Integrating Sustainability concepts in IOT

Schultz, Ole; Hundebøll, Peder M.

Publication date:
2014

Document Version
Publisher's PDF, also known as Version of record

Link back to DTU Orbit

Citation (APA):
Integrating sustainability concepts in IOT
Ole Schultz (osch@dtu.dk), Peder M. Hundebøll (pehu@dtu.dk)
DTU Diplom - Informatics
Campus Ballerup Lautrupvang 15, 2750 Ballerup, DK

1. Introduction
The DTU B.Eng (IT and Electronics students) elective course Sustainable Electronics and IT - SUSIE applies sustainability in embedded wireless systems. As technical interested students makes sense to apply the science in sustainability in embedded wireless systems. As technical

2. Course learning outcome

3. Active students
The 15 week course has been structured with weekly lectures in the first 10 – 11 weeks and as related lab-work of 3.5 hours each. Students work in groups of 2 to 3 students. By using the theories for solving questions in the labs, the students become active learners. That is the foundation for working on a team chosen project the last 4-5 weeks.

4. Life cycle screening - MECO

5. Project work with embedded systems

5.1 Room monitoring
How is a class room used? That was monitored using the SUSIE kit and the knowledge gained in the first part of the course and using a field cloud service Xively.com (formerly cosm.com) for storage and visualization.

5.2 One node – natural energy
Solar cell powered Xbee end-device
For getting a sensor working without battery or main power supply, the students must find out a Natural resource for at least one node
Ex. The student made a test setup like this using a solar cell for charging a super capacitor of 35 F using a TI-charger evaluation Board (BQ25504EVM)

6. Protocol and energy

7. Preliminary results

8. Course web site with projects and reports:
- 2. Rapport BIHK-course by Morten T. Egholm., 2013
- 4. Rapport HIL-course by Morten T. Egholm., 2013
- 5. Sustainable model house -Low power temperature measurement and control of a model house by Morten T. Egholm, Mikkel Tübke Friis 2013
- 6. Window comparison project by André Daniel Birkkjær Christensen.
- 8. Course web site with projects and reports:

References
2. Handbook on Environmental Assessment of Products by Environmental Project No 813, 2003
4. Rapport HIL-course by Morten T. Egholm., 2013
5. Sustainable model house -Low power temperature measurement and control of a model house by Morten T. Egholm, Mikkel Tübke Friis 2013
6. Window comparison project by André Daniel Birkkjær Christensen.

Fig. 7 Measured voltages across 1 ohm (ref 6)

Fig. 8 Comparison of power consumption in transmit, receive, and processing mode for conventional 802.11 and low-power 802.11 (ref 7)

The focus of the students is to teach the students how to design a low power system, using sensors for indoor climate monitoring, on low power Xbee wireless nodes. Students also learn how to use the internet protocol stack for transmitting data to a cloud service ex. www.thingspeak.com using an IBoard and Xbee. They are supposed to estimate power consumption and confirm by measurements. An example showing a measurement on coordinator Xbee module while it’s active.

Fig. 5 Measured voltages day (ref 5)

Fig. 6 Measured voltages night – day (ref 5)

Note in fig. 6 Xbee device stops working at 6 o’clock - when the voltage Vbat drops below 2.5V and at 8.30 it is again activated when capacitor is charged to 3 V. Power estimation problem?