CHAPTER 7

CONCLUSION AND FUTURE WORK

In this research work, various cross-layer based techniques which include routing and rate control, routing and power-aware rate adjustment, fair resource allocation and multicast routing for MANET have been proposed. These techniques are used for improving bandwidth utilization and reducing the packet loss ratio, energy consumption, and delay.

In Chapter 1, a brief introduction of the characteristics, applications, and challenges facing in mobile ad hoc network, cross-layer approach and its issues, routing and routing protocols in MANET, multicast routing and its issues have been explained. In addition, rate assignment and resource allocation are discussed. Finally, an overview of proposed work and thesis organization were proposed which indicate the chapters corresponding to the proposed techniques.

In Chapter 2, the existing works on the routing, multicast routing, cross layer based routing, rate assignment, and resource allocation have been discussed. A study of the existing system, helps getting to know the limitations of the existing protocols creating a motivation to propose a new technique. The conclusion provides the overall problem identified in the existing system.

Chapter 3 presented a Cross layer Based Routing and Rate Control (CBRRC) protocol for MANET. In CBRRC, Fuzzy Logic System 1 (FLS1) is responsible for best path selection, whereas Fuzzy Logic System 2 (FLS2) is for rate adjustment. The current transmission rate of the path is adjusted through comparison of the initial transmission rate of the path with the output of FLS2. This prevents the path from congestion.Simulation results show CBRRC outperforming the existing SMRP by 20% in terms of delay, 44% in terms of delivery ratio, 54% in terms of packet drop and 50% in terms of overhead, when the number of data flows is varied from 2 to 10. Similarly, the inference is that CBRRC outperforms SMRP by 59% in terms of delay, 31% in terms of delivery ratio, 74% in terms of packet drop and 42% in terms of overhead, when the pause time is varied from 5 to 25 seconds.

Chapter 4 presented Cross-layer Based Routing and Power Aware Rate Adjustment (CBR-PARA) protocol for MANET. In this protocol, the process of selecting the best path is extended by including path's residual energy of the node, along with path stability and bandwidth. This residual energy is estimated at both the situations whenever the node receives data packets and transmits the data packets. Also, a method is proposed where each node updates a table. This includes energy efficiency in all combinations of transmission power and rate. Simulation results show the outperformance of CBR-PARA over the existing EEMAC when the transmission rate is varied from 100 to 500kb in terms of delivery ratio by 39%, in terms of packet drop by 17.8% and in terms of residual energy by 2.1%. Similarly, when the number of data flows is varied from 2 to 10, CBR-PARA outperforms EEMAC in terms of delivery ratio by 13%, in terms of packet drop by 19% and in terms of residual energy by 18.4%.

Chapter 5 proposed a Cross-layer based Fair Resource Allocation technique (CFRA) for the selected routes to enable fair distribution in resource utilization. In TDMA-MAC protocol, the path bandwidth can be estimated using the two-hop bandwidth allocation. Whenever neighbour nodes receive a resource allocation information message from a node, the neighbour node updates its own RAT. The node checks the RAT, when it receives a Resource Request message it decides the requested user data slots are available or not. Simulation results show that, CFRA outperforms the existing DTDMA protocol by 25.1% in terms of delay, 20% in terms of bandwidth utilization, and 19.98% in terms of residual energy, when the number of data flows is varied from 2 to 10. Similarly, it outperforms DTDMA by 13.25% in terms of delay, 20.34% in terms of bandwidth utilization, and 19.91% in terms of residual energy, when the transmission rate is varied from 100 to 500Kb.

Chapter 6 presented a Cross layer Based Multicast Routing protocol (CBMRP) for MANET. It uses fuzzy logic systems for the best path selection. In FLS, the source obtains the input parameters viz., path stability and bandwidth through route discovery mechanism. These inputs are fuzzified for obtaining the optimal path for data transmission. Simulation results show CBMRP outperforming the existing PDTMRP protocol by 23% in terms of delay, 44% in terms of delivery ratio, 54% in terms of packet drop and 50% in terms of overhead, when the number of data flows is varied from 2 to 10. Similarly, it outperforms PDTMRP by 43% in terms of delay, 31% in terms of delivery ratio, 74% in terms of packet drop and 42% in terms of overhead, when the pause time is varied from 5 to 25 seconds.

Future Work

As a future work, we wish to extend this work to real-time Variable Bit Rate (VBR) traffic classes like voice, video etc. They have the strict bandwidth, rate and delay constraints. Hence extending the cross-layer based rate control and resource allocation techniques to VBR traffic to meet their constraints will be the future scope of this research work.