CHAPTER 8

CONCLUSION

This chapter presents the final conclusions and discussion on results obtained from the thesis. It proposes different algorithms which improve the performance of the TCP over mobile ad hoc networks. These algorithms mainly use the techniques like buffer management, prior determination of link failure using signal strength, delay window and delay window limit to reduce the number of acknowledgements. They reduce the traffic and avoid congestion in the network, explicit multibit congestion feedback from routers and explicit signaling protocol to achieve the improvement in the performance of TCP in the system.

A novel stability metric based on the residual link lifetime concept that maximizes (minimize) the joined link-stability energy metric is based on node selection with higher link duration when a higher weight is given to the stability index and a higher residual energy is given to energy aware index. This local criterion permits a high scalability to be offered to the routing algorithm in terms of state info storage and control packets transmission sent by any underlying routing protocol to maintain the network state knowledge.

Chapter 3 explained that, the number of acknowledgments is significantly reduced by TCP-SA when compared to TCP-DA which reduces acknowledgments roughly in half. Also the improvement of TCP-SA over TCP-DA is that it performs better even in long hop networks. When the
number of acknowledgements is reduced, the collision in the link from the sender to the receiver decreases which is helpful to improve the performance and increase throughput. When there is no need to send more acknowledgments, definitely there is a chance of effectively utilizing the bandwidth in sending the important information among the nodes in the network. The comparison of the traditional TCP, TCP-DA and TCP-SA in terms of throughput is shown in Figure 8.1.

![Comparison graph of TCP, TCP-DA and TCP-SA in terms of throughput](image_url)
In chapter 4, an improvement in the performance of the TCP in mobile ad hoc networks is carried out by making use of buffer management at every node. It buffers the packet during the link breakage, prior identification about the link breakage using signal strength. It helps in identifying a new route without stopping the transmission, by reducing the number of acknowledgments using the delay window which is maintained as dynamic size in nature.

![Comparison graph of TCP and the proposed algorithm in terms of throughput](image-url)
The results indicate that the proposed algorithm performs better when compared to the traditional TCP in terms of throughput, retransmitted packets – this parameter provides the number of lost packets, delivery rate, percentage of ACK sent and they are shown in chapter 4. The overall performance of the proposed algorithm in terms of throughput is shown in Figure 8.2.

In chapter 5, a new approach for multi-hop wireless networks have been demonstrated controls the congestion in the wireless network and fairly allocates the network resources among the communication flows.

Besides, it minimizes the delay of packet sending between the source and destination is developed. ECCPBM, Explicit Congestion Control Protocol with Buffer Management is a new approach which notifies the congestion explicitly similar to RED/ECN and it maintains the buffer at each node. When there is a congestion identified, packets are not dropped; instead they are buffered at a particular node and are sent once the route is clear.

Congestion Control in multi-hop wireless networks is done using the ECCPBM method. In this approach the main thing is that it uses the feedback which is controlled by the ECCPBM sender and routers. The ECCPBM routers check whether the network is congested or not.

It acts on TCP so the packets which are being sent from TCP layer to ECCPBM layer are regulated by the ECCPBM. Only after checking, the packets can be allowed to be sent by the ECCPBM window. The performance of the proposed approach is depicted in Figure 8.3 in terms of end-to-end delay.
Figure 8.3 End-to-End delay using ECCPBM

In chapter 6 a new protocol has been posited to evaluate the node lifetime and the link lifetime utilizing the dynamic nature, such as the energy drain rate and the relative mobility estimation rate of nodes. A novel stability metric based on the residual link lifetime concept that maximizes (minimize) the joined link-stability energy metric is based on node selection with higher link duration when a higher weight is given to the stability index and a higher residual energy is given to energy aware index.

This local criterion permits a high scalability to be offered to the routing algorithm in terms of state info storage and control packets transmission sent by any underlying routing protocol to maintain the network state knowledge. A route Lifetime-prediction protocol has been proposed in an Energy aware greedy nature routing for mobile ad hoc network (LEGR).
Figure 8.4 Number of nodes versus throughput