POLITECNICO MILANO 1863

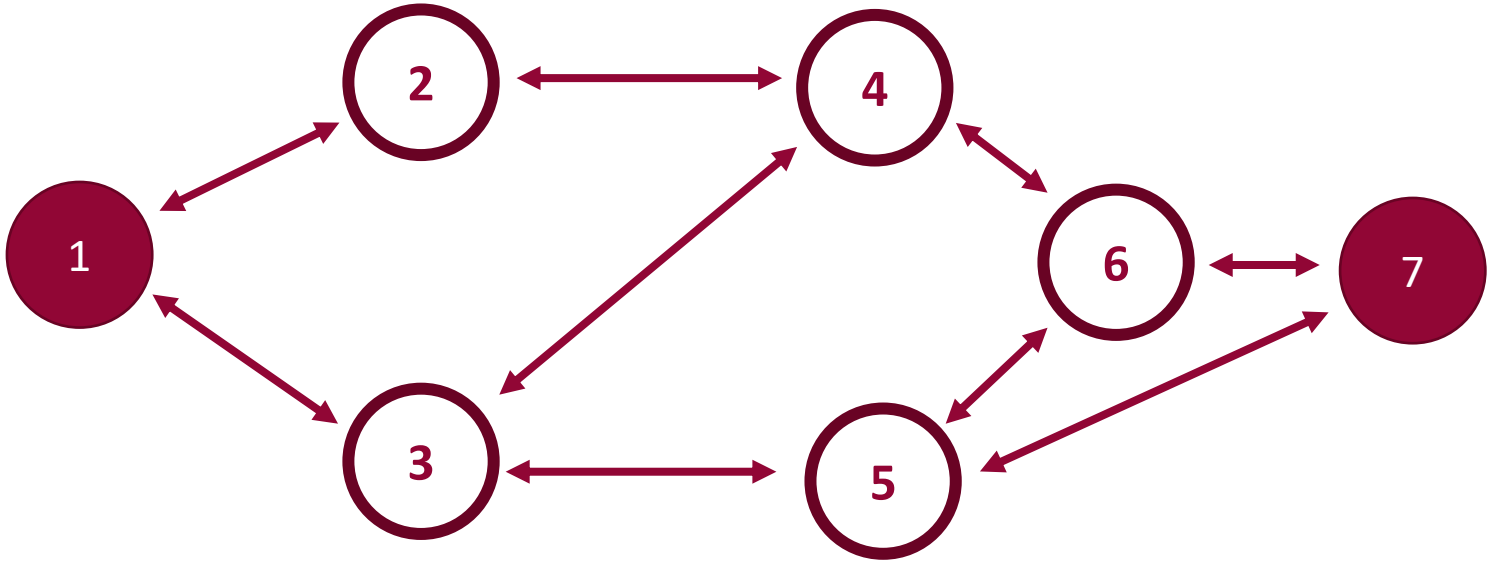
ANTLAB

IoT Challenge #3

TinyOS and TOSSIM

What to do?

- Develop a TinyOS application to be simulated with **TOSSIM**
- Implementation of a simple routing protocol based on broadcasting **STARTING FROM OUR SKETCH (find the RadioRoute.zip in WeBeep)**
- Simulation of the network with the following topology (7 nodes)



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Routing protocol specifications (1)

- Before transmitting a message, each node checks its **routing table** to see if a route is present for the selected destination:
  - If the destination is present, the message is forwarded to the **next hop** indicated in the routing table.
  - Otherwise a ROUTE_REQ message is sent in **broadcast**, containing the selected destination in the message.

Routing table example (Node 1)

Destination	Next Hop	Cost
4	2	2
5	3	2

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Routing protocol specifications (2)

If I receive a ROUTE_REQ I should:

- **Broadcast** it if the ROUTE_REQ is a new one (i.e. requesting for a node not in my routing table and not me)
- If I am the node requested, I reply in **broadcast** with a ROUTE_REPLY, setting the ROUTE_REPLY cost to 1
- If the node requested is in my routing table, I reply in **broadcast** with a ROUTE_REPLY, setting the ROUT_REPLY cost to the cost in my routing table + 1

If I receive a ROUTE_REPLY I should:

- If I am the requested node in the reply:
  - Do nothing
- If my table does not have entry or if the new cost is lower than my current cost:
  - I update my routing table
  - I forward the ROUTE_REPLY in **broadcast** by **incrementing** its cost by 1
- Otherwise: Do nothing

Message formats

Data messages:

Type = 0
Sender - integer
Destination - integer
Value – integer

Route Request messages:

Type = 1
Node Requested – integer

Route Reply messages:

Type = 2
Sender - integer
Node Requested – integer
Cost – integer

USE A SINGLE MESSAGE STRUCT in the header file (RadioRoute.h), **NOT 3 DIFFERENT** !

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What to do (2)

Every time a node receives a message (of any type), it updates the status of the LEDs as it follows:

Take the leader person code: i.e. **10692911**

Starting from the first digit of your person code, in a round robin cycle, toggle the LED with index led_index = **digit modulo 3**

At each message the digit is changed, (for the first request take the first, then the second and so on) going back to the first digit after it reaches the end

Example:

First msg: digit = 1 1 modulo 3 = 1-> I update the LED with index 1 (toggle led1)

Second msg : digit = 0 0 modulo 3 = 0 -> I update the LED with index 0 (toggle led0)

Third msg : digit = 6 6 modulo 3 = 0 -> I update the LED with index 0 (toggle led0)

…. At the 9th message you go back to the first digit

Simulation settings in TOSSIM

- Set the topology of the simulation (topology.txt) as in the **slide 2**
  Note that links are all bi-directional (**use -60.0 dBm** as gain for all entries)

- **All the routing tables are empty at the beginning of the simulation,** they should be filled with proper ROUTE_REQ and ROUTE_REPLY when needed

- Set all the nodes to boot at time t=0.

- **5 seconds after** its Radio is ON, **Node 1** wants to transmit a data message with **value 5** with destination **Node 7**. Since its routing table is empty, it will issue a ROUTE_REQ.
  At the reception of the ROUTE_REPLY in node 1, the actual DATA message should be sent (hop-by-hop based on routing table, **NO BROADCAST!!!**
  If more ROUTE_REPLY for Node 7 are received in node 1, **only send DATA the first time**
  (only 1 DATA is sent out from node 1)
- Use the same **meyer-heavy.txt** noise file as the RadioToss project

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Important Note (to do 3)!

- To simplify the outcome and reduce the number of messages, **limit the number of ROUTE_REQ and ROUTE_REPLY that a node sends to 1** **(1 ROUTE_REQ and 1 ROUTE_REPLY)**

- If a node has already sent one ROUTE_REQ, it **should not** send other ROUTE_REQ msgs

- If a node has already sent one ROUTE_REPLY, it **should not** send other ROUTE_REPLY msgs

- Enable debugs for all the important events you think are useful to report
- IMPORTANT: Print debug for leds at every message reception