University of Helsinki
Introduction to IoT: Autumn 2019

Exercise set: 1

Due on 11th September 2019 by 16:00.

Instructions: All course participants are requested to submit their exercise solutions (in English) by Moodle and electronically to the instructors Agustin Zuniga (agustin.zuniga at helsinki.fi) and Prof. Petteri Nurmi (petteri.nurmi at cs.helsinki.fi) by the due date. Use the following subject in your email: *IoT_week[#]_[last name_first name]_[student number], (i.e. IoT_week1_Zuniga_Agustin_12345)*

Your submission have to contain no more than **two (2)** single-spaced and numbered pages. Use font type Arial with size no smaller than 10 points. Include the exercise set number, your full name and student Id in the upper right corner of the first page.

In all the exercises, do not just give the answer, but also the derivation how you obtained it. Participants are encouraged to review course material to answer the problems and in some cases write computer programs to derive solutions.

Learning objective: In this set of exercises you will understand better the definition of *Internet of Things, IoT*. The exercises will help you to be more familiar with IoT applications and subcomponents, as well as you will learn how IoT can contribute in diverse areas.

1 Ex 1. Identifying IoT applications (4 pts.)

A set of applications is presented below. Your task is to describe why they could be and why they cannot be considered as IoT applications (give justified arguments for both for maximum points).

Application 1. While Jane is driving, her car periodically records internal sensors' readings. Information includes measurements like GPS coordinates, driving speed, tires air pressure, break fluid level, engine temperature and oil level. When Jane takes her vehicle to maintenance, the technician hard wires car's computer to the local maintenance server connected to the Internet. The server uses car's data collected since last maintenance and historical records, and manufacturer's on-line system to evaluate Jane's car. After the evaluation, the server generates the car conditions report and recommends maintenance task list, while re-calibrating the sensors and resetting the cars memory.

Application 2. Besides of having a temperature sensor, Xin's fridge includes features like touchscreen interface, microphone, internal camera and RFID reader. Before going home, Xin gets a reminder that the milk in his fridge expires soon. At the supermarket, Xin uses his mobile to connect to the internal camera of the fridge and checks if there is something else he should buy.

2 Ex 2. Defining Smart objects (6 pts.)

Choose two application fields of IoT. Then, select two different smart objects from the first week lectures which can be used in the chosen applications. Describe the following information:

1. What would be the function of the smart object?
2. What power source would the smart object use? Why?
3. Which type of control unit would they use? Why?

You can find examples of IoT applications from the first lecture' slides and section XI of the survey *Internet of Things (IoT) operating systems support, networking technologies, applications, and challenges: A comparative review* by Javed F, Afzal MK, Sharif M, Kim BS, Mar 2018.