

EMPLOYING BUILDING SPATIAL DATA, MAPS AND 3D MODELS IN A WEB-BASED INDOOR POSITIONING VISUALIZATION

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Outline

1. Introduction: Motivation and Objectives
2. Approach
3. Proof of Concept
4. Discussion and Future Work

Motivation



[source: <http://www.irishenvironment.com/wp-content/uploads/2016/12/carbon-neutral.jpeg>]

Motivation

- Architectural solutions are necessary but not sufficient to face climate change (Janda, 2011)
 - Awareness-raising could help people to adjust their behavior
- Building occupants' behavior plays critical role, but is often not taken into account (Delzendeh, 2017; Hong, 2017)

Delzendeh, E., Wu, S., Lee, A. and Zhou, Y., 2017. The impact of occupants' behaviours on building energy analysis: A research review.

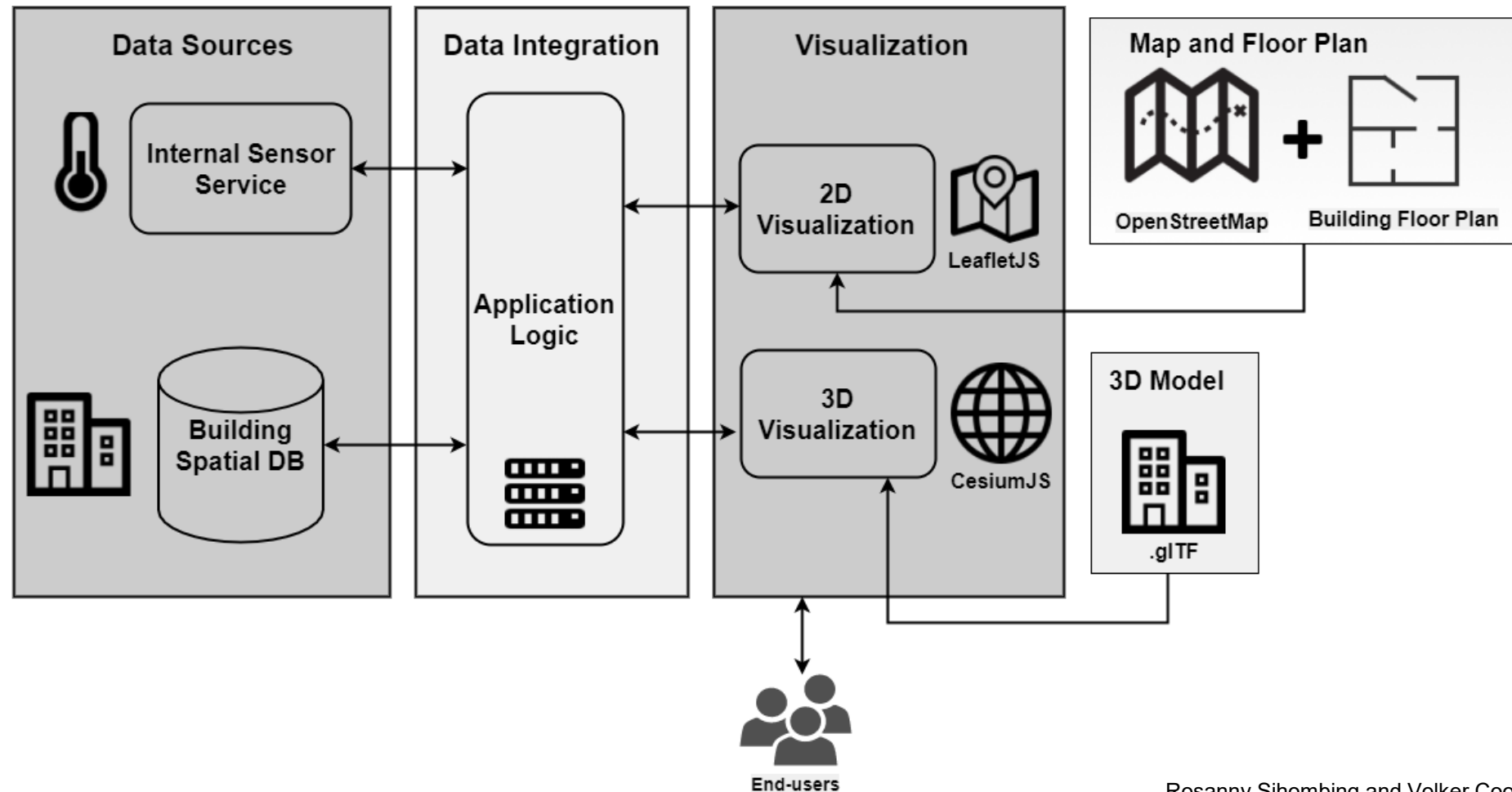
Hong, T., Yan, D., D'Oca, S. and fei Chen, C., 2017. Ten questions concerning occupant behavior in buildings: The big picture. *Building and Environment* 114, pp. 518–530.

Janda, K. B., 2011. Buildings don't use energy: People do. *Architectural Science Review* 54(1), pp. 15–22.

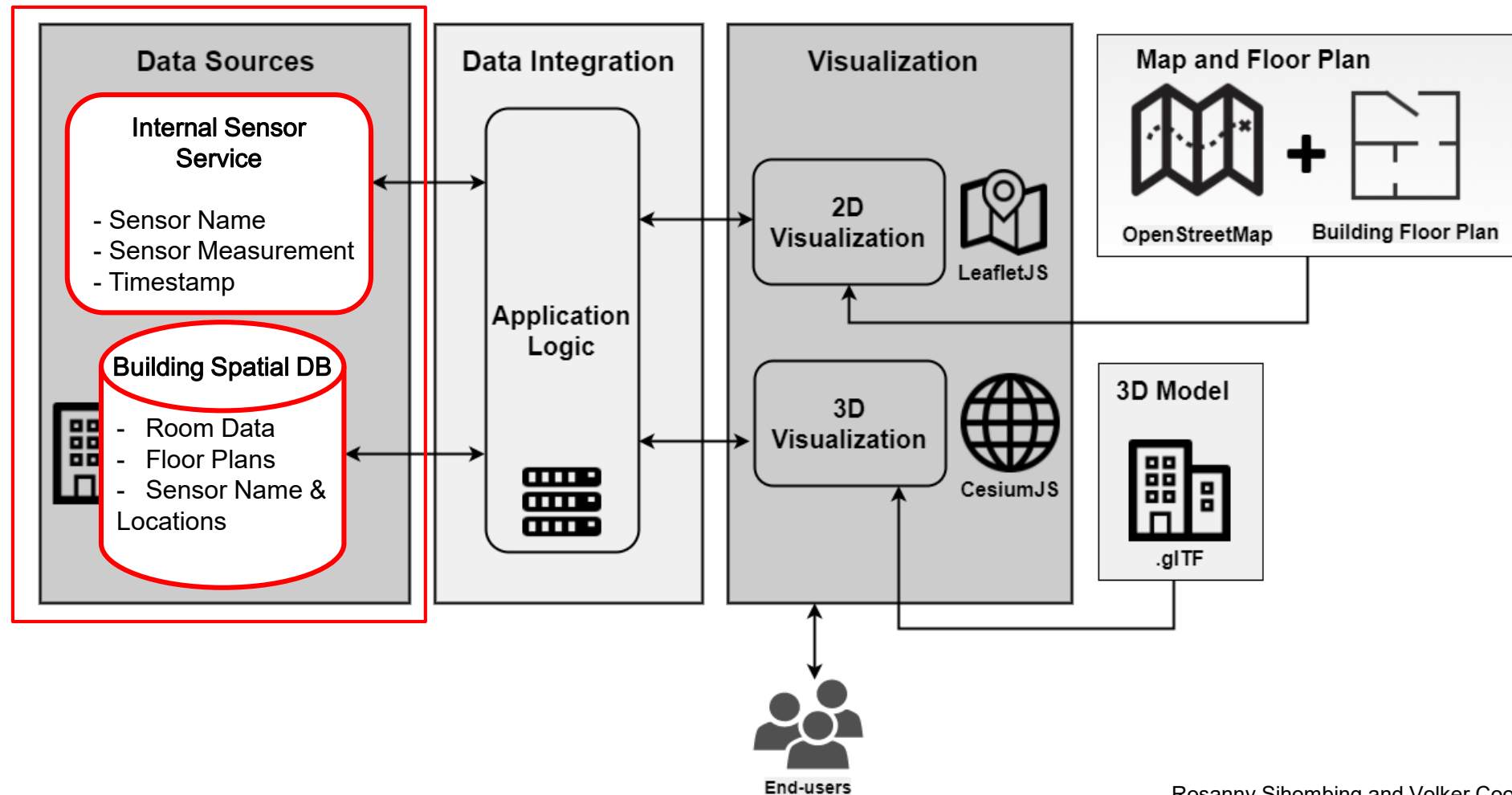
Objectives

- Provide easy access to energy-related data to all building occupants.
- Provide indoor visualization.
 - Implement indoor positioning visualization to locate energy-related sensors which are not equipped with a wireless positioning system.

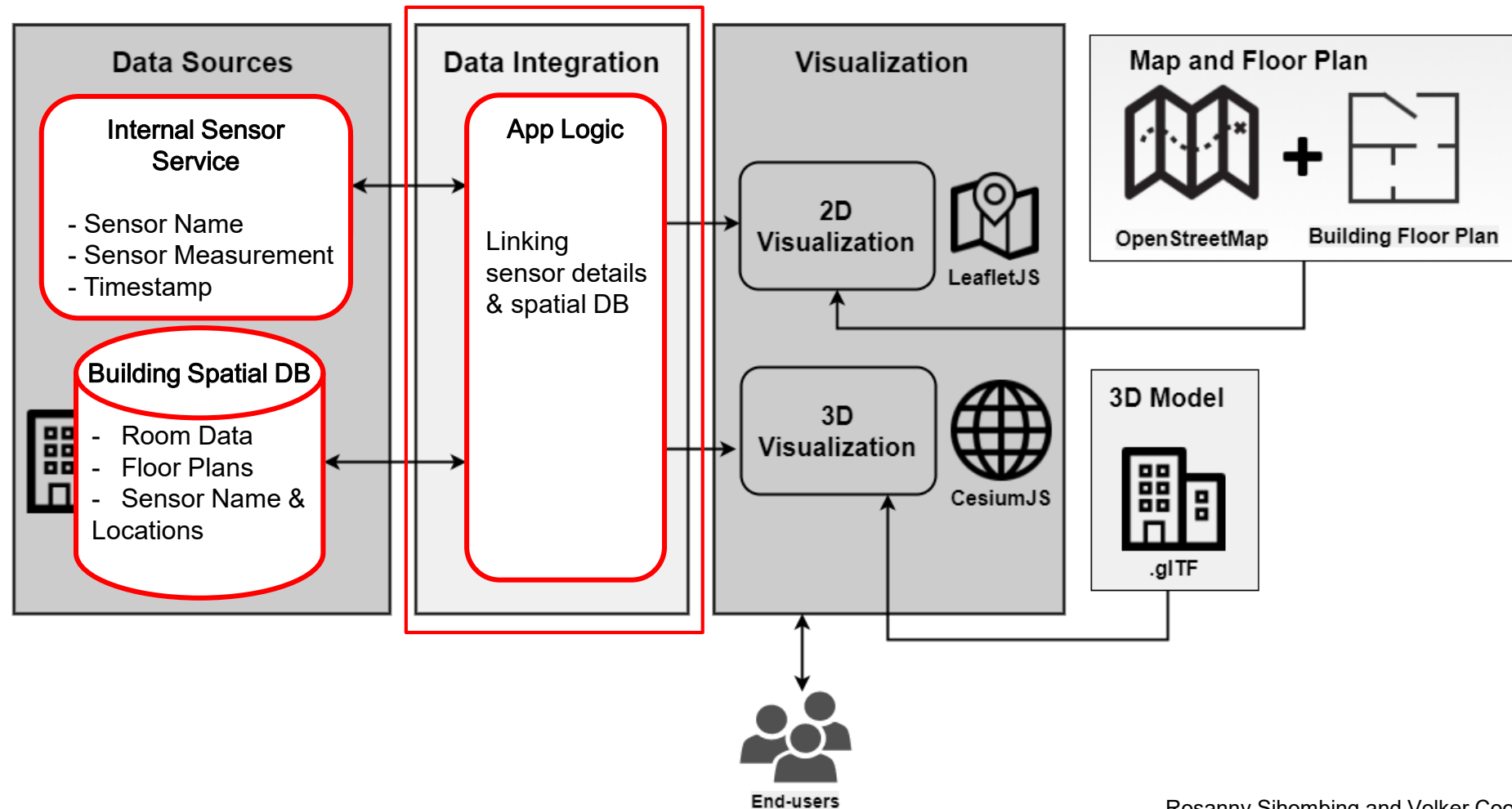
Approach



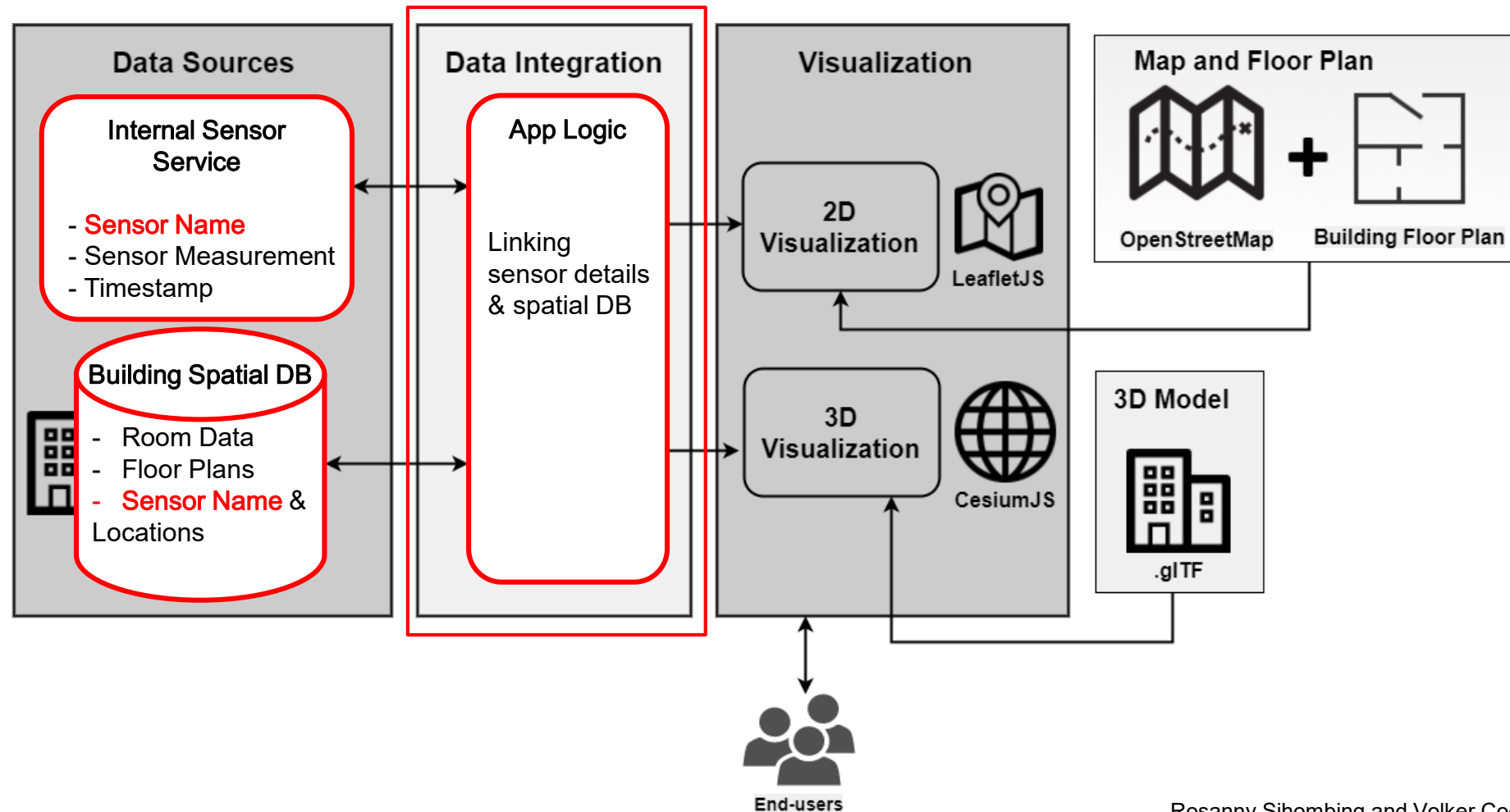
Approach



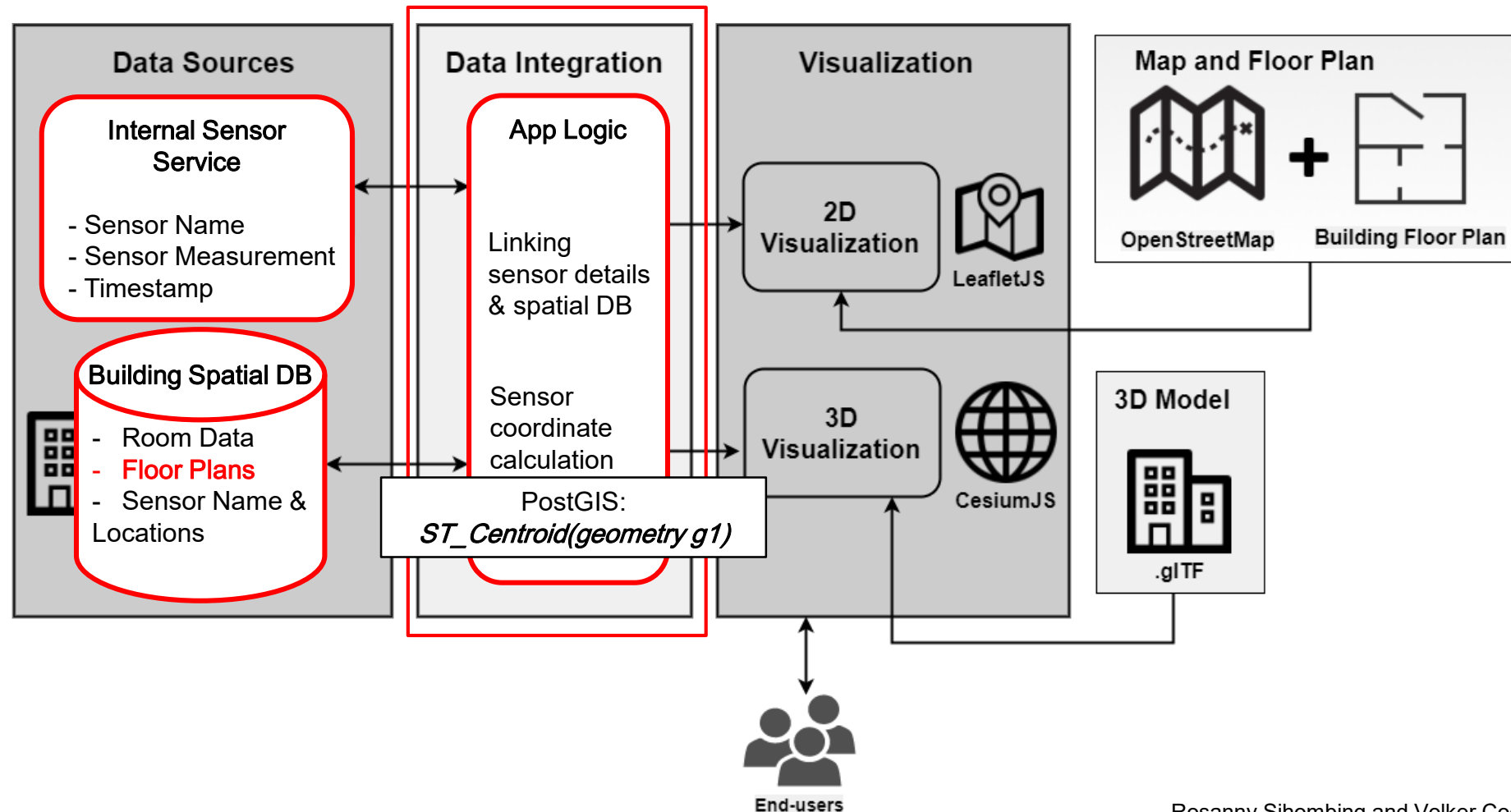
Approach



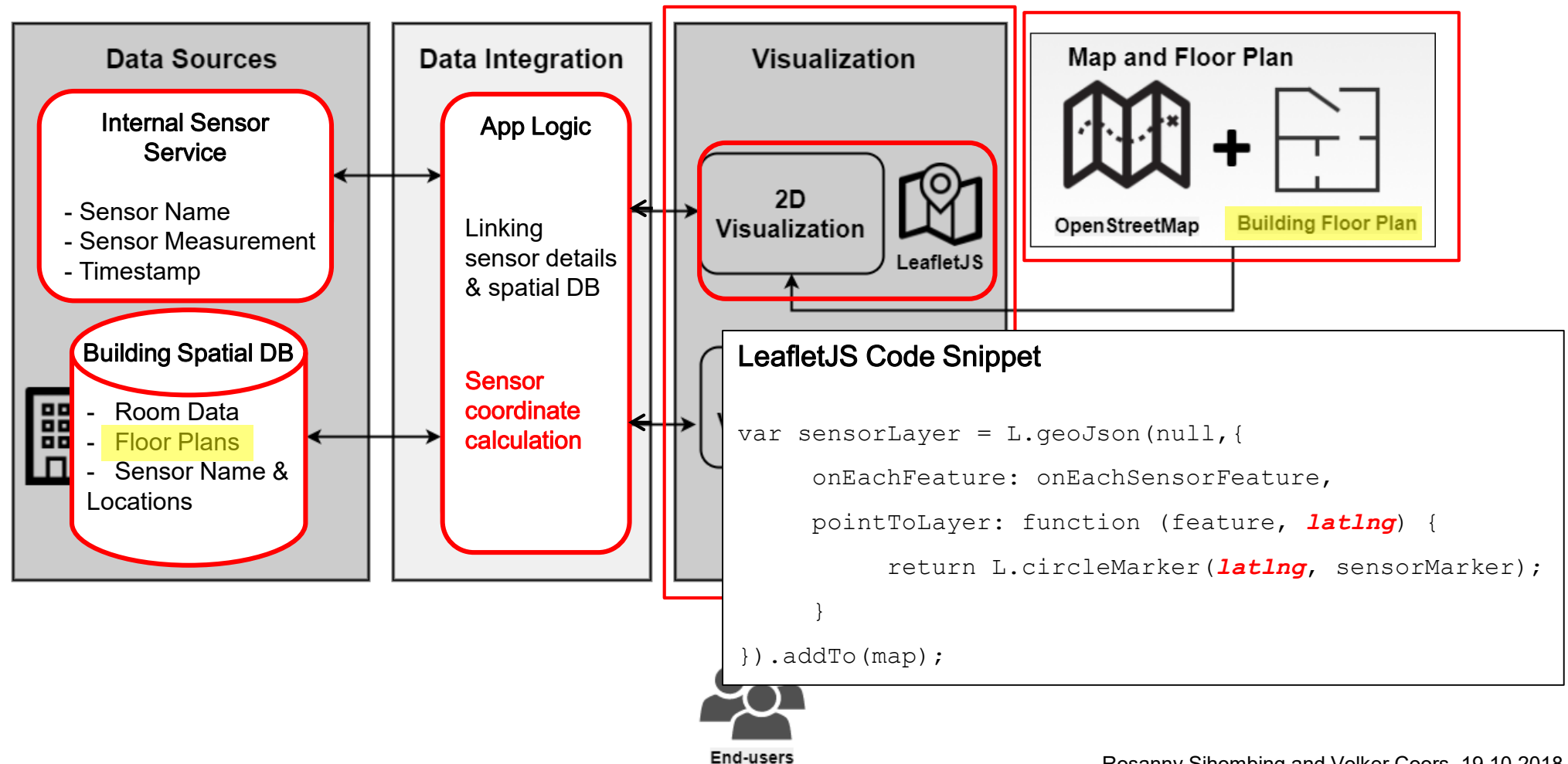
Approach



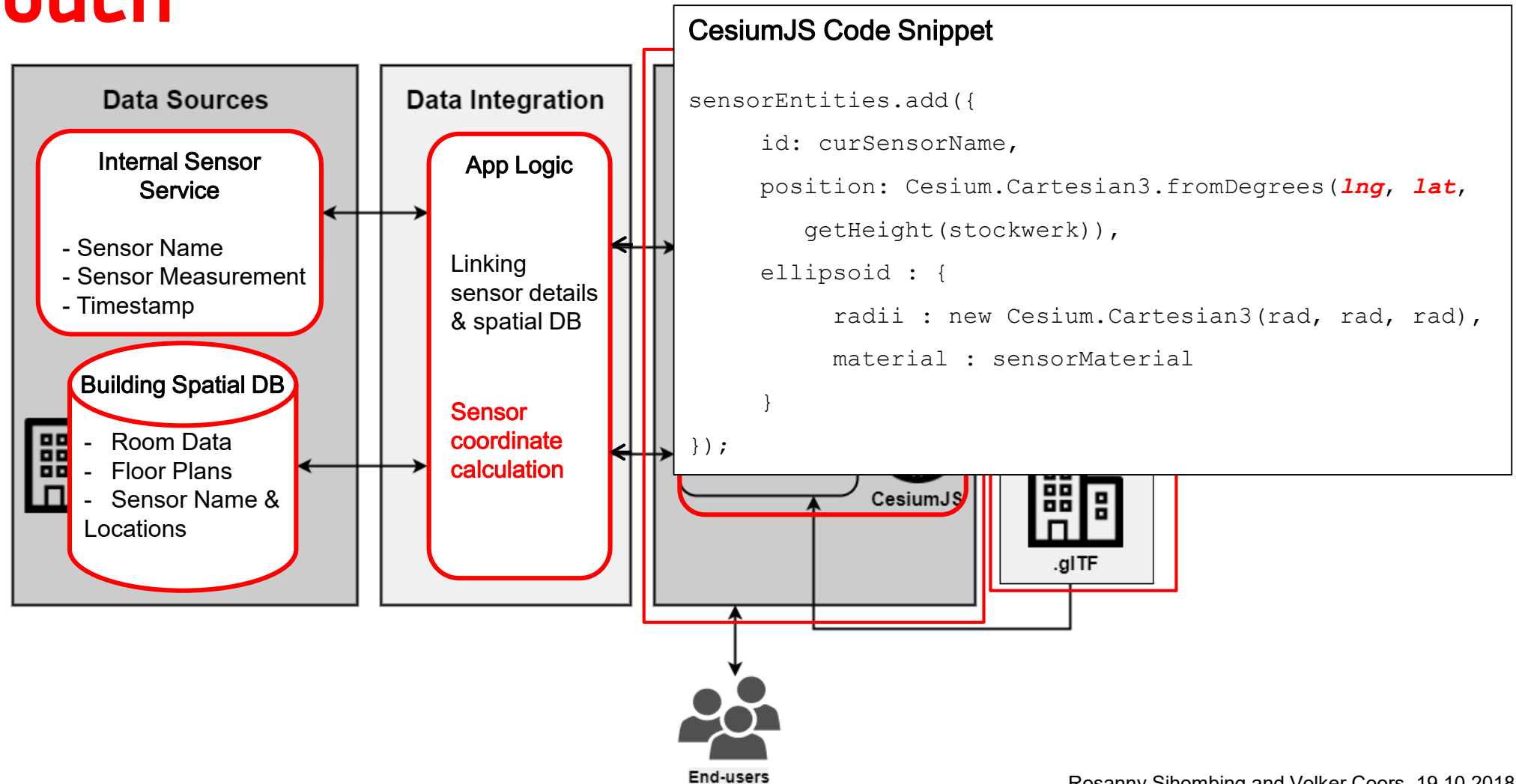
Approach



Approach



Approach



Proof of Concept

- Test Building: A Building of University of Applied Sciences Stuttgart
 - 1 Basement and 4 Floors
- Energy-related data: Room Temperature
 - Sensor Type: Room Temperature Sensor
 - Unit of measurement: Celcius
 - Time range: 01/01/2016 – 30/11/2016
- No sensor mounted in the basement

Proof of Concept – 2D Visualization

The screenshot displays a web-based interface for sensor data visualization. On the left, a sidebar contains several red navigation buttons: 'Energieverbrauch', 'Sensoren', 'Download Sensor', and 'Bau 1'. Below these are input fields for sensor selection and a 'Show Overview' button. The main area shows a 2D map of a building complex with sensor locations marked by blue dots. A tooltip for a selected sensor is visible, showing its ID and a 'select to download' checkbox. A legend at the bottom left indicates priority levels: 'Niedrig' (green), 'Normal' (orange), and 'Hoch' (red). The map includes labels for streets like 'Breitscheidstraße' and 'Schellingstraße', and building names like 'Hochschule für Technik'.

Gebäudeinformation

Bau 1 OG 3
GID: 2
Raum: Hoersaal
Raum Nr: 303

Uni Stuttgart
Soziologie,
Navigation,
Sprachen,
Zendas

Breitscheidstraße

Block

Hochschule
für Technik
Bau 3

Schellingstraße

Stahlskulptur

01'H306'M800_Raum_Temp.

2

Show Overview

3

Bau 1

Ebene 4 - OG3

Ebene 3 - OG2

Ebene 2 - OG1

Ebene 1 - EG

Ebene 0 - UG

Priorität

Niedrig

Normal

Hoch

Gebäude

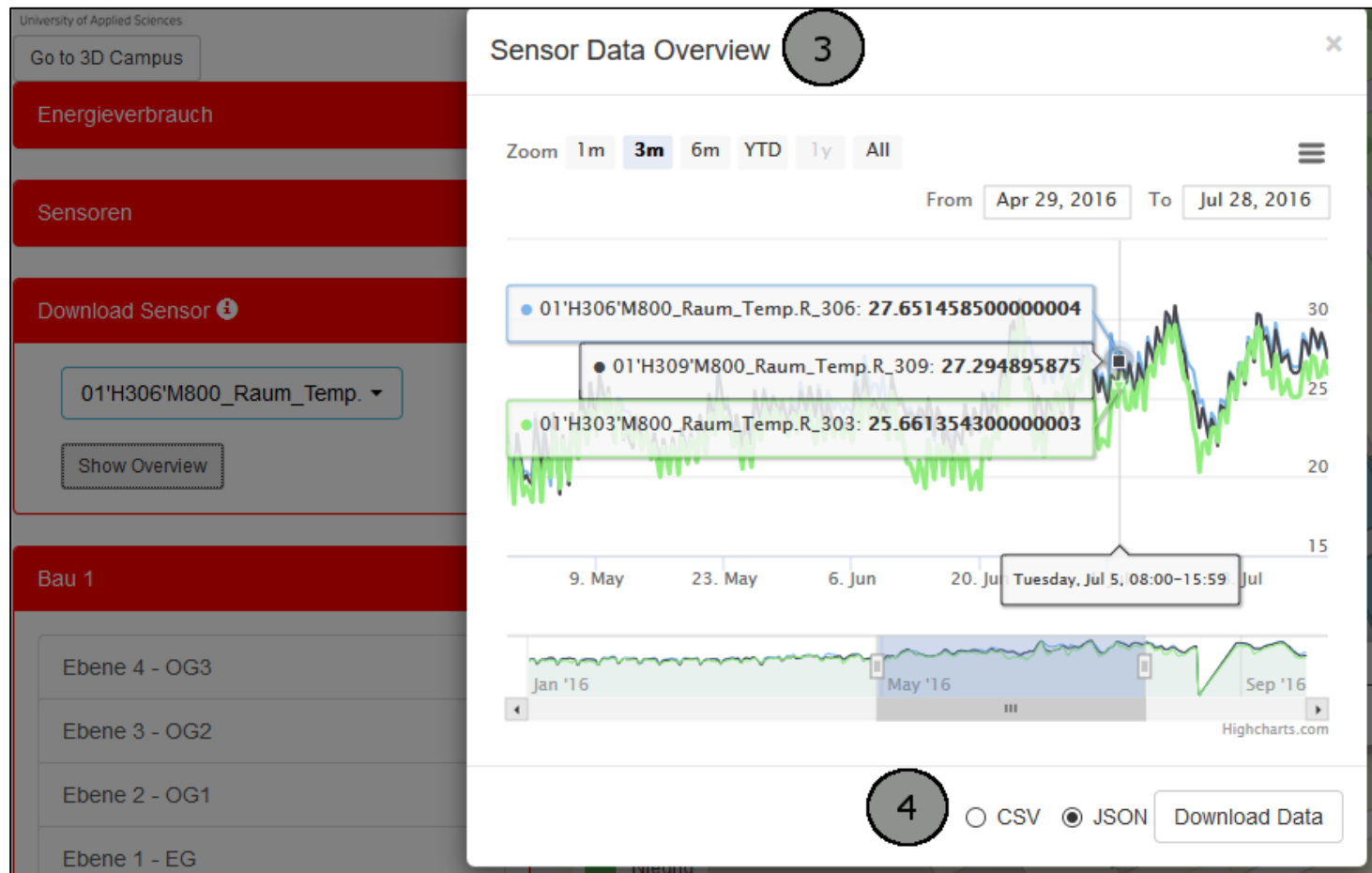
01'H306'M800_Raum_Temp.R_306

select to download

1

1. Select sensor(s)
2. A list of selected sensors
3. Data overview button

Proof of Concept – 2D Visualization



3. Sensor data overview
4. Format selection and download button

Proof of Concept – 3D Visualization



1. Select a sensor(s)
2. A list of selected sensors
3. A button to show sensor data overview
4. Show/hide a building floor(s)

Proof of Concept – 2D and 3D

2D

3D

2nd floor

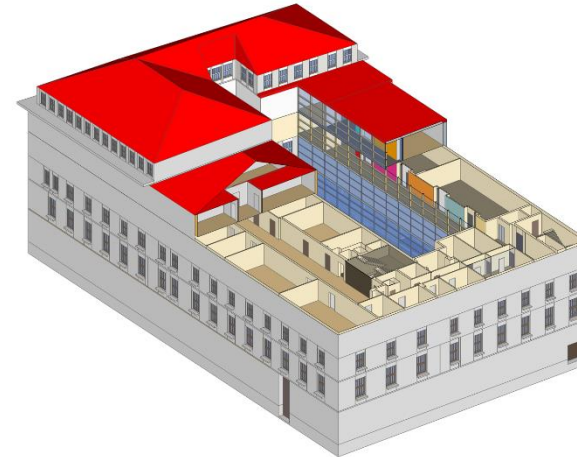


Discussion

- Objects that not equipped with wireless positioning technology could be correctly located.
 - Not exactly where they are on the wall or ceiling.
 - DB must be updated every time an object is moved from one room to another room.
- 2D or 3D ?
 - 2D needs less resources
 - 3D can perform better in giving visual perspective

Future Work

- Explore the new Level of Detail concept in CityGML 3.0
- OGC Standard: SensorThings API
- Live data



Thank you

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demo: <http://campus.hft-stuttgart.de>