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## Studio iSPACE –

Live Sensor data for smart buildings  
interim results the4bees project  
Dr. Manfred Mittlboeck

13. Juli 2017

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## Application areas of indoor geoinformation

**AR**

**VR**

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## Smart Buildings

*Sketching the building*

- add applications and analytical layers layer on top of existing building management systems, without the need to replace existing infrastructure
- to support
  - automated fault detection and diagnosis
  - alarm management
  - energy management
  - (indoor positioning)
- background
  - Buildings are the largest contributor to global carbon emissions
  - buildings are one of the biggest operational expenses for organizations

source: <http://cagbc.org/energy-smart-buildings-whitepaper.pdf>

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## The4bees Goal?

**Interreg Alpine Space** **THE4BEES**

master-plan for climate + energy 2020

- reduction of 30% of greenhouse gas emissions
- share of renewable energies at total energy

- Raising „energy consumption awareness“
- IT tools & storytelling (m)ap(p)s

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## Everything is mapped, isn't it?

Time spent ...

- 2.55 mio km<sup>2</sup> of buildings are not mapped
- Who is responsible for indoor acquisition?

People spend 80-90% of their time indoors  
70% of cellular calls and 80% of data connections originate from indoors.  
(Source: Strategy Analytics)

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## Austria CoCreation Labs Who?

- RSA iSPACE
- School of education, University of Salzburg
- Teacher IT: Dr. Anton Hofmann – HTL Salzburg
- Teacher physics: Angela Lindner – HTL Salzburg
- Teacher physics: Roman Gloning – BORG Oberndorf
- Teacher Geography: Michaela Fally-Lindner - BORG Oberndorf
- Students of 2 classes of HTL Salzburg, 1 class BORG Salzburg

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### iSPACE :: the4bees

energy is consumed by people rather than by buildings

Energy consumption in schools: What are the biggest consumers?

**Unconference @ GIS-Day Salzburg 2016-11-16**

Category	Percentage
Computer & Electric Devices	1%
Heating	2%
Electric Lighting	3%
Boiler	4%
Cafeteria	5%
Hot Water	6%
Teachers & Pupils	7%
Open Windows	8%
Electric Blackboard	9%
Elevator	10%
Printer	11%
Vending Machines	12%
Other	17%

Storytelling Introduction BORG Oberndorf ; Storytelling THE4BEES

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### OpenHAB Structure

The screenshot displays the OpenHAB web interface. On the left, there is a 'Structure Overview' tree showing a hierarchy of items. On the right, a 'Measurements' table is visible, listing various sensors and their current values.

Measurement	Value
Status (off, 1 - watt)	1.00000
Current	347.50 mA
Energy Counter	400.20 kWh
Frequency	150
Power	55.77 W
Voltage	231.6 Volts
Location URI	http://openhab.measurementdata.ath.cx/proxy/1001/10000/1001
Procedure URI	http://openhab.measurementdata.ath.cx/proxy/1001/10000/1001

### iSPACE :: the4bees

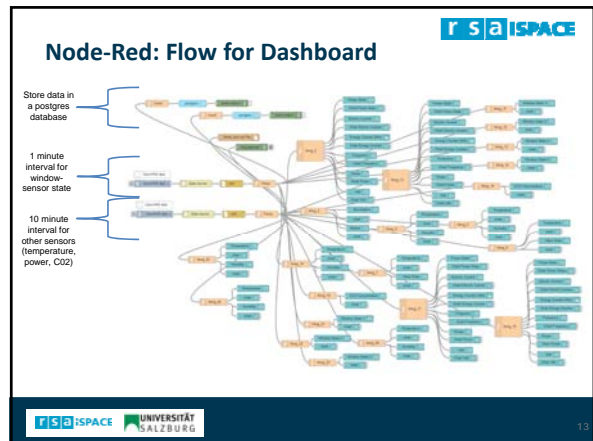
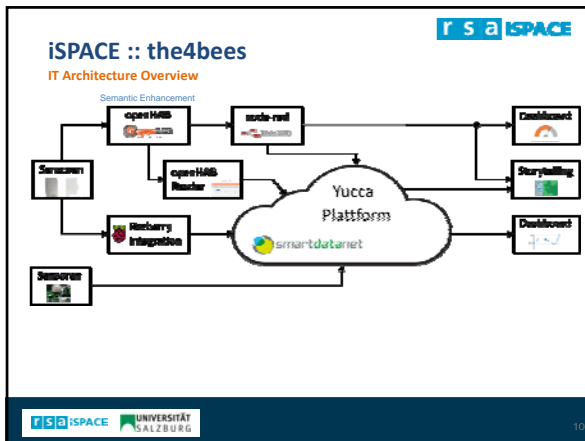
Sensors being used

- Homematic
  - › Base
  - › Window opened/closed
  - › Temperature and humidity
  - › Heating thermostat
  - › LUX / Motion detector
  - › Measuring socket
- Raspberry PI

- the4bees Haladin
  - › Temperature and humidity
  - › Lux
  - › CO2

### OpenHAB Metadata

The screenshot shows the metadata page for a weather sensor in OpenHAB. It lists various metadata fields such as Procedure Title, Procedure URI, Procedure Type, Procedure Keywords, Procedure Metadata, Procedure Control Panel, Procedure Control Panel URI, Procedure Control Label, Sensor URI, Sensor Title, Sensor Group Title, Phenomenon 1 Title, Phenomenon 1 URI, Phenomenon 1 Value/Tolerance, Phenomenon 1 UC/Media, Phenomenon 2 Title, Phenomenon 2 URI, Phenomenon 2 Value/Tolerance, and Phenomenon 2 UC/Media.



### iSPACE :: the4bees Dashboard

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### StreamService' for live webmap integration

Subscribe to StreamService to see the live data

ArcGIS REST Interface

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### PostgreSQL Database: Archiving Data

Sensors have different numbers of phenomena

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### iSPACE :: the4bees Workshop: JOSM model of pupils

Pupils create their own school building in JOSM using a predefined guideline during the first Workshop in BORG Oberndorf.

This building model is used for further processing to visualize it in a 3D storytelling map

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### Node-Red: Flow for StreamService

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### iSPACE :: the4bees – BORG Oberndorf – Feb. 2017

25.3 °C

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### Building modelling in schools

**Approach**

- Prerequisites for data capture:
  - Easy-to-use
  - Free of charge
  - Transferrable into GIS in 2D and 3D
- Java OpenStreetMap Editor (JOSM)
  - Most-used OSM editor (~70.8% in 2017)
  - Customization via "Presets"
- georeferenced floorplan & tools

energy is consumed by people rather than by buildings

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L. Knoth & M. Mittlböck & B. Vockner

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### Building modelling in schools

**Transform 3D & publish**

automated transformation

-3 hours for:

- Software Installation
- Measurement
- Digitization

Outcome:

- 3D Geodatabase
- Interactive 3D Model in Browser

energy is consumed by people rather than by buildings

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### Building modelling in schools

**Configure OSM Editor**

Preparatory steps: Division of a project, Identification of the project, Drawing of all OSM elements, Assignment to a preset, Scoring of the attributes, JOSM building mode

```

1 <<< Set a subgroup named "Wandmaße" -->
taginfo name="Wandmaße"
2 <<< Set the group for the first element "wall" -->
name="wall" type="building"
3 <<< Label "wall" -->
<<< -->
4 <<< Automatically set the key for wall for this item -->
5 <<< key key="type" value="compound" -->
6 <<< key key="building" value="wall" -->
7 <<< key key="tunnel" value="wall" -->
8 <<< Label text="Please enter the height of the wall in meters (m, e.g. 2.30)." -->
9 <<< create key="height" text="height of the wall" default="" -->
<<< -->

```

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### Building modelling in schools

**3D browser visualization**

12.05.2017

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### Building modelling in schools

**Sketching the building**

- Pupils measure their building (heights, etc.)
- Students install JOSM (Java OpenStreetMap Editor)
- Draw building in 2D

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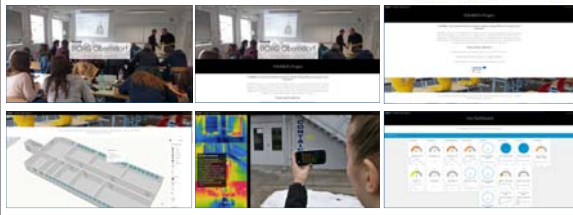
**3D visualization: BORG Oberndorf**

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**iSPACE :: the4bees**  
storytelling 3D map prototype



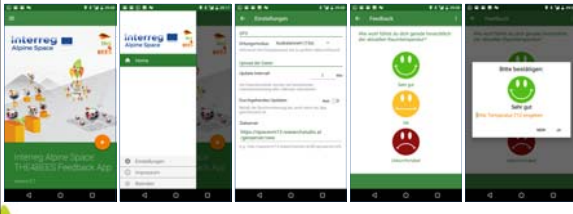
<http://ispace.maps.arcgis.com/apps/Cascade/index.html?appid=18043588376242cb94a4ec1470a81866>

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**iSPACE :: the4bees**  
the4bees feedback app



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