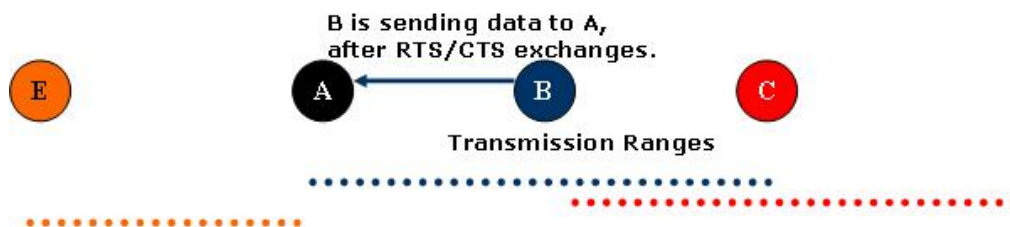


Exercises of lecture
Wireless Sensor Networks
 Winter 2006/2007
 Sheet 5

SECTION 1:
 MAC protocols

1. The design of energy-efficient strategies to prolong the lifetime of sensor node is of utmost importance. To date, many energy-efficient protocols have been proposed for WSN. One of them is S-MAC. It was proven in the experiment conducted on the Mote sensor node by WeiYe and et. al. [1] that the S-MAC protocol is capable of reducing the energy consumption to 2-6 times than that of an 802.11-like MAC protocol. What are the energy-saving methods being adopted by S-MAC protocol? Identify the drawback(s) of S-MAC if any.
2. Consider a protocol which is based on RTS/CTS messages. Furthermore in this protocol nodes not use CSMA and never sleep. In this protocol, any node that overhears CTS (with or without hearing RTS) defer its transmission for the time-period data will take to transfer (for example node-E). Furthermore, when any node overhears RTS (from a Node-B), it defers its transmission until CTS should have been received. *However, a node (consider node-C) resumes transmission when CTS is not heard after RTS within a specified time period, because it is out of range from receiver (or because of collision).*



- (a) The protocol creator claims that he has solved hidden terminal problem (hint: also consider node-C start sending data to node-B). Explain if his claim is right or wrong?
 - (b) Furthermore, the protocol creator claims that he has also solved exposed terminal problem. Explain if his claim is right or wrong?
3. **SMACS protocol:** Both node x and node y have already few "links" attached with other nodes. Draw the messaging diagram (similar to one drawn in class) to establish a new link between node x and y.

4. IEEE 802.15.4:

- (a) State **three** reasons that why a device has to wake up to listen beacon transmission when it has already a guaranteed time slot reserved and can be used to send/receive information to/from it.
- (b) State **two** reasons that why a guaranteed time slot reserved for a device can be de-listed by coordinator?

References

1. Wei Ye, John Heidemann and Deborah Estrin, *An Energy-Efficient MAC Protocol for Wireless Sensor Networks*, In Proceedings of the 21st International Annual Joint Conference of the IEEE Computer and Communications Societies (INFOCOM), Vol.3, pp. 1567-1576, New York, NY, USA, June, 2002.