



Using a sensor network for energy optimization of paper machine dryer sections

Till Hänisch, Baden Württemberg State University, www.tillh.de

State of the art in paper industry

- Optimization is done on a regular base, energy audits even required by law
- "Traditional" measurements done with wired equipment: Sensors, cables, equipment, cables, computers, cables, power, cables
- Interfere with production
 - Typically done for one or two days a year
 - But Process parameters change over time !

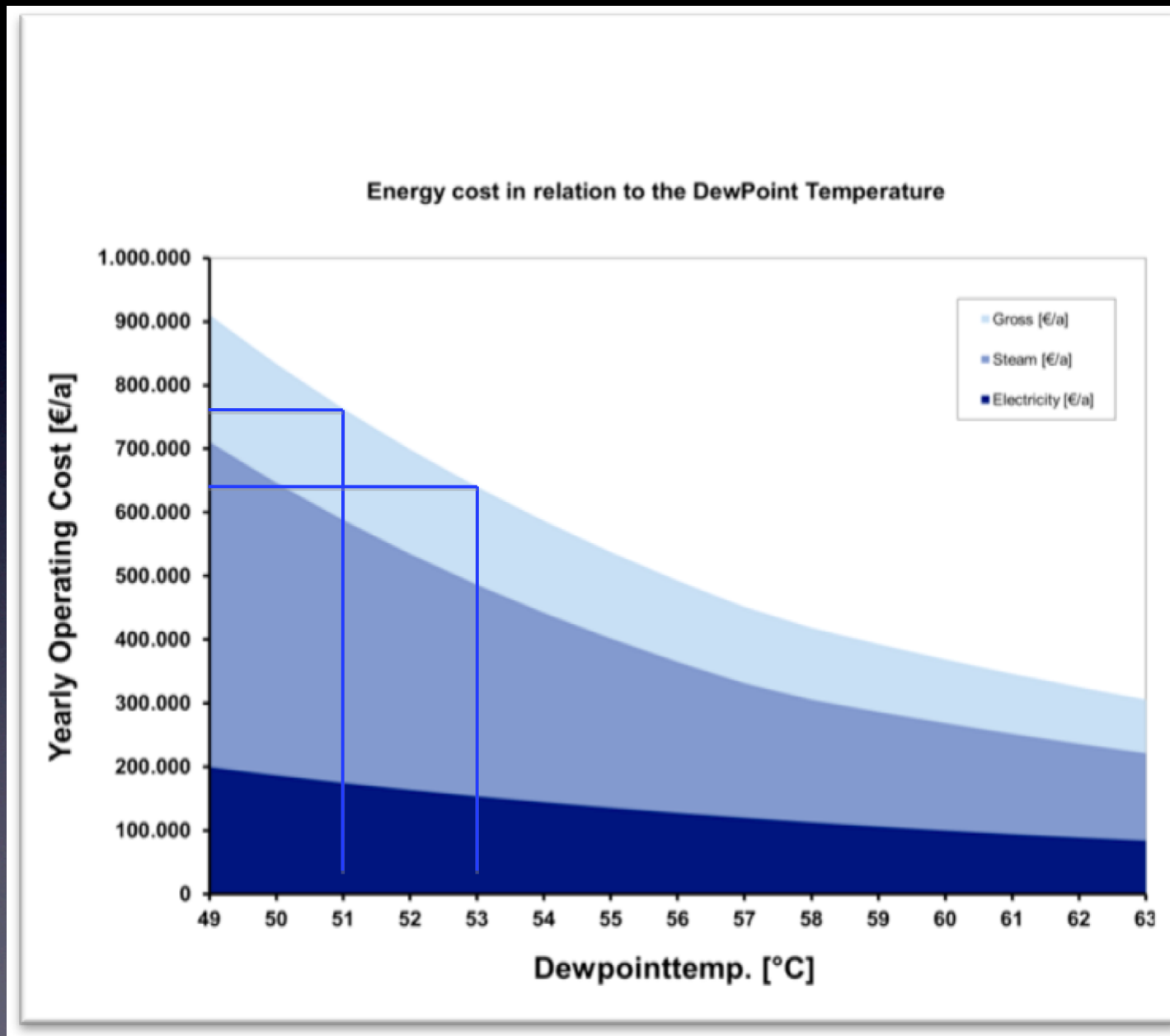
Flexible, ad hoc, long time measurements are needed to reduce "safety margin"

(Industrial) Sensor Networks: Why now ?

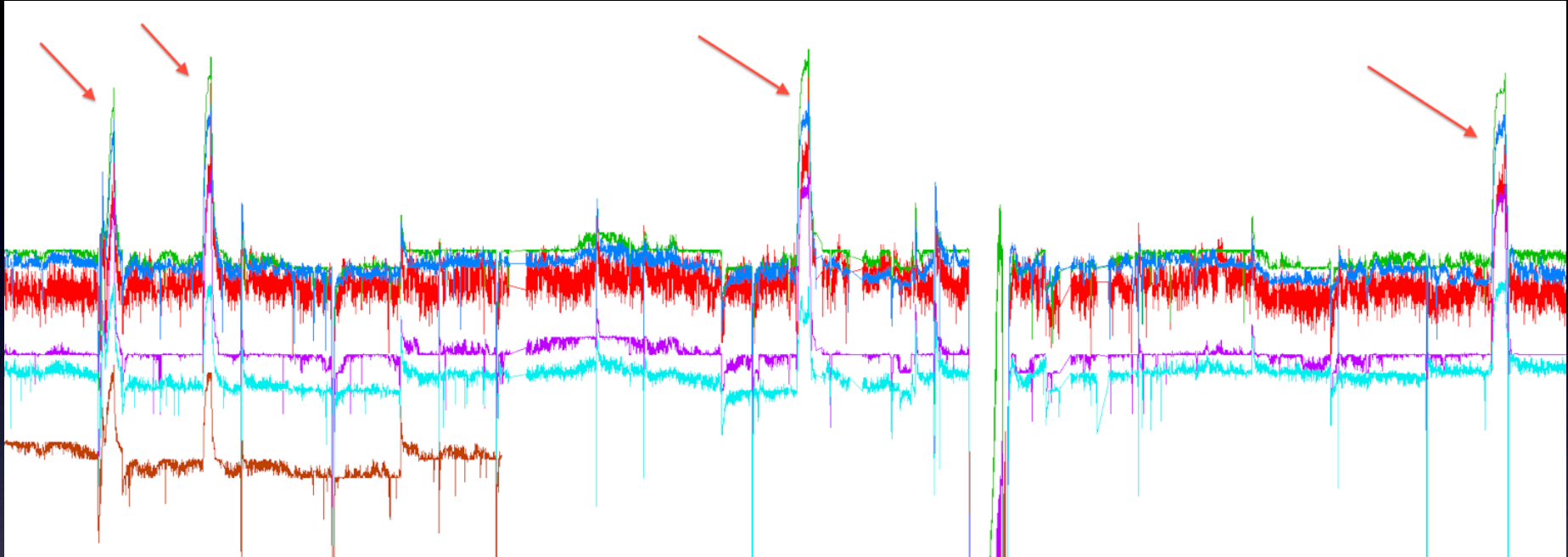
- High quality, small size, low cost of sensors
- Robust wireless technologies cheap & easy
- Better batteries
- low cost, high leverage



High leverage



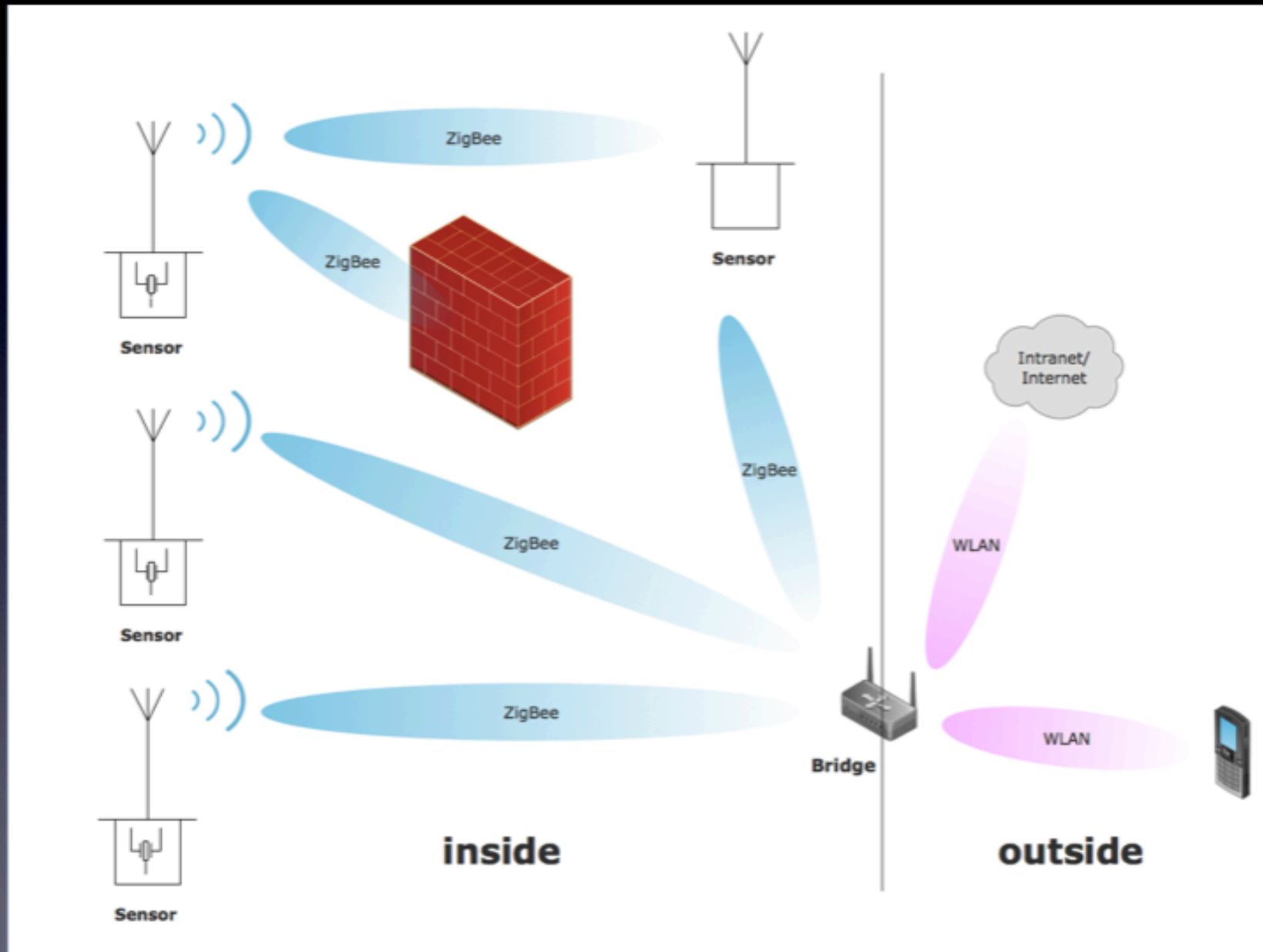
First Results



During the technical tests of the system, machine operators tried an ad hoc optimization and verified the results with different operating conditions.

Saves 80.000 € per year in energy cost

How it works



Interface supports ad hoc use

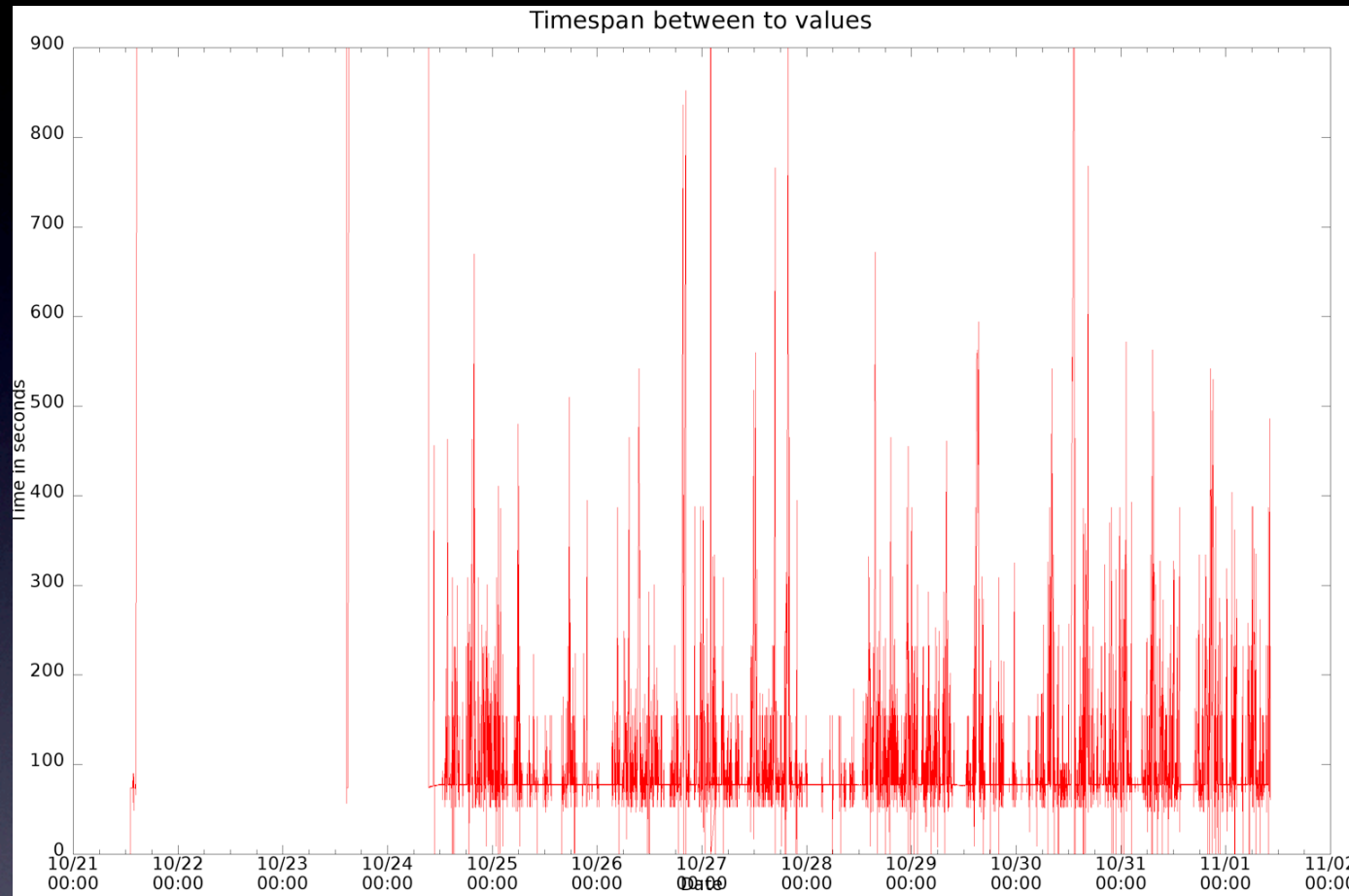


Interesting stuff, part I

- Our theory was
 - metal housing and frame construction would disturb wireless data transmission, therefore we need mesh network
 - wrong !

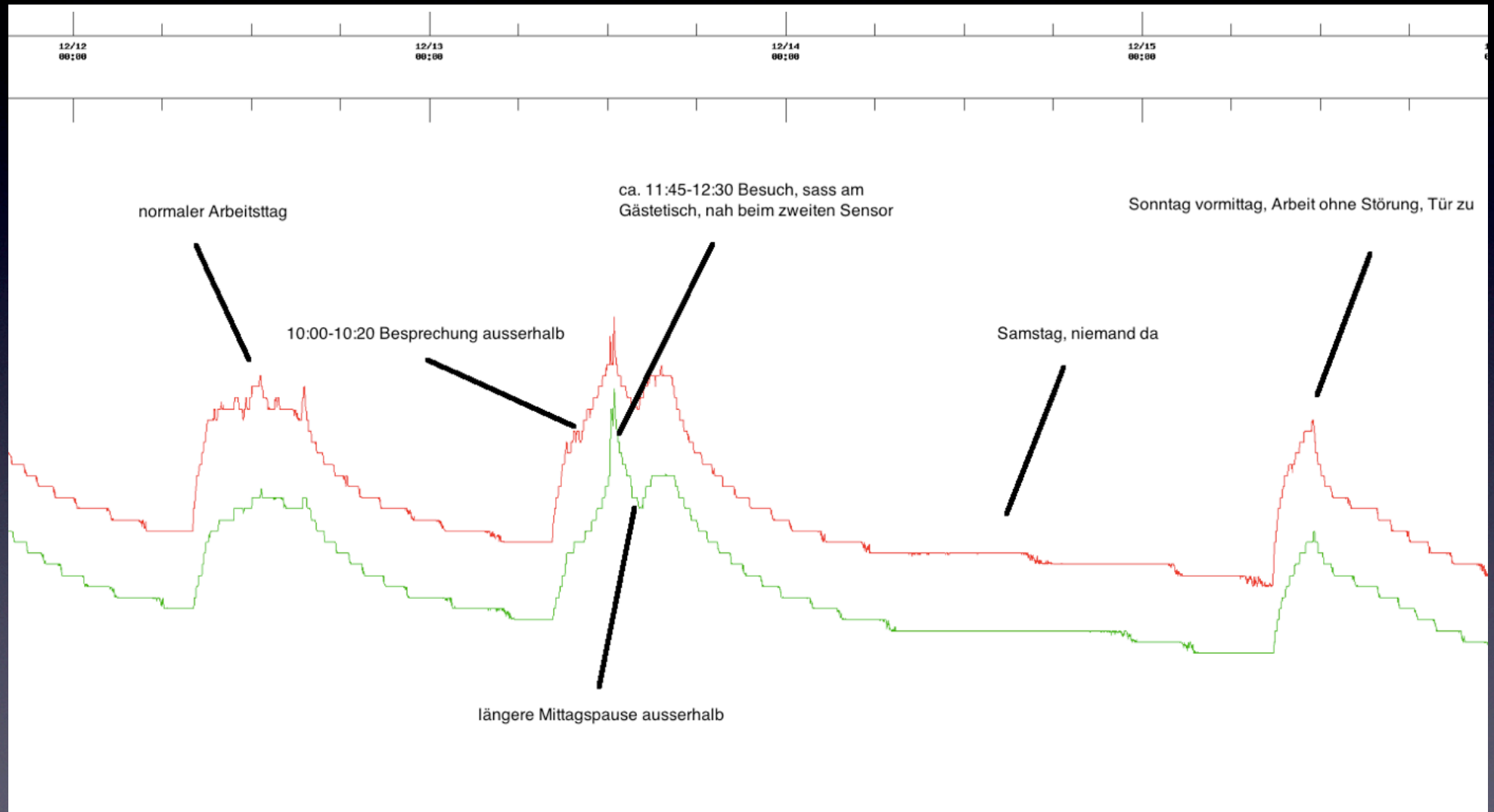


Interesting stuff, part II



Network retransmissions lead to massive battery drain,
one sensors fails after just a week of (bad) work

What else to do with these thingies ?



The End

- It works
- It's easy
- Flexibility is important
- Many interesting applications



