

#### Politecnico di Milano





## Challenge

Home challenge #3:

TinyOS + Node-Red + Thingspeak



# Home Challenge #3

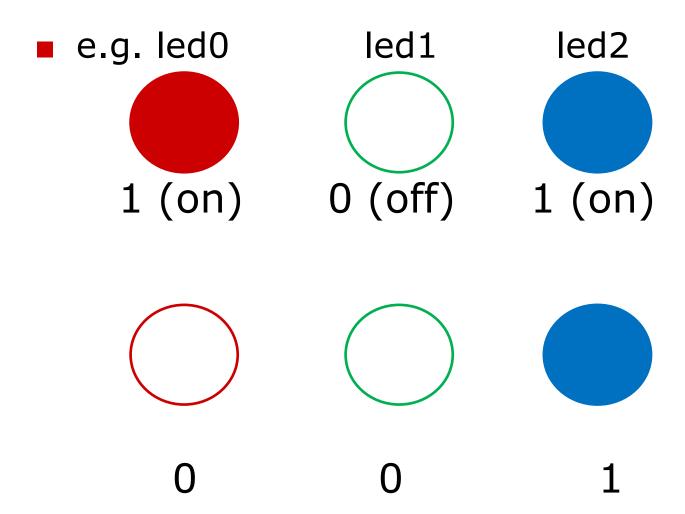


- Goal of the challenge: send data from a mote to thingspeak using <u>MQTT</u>
- Data to send: current status of the three LEDs of the mote in three different field.
  - $\square$  led0 = field0
  - led1 = field1
  - $\square$  led2 = field2
- Send one data per minute: please dont't DDOS Thingspeak's servers!
- Challenge evaluated 0 points and thingspeak blocks your account



# Status example







### **Determine LEDs status**



- Convert your person code (first team member) in ternary (base 3).
- Every converted digit <u>toggle</u> its correspondent LED

Eg:

#### **Decimal to Ternary Conversion**

$$101_{10} = 10202_3$$



## **TinyOS steps**



- Store your person code
- Start a periodic timer of 1 minute
- Every iteration of the timer:
  - do a step of the ternary conversion
  - according to the remainder of the iteration, <u>toggle</u> the correspondent LED
- When the ternary conversion is done (quotient = 0), stop the timer
- N.B. the conversion must be done in TinyOS



# Cooja/Node-Red steps



- Create a mote on Cooja
- Start the serial socket
- Read from Node-Red the LEDs status
- Every iteration of the conversion done on the mote, send to Thingspeak via MQTT the LEDs status
- Create a three charts for the three fields

led0 on
Field0: 1

led2 off
Field2: 0



# Ternary conversion iterations example



 $\blacksquare$  10410164<sub>10</sub> = 201120220001122<sub>3</sub>

```
LED status t_0 = 0, 0, 0
      10410164 / 3 = 3470054 \text{ remainder: } 2 \rightarrow \text{LED: } 0, 0, 1
     3470054 / 3 = 1156684 \text{ remainder: } 2 \rightarrow \text{LED: } 0, 0, 0
      1156684 / 3 = 385561 \text{ remainder: } 1 \rightarrow \text{LED: } 0, 1, 0
     385561 / 3 = 128520 \text{ remainder} : 1 \rightarrow \text{LED} : 0, 0, 0
      128520 / 3 = 42840 \text{ remainder} : 0 \rightarrow \text{LED}: 1, 0, 0
     42840 / 3 = 14280 \text{ remainder} : 0 \rightarrow \text{LED} : 0, 0, 0
      14280 / 3 = 4760 \text{ remainder} : 0 \rightarrow \text{LED}: 1, 0, 0
     4760 / 3 = 1586 \text{ remainder} : 2 \rightarrow \text{LED}: 1, 0, 1
     1586 / 3 = 528 \text{ remainder} : 2 \rightarrow \text{LED} : 1, 0, 0
     528 / 3 = 176 \text{ remainder} : 0 \rightarrow \text{LED} : 0, 0, 0
                                                                           nead from low to high
      176 / 3 = 58 \text{ remainder} : 2 \rightarrow LED: 0, 0, 1
     58 / 3 = 19 \text{ remainder} : 1 \rightarrow \text{LED} : 0, 1, 1
■ 19 / 3 = 6 remainder : 1 \rightarrow LED: 0, 0, 1
■ 6 / 3 = 2 remainder : 0 \rightarrow LED: 1, 0, 1
```

2/3 = 0 remainder:  $2 \rightarrow LED$ : 1, 0, 0





- field 1 (referring to LED0):
- 0,0,0,0,1,0,1,1,1,0,0,0,0,1,1
- field 2(referring to LED1):
- 0,1,0,0,0,0,0,0,0,0,1,0,0,0
- field 3 (referring to LED2):
- 1,0,0,0,0,0,0,1,0,0,1,1,1,1,0



#### What to deliver



- Form: <a href="https://forms.office.com/r/WCanibW4EU">https://forms.office.com/r/WCanibW4EU</a>
  - List of values from the three requested fields corresponding to the three LEDs
- □ Zip content:
  - Source code folder:
    - fileNameC.nc
    - ☐ fileNameAppC.nc
    - Other files, if needed
  - Node-Red flow
- □ Small project report (max 1 page)
  - Your names + person code on top of the report
  - Thingspeak channel ID and link
  - ☐ Git repository link (if used)



#### **Homework Rules**



- Max 2 people in a group
- Deadline: 9/5/2021 23:59
- Score: max 1 point
- Folder Consegne-> Challenge #3 on WeBeep
- File name:

<personal\_code1>\_<personal\_code2>.zip





- Start from a clean folder with clean files
- 2. Identify the interfaces to use
- 3. Wire the interfaces in the AppC.nc file
- 4. Write the logic in the C.nc file
- Use Blink and Printf examples as reference
- Compile often the code checking if all the interfaces are okay
- Debug node is your friend! -> check what you are doing