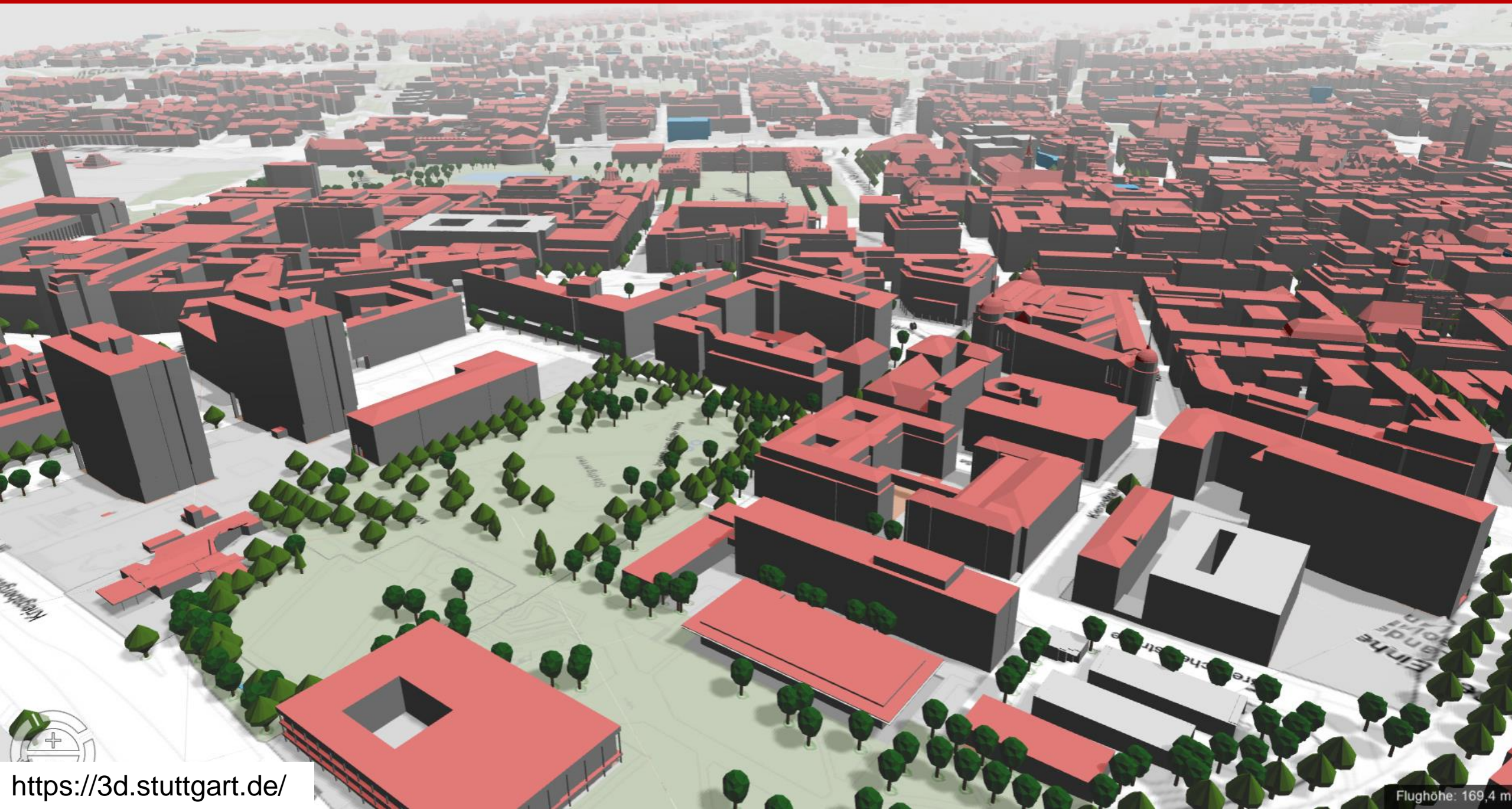


Smart City Standards Workshop
**OGC 3D Portrayal Service &
OGC 3D Container Pilot**

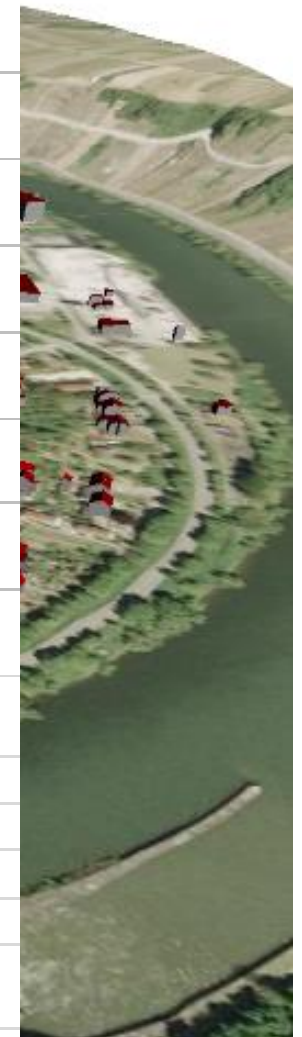
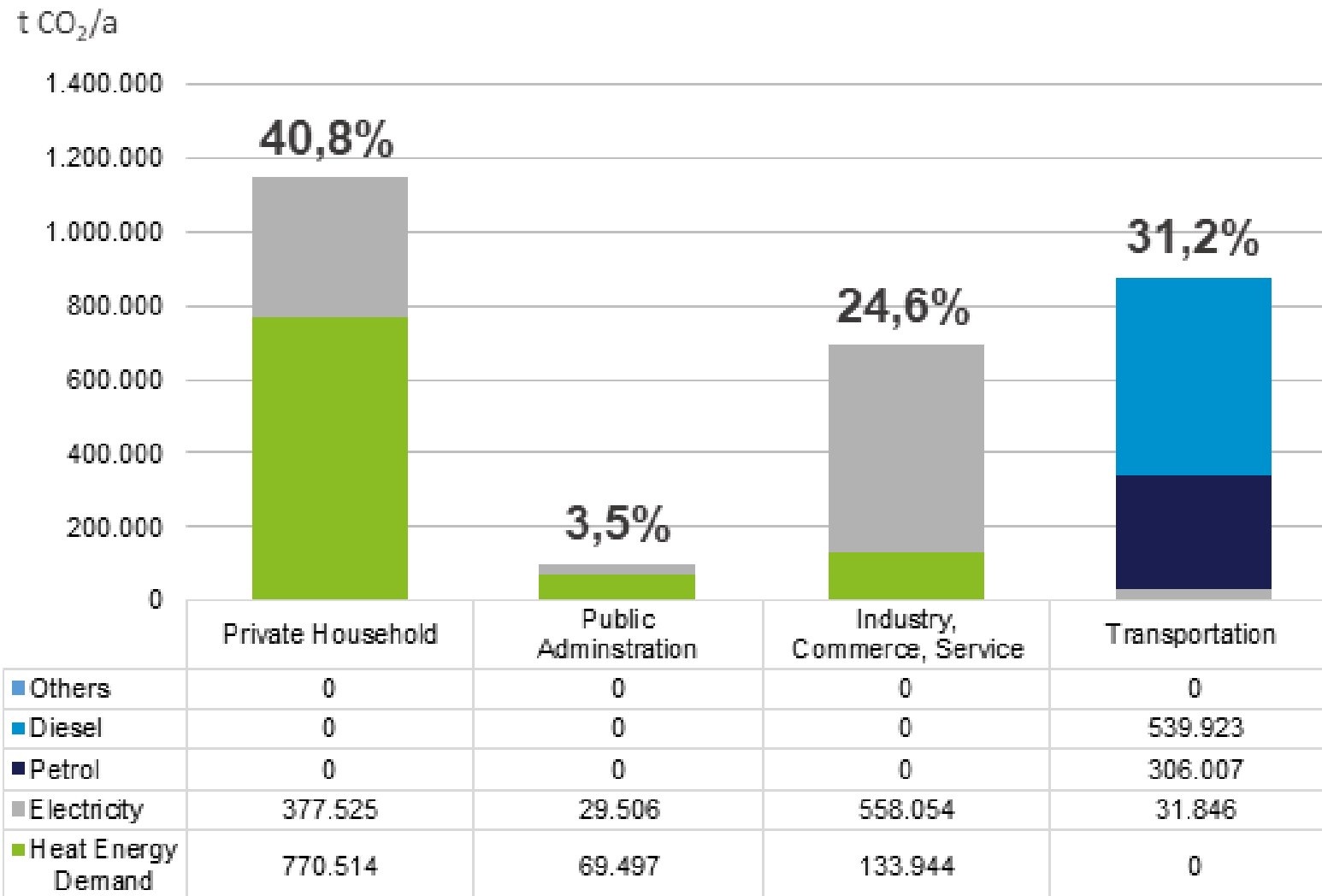
Prof. Volker Coors

Faculty of Geomatics, Computer Science and Mathematics

University of Applied Sciences Stuttgart



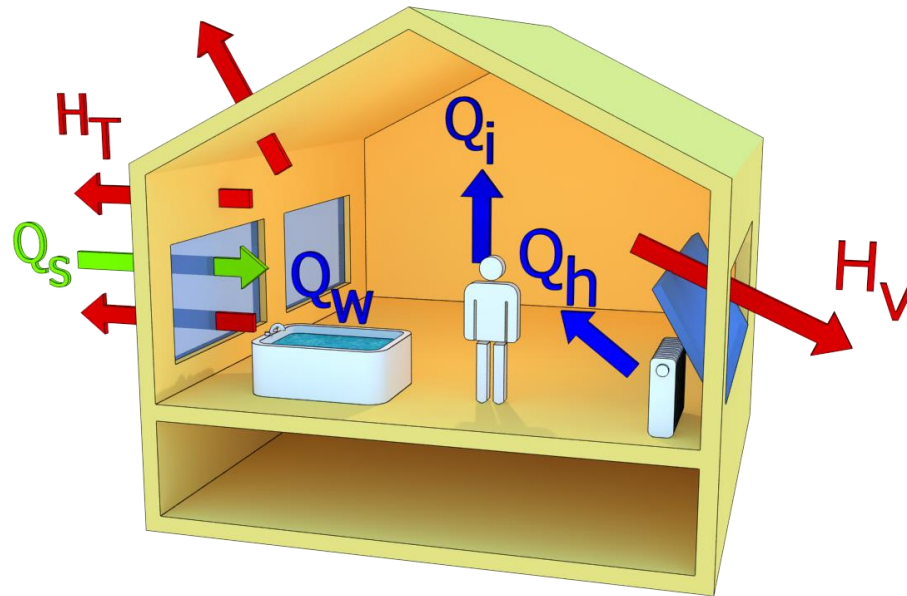
CO2 Emissionen for different sectors and applications
County of Ludwigsburg (34 city districts) 2013



Building Simulation

- Q_h heating demand
- Q_w hot water heating demand
- Q_s solar gains
- Q_i internal gains

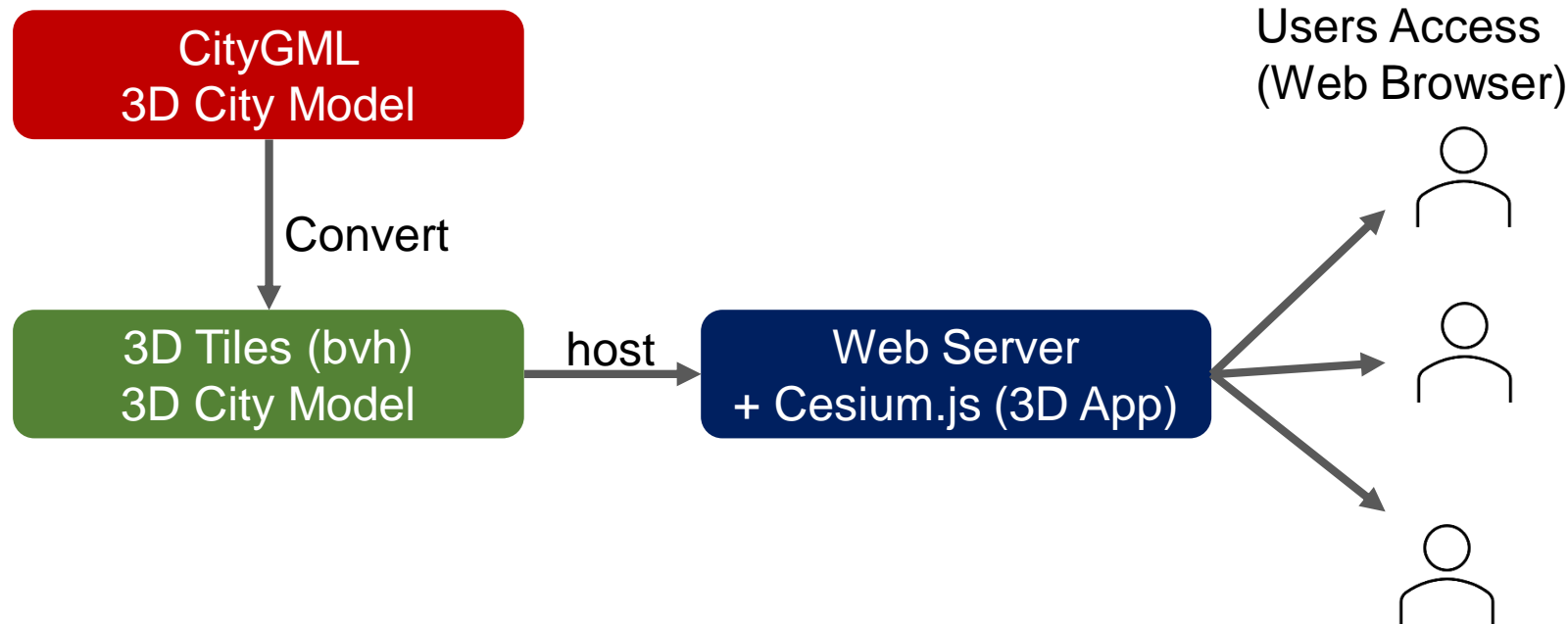
- H_T transmission heat loss
- H_v ventilation losses



Bruse, M., Nouvel, R., Wate, P., Kraut, V., and Coors, V.: An Energy-related CityGML ADE and its Application for Heating Demand Calculation, [International Journal of 3-D Information Modeling \(IJ3DIM\)](#) 4(3), IGI Global, pp 59-77, DOI: [10.4018/IJ3DIM.2015070104](https://doi.org/10.4018/IJ3DIM.2015070104)



Simple approach



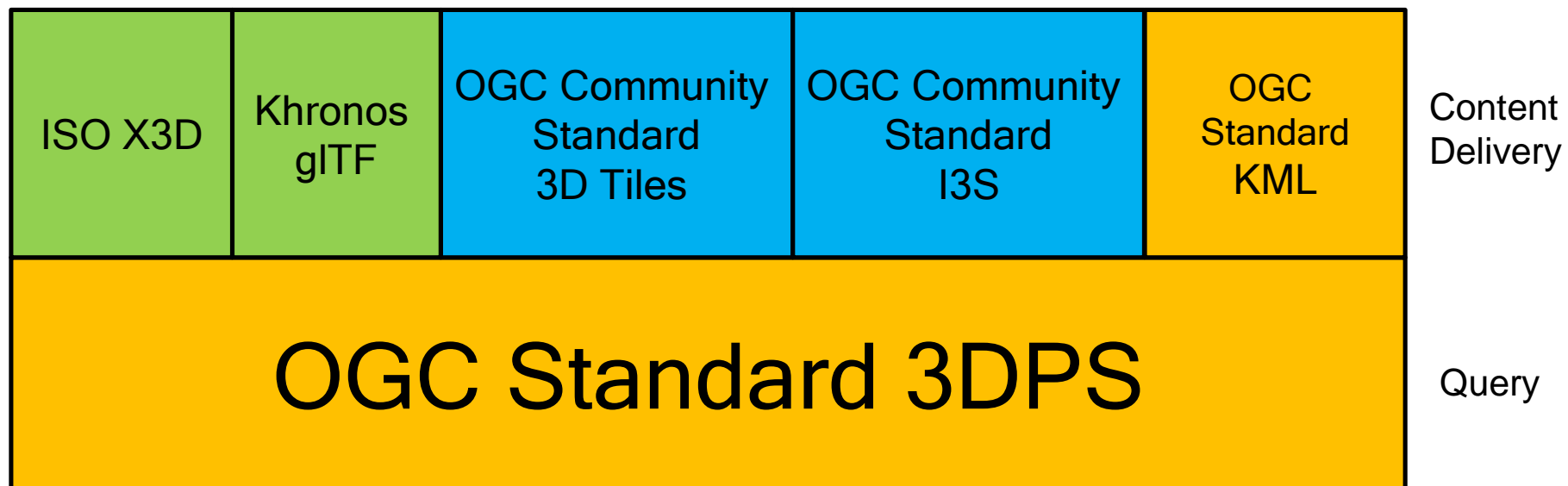
- Scalable: bounding volume hierarchy
- Data provider: how to structure the data on server side?
- Scene that contains everything?
- Scene per Layer?
- Data formats depend on web-client
- How to find data sets?

https://transfer.hft-stuttgart.de/pages/3dgeovisclient/VisualizationWorkshop_stepBystep.html

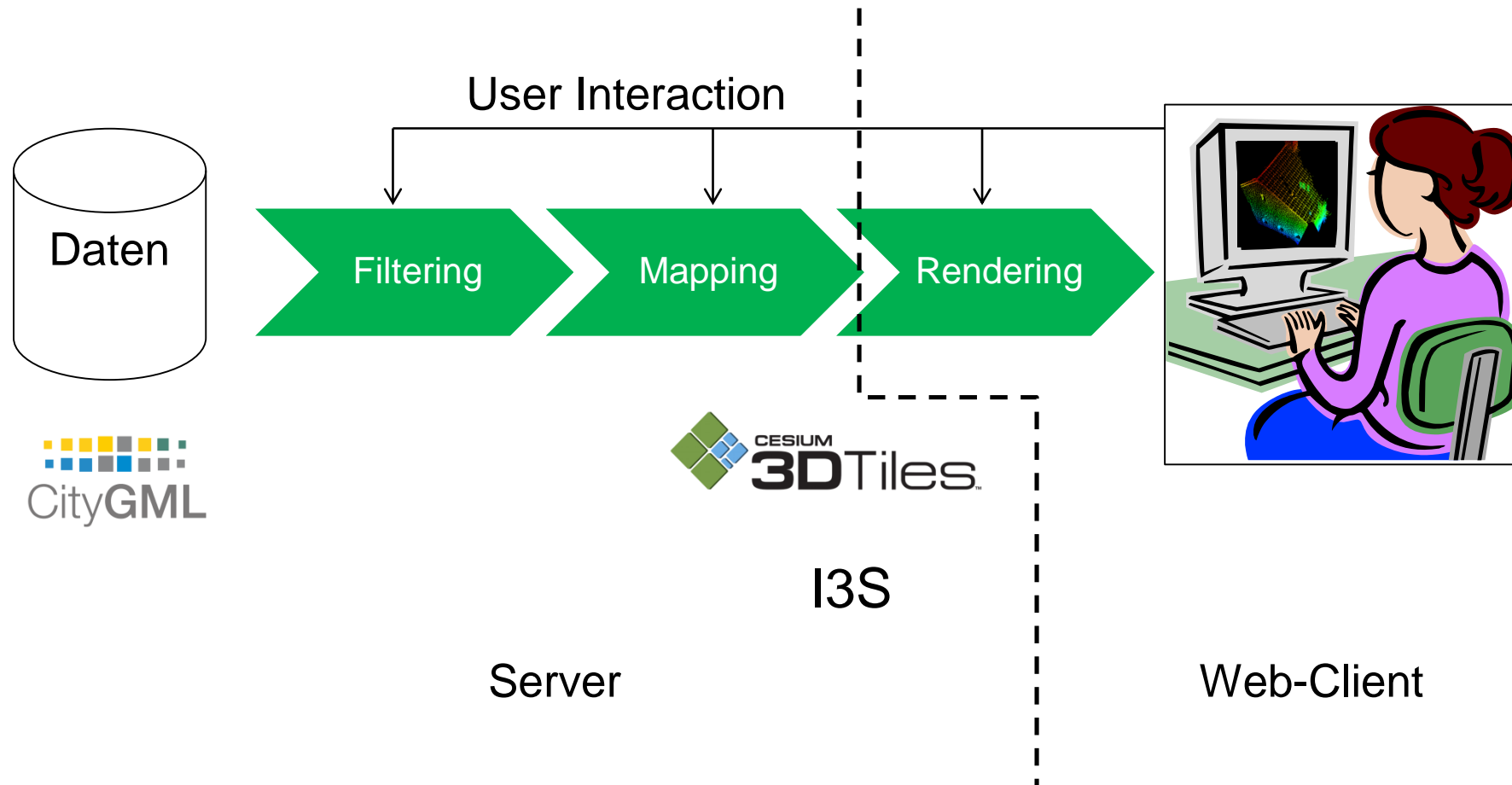
<https://transfer.hft-stuttgart.de/pages/3dgeovisclient/VisualizationWorkshop.html>

The vision:

For images, we don't talk much about data formats itself, we just select suited formats (such as jpeg, png, etc.). We want to achieve the same in 3D.



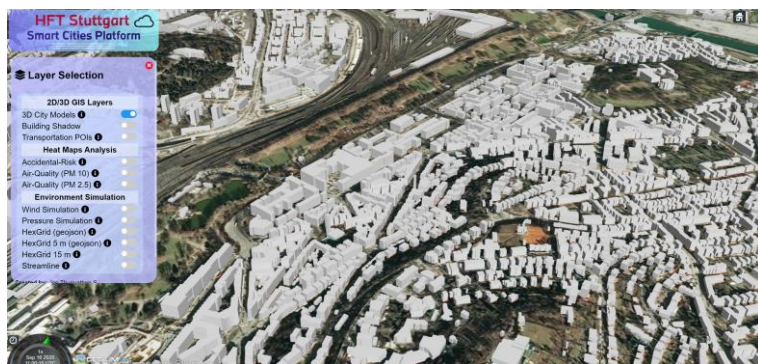
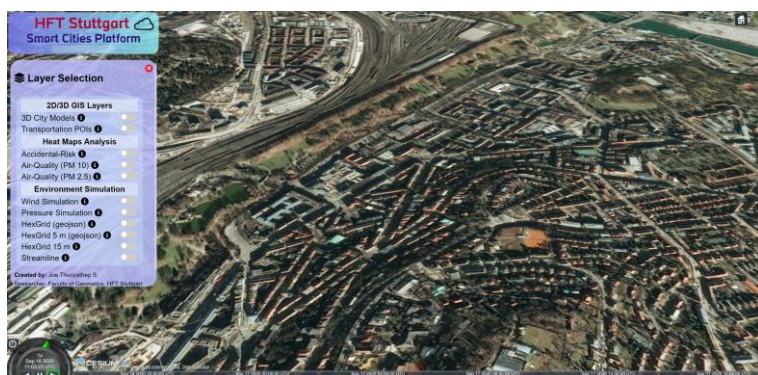
3D Portrayal Service



3D Portrayal Services

Example of the 3DPS GetScene Request of the Stuttgart City Models

Client

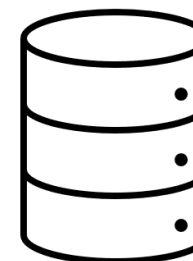


3DPS - GetScene building Request

HTTP GET Request



3DPS Server



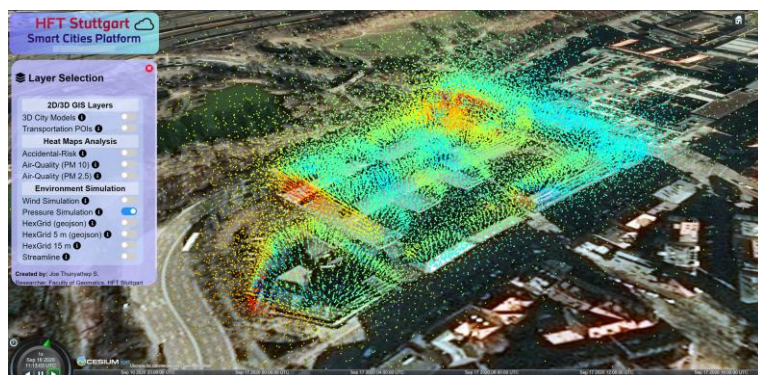
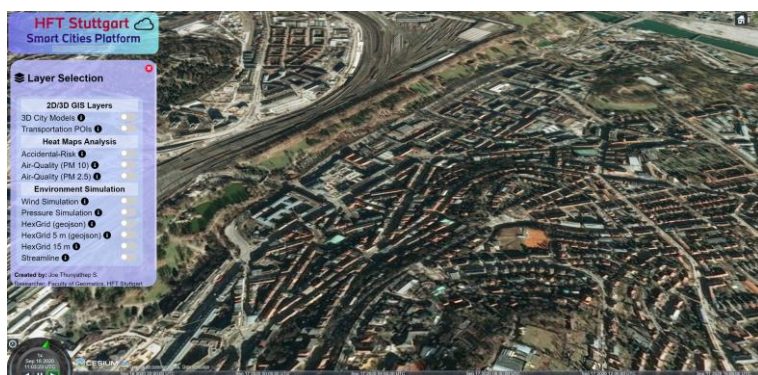
test above link, click here:

<http://193.196.37.89:8092/service/v1?service=3DPS&acceptversions=1.0&request=GetScene&boundingbox=9.19,48.78,9.21,48.79&format=application/json+3dtiles&layer=building&lod=1>

3D Portrayal Services

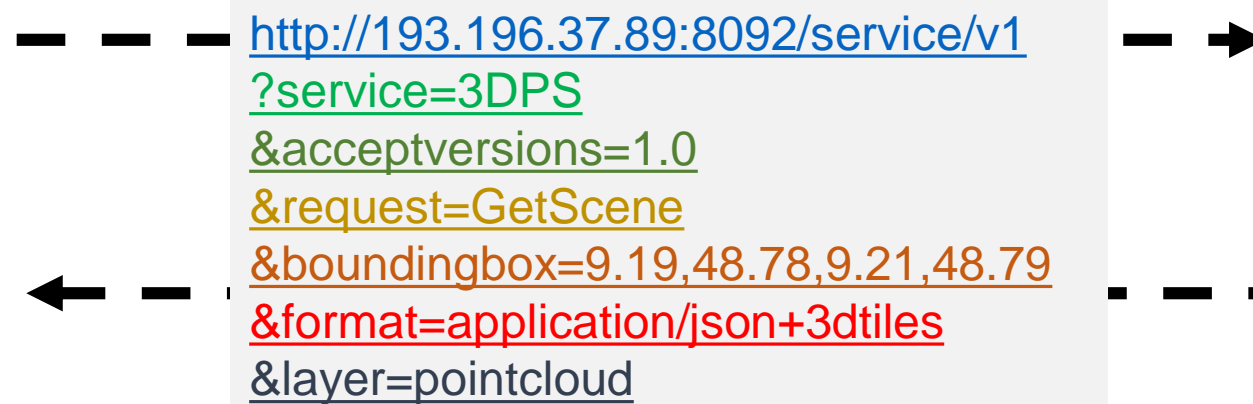
Example of the 3DPS GetScene Request of the Stuttgart Wind Simulation Pointcloud

Client

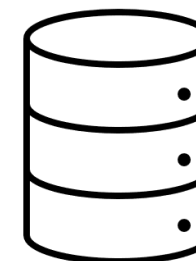


3DPS - GetScene building
Request

HTTP GET Request



3DPS
Server






test above link, click here:






<http://193.196.37.89:8092/service/v1?service=3DPS&acceptversions=1.0&request=GetScene&boundingbox=9.19,48.78,9.21,48.79&format=application/json+3dtiles&layer=building&lod=1>

HFT Stuttgart

Smart Cities Platform








- Accidental-Risk 
- Air-Quality (PM 10) 
- Air-Quality (PM 2.5) 

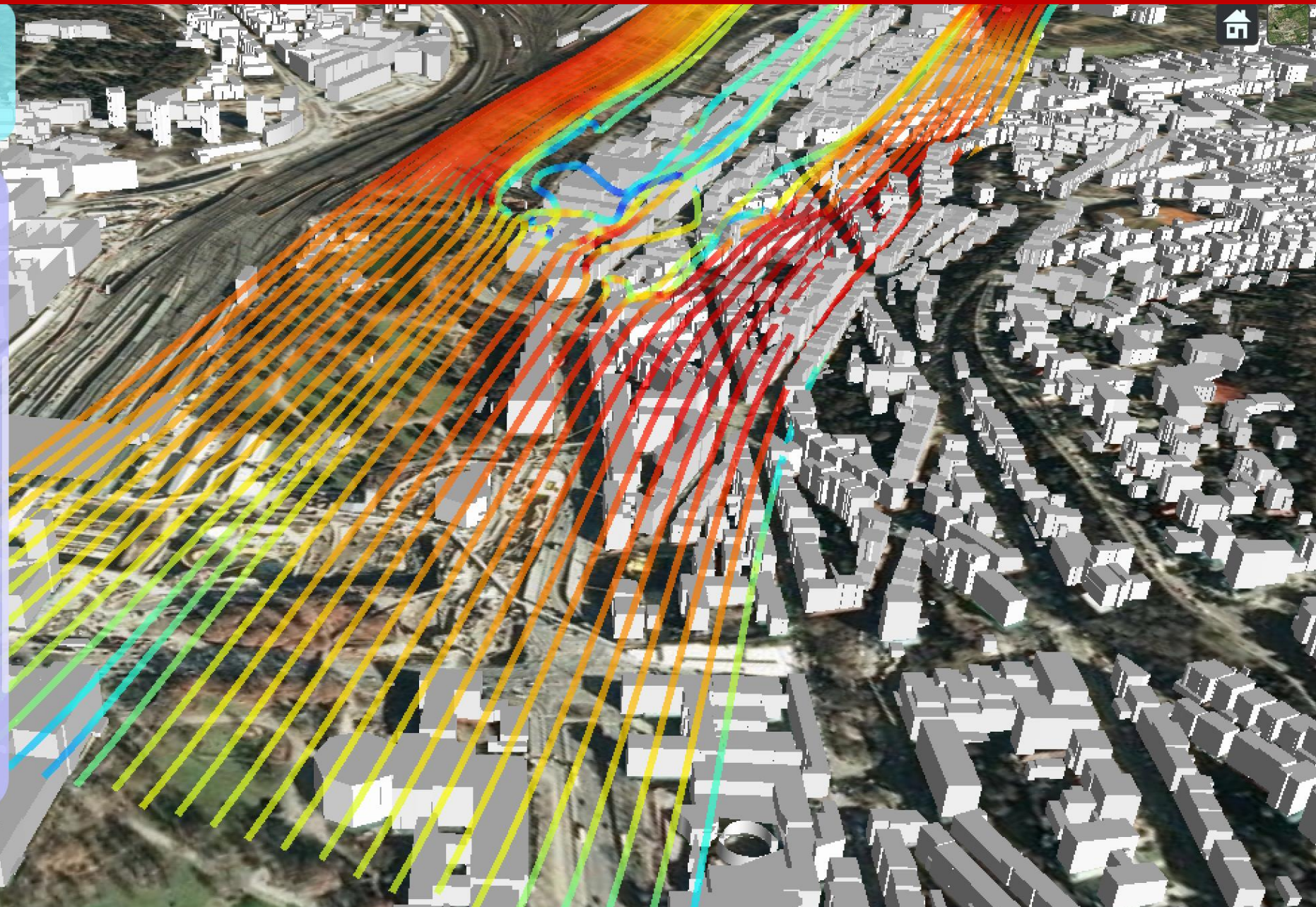
Environment Simulation

- Pressure Simulation 
- HexGrid 5 m (geojson) 
- HexGrid 15 m 
- Streamline (Point) 
- Streamline (Polyline) 

Derived from CFD pressure simulation. Courtesy of Sven Schneider

Wind speed (m/s)

-  > 3.5
-  3
-  2.5
-  2
-  1.5
-  1
-  0.5



3D Container API (AKA GeoVolumes API)

Overview

The GeoVolumes Application Programming Interface (API) defines a Web API enabling servers and 3D clients to access multiple 3D model formats that represent features and models common to specific 3D geospatial volumes of interest. The Web API promotes interoperability providing the capabilities for 3D clients to access multiple servers and 3D formats (e.g. I3S, 3D Tiles, and CityGML). It is consistent with the emerging OGC API family of standards.

Youtube Playlist:

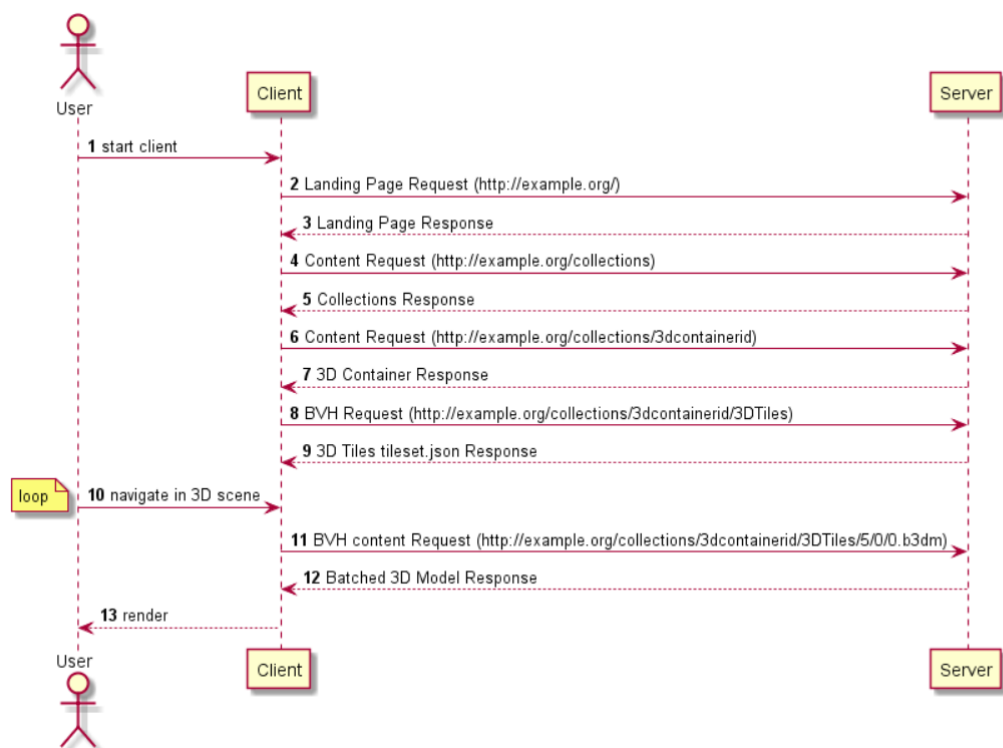
<https://www.youtube.com/playlist?list=PLQsQNjNIDU84-8pPkJvWSxnR0pizjU4tP>

Engineering Report Links:

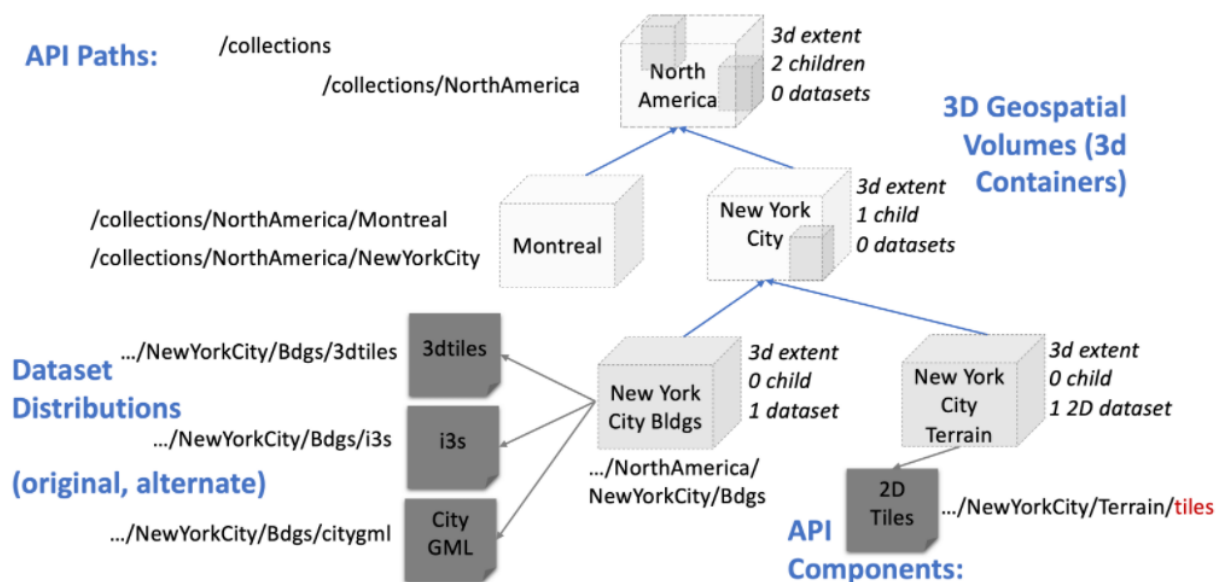
- <https://docs.ogc.org/per/20-029.html>
- <https://docs.ogc.org/per/20-030.html>
- <https://docs.ogc.org/per/20-031.html> (Summary)

3D Container API (AKA GeoVolumes API)

API Sequence Diagram & Resource Architecture



GeoVolumes API Resource Architecture



3D Container API (AKA GeoVolumes API)

Example Application

GeoVolumes API server: <https://steinbeis-3dps.eu/3DGeoVolumes/>

3D Client: <https://steinbeis-3dps.eu/STT3DClient/index.html>



STT 3D GeoPortal

OGC 3D Data Container and Tiles API Pilot



The Steinbeis Transfer Center
Technology Consultancy
HFT Stuttgart

Edited by
Joe T. Santhanavanich

Styling Options

Heating demand in a changing climate [MWh]



Heating demand



Heating saving potential



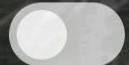
CO2 emissions



Climate change



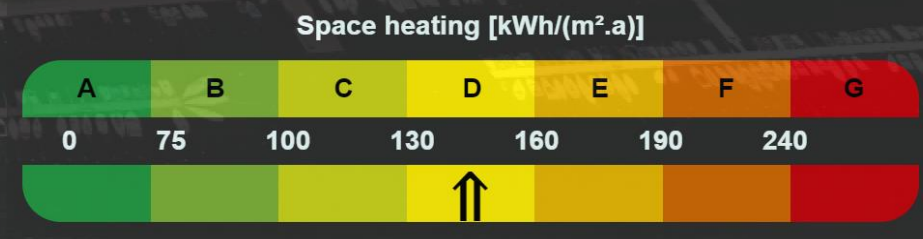
Refurbishments



Space heating demand: 91 (kWh/m²a)

<http://193.196.52.104:8080/Apps/Helsinki/view.html>

Rosknecht, M.; Airaksinen, E. Concept and Evaluation of Heating Demand Prediction Based on 3D City Models and the CityGML Energy ADE—Case Study Helsinki. *ISPRS Int. J. Geo-Inf.* **2020**, *9*, 602.



Get involved

3D Container API (AKA GeoVolume API)

Youtube Playlist:

<https://www.youtube.com/playlist?list=PLQsQNjNIDU84-8pPkJvWSxnR0pizjU4tP>

Engineering Report Links:

- <https://docs.ogc.org/per/20-029.html>
- <https://docs.ogc.org/per/20-030.html>
- <https://docs.ogc.org/per/20-031.html> (Summary)

3DPS open source implementation (by Athanasios Koukofikis)

<https://gitlab.com/tomeof/node-3dps>

<https://gitlab.com/tomeof/node-3dpsx>

open source client implementation for 3DPSx

<https://gitlab.com/tomeof/dojo-3dps-client>

**6th Intern. Conference on
Smart Data for Smart Cities
15.-17.9.2021 at HFT Stuttgart**



Kontakt

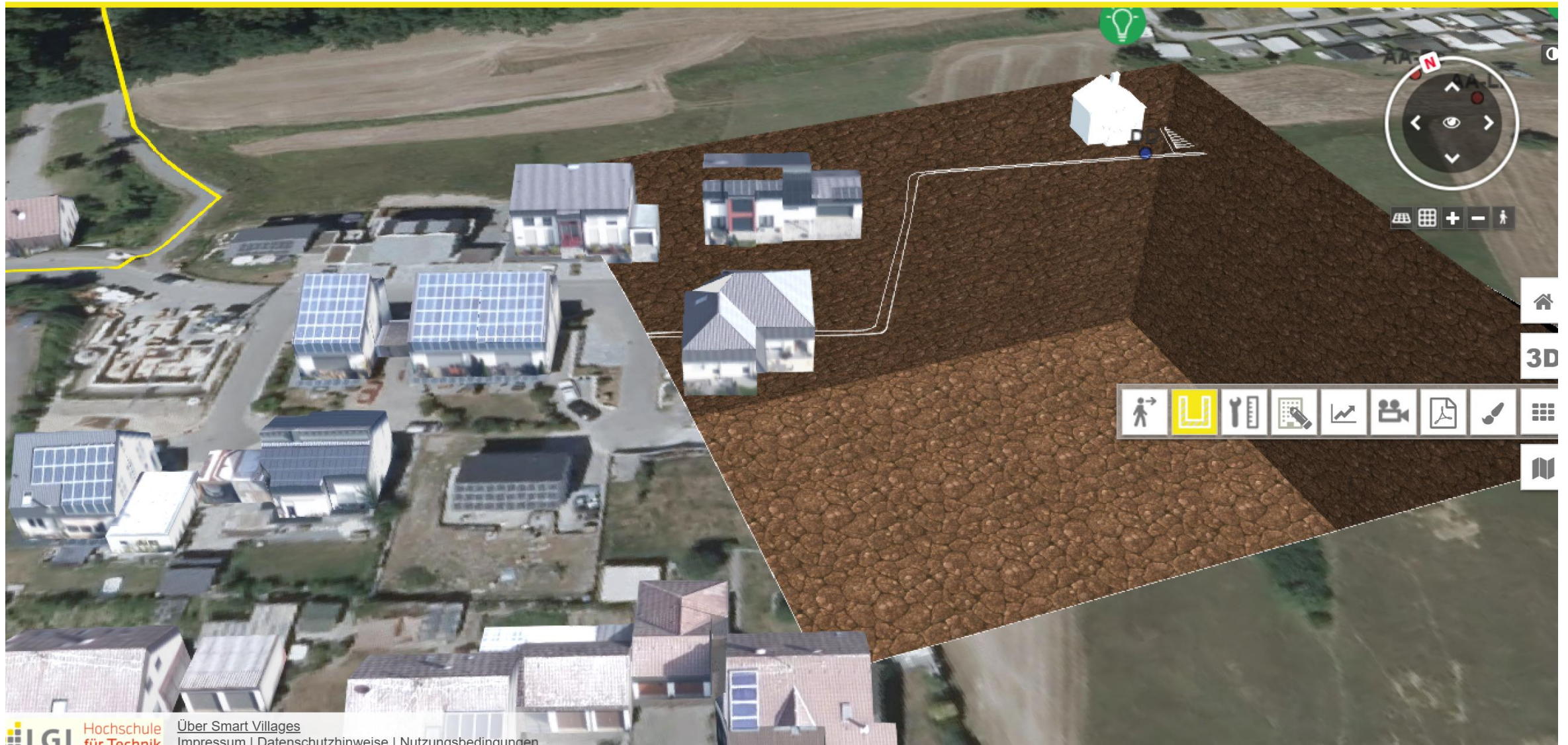
Prof. Dr. Volker Coors
volker.coors@hft-stuttgart.de
<http://www.coors-online.de>





Projekt Smart Villages

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