

Exercises of lecture
Wireless Sensor Networks
Winter 2006/2007
Sheet 4

SECTION 1:

Wireless Sensor Transceiver, Energy

1. Energy is limited in wireless sensor network. Therefore, the energy supply and consumption scheme has to be designed as efficient as possible. State the requirements for the energy module of wireless sensor network.
2. Consider a wireless sensor network with the energy consumption for each sensor node stated as follows:

Idle mode: 0,05mA

CPU computation (e.g. doing calculations): 9mA

Sending of wireless data: 10mA

Receiving of wireless data: 5mA

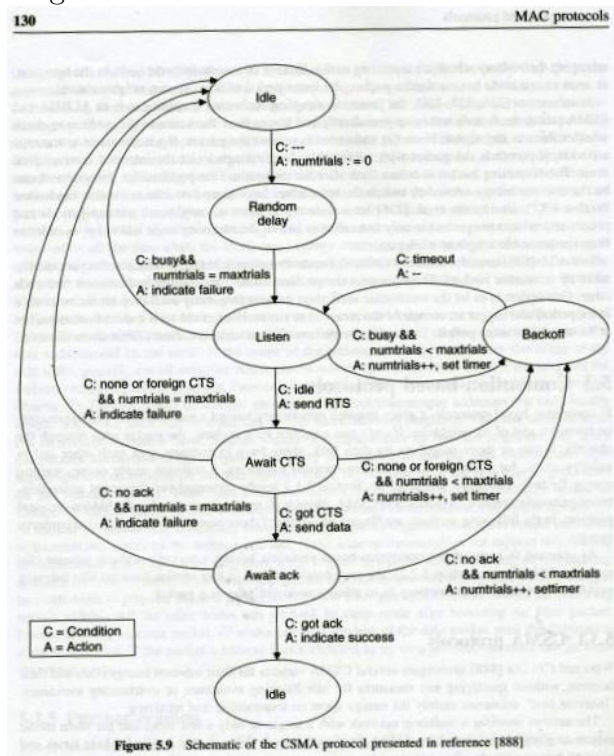
Based on the following scenario:

- Each sensor node is equipped with the battery that provides an amount of energy of 1500 mAh. Assume that every node is driven with the same voltage supplied by the battery.
 - A measurement has to be taken every 200ms. For each measurement, sending is required only once per second, and each attempt to send a packet requires the node to receive one packet. Assume that a node knows exactly when a foreign packet will arrive.
 - Every packet length is 250 bytes and the radio bandwidth is 9600 bits/s.
 - A single measurement takes 5ms.
- (a) What is the lifetime of each node?
 - (b) There are several influences that are not taken into account in this example. State the influences and briefly explain whether and how they reduce or extend the lifetime of the sensor node.

SECTION 2: MAC Layer

Provide short answers for the following questions.

1. Write four major sources of energy wastage and explain them very briefly.
2. Explain briefly (not more than three sentences) that why busy tone should not be stronger or weaker than data signal?
3. Following figure shows steps a CSMA protocol follow at the sender side. Draw a similar diagram for the receiver side.



Choose between true and false for the following questions.

1. MAC protocols provide medium access control mechanism when a number of nodes compete for a shared communication medium? (True/False)
2. In WSN, if a sender sense that medium is free (and suppose that condition will hold) then is that means receiver will get its transmission without facing any collisions? (True/False)
3. In Ethernet, if a sender sense that medium is free (and suppose that condition will hold) then is that means receiver will get its transmission without facing any collisions? (True/False)
4. In pure ALOHA a sender after sensing the medium immediately sends the data packet. ? (True/False)
5. In slotted ALOHA a sender can send only at the beginning of a time slot and wait otherwise? (True/False)

6. In persistent CSMA, a node wait for random amount of time after last collision before sensing the channel again? (True/False)
7. In p-persistent CSMA, a node decide to transfer with probability p on current time slot? (True/False)