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Exercises of lecture

Wireless Sensor Networks

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Sheet 7

SECTION 1:
Synchronization

1. Given a wireless sensor network consisting of sensor node x and sensor node y that are designed to detect the same event at a fixed event rate.

   After the initialization of the sensor node x, it detects:

   (a) a synchronization signal at 2.4s

   (b) an event at 2.5s

   After the initialization of the sensor node y, it detects:

   (a) a synchronization signal at 1.9s

   (b) an event at 2.1s

   Then, node y informs node x about the time it receives the first event. Assume that all the synchronization signals received by node x and y are based on the same global source, and both nodes are located at the same distance from the synchronization source, which node detects the event first? And how advanced or late this node detects the event compared to another?

   Solution:
   The synchronization signal is received by node x and node y at 2.4s and 1.9s respectively after their initialization. So, the time difference of their clock is 0.5s, meaning that time of node y is late by 0.5s compared to that of node x clock. When node y detects the event at 2.1s, it is 2.6s at the clock of node x. So, we can see that node y perceives the event 0.1s later after node x detect the same event.

2. An MS Project involves logging environmental events on different sensors during experiment and after the experiment presenting a list of logged data with corresponding logic time on PC. However the project does not covers clock synchronization. How can the MS student present reliable log data on PC without worrying about writing time synchronization code on the sensors? (Hint: He also logs the end time of experiment on each sensor).
   Solution:
   By using a-posteriori Synchronization. That is on his PC after collection all sensor logs, he can use the end time of experiment on each sensor and synchronize there respective log data accordingly before presenting it.

3. Differentiate between external synchronization and internal synchronization **Solution:**
   In external synchronization nodes try to synchronize with real time scale like UTC.
   Hence at least one node must have access to real time.
   In internal synchronization nodes much agree on some common time.