Cross Layer Based MANET Frame work to minimize the energy Consumption and maximize the Network Life Time

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ABSTRACT
The versatile Ad hoc networks provide communication among wireless nodes which occur in the wireless medium. Energy effective routing in MANET is a demanding goal which should be made under consideration. Moreover, energy effective routing is deemed to be the most important design criteria for MANETs because mobile nodes will be powered by batteries with limited capacity. The architecture, of ad hoc network protocol generally based on a conventional layered approach has been found ineffective to deal with energy efficient routing and breakage of links in MANET. This paper proposes a Cross Layer based MANET framework to minimize the energy consumption and maximize the network lifetime.

Keywords
Cross layer, Lifetime, Energy consumption and Mobile ad hoc Network

1. INTRODUCTION
A mobile Ad hoc network (MANET) is a consistent, self-composing, infrastructure less network that is organized from claiming versatile apparatuses that need aid joined without wires. MANET [1] will be the contemporary developing engineering which empowers clients and will impart without any physical framework in any case for their geographic location. Due to this reason it is frequently allowed on concerning an illustration of infrastructure less system. Ad hoc networking permits the devices to deal with associations to maintain network connections and in addition to effectively including and excluding device to and from the network. Because of nodal transportability, the system topology might transform quickly furthermore change unpredictably over time. Therefore the mobile ad hoc network outline will be exceedingly challenging, but this technology need some way or another have figured out how to beat such limits on a percentage degree.

Previously, design offered by ad hoc network protocol has mostly been based on the layered approach. In layered architecture, the designer of the protocol algorithm focuses on a particular layer, without being required to consider the parameters of the rest of the stack. To overcome this, the cross-layer [2] approach has been found to address power consumption and network life time-related issues in wireless ad hoc networks

The cross-layer design [3] deviates from the traditional design approach of network in which each layer of the stack would be made to operate independently. The inter-layer communication metrics and the benefits of information exchange among the lower layers such as network layer and transport layer were also reported. The simulation of Cross Layer based MANET framework to minimize energy consumption [3] and maximize network life time with comparison to Layered based MANET is proposed. A design approach switching from the traditional layered architecture that has been found inefficient to cope with receiving signal strength (RSS)-related and power control problems. This influences the physical layer, the network layer and the transport layer towards enhancing the cross-layer interaction among different layers. Hence evaluated [4] three ad hoc networks routing protocol such as EPAR, DSR and MTPR in different network parameter taking into consideration the power consumption. While achieving QoS metrics like PDR, Throughput, Jitter, end-to-end Delay etc. along with the optimization of energy consumption.

Therefore the surveyed papers show the different approaches of routing protocol that provides the stable path from source to destination will consume less energy and maximize the network life time.

2. PROPOSED CROSS LAYER APPROACH
Energy proficient routing over MANET [1] is a testing objective which has to be made under thought. In particular, power effective routing may be a chance to be the majority vital outline criteria to MANETs since mobile nodes will be powered by the batteries with limited capacity. Power failure of a mobile node not only influence the node itself as well as its ability of transmitting packets and as a result affecting the overall network life time [5].
Institutionalization of layered protocol stacks has enabled quick improvement of interoperable systems, but at the same time long haul restricted the execution of the general architecture, because of the absence of coordination among layers which has failed to provide the efficiency in minimization of overall energy consumption and therefore, maximizing the network lifetime. Cross-layer Framework is an escape from the layered architecture of the OSI communications model with virtually strict boundaries between layers.
The proposed Cross layer removes such strict boundaries which oppose the communication between the layers that is to let one layer to access the data of another layer so that the information exchange and interaction is enabled. This Cross Layer based MANET framework is simulated with the help of Network Simulator (NS2) to minimize the power consumption and maximize the network lifetime .The desired information is passed from the physical layer to the network layer so that it can take optimum decisions required in the routing protocols. A major advantage provided by this approach is to allow access of information between physical layer and top layers such as MAC and network layer. The illustration of the cross-layer interaction among the layers is shown in Fig. 1.

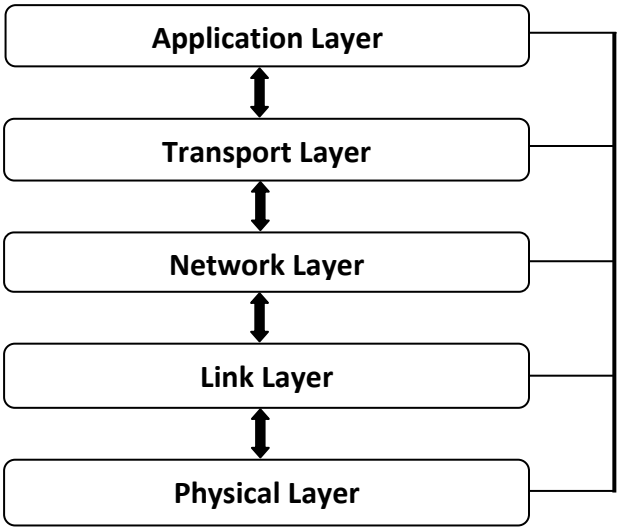

Fig 1: Cross Layer Interactions among the layers.

3. METHODOLOGY

At network initialization (ND, when a node has data of interest), the nodes start to broadcast ND packets to establish their neighbor tables where the neighbor nodes {NR} {N}. Therefore, the energy consumed by the network is the energy consumed by each node after sending and receiving ND packets is given by

$$P_{initialization} = \sum_{i \in N_R} P_{ND}(\Phi i\ (t_s + t_{ND}))$$

ALBA (*Adaptive Load-Balancing Algorithm)* a protocol for converge casting in wsn [10]. ALBA-R comprises the cross-layer feature of geographic routing with contention-based MAC for load balancing (ALBA). ALBA and Rainbow (ALBA-R) together solve the problem of routing around a dead end without overhead-intensive techniques such as graph planarization and face routing. Despite of its lots of advantages, still it lacks in terms of energy utilization scheme. The protocol waste lots of energy unnecessary to perform redundant jobs. The energy comparison is shown in the following graph fig.2.

4. SIMULATION MODEL

The NS2 simulator is used to simulate the proposed system. In this simulation, 50 mobile nodes move in a 500m x 500m square region with 50 seconds reproduction time. Assume each node moves independently with the average speed of 0-35m/sec. All nodes have the same transmission range of 100 meters. Simulated traffic is Constant Bit Rate (CBR). The simulation settings and parameters are summarized as follows;

No. of Nodes	50
Area	500 X 500
MAC	802.11
Traffic Source	CBR
Rate	100Kb
Propagation	Two Ray Ground
Antenna	Omni Antenna
Initial Energy	7.1J
Transmission Power	0.660
Receiving Power	0.395

Table-1: Simulation Settings & Parameters

5. RESULTS AND DISCUSSION

Performance of the simulated cross layer model is evaluated in terms of energy consumed, packet delivery ratio and throughput are defined as follows:

5.1. Energy Consumed

The energy consumption of a node at any time of the simulation can be determined by finding the difference between the current energy value and initial energy value.

Energy Consumed= (Initial Energy value-Current Energy value)/ Number of nodes

The energy consumption (Joules) of the network and the energy consumption per packet (Kb) results are shown in Fig. 2. The results show an improved performance of the network energy consumption. The proposed operational model consumed energy lower than the standard module. The energy consumption per packet was like wise lower for the cross layer model than the standard model. The energy consumed was low per packet , because the packet delivery ratio for the cross-layer model was higher than the standard model and the network energy consumption was lower. Energy consumption by node wise is given by

$$E_{node} = \sum E_{tx} + E_{rx} + E_{idle} + E_{sleep} + E_{trpower}$$

Where Etx represented the transmission energy of the node, Erx the reception energy, Eidle the idle/listening energy, Esleep the nodes' sleep energy and Etrpower represented the state transition power.

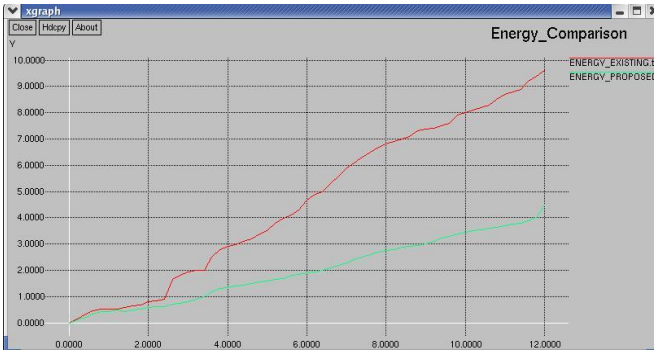

Fig.2 Total Energy consumption (joules)

5.2. Packet delivery ratio (PDR)

The ratio of the number of packets that are successfully received by the destination to the total number of packets sent by the source is defined as the packet delivery ratio. This metric is expressed in percentage. Mathematically it is calculated by the following equation:

PDR= Number of received packets/Number of packets sent

The Figure 3 shows variation of packet delivery ratio with respect to the increasing velocity of nodes in the network. We observe the impact of node mobility (i.e. node velocity) and offered network load on packet delivery ratio (PDR). In general, it is noticed that the PDR decreases as the node speed increases. PDR is 5% to 15% better. This shows little

variation when compared to proposed Cross layer model. This is due to the network topography does not change significantly when the nodes are less mobile.

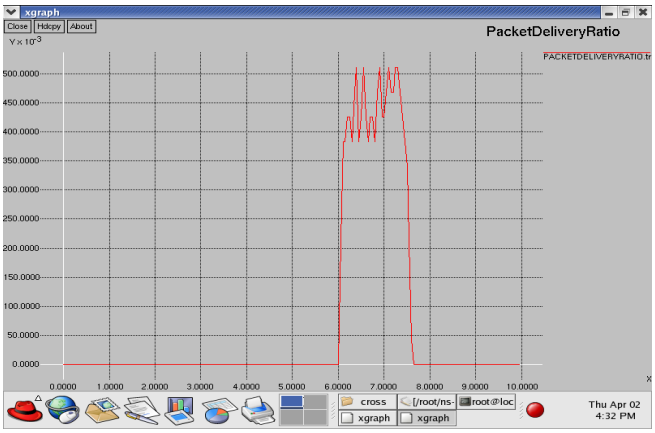

Fig.3 Packet delivery Ratio

5.3.Throughput

It is the number of packets transferred from one node to another in a specified amount of time. Data transfer rates are measured in terms of throughput. Typically, throughput is measured in bits per second.

The fig.4 shows that the throughput comparison, using cross layer model concept. The throughput is to increase to 25%. Cross layer enhancement expels strict limits to permit correspondence between layers by allowing one layer to get to the information of another layer to trade data and empower association.

5.4. Energy Efficiency

It diminishes because of more power utilization in retransmission of data if there should be an occurrence of connection breakage regarding portability of node hubs. It can be enhanced by the determination of the correct cross-layer conventions can identify the portability and set up new multihop connection before past connection debasement

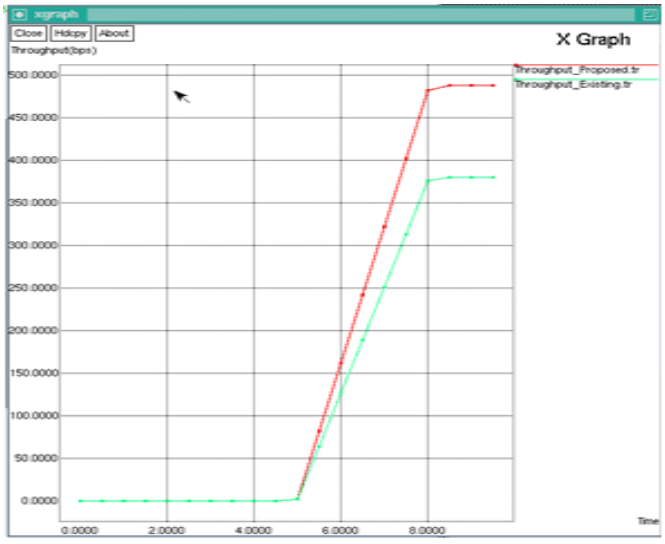

Fig.4 Throughput Comparison Graph

6. CONCLUSION

Simulated results show a cross layer based MANET framework minimizes the power consumption and maximizes network lifetime with comparison to conventional layered MANET. The performance of the proposed model better than the standard model in terms of packet delivery ratio, throughput and energy consumption. In future for better improvement of the network lifetime can be kept in a challenge for designing an optimized cross layer routing protocol.

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