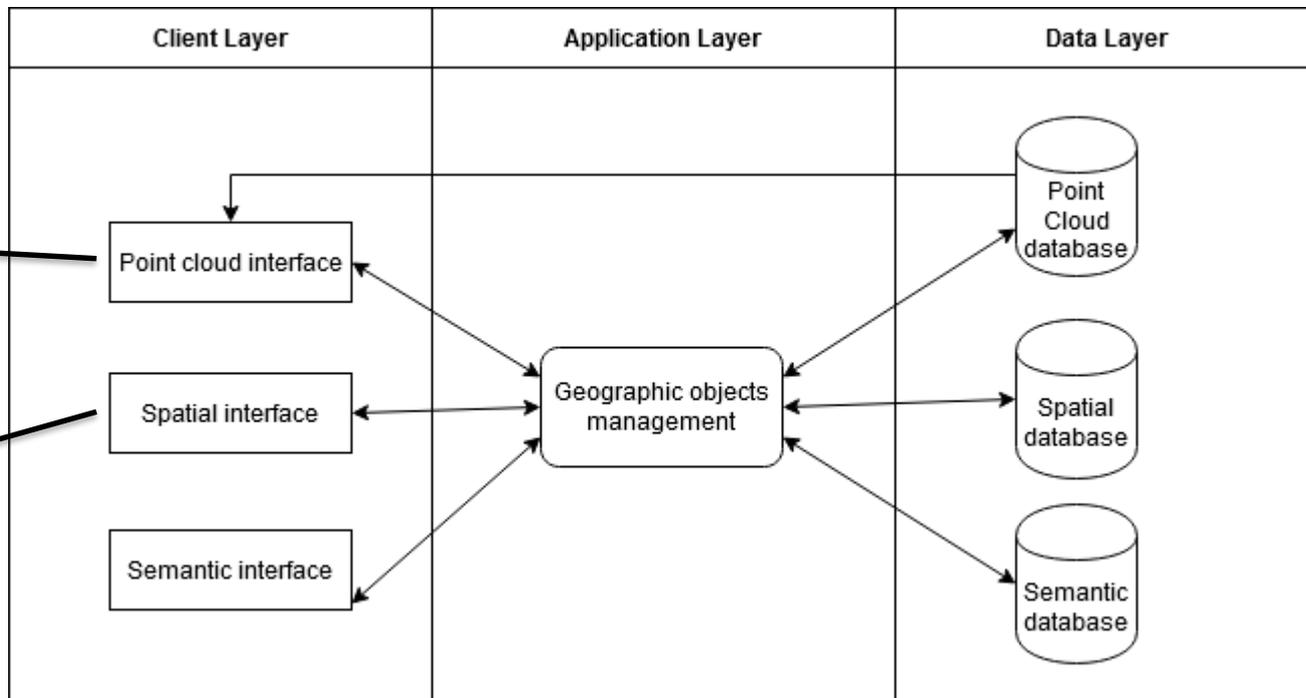


- Phase 2 – started in May 2020 – on process...



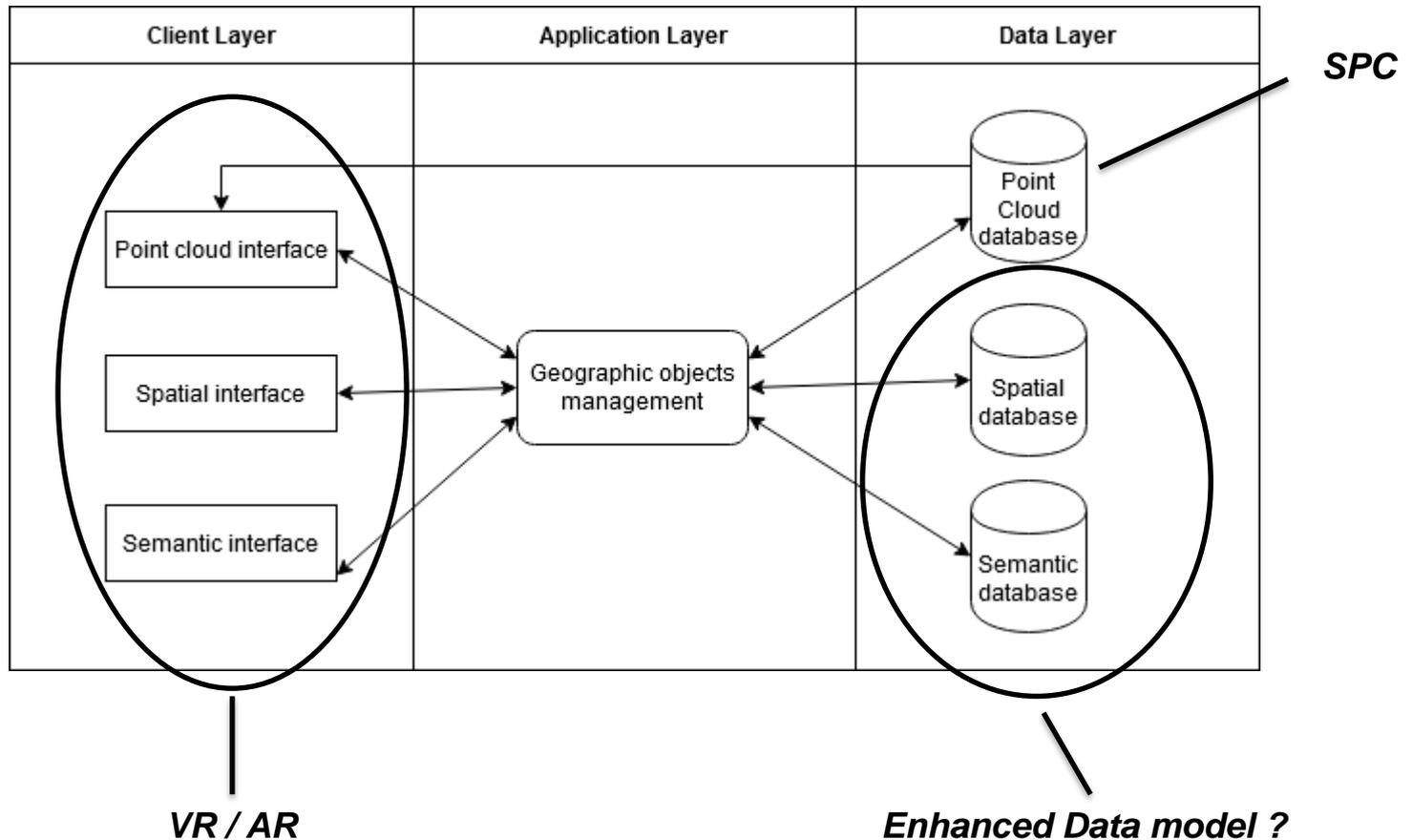
# Perspectives

- IS – phase 2 ?



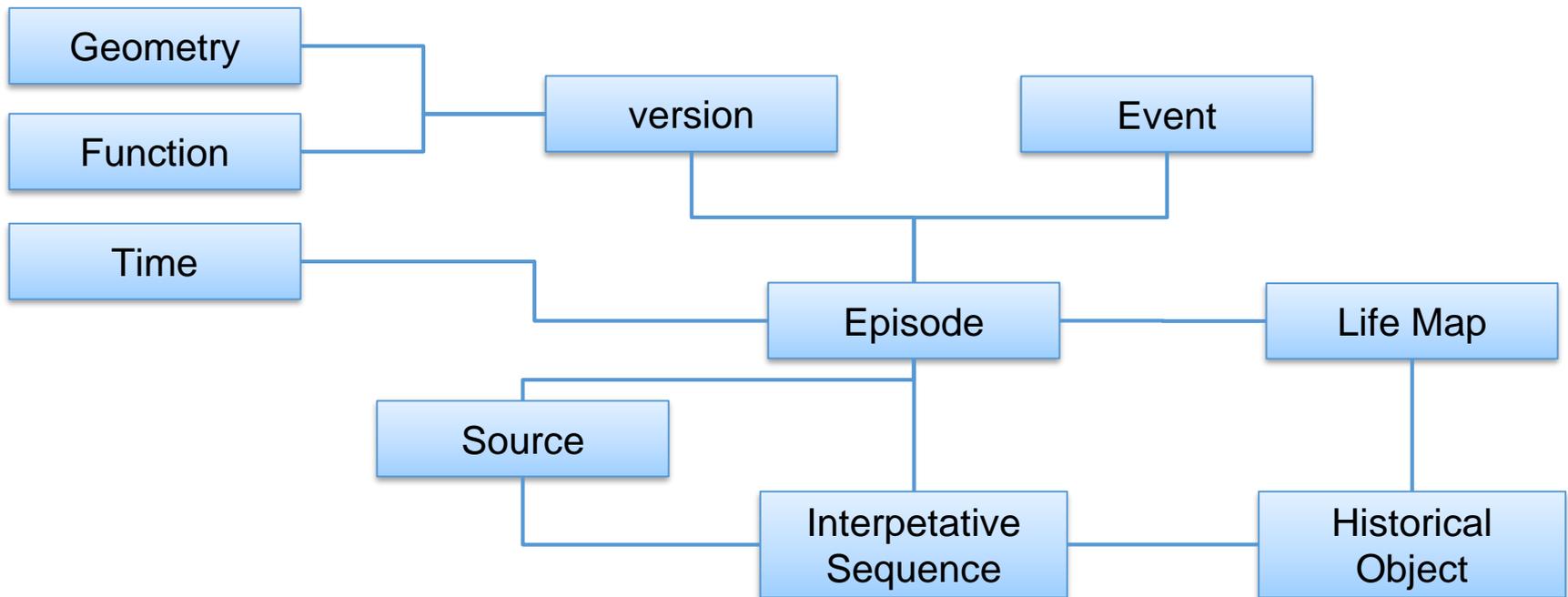
# Perspectives

- Future IS ?



# Perspectives

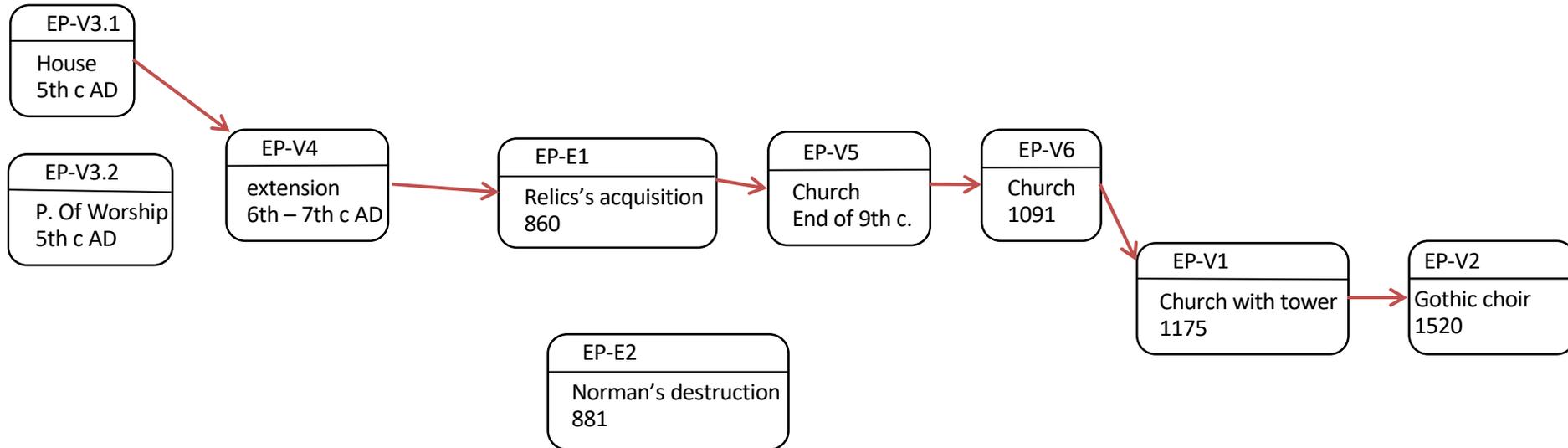
- Enhanced CDM?



**MIDM – Muriel Van Ruymbeke**

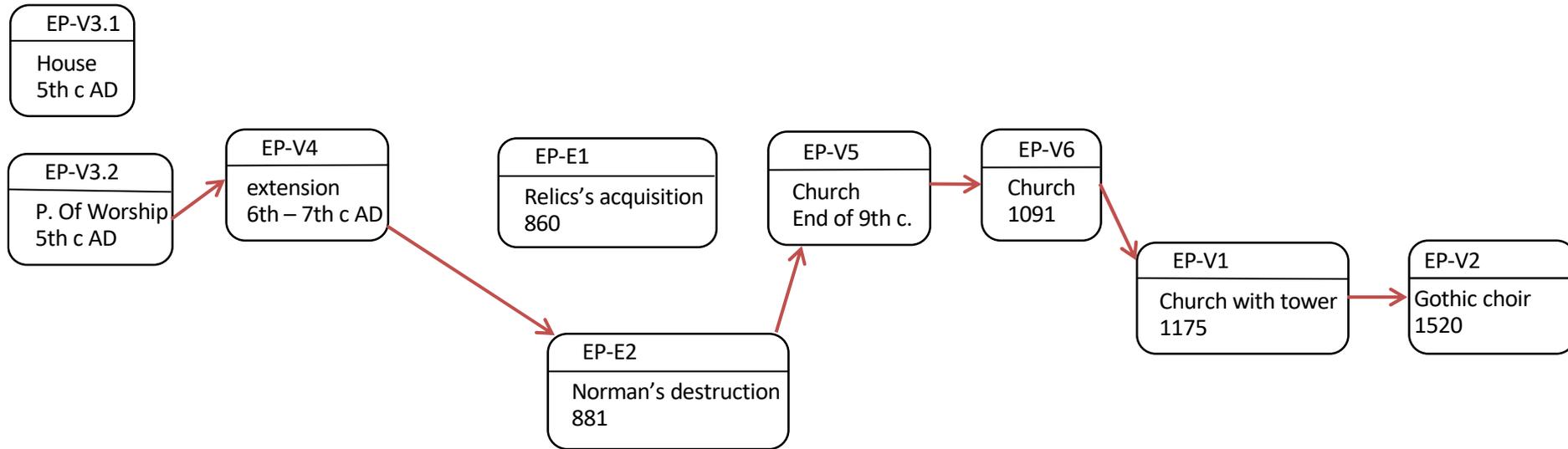
# Perspectives

- Interpretative sequence by author 1



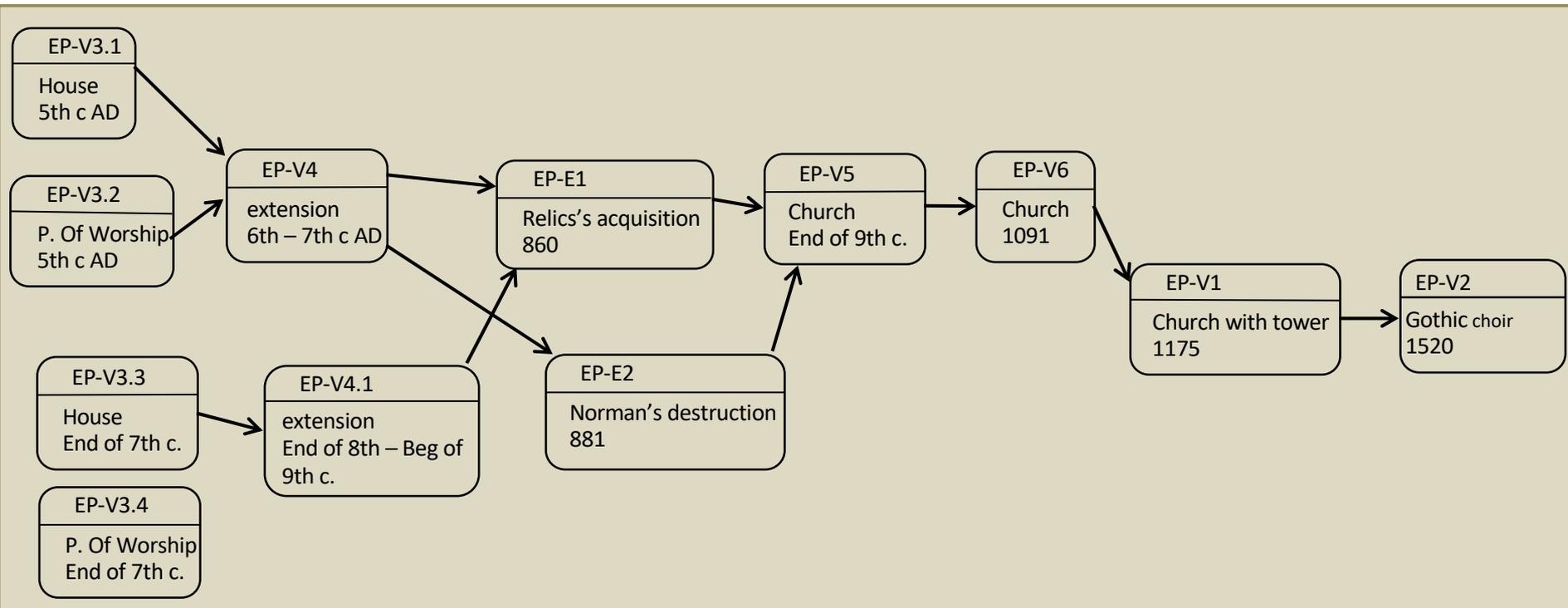
# Perspectives

- Interpretative sequence by author 2



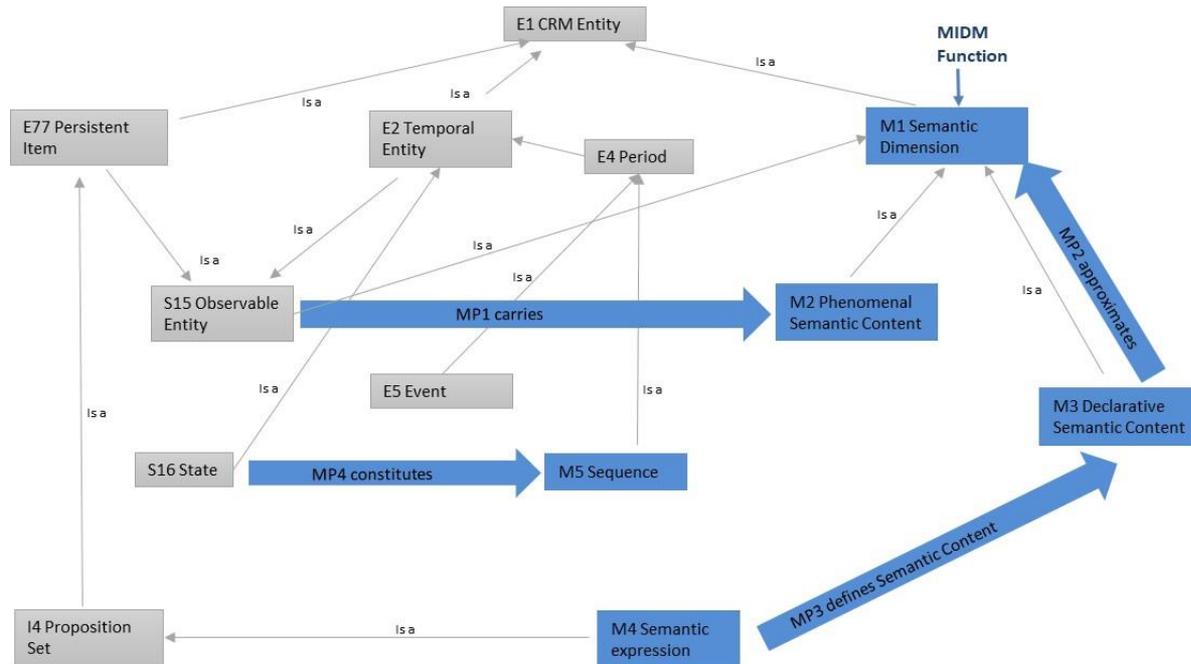
# Perspectives

- Life Map



# Perspectives

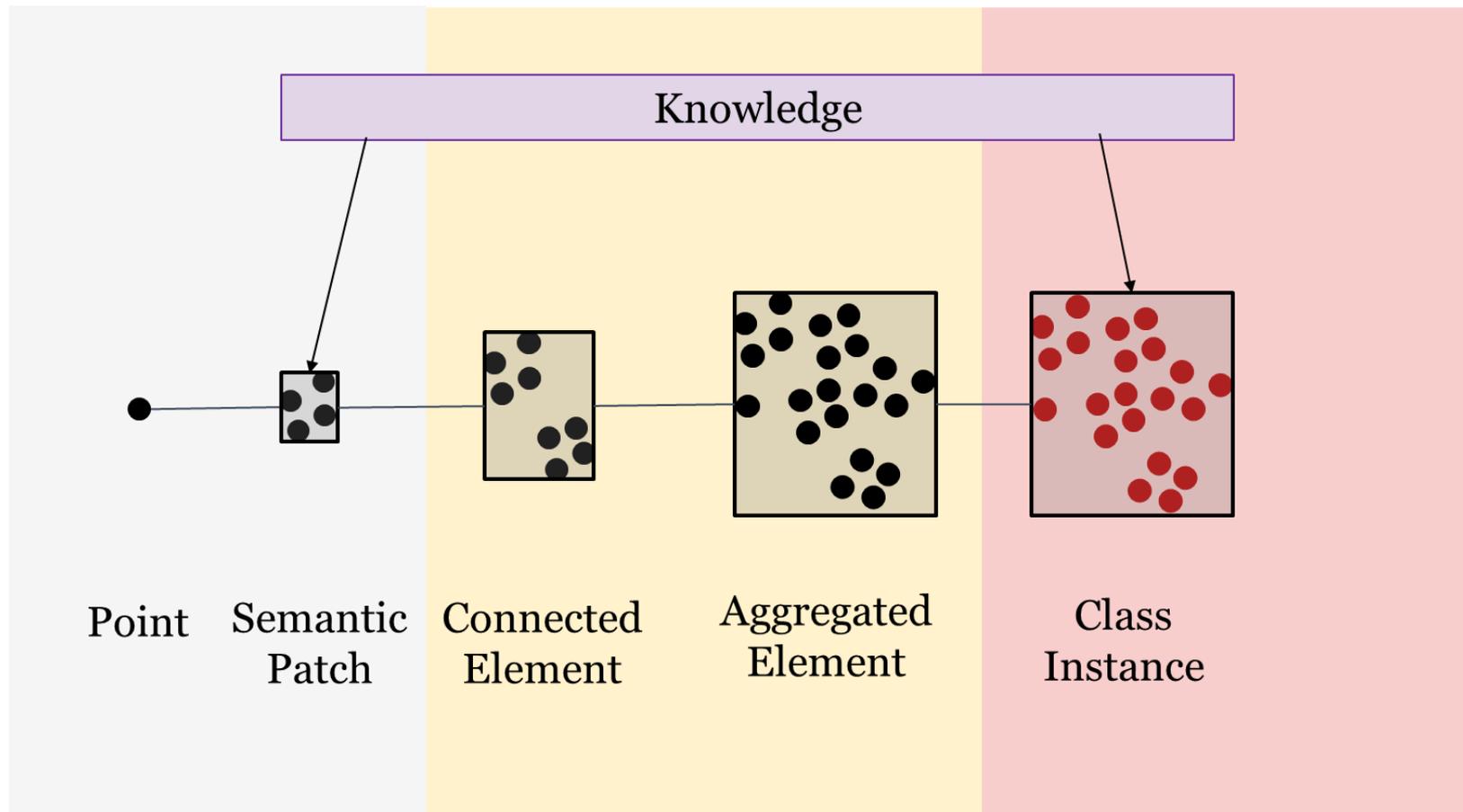
- Enhanced CDM?



**MIDM mapping to CIDOC CRM**

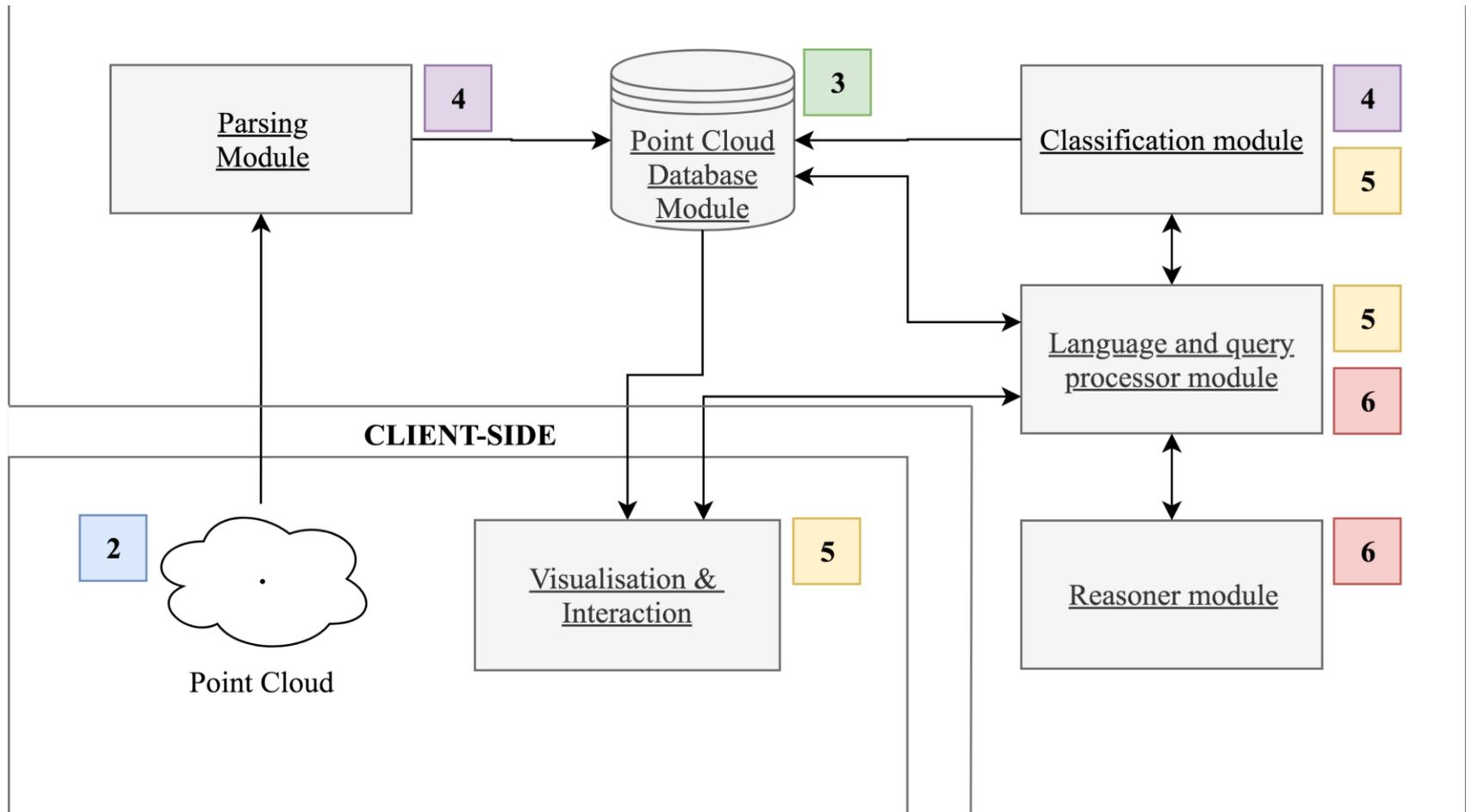
# Perspectives

- Smart Point Cloud (Florent Poux)



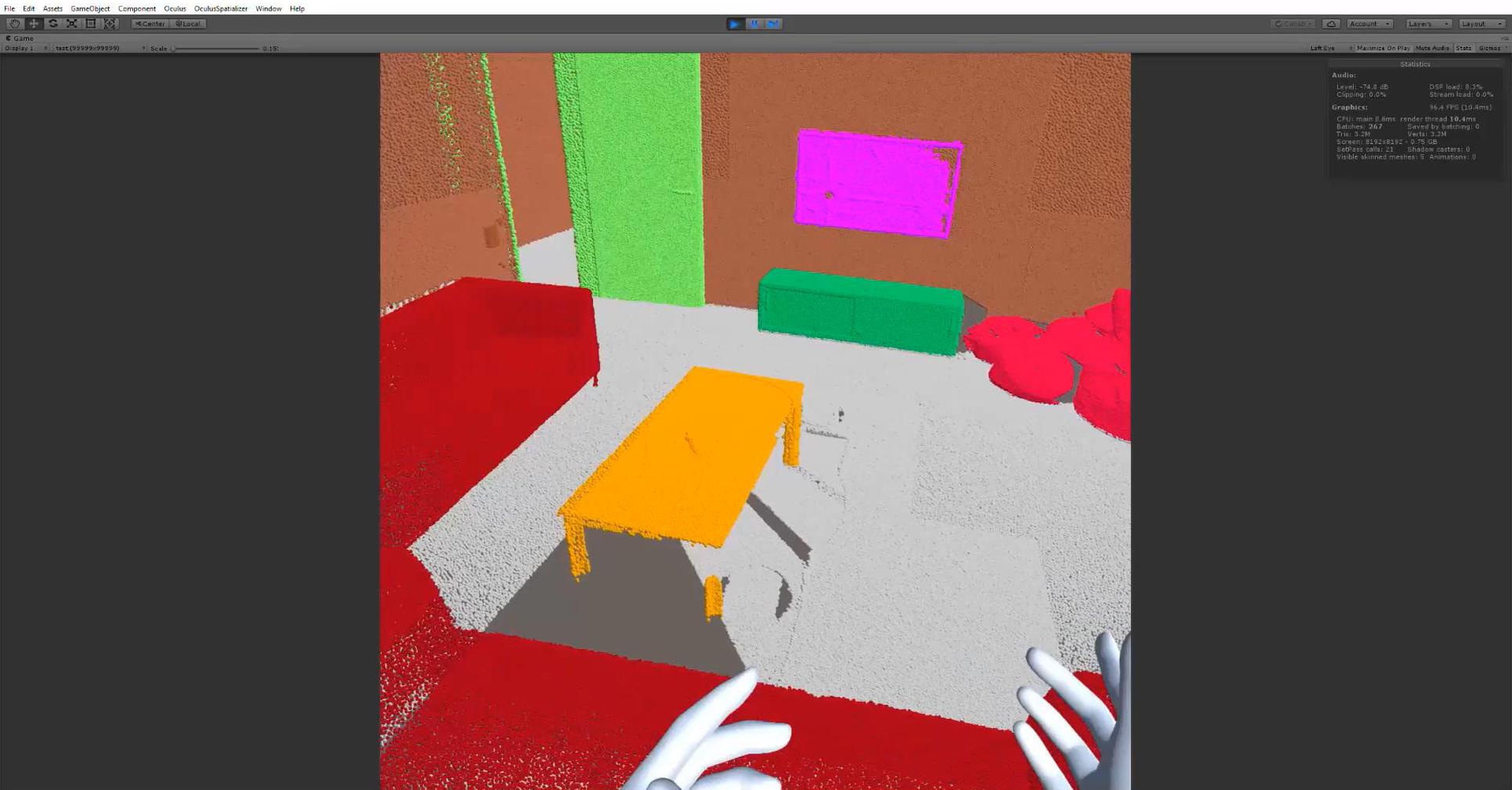
# Perspectives

- Smart Point Cloud (Florent Poux)



# Perspectives

- VR in Point Cloud



# Conclusions

- High challenging project for a University lab  
→ Real scale experience!
- « Collaborative » IS design approach  
→ Requires interdisciplinarity
- Such IS needs to be open and maintainable
  - Fast growing acquisition techniques
  - Fast growing IT solutions
- Huge change of paradigm for Heritage experts

# References

- Poux, F., Neuville, R., Van Wersch, L., Nys, G.-A., & Billen, R. (2017). 3D Point Clouds in Archaeology: Advances in Acquisition, Processing and Knowledge Integration Applied to Quasi-Planar Objects. *Geosciences*, 7(4), 96.
- Van Ruymbeke, M., Hallot, P., Nys, G.-A., & Billen, R. (2018). Implementation of multiple interpretation data model concepts in CIDOC CRM and compatible models. *Virtual Archaeology Review*, 9(19), 50-65.
- Poux, F., & Billen, R. (2019). Voxel-Based 3D Point Cloud Semantic Segmentation: Unsupervised Geometric and Relationship Featuring vs Deep Learning Methods. *ISPRS International Journal of Geo-Information*, 8(5), 213.

## Forthcoming

- *Marker-less mobile augmented reality application for massive 3D point clouds and semantics, KHARROUBI, Abderrazzaq; Billen, Roland; Poux, Florent*
- *HeBIS-PC An Heritage Building Information System based on Point Cloud Data*



Prof. R. Billen



Prof. P. Hallot



Dr. P-H. Lefebvre



Dr. C. Dubois



Dr. F. Poux



Dr. J-P. Kasprzyk

# Thanks for your attention



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