ISSN:0975-9646

Enhancing Routing With Cross Layer Optimization in MANETs

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***Abstract*— Cross-layer design is an emerging proposal to support flexible layer approaches in MANETs. The routing information about bandwidth, channel capacity, received power and distance to reach its destination could be exploited by the MAC layer in order to give priority to the packets that are closer and appropriate to their destination. By exploit bandwidth information at the MAC layer in order to find out the best route for multimedia data. With the help of performance metrics like packet delivery ratio, Average Throughput, average end-to-end delay and normalized routing load, it will be shown that cross-layering between MAC and routing layer performs much better than using routing layer and MAC layer separately.**

***Keywords*—** Cross Layer Design, QoS, TCP/IP, Wireless Networks

I. INTRODUCTION

Wireless networking is an emerging technology which permits users to access information and services, without considering their geographic position. A central challenge in the design of Mobile ad-hoc networks is the development of efficient MAC and Routing protocols that can efficiently find routes between the communicating nodes. In an effort to improve the performance of wireless networks, there has been increased interest in protocols that rely on interactions between different layers. Cross-Layer Design has become the new trend in wireless communication systems as it seeks to enhance the capacity of wireless networks significantly through the joint optimization of multiple layers in the network.

Cross-layer design emphasizes on the network performance optimization by enabling different layers of the communication stack to share state information or to coordinate their actions in order to jointly optimize network performance. It is a human mentality and psychology that if a new design paradigm is proposed, we compare it with the existing one. Hence the concept of cross-layer design must be compared with the traditional layered architecture so that people can be motivated towards the use of the layered design.

The cross-layer approach can be referred to as a protocol design based on actively utilizing the dependence between protocol layers to enhance the network performance. This differs from the traditional layered approach where the protocols at the different layers are designed independently.

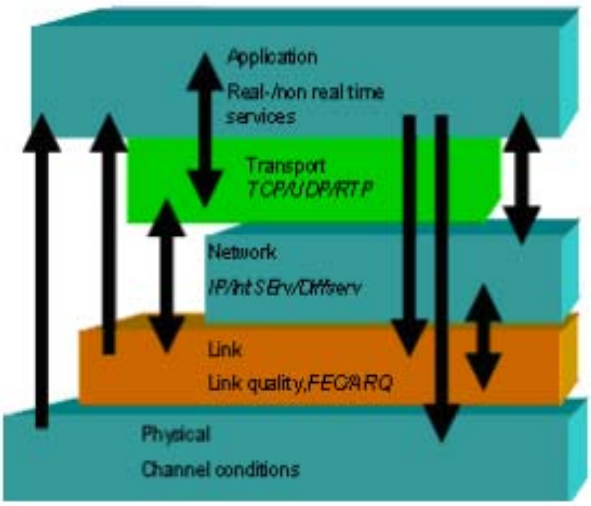

Figure 1.1 Cross Layer for Wireless Protocol Stack [5]

OBJECTIVES

The objective of our work is to utilize MAC Layer information at the routing to improve the global performance of the network. By using cross layer interaction between MAC and routing layer with the help of performance metric like packet delivery ratio, average throughput, average end to end delay, it performs much better than using routing and MAC layer separately.

The goal of implementing a cross layer technique for routing mechanism is to find good path that are reliable and efficient.

II. LITERATURE SURVEY

A literature survey on MANETs found there are three main issues like Mobility, security and QoS. The strict boundary of the five layers in the TCP/IP network model provides the information encapsulation that enables the standardizing of network communications and makes the implementation of networks convenient in terms of abstract layers. . However, the encapsulation results in some side effects, including compromise of QoS, latency, extra overload, etc. Therefore, to mitigate the side effect of the encapsulation between the abstract layers in the TCP/IP model, number of cross layer designs have been proposed. Cross-layer designs allow information sharing among all of the five layers in order to improve the wireless network functionality, including security, QoS, and mobility. In this article, we classify cross-layer designs by two ways. Cross-layer designs allow

information sharing through the layer boundaries to enable the compensation for the network performance and reliability, e.g., increasing throughput, reducing latency, and minimizing bit error rate, by control the input to another layer.

III. PROPOSED SCHEME

Normally shortest route is computed in network layer routing, but it doesn't take into account the interferences in the network nor the differences of link quality between different wireless links, including the local availability of the bandwidth, transmission rate. Problem here is to find out adequate "bandwidth" route required by multimedia traffic instead of finding a shortest route.

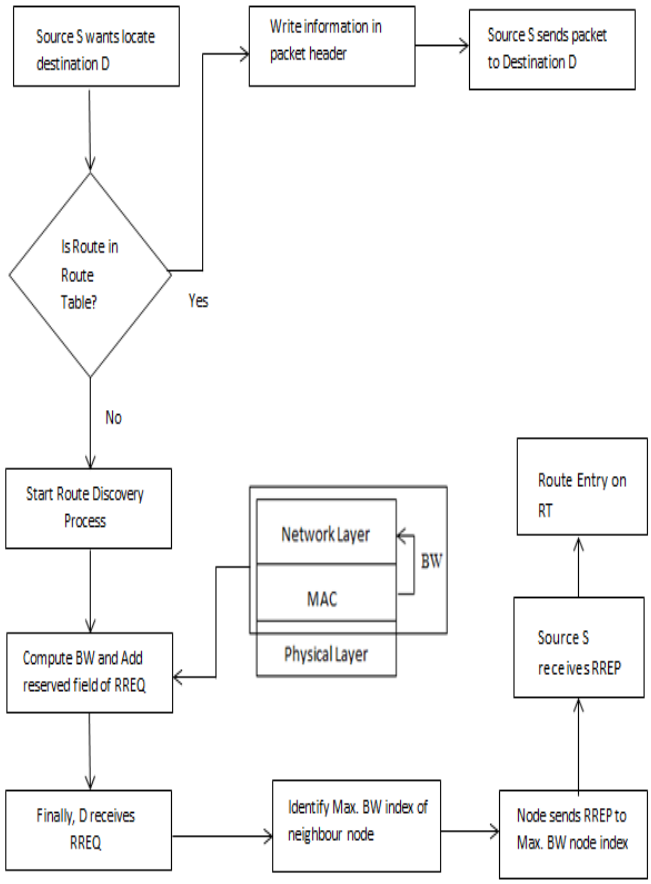

Figure 3.1 Flowchart of Proposed Work

A. Steps for Proposed Mechanism

1. If there is no route Source node send RREQ message its neighbors
2. Node calculates Bandwidth from MAC/Datalink Layer and adds value in reserved field of RREQ.
3. Destination node receives multiple RREQ and identifies Maximum Bandwidth (MAXBW) index of neighbor and node sends RREP only to those node index instead of comparing hop-count value. So only those paths would have been chosen for which bandwidth is sufficient.
4. In order to correcting execute above step, each intermediate node will have to acquire the bandwidth information from MAC/ Datalink Layer. So information from MAC /Datalink layer would be transferred to Network/Routing Layer.
5. Gradually the RREP will reach to Source Node and finally source node start transmission of multimedia data.

IV. RESULTS

NS2 simulator was used to analyze the performance improvement of modified AODV protocol compared to the standard AODV Protocol. The analysis focused on the improvement in Packet Delivery Ratio and Average Throughput.

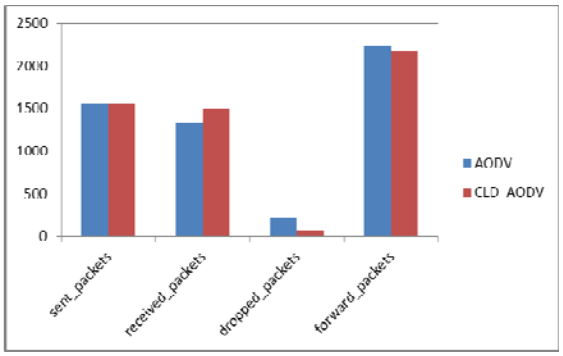

Figure 4.1 Comparison of sent, received, dropped and forwarded Packets

Comparison Graph shows sent packets, received packets, dropped packets and forwarded packets in network of 60 nodes AODV and Cross Layer ADOV.

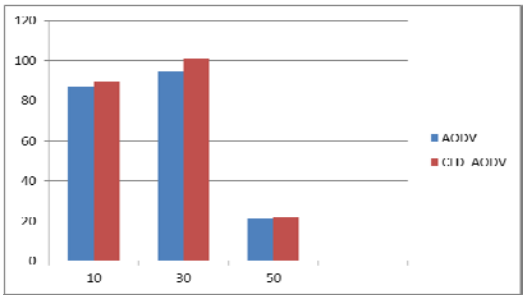

Figure 4.2 Comparison of no. of node vs. Average Throughput

It is defined as the total number of packets delivered over the total simulation time. The Performance graph demonstrate that average throughput of the network is high in proposed algorithm. Comparison shows that the Cross layer AODV has better Average Throughput than AODV.

V. CONCLUSION

The cross-layer design (CLD) approach is an important concept in mobile ad-hoc networks (MANETs) which is adopted to solve several open issues and challenges. It aims to overcome MANET performance problems by allowing protocols belonging to different layers to cooperate and share network status information while still maintaining

separated layers. It can be concluded from the results that, by applying proposed algorithm cross layering between MAC and routing layer performs much better than using MAC and routing layer separately.

In future average end to end delay and normalized routing load will be carried out for varying number of node and pause time.

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