Lab Exercise 4 – CoAP with Contiki

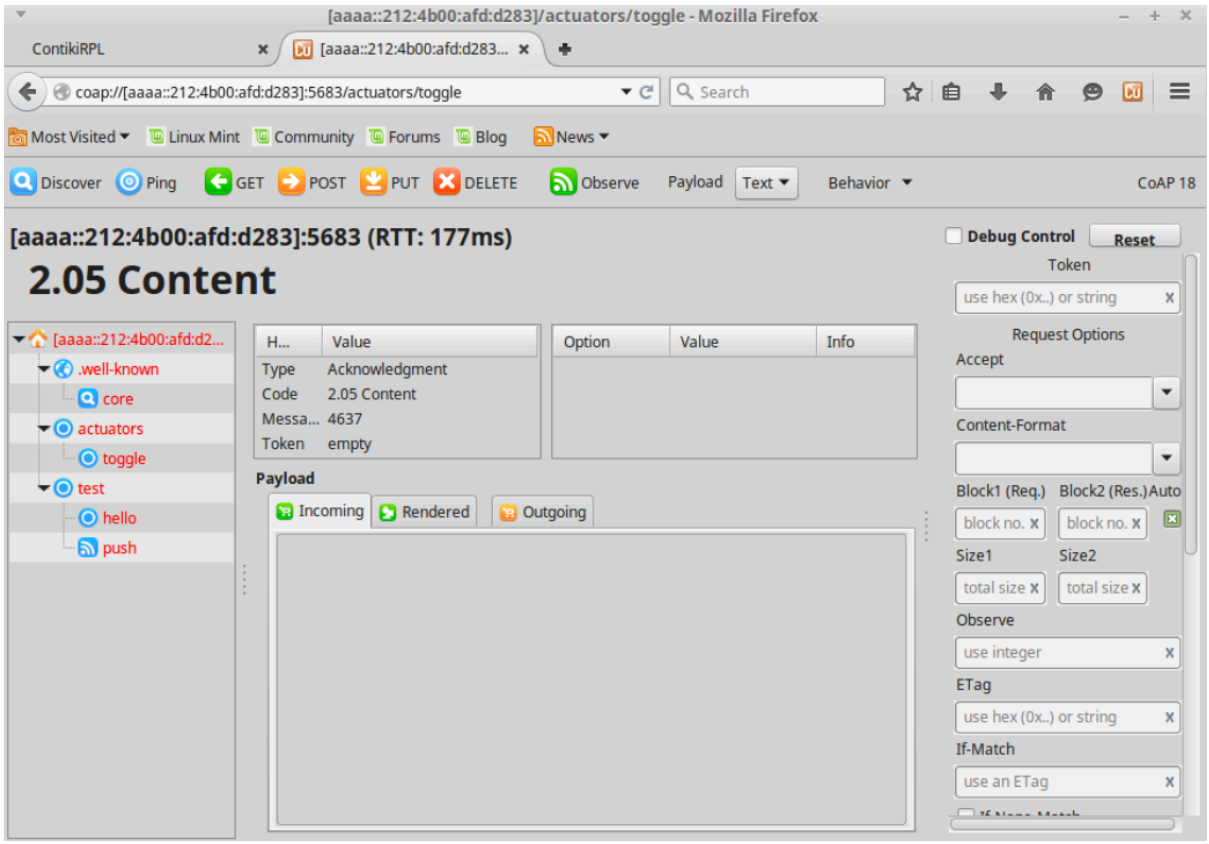
Objectives:

- Gain familiarity with 6LoWPAN, the IPv6 implementation for wireless sensor networks.
- Understand the CoAP packet format.
- Use CoAP to collect data from sensortags.
- Use CoAP to control sensortag actuators.

You will be required to work in a group as you will need 2 sensortags for the exercise.

Introduction:

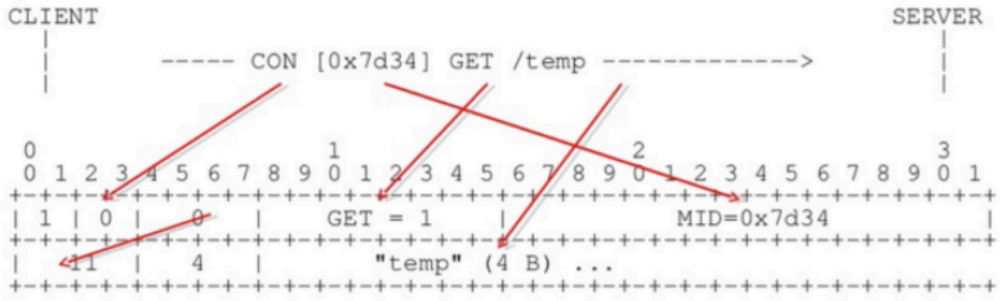
This lab exercise introduces you to the Contiki CoAP library, which works on top of 6LoWPAN/IEEE802.15.4. The goal is to understand the basics of CoAP and to gain familiarity with using CoAP to transfer information from and to the sensortags, and experience the performance difference between TCP/HTTP (last week's lab) and UDP/CoAP on low power and lossy networks.

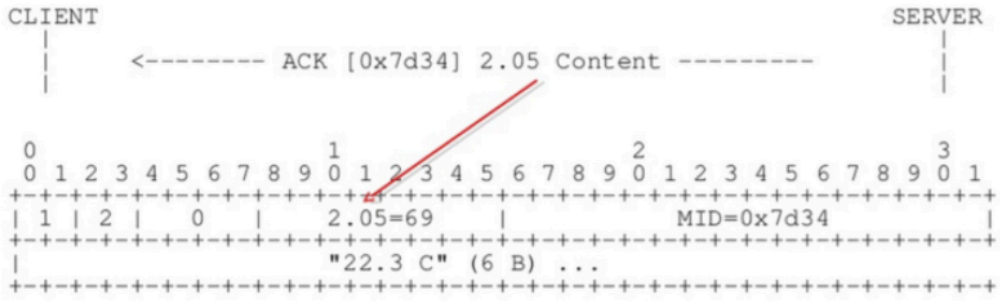


1. Analyse CoAP packet format. (2.5 Marks)

You are required to highlight both request and response CoAP packets for both GET and POST commands captured by Wireshark and produce four figures (see the above figure for an example). You are also required to produce CoAP headers for both request and response packets similar to the figure below.

You will need to demonstrate the completion of this assessment exercise to your lab demonstrator in next week's lab. You will also need to submit eight figures. Show these figures to the lab demonstrator and also include them when you upload your submission using give.





2. CoAP Network (2.5 Marks + 2 bonus)

You must demonstrate a simple network with a rpl-border-router executing on one sensortag and a second sensortag running the `er-example-server` code provided. Modify the `er-example-server` to implement the commands below. You must be able to use the Copper add-on for Firefox to post a buzzer turn on/off command and green LED set/read values to, as well as display the sensor values collected from the Sensortag. Implement the following commands:

- Use URLs '/led/red/toggle', '/led/green/toggle' to toggle LED Red/Green on the sensortag with a frequency of 1Hz (**2.5 marks)**

- Use URLs 'sensor/mpu/gyro/x/n', 'sensor/mpu/gyro/y/n', 'sensor/mpu/gyro/z/n' to remotely collect n (where n is an integer) samples from on-broad gyroscope x-axis, y-axis, or z-axis on the sensortag respectively and the gyroscope is samples at 5Hz. Use block transfer feature of CoAP. (**Bonus: 2 marks**)

References:

- Tutorial 6 – 6LoWPAN Introduction (from last week)
- Tutorial 7 – Contiki CoAP

Note: The total lab marks will be capped at 30 marks. The bonus marks cannot be used to compensate for marks lost in other assessable components.