

Ad Hoc And Sensor Networks

Exercise 6

Assigned: October 26, 2009

Due: November 2, 2009

1 MAC Layer

We want to build a wireless sensor network monitoring the occurrence of lightning flashes (= "Blitze"). Sensor nodes are placed on roof tops of different buildings around the ETH main building. Some nodes are equipped with a combination of a light sensor and a microphone, some nodes solely serve as communication relays. Using information from the light sensor and the microphone allows to estimate the distance where the flash occurred. Sensor readings are propagated to a base station using multi-hop communication. Furthermore, all devices are battery driven. The system should run for several months without human intervention. Message delay is not of primary importance but should be relatively small (no long term buffering). Note: Operating the light sensor and the microphone needs only a very small fraction of the energy the radio transceiver is using. Therefore, we can assume that the light sensor/microphone can always be operating without having a large impact on the lifetime of the system.

- a) You are asked to design an energy efficient MAC protocol for this scenario. Identify the requirements of the application and discuss which of the MAC layer approaches presented in the lecture is/are best suited for the application. Describe your proposed solution in a few sentences. Would it make a difference if all nodes had a light sensor?
- b) After a couple of months of successful operation the lightning detection system is extended to additionally measure the ozone concentration in the air. Thus, *all* nodes are enhanced with custom ozone-sensors which are sampled once every two minutes. Would you stick with your MAC protocol from a) and tweak it to better cope with the new situation? If so, what changes would you propose? Or would you rather choose another MAC layer approach? If so, what would your new system look like? Explain your decision.