

# Introduction to the Internet of Things

Session 02

Ulrich Norbistrath

# Architecture and Terminology of IoT

- Research IoT architecture in respect to
  - Cloud (-computing)
  - Edge (-computing)
  - Fog (-computing) / Swarm
- How are these concept related/connected
- Examples for each of the three
- 10 minutes alone, 5 min exchange with neighbor
- → research record

# Architecture and Terminology of IoT

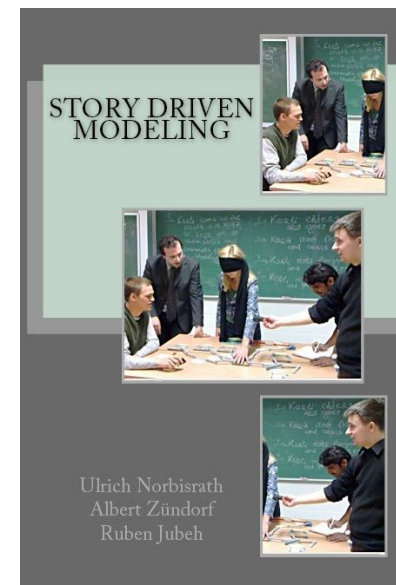
- Cloud
- Edge
- Fog/Swarm

# Low Level Buses

- RS232(1), RS485 (2), I2C (3), SPI (4), Onewire(5)
- Research your respective bus (start at English Wikipedia) (10min): cover more than wiring, speed, max length, use, examples(!!)
- Exchange with peer (same number) (5min)
  - keep result for participation record
- Mutual presentations: >5 people (4min each), take notes while others present → participation record
  - 1, 2, 3, 4, 5

# Story Driven Modeling

- Scenarios (user stories) first, very concrete, example based
- Scenarios are base for tests (similar to tests first)
- First diagrams usually on object level to show relations between concrete instances
- Very agile, iterative development process
- Allows and embraces problems and their solutions (XP style → embrace change)

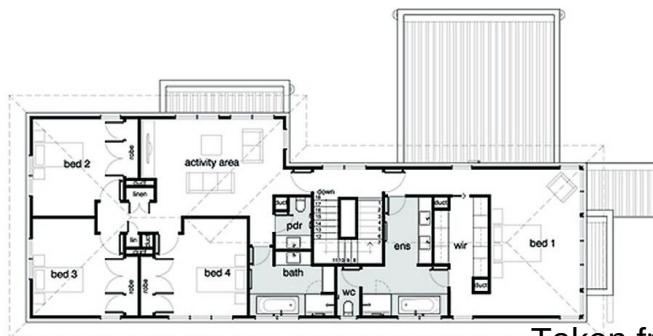


[1] Zündorf, Albert. *Story driven modeling: a practical guide to model driven software development*. Proceedings of the 27th international conference on Software engineering. ACM, 2005.

[2] Norbistrath, Ulrich, Zündorf, Albert, Jubeh, Ruben. *Story Driven Modeling*. CreateSpace Independent Publishing Platform, 2013, S. 1-333, ISBN 978-1483949253.

# Story/Scenario?

- From Home and Building Automation lecture this spring
- Students' final scenario:  
*“Big house, airbnb, smart lock and more automation.”*
- Great idea, but enough to design, implement, and test software?



first floor plan



ground floor plan

Taken from: <http://www.houseplans.com/plan/3584-square-feet-4-bedrooms-2-5-bathroom-modern-house-plan-2-garage-37341>

# Story v2

- A landlord has a house with multiple bedrooms and offers these rooms on airbnb.
- Each room is supposed to have a smartlock, hvac, temperature sensor, and an automated media system.
- This should all be controllable via phone.



first floor plan



ground floor plan

# Story v3+



ground floor plan

## Airbnb-Homeautomation Smartlock/Noise/Temperature Scenario

Landlord: Karli, Tenants: Bob, Eddy

Karli has a house in Linz, Austria with four bedrooms and rents out three on AirBNB. He is currently on a small hiking trip in the forests nearby Linz. It is summer and the outside temperature is around 30 degrees Celsius. Eddy stays already in his room and is binge-watching Game of Thrones.

Karli's cell phone rings. It's his new tenant Bob, who just arrived to his house and wants to enter, however the main door is locked.

Karli opens his House-Management App and activates Bob's profile. Bob logs into Karlis public airbnb wifi as he doesn't have a data plan in Austria using previously exchanged credentials.

He opens the karlis-house-app, Karli made him download earlier, and presses the open main-entrance-door button which unlocks it.

Bob can now enter.

Bob finds his private bedroom (which has he number 3 written on it). It is also locked.

He presses the unlock-room button in the application.

The bedroom door opens and Bob can enter the room.

Bob presses the media button, which starts the TV, and displays the kodi media-center main screen. Using a built-in remote, Bob selects a youtube documentation on home automation. When the movie starts, the light in the room is dimmed.

An hour later, Bob feels tired and goes to bed. Using the app he switches of the TV and all lights. There are buttons for singel lights or one for interacting with all lights. Bob is very tired from traveling and falls asleep.

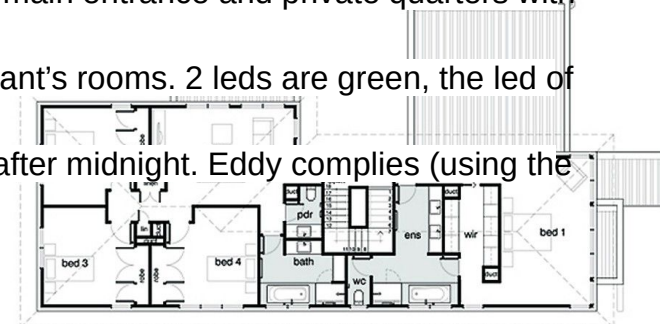
As it is hot outside Bob's room temperature reaches 22 degrees triggering the air conditioning unit to switch on to bring the room down to 21.

Later, Karli comes back home, enters his house and goes to his private rooms (unlocking main entrance and private quarters with his app).

On one wall he has led-strips showing the temperature and noise levels in each of his tenant's rooms. 2 leds are green, the led of Eddy's room is red.

Karli goes to Eddy's room, knocks at the door and asks Eddy to lower the volume as it is after midnight. Eddy complies (using the app) and Karli goes back to his quarters.

All status led's are green now.



first floor plan



# Design Based on Stories

## Airbnb-Homeautomation Smartlock/Noise/Temperature Scenario

Landlord: **Karli**, Tenants: **Bob**, **Eddy**

Karli has a **house** in **Linz**, Austria with four **bedrooms** and rents out three on **AirBNE**. He is currently on a small hiking trip in the forests nearby Linz. It is summer and the **outside** temperature is around 30 degrees Celsius. Eddy stays already in his room and is binge-watching Games of Throne. **Karli's cell phone** rings. It's his new tenant Bob, who just arrived to his house and wants to enter, however the **main door** is locked.

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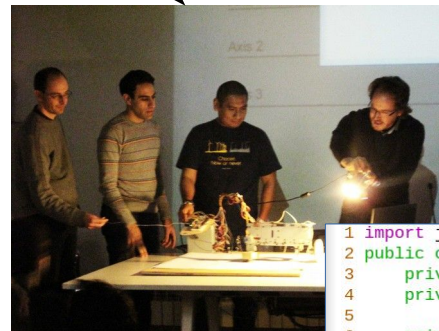
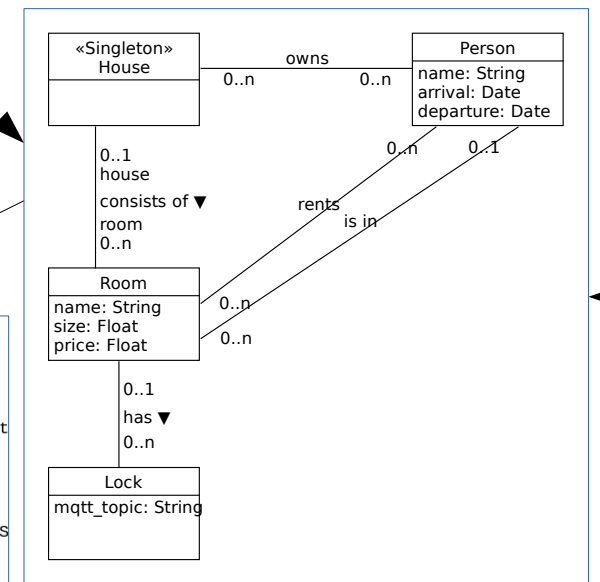
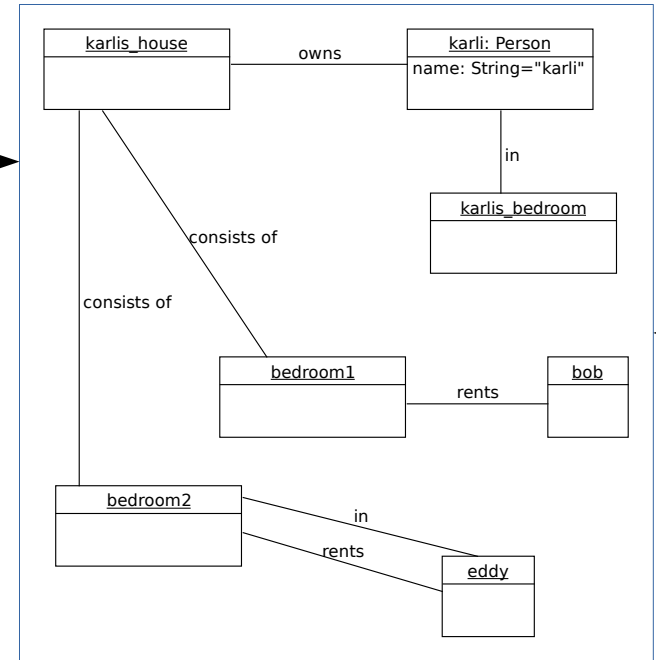
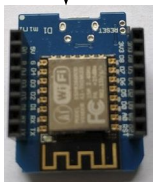


Image from:  
<http://www.iaacblog.com/blog/2011/arduino-workshops3-session/>

```

1 import java.util.*;
2 public class Person {
3     private Boolean turn;
4     private String name;
5
6     private LinkedHashSet<StoneStorageObject>
7
8     private StoneStorageObject kalah;
9     public Person(String name) {
10        this.name = name;
11        this.pits = new LinkedHashSet<StoneS
12        this.turn = false;
13    }
    
```



# IoT Scenarios → Lab2

- Research one of the following in small team (ca. 30minutes):
  - You build home gateways
  - You build a middle school emergency remote for schools against robberies
  - You have to record current wind and temperature data over all Upper Austria to allow decisions for wind farms management.
- Create story
- Meet peer/neighbor team(s)
- Present scenario (2x5minutes)
- Discuss potential problems/challenges (5min)
- Discuss implementation possibilities (5min)
- Discuss homework base ideas (5min)

# Lab 2

- Stories (slide from before)
- Finish tasks from Lab 1 (especially remote switch)
- Create Button Device, which triggers via HTTP Post to IFTTT WebHook (use http – https might be too difficult) → then triggers (a) report to phone or (b) tweet/sends message on telegram  
(emergency remote, tweet button, shopping button)
- Figure out how to use I2C 2 lines display (send data remotely)
  - optional: use I2C display to show message when ifttt event triggered
- Get remote data from DS11 onewire temperature device (get remotely)
- HW:
  - Finish Lab work
  - In big team: come up/research 2 potentially useful IoT scenarios (can be new) where parts could be commercialized → tell a (long and detailed) story (>1 page) where this is used successfully  
→ needs to show up in portfolio (which I will review first time next week)  
in the end each small team should have a unique scenario (→ 6 people teams need 3 stories)