Energy Optimization and Monitoring in Wireless Mesh Sensor Networks

Air pollution is a major problem worldwide. Using sensor devices that measure air pollution, as part of an urban wireless network such as the City of Luxembourg’s Hot City network, can provide information on concentrations of pollutants. This can be used by city authorities to improve air quality through better traffic management. The goal of the project is to design a network architecture that uses sensors to provide real-time measurements of air pollutants specially NO2. Measurement sensors are equipped with omni-directional antennas for packet transmission and reception, and are linked to their neighbours via WiFi connections. How the information provided by the sensors are routed to the central workstation (Sink) has a strong impact on energy consumption and lifetime expectation of the overall network: Every data packet costs a fixed amount of energy. Inefficient routing affects the energy reserves of the sensor nodes in the vicinity of the sink, because they aggregate the data from sensors located at a further distance. In that case, data traffic should be evenly distributed over the network in order to increase network lifetime. In the first phase of the study, a survey of existing air quality sensors will be undertaken followed by a study of existing architectural solutions for sensor deployment to determine an optimal architecture. The work on power aware routing in wireless sensor networks with a multi-criteria routing should be done for minimizing local congestions. The proposed routing schemes will allow the number of highly congested sensors to be decreased by spreading the data along multiple non-overlap paths, in order to equally distribute the energy consumption of sensors over the entire network topology.