Abstract of the Ph.D. Work

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Title	**:**	Performance Evaluation & Optimization of the QoS issues related to Wireless Sensor Networks

This work provides evaluation, analysis and optimization of the clustering, coverage, MAC and data acquisition issues in the field of Wireless Sensor Networks (WSNs). WSNs is an emerging area of research due to its wide range of tracking and monitoring applications ranging from environment monitoring, security surveillance, traffic control, retail market, medical and heathcare monitoring to name the few.

WSNs are highly resource constraint and hence designing protocols and approaches that can enhance the existing one and new ones that can make use of the latest technological development to meet the desire quality of service metrics, is always an open research challenge in this field.

One of the approaches to address energy efficiency in WSNs is clustering. A typical hierarchical clustering scenario contains of Cluster Head (CH) Nodes, Regular Nodes and Base Station. Clustering is an effective approach in wireless sensor networks, which can increase network scalability and lifetime.

LEACH is one of the most discussed & explored hierarchical clustering protocol in WSNs, owing to its energy efficiency, simplicity and load balancing capability. This thesis has dealt with two problems associated with this protocol in the area of clustering, namely skewness of the cluster heads and the balancing of the clusters. The behavior of the normal LEACH protocol has been compared with the proposed protocols. The simulation results clearly favor our proposed protocol thereby giving energy boost and fault tolerance to the network.

Day by day new techniques and technologies are coming up like global positioning system (GPS), wireless charging etc. There is a requirement to adopt these developments to make the futuristic networks. The work has proposed a protocol that addresses these issues and provides an approach to incorporate these for the better design & long life of the network.

Sensing coverage is one of the fundamental QoS problems in sensor networks is sensing coverage. Coverage in wireless sensor network is usually defined as a measure of how well and for how long the sensors are able to monitor or track the given physical space. Deployment of sensor nodes with full coverage and connectivity is a real challenge in the field of Wireless Sensor Network. The different node and deployment characteristics highly influence the coverage as they directly impact the amount of overlapping experienced by the different nodes. This work provides a tradeoff between coverage and different characteristics of the WSNs, both in homogeneous and heterogeneous environment.

Medium Access Control (MAC) protocols control the usage of the shared radio in WSNs and directly influence the energy-efficiency of the network. MAC protocols try to synchronize and schedule of radio usage to enhance the QoS parameters like lifetime, throughput and the latency of the network. An efficient MAC for LEACH protocol has been proposed in this thesis. In this work, we have concluded that if the proposed enhancements to the existing LEACH protocol are incorporated, then the throughput of the network can be greatly increased and the latency can be highly reduced especially in the case of bursty nature of traffic.

Data gathering is a common but critical operation in many applications of WSNs. Most of the energy of a sensor is consumed on two major tasks: sensing the field and uploading data to the data sink. Energy consumption on sensing is relatively stable. On the other hand, the data gathering scheme is the most important factor that determines the network lifetime. Mobile Agent based techniques are considered to be a better alternative in the field of data gathering in WSNs. The thesis has proposed and compared the mobile agent based data gathering technique to the traditional data gathering technique along with the effect of data fusion.

Finally, the thesis suggests some issues and ideas for further research work in this field.