CHALLENGE 3

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TinyOS and COOJA

The personal code we used is 10566536, which corresponds to 201212211120012 when encoded in base 3. Therefore our LEDs, which toggle starting from the least significant position, following the encoding procedure steps, should toggle in this way (and they do):

001→011→111→011→010→000→010→000→001→000→010→011→001→101→100

The tinyOS code we used to complete the task is pretty self explanatory, and we thoroughly commented in the source file. Briefly, when the timer is fired (Timer.fired() event triggered, once per minute=60000ms), we do one step of the ternary conversion of the personal code. Based on the remainder of the division by 3, we toggle the corresponding led and then print the new led states in the form of 3-bits strings, one for each led (0 if off, 1 if on). Once the conversion process ends, we stop the timer. The output of the code is the series of led states. These results can be seen in the Cooja dashboard after simulating the mote.

Note on the implementation: we had to keep track of leds state updates manually using 3 integers, as the Leds.get() function returned 1 for all the motes every time, regardless of their real activation state.

NODE-RED

Our node-red flow contains the following nodes:

- **TCP**: listens on port 60001 (server serial socket of the mote) on localhost, to receive the output of the *printf* by TinyOS and displayed in cooja
- **Rate limiter**: limits the forwarding rate to 1 packets per minute
- **Set MQTT parameters**: javascript function to set the message topic and payload to be fed to the mqtt node. The values of the first/second/third bit of the received string are associated to their respective field in the thingspeak channel.
- **MQTT to Thingspeak**: publishes the messages on the thingspeak channel

The structure of our node-red solution is contained in the JSON file included in the delivery

THINGSPEAK

We created a channel with 3 fields, one for each led, and we called them ledN. The results of our node-red publishes can be seen on our public channel at this link: https://thingspeak.com/channels/1724905