CHAPTER 8

CONCLUSION AND FUTURE WORK

8.1 CONCLUSION

The need for efficient QoS provisioning in mobile ad hoc networks is clearly justified. Driven by the limitations in the existing solutions, approaches have been proposed to circumvent the issues and achieve higher QoS levels. In the IEEE 802.11 MAC, a priority scheduling scheme called AT-ST is defined but the scheme is not concrete in addressing issues like predetermining the value of retry count and granting nodes, the right to suspend transmission. The scheme is, thus, extended using probabilistic Markovian model which provides optimum values for retry count and the criteria needed for fixing ST packet value, thereby improving the performance of the scheme. This is substantiated by the simulation results comparing the performance of the schemes with and without markovian model adaptation in terms of throughput and delivery ratio. It is observed that Adaptive AT-ST scheme performs much better if markovian model is adopted. It enhances the QoS by avoiding starvation of nodes and providing an efficient scheduling mechanism.

Handling MAC layer misbehavior is an important requirement in guaranteeing service availability. Nodes which do not comply with the protocol and manipulate their backoff values deprive their counterparts of their fair share in access to the channel. The malicious nodes observe the behavior of other transmitting nodes and manipulate accordingly. The
question of whether this observation capability can be tapped to develop a counter-measure to identify potential misbehavior instances is answered by proposing a new mechanism called DCF/SMA. The mechanism not only diagnoses and penalizes such selfish misbehavior but also reduces misdiagnosis of selfish nodes. The overall quality of service is improved when the legitimate nodes are guaranteed the bandwidth resources they deserve.

The reasons for the packet losses have been examined and Guaranteed RTS/CTS coverage algorithm is adduced to solve the hidden terminal problem with reduced end-to-end delay. In GRCC, all the nodes in the interference range know about the ongoing transmissions and thus, cease from disturbing them. A mathematical model to throw light on the impact of the hidden terminal problem is provided and an analytical model to show how MAC layer parameters affect the TCP end-to-end delay is explicated. The algorithm SQB-RA is proffered to improve the MAC protocol such that all the nodes can successfully transmit within two stages of retransmission. Thus, the throughput of the network is increased by removing the hidden terminal problem. As the proposed algorithms are modeled using a centralized approach, an efficient algorithm called the KEL algorithm is used to elect the cluster heads periodically.

Since stale updates waste the bandwidth and the channel allocation property, a stateful algorithm called SPP is introduced to alleviate such stale updates in cooperative caching. The algorithm is based on stateful cache consistency maintenance since this can significantly reduce the consistency maintenance cost by utilizing the cache status information. Simulation studies show that SPP algorithm improves traffic overhead and query latency for cache consistency maintenance when compared to the Pull with Dynamic
TTR algorithm because of the propagation of updates in lesser number of hops, thus, optimizing the channel utilization.

An Integrated QoS Enhanced MAC model has been designed to resolve the major issues in improving QoS in a typical MANET. The model can be employed in applications requiring differentiated services. Fairness provisioning and misbehavior avoidance are handled efficiently and bandwidth utilization is improved through cooperative caching. The number of MAC layer retransmissions is also reduced. Simulation results show that packet loss percentage and the traffic overhead are much less when compared to the 802.11 DCF MAC extended with other available mechanisms to handle the same issues. The average throughput which is the main determining factor in assessing QoS is high in the proposed Integrated QoS Enhanced MAC model and the end-to-end delay is almost the same in both the models.

8.2 FUTURE WORK

As part of future works, the Adaptive AT-ST scheme which currently only caters to binary priority levels, viz., high and low can be extended to accommodate multiple priority levels. This, in a way, would be a more exhaustive approach to provide differentiated services to the nodes in the network. The retry counts for the nodes belonging to each level also have to be determined when taking this approach.

GRCC and SQB-RA which have been proposed as centralized approach can be extended to distributed approach for applications that would require it. The issues inherent in distributed approach like lack of synchronization and central coordination have to be resolved. The proposed Selective Push and Pull technique can be applied to information other than the data packets. It can be adapted and incorporated into the appropriate layers of the network model to reduce the control overhead. For instance, the routing
tables, which also require periodic or sporadic updates, can be disseminated through the SPP mechanism, thereby making efficient utilization of the bandwidth.

A QoS framework is a complete system that attempts to give the guaranteed services to the users. It encompasses the QoS model, QoS routing, QoS resource reservation signaling and admission control. The Integrated QoS model proposed can be widened into a QoS framework by including the other components and all the techniques for practical use. In addition to QoS, security and privacy are also desired features to sensitive applications. Besides guaranteeing channel access, hard line guarantees such as providing the required bandwidth and reducing the delay of mission-critical applications can also be worked upon.