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A Simulation Study for Performance comparison of MAC Layer in flat and hierarchical network in MANET

Anzar Ahmad*, Prof. SC Gupta**
*(Department of Electronics &Communication, Graphic University, Dehradun)
** (Department of Computer science , IIT Roorkee University, India)

ABSTRACT

Out of several issues of MANET such as routing, mobility management, power management, security, and quality of service (QoS) issues, medium (or channel) access is also one of main issues . Many protocols are defined to establish and maintain routing paths in Ad hoc mobile networks. Some of the MAC protocols defined are Carrier Sense Multiple Access (CSMA), Multiple Access with Collision Avoidance (MACA),Floor Acquisition Multiple Access (FAMA), and IEEE 802.11 MAC protocol which specifies a Distributed Coordination Function (DCF) . In this paper by using Exata Cyber Simulation tool we compare and analyzed MAC layer performance for flat and hierarchical network . We analyzed the reduction of number of packets dropped at MAC layer in flat and hierarchical network .

Keywords - **Cluster ,CH , MAC, Overheads**,

I. INTRODUCTION

Future information technology will be mainly based on wireless technology. Infrastructure based cellular and mobile networks are still limited by the need of infrastructure such like base station, allocation of frequencies .To fulfill the demand of users various approaches are given such as frequency reuse concepts, clustering technique, sectoring technique, and assignment of conflict free channels.

This infrastructure based communication fulfills the desire of users, but we are still lag behind to use the full advantage of wireless communication, where there is no infrastructure such as mobile ad hoc network. Adhoc networks are key to the evolution of wireless networks [6]. A mobile Ad hoc network (MANET) is an autonomous system of mobile routers (and associated hosts) connected by wireless links. The routers are free to move randomly and organize themselves arbitrarily; thus, the network's wireless topology may change rapidly and unpredictably. Such a network may operate in a stand-alone fashion, or may be connected to the larger Internet. In general, Ad hoc wireless networks are self-creating, self-organizing, and self-administrating networks. Hence, they offer unique benefits and flexibility for a variety of situations and applications. Because of these features, the Ad hoc networks are used where wired network and mobile access is either unproductive or not feasible.. The principal use of MAC is to manage the channel access among multiple nodes to achieve high channel utilization. In other words, the coordination of channel access should minimize or eliminate the incidence of collisions and maximize spatial reuse at the same time .The scalability issue of MANET is addressed through a hierarchical approach that divide the network into clusters. In this way the network becomes more manageable. The implementation of clustering schemes allow a better performance of the protocols for the Medium Access Control (MAC) layer by improving the spatial reuse, throughput, scalability and power consumption.

II. RELATED WORK

Cluster based routing [8] is a convenient way for routing in MANET . In MANET nodes are very close to each other normally one hop or two hop distance, each cluster has one or more gateway node to connect to other cluster in the network. Back bone base routing [9] and spine based routing [10] uses a similar approach. In most clustering techniques nodes are selected to play different roles according to a certain criteria. In general, three types of nodes are defined: Ordinary nodes are simply members of a cluster ,other node is are called gateways node because they are able to listen to transmissions from another node which is in a different cluster[1] [22]. In most clustering techniques nodes are selected to play different roles according to a certain criteria. In general, three types of nodes are defined [23].Ordinary nodes are members of a cluster which do not have neighbors belonging to a different cluster [1].Gateway nodes are nodes in a non-cluster head state located at the periphery of a cluster. These types of nodes are called gateways because they are able to listen to

transmissions from .Most clustering approaches for mobile ad hoc networks select a subset of nodes in order to form a network backbone that supports control functions. A set of the selected nodes are called cluster head (CH) and each node in the network is associated with one. Cluster heads are connected with one.

III. PROBLEM FORMULATION

In our problem, we have taken two scenario one for flat architecture of 30 nodes without any head and gateway and other we have partitioned this flat architecture into two hierarchical network having cluster head(CH) and gateway both scenario shown in the figure1 and figure2 respectively.

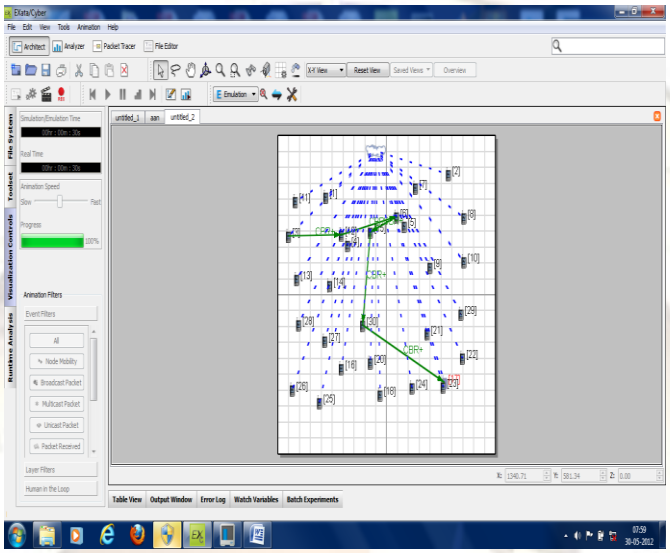

Fig1: Flat architecture without any head and gateway

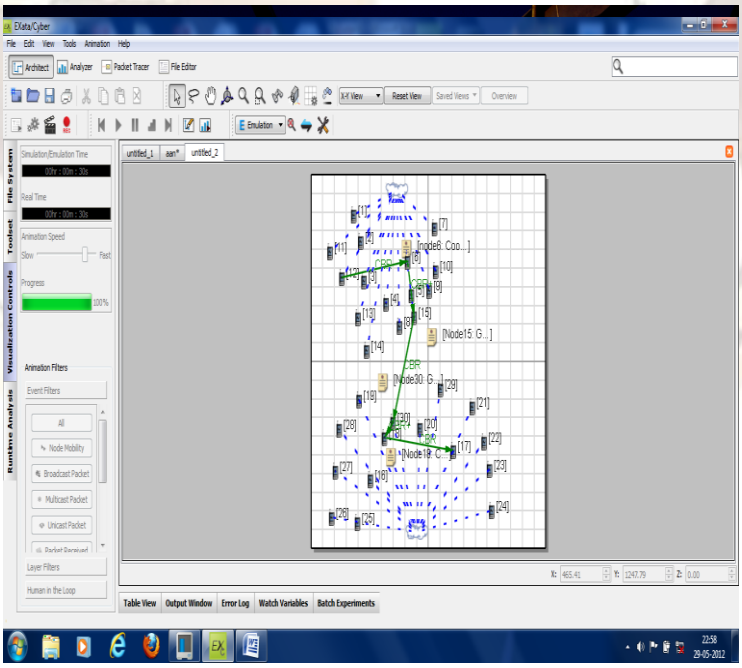

Fig 2: Hierarchical architecture with cluster head and gateway

IV. SIMULATION ENVIRONMENT

We used Exata Cyber 2.0 simulator to simulate and compared MAC layer performance in flat and hierarchical network EXata is a comprehensive suite of tools for emulating large wired and wireless networks. It uses simulation and emulation to predict the behavior and performance of networks to improve their design, operation, and management. It creates a digital network replica that interfaces with real networks and applications.

1.1**Problem Definition**

We have taken 30 mobile nodes with AODV enabled, and all nodes are randomly distributed with the mobility of 0- 10 me / sec. Node 12 is source node and node17 is destination node sending CBR file. Environment size for simulation is 1500x1500 mtrs .

2.1**Simulation Setup:**

In Exata first we have to configure the profile for MANET, and there were three important configurations for standard application.

2.3Mobility Configuration

Mobility configuration, related to description about the mobility of mobile nodes, and for this we set the three important parameters

TABLE 1

S. No	Parameter	Value
1	Speed	10 Meter / Sec
2	Pause Time	0 Sec
3	Start Time	10 Sec.

Mobility Configuration

V. VALIDATION

Analysis for Wireless LAN Throughput (Server)

In the result analysis for the throughput of both flat and hierarchical network, we concluded that throughput of both case is same as shown in the fig 3 and fig 4.

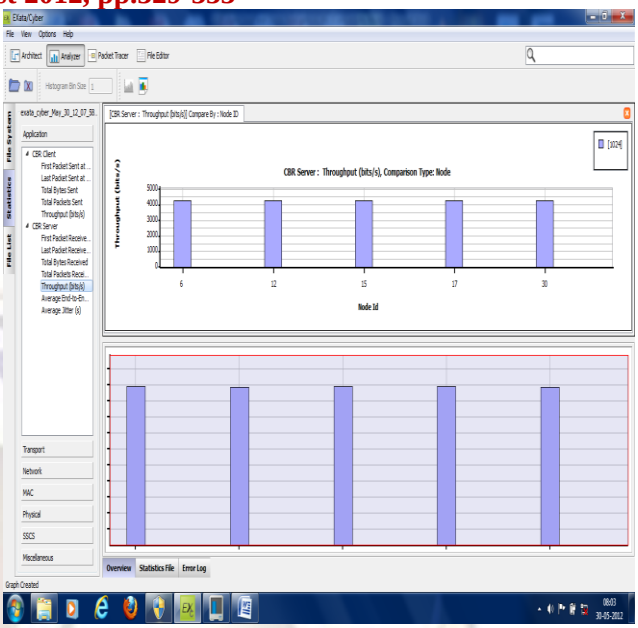

Fig3: CBR Server throughput of flat architecture

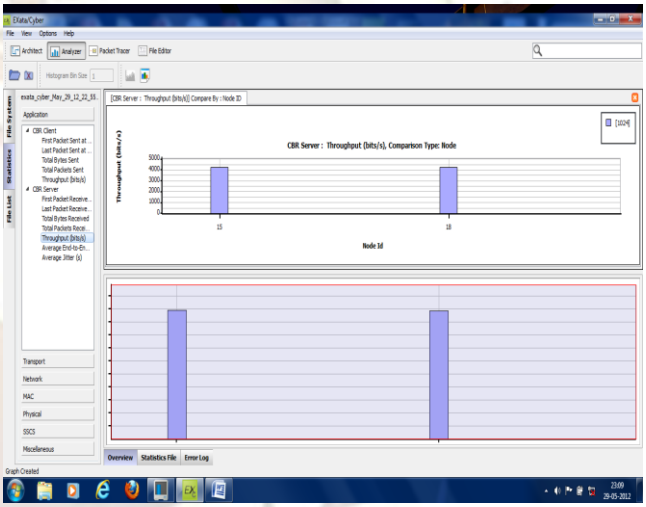

Fig4: CBR Server throughput of hierarchical architecture

Analysis for Wireless LAN number of dropped packets at MAC layer

In the result analysis for number of dropped packets at MAC layer 802.11.4 we concluded that for the hierarchical network number of packets dropped are only at three nodes while in flat network number of packets dropped are at fourteen nodes as shown in the fig 5 and fig 6.Hence over performance of hierarchical network is better.

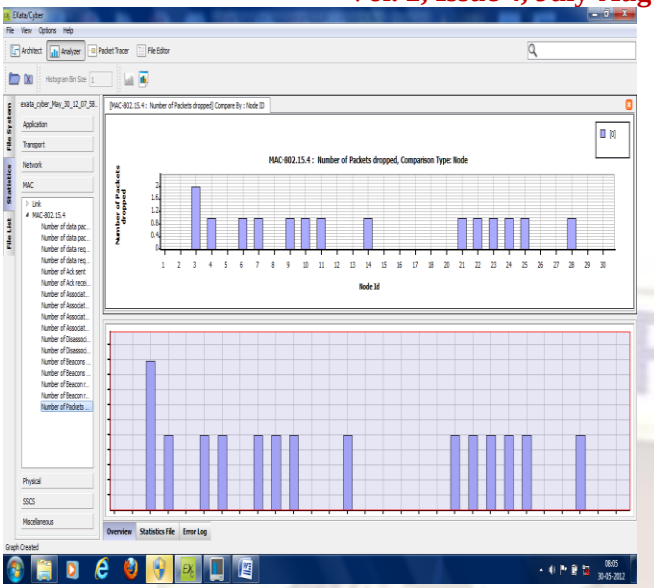

Fig5: No of packets dropped in flat architecture

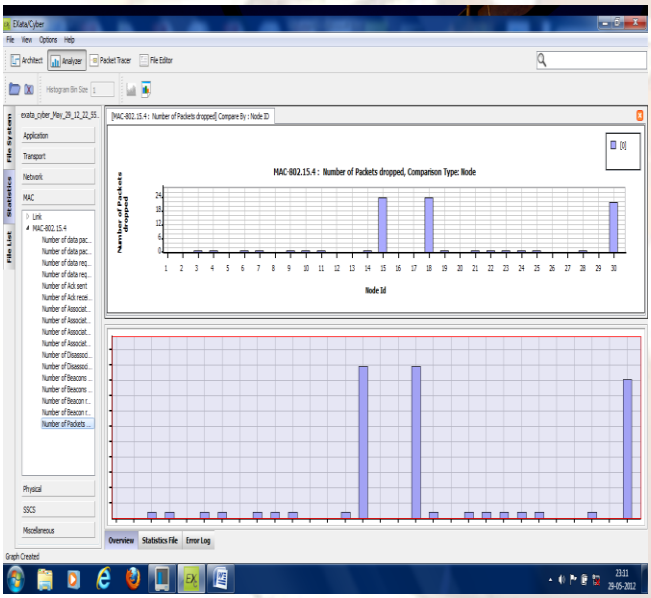

Fig6: No of packets dropped in hierarchical architecture

IV.CONCLUSION

In the given approach by partitioning the large MANET network into small clusters ,we have simulated and compared the MAC Layer performance of flat and hierarchical network and concluded that in hierarchical network MAC layer performance is good because of less overheads .

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