



Politecnico di Milano

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



Home Challenge #4

Simulate a Wireless Sensor Network
with TOSSIM



Home project #4

- ☐ Develop a TinyOS application
- ☐ Simulate the application with TOSSIM

- ☐ Team: max 2 people
- ☐ Score: max 1 point
- ☐ **Deadline: May 16th – 23:69**

- ☐ Submit through webeep «Challenge 4» folder

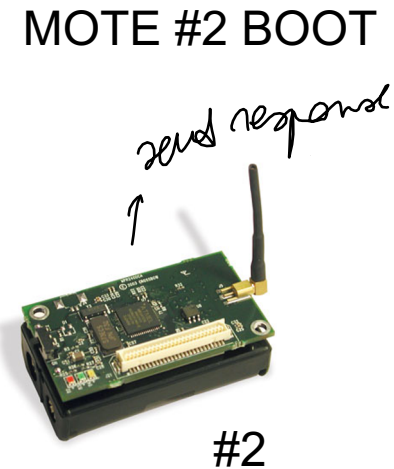
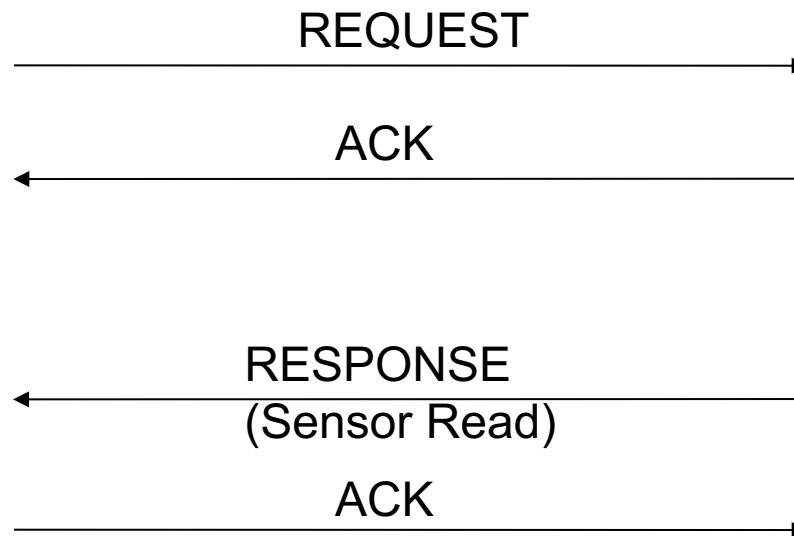
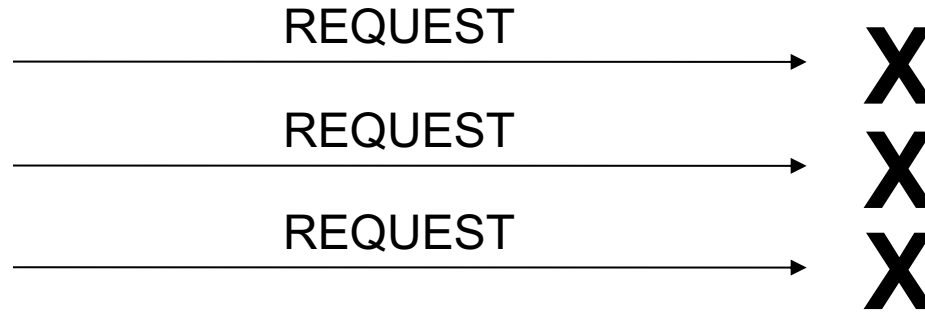
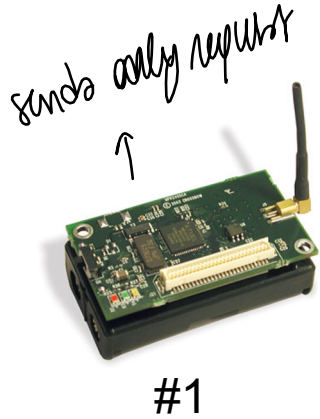
- ☐ File name:
<personal_code1>_<personal_code2>.zip



Challenge deliverables

- Form: <https://forms.office.com/r/1CXDaMAvbP>
 - Only one entry for group
- Zip Content:
 - All the source code (TinyOS files, python file, topology, noise, etc...)
 - Complete log of the simulation
 - Short report (max 1 page)
 - Your names + ID number on top of the report
 - Repository link (if used)

Send/ACK example





What to do

- Simulate 2 motes talking between each others
- Mote #1 sends periodic request (REQ) messages to mote #2 containing:
 - Message type: REQ
 - An incremental counter
- The request has periodicity **1000ms**



What to do

- Only on receipt of a request, mote #2 sends back a reply (RESP) message with:
 - Message type: RESP
 - The counter sent by mote #1
 - A value read from the fake sensor
- Fake sensor is just a module which return a random number, you don't need to modify it

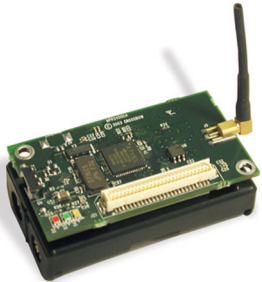


What to do

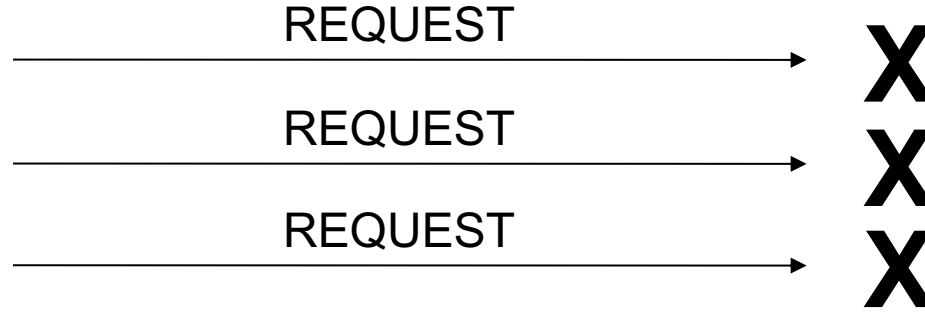
- Each message, REQ and RESP, must be acknowledged using the TinyOS built in ACK module
- Upon receipt of the Xth REQ-ACK message:
 - Mote #1 stops to send requests
 - The exercise is done!
- Use the module PacketAcknowledgements to send the ACK, **don't** reimplement it!



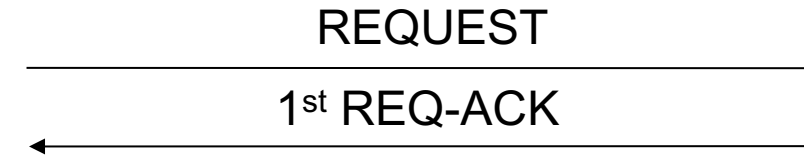
Send/ACK example



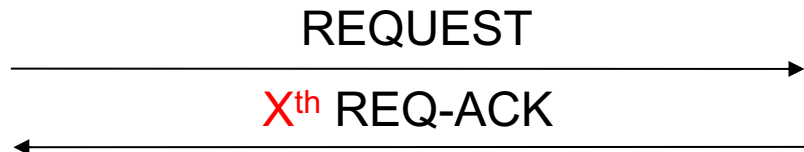
#1



...



...



MOTE #2 BOOT
(at time Y)



#2

DONE!



Parameters

10626081



- $X = [\text{last digit of your (team 1) person code}] + 1$
- $Y = \text{person code without:}$
 - last three digits
 - first three digits

$$X = 1 + 1 = 2$$

$$Y = 26$$

- 104**10**16**4**
 - $X = (4+1) = 5$
 - $Y = 10$



don't reimplement it!
7



PacketAcknowledgements

- Read the documentation
- Available at `/home/user/Desktop/tinyos-main/doc/nedoc/telosb/index.html`

Commands

command error_t [noAck](#)(message_t *msg)

Tell a protocol that when it sends this packet, it should not use synchronous acknowledgments.

command error_t [requestAck](#)(message_t *msg)

Tell a protocol that when it sends this packet, it should use synchronous acknowledgments.

command bool [wasAked](#)(message_t *msg)

Tell a caller whether or not a transmitted packet was acknowledged.



Template

- ❑ In the folder SendACK_template there's a draft of the code to fill in
- ❑ Try to use as much as possible that draft
- ❑ Files to modify:
 - SendAck.h
 - SendAckAppC.nc
 - SendAckC.nc

```
***** AMSend interface *****//  
event void AMSend.sendDone(message_t* buf,error_t err) {  
    /* This event is triggered when a message is sent... */  
    /*  
    * STEPS:  
    * 1. Check if the packet is sent  
    * 2. Check if ack is received (Read the docs!)  
    * 2a. If yes stop the timer, the program is done  
    * 2b. Otherwise: send again a request  
    * Always: use debug statements  
    */  
}
```



Simulation

□ Simulate it with TOSSIM

- Mote #1 at time 0
- Mote #2 after **Y** seconds

See sendAckC



Message structure



- Only one message type containing:
 - msg_type: REQ/RESP
 - msg_counter: incremental integer
 - value: value from the fake sensor



Hints



- 1) Create the message structure
- 2) Choose which modules you'll use
- 3) Write the modules in the ...AppC.n and in the ...C.nc files
- 4) Wire the modules in the ...AppC.nc file
- 5) Implement the logic in the ...C.nc file



Hints



- ❑ Run the code often to check syntax or compiler errors, not only at the end!
- ❑ Use a lot of debug statements (DBG/DBG_CLEAR)
- ❑ Read the docs
- ❑ Use the examples seen before as scheme
- ❑ Think!



Commands



- ❑ Compile the mote's code
 - `make micaz sim`
- ❑ Run the simulation
 - `python RunSimulationScript.py`
- ❑ Before run a simulation, recompile the code of the mote if you have modified it