ABSTRACT

Mobile Ad-hoc Networks (MANET) is a network consisting of a collection of nodes, which can communicate with each other without any help from a network infrastructure. There has been a growing interest in MANET motivated by the advances in wireless technology and the range of potential applications that might be realized with such technology. Due to the lack of infrastructure and their dynamical nature, MANET demand a new set of networking protocols to stockpile all the benefits of the versatile communication systems.

Packet loss and bandwidth dilapidation are caused because of congestion, and consequently time and energy is wasted during its recovery. To avoid this, there is a need for congestion control mechanism. In the layered protocol stack, each layer communicates only with the adjacent layers using well-defined interfaces. Hence there is no performance optimization, so there is a demand for Cross-layer design which emphasizes on the network performance optimization by enabling different layers of communication stack to share stated information or to coordinate their actions in order to jointly optimize network performance. The vulnerability of attacks may introduce damage to the whole network connectivity; therefore physical layer authentication for the detection of the intruder is integrated with the cross-layer design, which can improve the security of the wireless networks. In addition to this, efficient energy consumption algorithm is required to enable the nodes to efficiently utilize their energy resources and to maximize the battery life of the node and high throughput.

The proposed Effective Congestion Avoidance Scheme (ECAS) that consists of congestion monitoring, effective routing establishment and congestion less routing. The overall congestion status is measured in congestion monitoring. Based on the congestion standard, the congestion free routing is established to minimize the packet loss, long delay and high overhead in the network when compared with the existing work.

Cross Layer Based Congestion Control Scheme (CLCCS) is proposed for reducing the packet losses in the network. This work contains three parts. In the first part, the cross layer design is proposed to ensure that information sharing can be done between the different layers in protocol stack. In the second part, the congestion detection scheme
is explored; which attains packet loss rate and congestion scale factor. In the third part, congestion control is achieved using cross layer approach. Hence, the congestion route is determined based on the path gain and buffer tenancy fraction. As a result each node maintains the congestion scale value and also the buffer tenancy fractional value.

In MANET the nodes are attacked by several attacks and lack to attain correct balance between data integrity and congestion status. To overcome this, there is a need of secure mechanism to provide integrity of data packets and avoiding more congestion.

A Cross layer based Secure Multipath Routing (CLSMRSCA) is developed for congestion avoidance. The cross layer model is introduced to give more security among the nodes. The multipath routing is focused to provide the load balancing and network lifetime. Each node chooses multipath to avoid the network congestion based on optimized encryption and decryption algorithm. Here, the asymmetric key is chosen. Both encryption and decryption are used in validating the cipher text and in manipulating the plaintext according to the given message. Integrity and authentication of data is improved in this scheme.

Several works concentrate either on congestion avoidance or in reducing more energy consumption, but not both. Some intruders may cause misrouting, false packet injection and loss of packets. This leads to the unnecessary occurrence of retransmission of packets. Thus, the node consumes more energy after the sending and receiving period of the packets. To avoid retransmission, the proposed work focuses on congestion avoidance, energy consumption model and multipath routing scheme.

Efficient Energy based Congestion Control Scheme (EECCS) is proposed to improve energy efficiency of the mobile nodes. Cross layer design is deployed to improve the network performance and multipath routing is used to avoid congestion and to increase network lifetime. Calculating the energy level of data and acknowledgment packets reduces probability of the retransmission of packets. Based on the results, it is observed that the Efficient Energy based Congestion Control Scheme achieves more packet delivery ratio while attaining less delay and overhead than the congestion avoidance scheme and cross layer congestion control.