

Design and Simulation Analysis of an Improved Time Synchronisation Protocol for Wireless Sensor Networks



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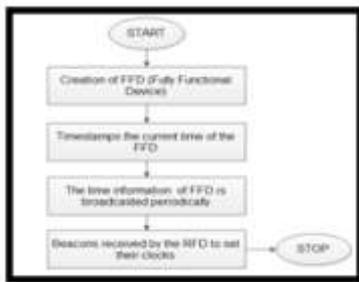
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Abstract:

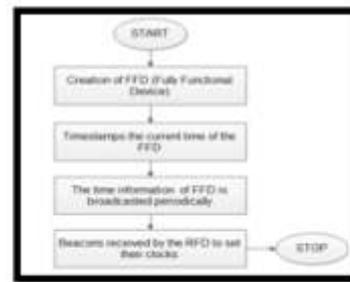
Wireless Sensor Networks (WSNs) are clusters of tiny sensing devices which are widely distributed in an area to monitor the environment. These sensing devices should be active for a long duration to continuously monitor the environment. Therefore, in WSNs conservation of energy is very important. In order to conserve energy, the nodes transit between sleep and wakeup modes. This transition of the nodes between sleep and wakeup modes leads to unsynchronised clocks in the network. Time synchronisation is essential among sensor nodes to enable integration of the data collected at all the nodes in the network. Synchronised clocks are also essential if the application follows the Time Division Multiple Access (TDMA) mechanism to access the medium. This thesis presents the design and simulation analysis of an energy efficient time synchronisation protocol for WSNs.

The time synchronisation mechanism presented in this thesis is aimed to conserve energy of the nodes while synchronising their clocks. The nodes are synchronised both locally and globally. While global synchronisation is periodic, local synchronisation takes place only when the nodes need to communicate with each other. The developed algorithm is implemented in network simulator NS-2.35 and is tested for its functionality. IEEE 802.15.4 files in NS-2.35 are modified to implement the designed algorithm.

The performance of the proposed time synchronisation algorithm is compared with that of existing IEEE 802.15.4 CSMA/CA in terms of energy consumption. From the obtained results it is observed that the use of proposed time synchronisation algorithm achieves higher energy conservation when compared to the existing IEEE 802.15.4 CSMA/CA, in absence of the proposed time synchronisation mechanism.



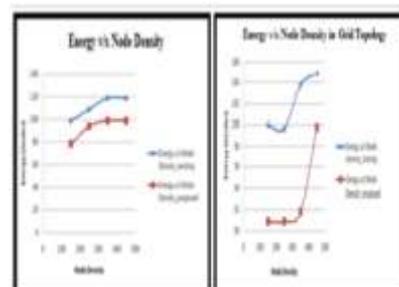
Flow diagram of protocol implementation



Flow diagram of protocol implementation network topology setup



Network topology setup



Analysis of performance metrics