



Politecnico di Milano

Advanced **N**etwork **T**echnologies **Lab**oratory



Challenge

Home challenge #3:

TinyOS + Node-Red + Thingspeak



Home Challenge #3

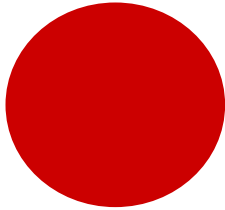
- Goal of the challenge: send data from a mote to thingspeak using MQTT
- Data to send: current status of the three LEDs of the mote in three different field.
 - led0 = field0
 - led1 = field1
 - led2 = field2
- Send one data per minute: please don't DDOS Thingspeak's servers!
- Challenge evaluated 0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



Status example

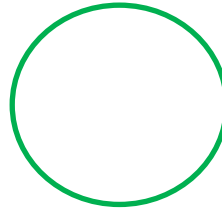


■ e.g. led0



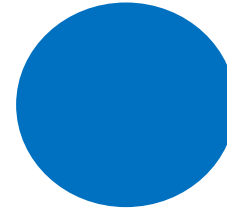
1 (on)

led1

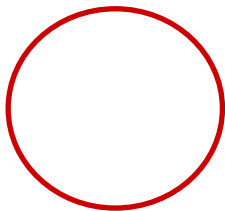


0 (off)

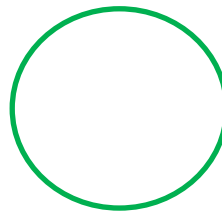
led2



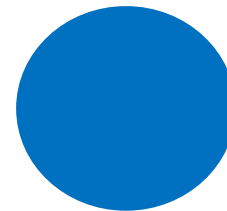
1 (on)



0



0



1



Determine LEDs status

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

Eg:

Decimal to Ternary Conversion

3	101	2	← toggle led2
3	33	0	← toggle led0
3	11	2	← toggle led2
3	3	0	← toggle led0
	1		← toggle led1

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



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, toggle 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
 - led1 off
 - led2 off
- Field0: 1
Field1: 0
Field2: 0



Ternary conversion iterations example



■ $10410164_{10} = 201120220001122_3$

LED status $t_0 = 0, 0, 0$

- $10410164 / 3 = 3470054$ remainder: 2 \rightarrow LED: 0, 0, 1
- $3470054 / 3 = 1156684$ remainder: 2 \rightarrow LED: 0, 0, 0
- $1156684 / 3 = 385561$ remainder: 1 \rightarrow LED: 0, 1, 0
- $385561 / 3 = 128520$ remainder : 1 \rightarrow LED: 0, 0, 0
- $128520 / 3 = 42840$ remainder : 0 \rightarrow LED: 1, 0, 0
- $42840 / 3 = 14280$ remainder : 0 \rightarrow LED: 0, 0, 0
- $14280 / 3 = 4760$ remainder : 0 \rightarrow LED: 1, 0, 0
- $4760 / 3 = 1586$ remainder : 2 \rightarrow LED: 1, 0, 1
- $1586 / 3 = 528$ remainder : 2 \rightarrow LED: 1, 0, 0
- $528 / 3 = 176$ remainder : 0 \rightarrow LED: 0, 0, 0
- $176 / 3 = 58$ remainder : 2 \rightarrow LED: 0, 0, 1
- $58 / 3 = 19$ remainder : 1 \rightarrow 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



Form



- ❑ 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):
0,1,0,0,0,0,0,0,0,0,0,0,1,0,0,0
- ❑ field 3 (referring to LED2):
1,0,0,0,0,0,0,1,0,0,1,1,1,1,0



What to deliver

- ☐ Form: <https://forms.office.com/r/WCanibW4EU>
 - 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



Hints



1. 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