International Journal of Innovative Research in Science and Engineering
Vol. No.3, Issue 02, February 2017
www.ijirse.com
ISSN (O) 2454-9665
ISSN (P) 2454-0663

A CROSS LAYER SUPPORTED NON-RESERVATION BASED APPROACH FOR QOS PROVISIONING IN MOBILE AD HOC NETWORKS

S.Venkatasubramanian [1], A.T.Barani Vijayakumar [2], P.B.Arun Prasad [3]

[1]*Associate Professor, Saranathan college of Engineering, (India)*

[2,3] *Assistant Professor, Saranathan college of Engineering, (India)*

ABSTRACT

Mobile ad hoc networks (MANET) which was more popularly used for military application has become more popular for common use. Where ever the network can be deployed, the MANET can play a crucial role in forming a network on demand. Use of MANETs for real time application give rise to the requirement of providing quality of service(QOS). Since the topology is not fixed in MANETs, provisioning of QOS by link bandwidth reservation is difficult to achieve. In this paper, a methodology of preventing the congestion in MANET is suggested. The parameters such as link quality at the physical layer, queue length at the transport layer and detection of node which creates congestion by the Data link and transport layers and routing of data based on the above parameters at the network layer. Since this procedure do not use any hard reservations of bandwidth, it is named as lightweight QOS(LWQOS) approach. The simulation experiments have shown the approach improves the packet delivery ratio.

Keywords : Cross-Layer Design, Denial-Of-Service(DoS),Mobile Ad Hoc Networks (MANETs), Quality-Of-Service(QOS), LWQOS QoS)

I. INTRODUCTION

The Mobile Ad Hoc Networks (MANETs) are highly dynamic in nature and infrastructure free. It is consisted of a group of mobile nodes which are not surrounded by any infrastructure. Because of non-restricted mobility these nodes are liberated to move autonomously in any direction and the straightforward deployment's uniqueness of MANETs make them incredibly popular and highly appropriate for applications like emergencies, natural disasters and military operations.A mobile ad hoc network includes a group ofwireless nodes which develops a networkwithout the deployment of existing networkinfrastructure. A node an communicate withthe other nodes by multi-hop, when the nodescooperate to forward packets with each other.In MANETs, the design of a quality ofService (QoS) routing protocol is moredifficult than the conventional networksbecause the host mobility can causefrequently unpredictable topology changes[1].

Due to high raterequirements and severe delay constraints,maintaining real-time media traffics such asaudio and video in presence of dynamicnetwork topology is difficult [2]. Recently,several QoS signaling protocols for

ISSN (O) 2454-9665
ISSN (P) 2454-0663

MANETshave been proposed in the research literature[1], [2]. However, these schemes were notdesigned with security in mind and are highlyvulnerable to attacks, in particular, denial-of-service(DoS) attacks.

The two solutions for QoS provisioning on the Internet such as [3]:Integrated Services (IntServ) Differentiated Services (DiffServ) can't be applied directly on the MANET as the topology and node stability are not constant. Generally, the existing solutions for QoS provisioning inMANETs can be classified into two categories [3]:

- **Stateful Approach:** These approaches are based on resource reservation. Eg: INSIGNIA [4].
- **Stateless Approach:** These approaches do not rely on resource reservation, and try to provide a certain degree of service differentiation. Eg: SWAN [5].

1.1 CHALLENGES OF QOS PROVISIONING IN MANET

The following are the some the important problems in providing QOS in Manet.

- Estimation of the available link bandwidth which is difficult in changing environment.
- Bandwidth reservations from source to the destination can be made through the intermediate nodes. Since the intermediate node keeps moving the reserved bandwidth may not be available throughout the session of data flow.
- there is no clear definition of what is core, ingress or egress router. Since all the nodes in the network cooperate to provide services, there is no clear definition of a Service Level Agreement (SLA).
- The wireless medium is more affected by noise; bandwidth and capacity are most affected.

II RELATED WORK

R. Gunasekaran et al [7] have proposed a model called High-Privileged and Low-Privileged Architecture (HPLP) for theforthcoming Ad Hoc networks where the differentiatedservices can be achieved for different classes of users. Theyhave considered only the bandwidth reservation among thevarious factors influencing the differentiated services andidentified the different factors that can influence the efficiencyof the bandwidth reservation. Claude Chaudet et al, [8] haveproposed a distributed algorithm to allocate bandwidth to eachmobile according to the topology of the network and theavailable bandwidth on each mobile for stable ad hocnetworks. Their algorithm guarantees a non null minimumbandwidth to each mobile. With their algorithm, each mobilecomputes its bandwidth usage in order to avoid saturating itscapacity or its neighbors and congestion is less likely toappear in the network.

M. Mirhakkak et al [9] have developed a prototypeimplementation of resource reservation, running as anextension to the Reservation Setup Protocol (RSVP) protocol.Their approach is to expand the semantics of the reservation,so that, instead of being a single value indicating the level ofservice needed by an application, it becomes a range ofservice levels in which the application can operate, togetherwith the current reserved value within that range.

KumarManoj et al [10] have proposed a bandwidth controlmanagement (BWCM) model to improve the QoSperformance by minimized end-to-end delay. In addition toend-to-end delay, they have proposed an algorithm for end-toendbandwidth calculation and allocation. They haveconsidered different QoS traffic flows in the network toevaluate the performance of their proposed algorithm ofBWCM model. Their algorithm includes a set of mechanisms:control management, co-ordination temporary resourcereservation process.

Xue Yang and Nitin H.Vaidya [6] have proposed the scheme for priority based scheduling in Manets. The paper dealt with the handling of real and non-real time data packets.

III PROPOSED NON-REASERVATION BASED QOS ARCHITECTURE

In this paper, A scheme to provide QoS called Light weight QOS (LWQOS) has the following components:

- ✓ Link quality assessment
- ✓ Measuring Queue size at each node
- ✓ Detection of and prevention of congetion
- ✓ Routing of data

3.1 Link Quality Assessment And Queue Size Exchange

Each node first measures the number of packets in their queue(queue length) and sends “Hello” packet to the neighboring nodes. The neighboring nodes responds with the acknowledgement piggybacked with the queue length. During this exchange of queue size, each node also calculates the response time with the help of a timer which starts during Hello packet transmission and stops at the response from the nodes. Each node constructs a table called neighbor queue table (NQT). The NQT structure looks like the following:

Neighbor node ID	Response latency(ms)	Queue size	Time stamp

The response latency indicates the difference of sending of hello packet and receiving response from neighboring nodes. Time stamp indicates the age of the data as old data will be purged frequently by the node. The node selects the first few neighbors with the least value of latency and queue size.

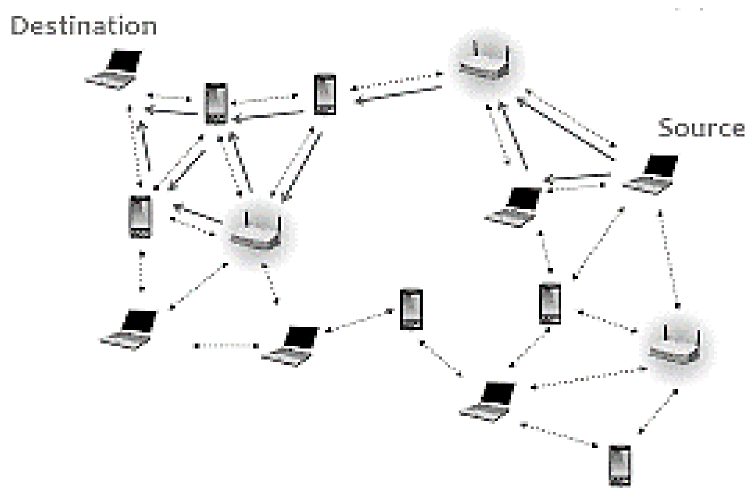
3.2 Detection of Congestion

A node can flood the network with Request-to-Send (RTS) frame. This can affect the performance of the network. This is a type of congestion creation and it freezes the network to transmit the legitimate packets. In our scheme of congestion detection and reduction, each node will retry with RTS frame when the previous one fails. The node will maintain a counter which is incremented each time RTS fame is sent and reset when CTS frame is received. The threshold value of the counter is fixed (in our case it is 3) and when the retry attains the threshold value, the node will wait for a random time before next try and the counter in this case also get reset.

International Journal of Innovative Research in Science and Engineering
Vol. No.3, Issue 02, February 2017
www.ijirse.com
ISSN (O) 2454-9665
ISSN (P) 2454-0663

3.3 Routing of data

While the node selects the route to destination, it routes the packet through one of the least cost(latency and queue size) node. If the link breaks because of the node moves away, the source node selects the next least cost node to forward the packet. Thus, a multipath is used by the node and thus avoid the overhead of finding a new route on link failure.



(Fig.1 A multipath routing)

IV SIMULATION RESULTS

The network performance has been calculated for various scenario and traffic patterns.Mobility models are created for the simulations for various number of nodes, with pause time of 0 seconds, maximum speed of 10m/s, topology boundary of 500x500 and simulation time of 100 milli seconds.

Table I Simulation Parameters

No. of Nodes	25,50,75 and 100
Area Size	1000 X 1000
Mac	802.11
RadioRange	250m
Simulation Time	100 sec
Traffic Source	CBR

International Journal of Innovative Research in Science and Engineering
Vol. No.3, Issue 02, February 2017
www.ijirse.com
ISSN (O) 2454-9665
ISSN (P) 2454-0663

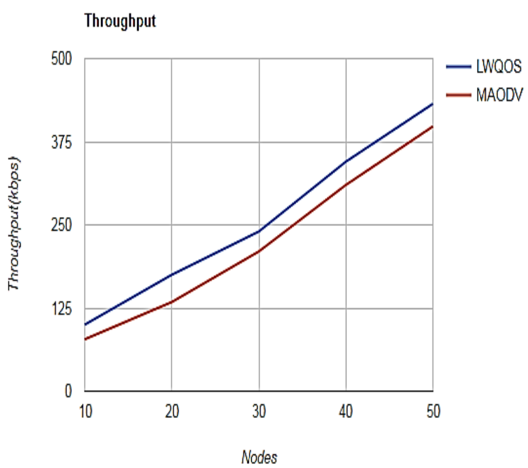
Packet Size	512
Mobility Model	Random Way Point
Speed	5m/s to 20m/s
Pause time	5 s

Traffic models were generated for various number of nodes with CBR traffic [7] sources, with maximum connections of 10 at a rate of 8kbps. (-rate 2.0: in one second, 2 packets are generated. The packet size is 512 byte. Therefore the rate is 2*512*8=8kbps). The simulation results are compared with that of Multipath Ad-hoc On-demand Multipath Distance Vector Routing (MAODV) on the same parameters.

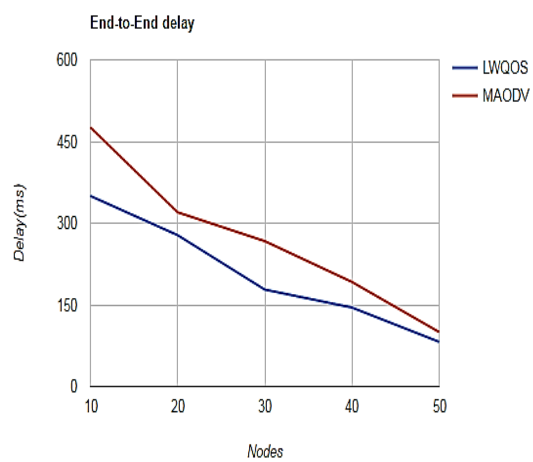
4.1. RESULT ANALYSIS

From the fig.2 it is evident that out LWQOS provides better throughput compared to the MAODV protocol. This is because the data packets are routed only though the nodes which are having less queue size which can process the packet faster.

From the fig. 3, our LWQOS gives less latency as the packets are routed through responsive nodes and the congestion is controlled.



(fig 2. Throughput vs nodes)



(fig 3. End-to-end delay)

V CONCLUSION

Thus theLight weight QOS(LWQOS) has the better performance than the existing MAODV routing protocol by an average of 15 % in their network performance.

REFERENCES

[1]. Yuh-Shyan Chen, Shin-Jr Jan and Ming-Chin Chuang, "A Shoelace-Based QoS Routing Protocol for Mobile Ad Hoc Networks Using Directional Antenna", Wireless Personal Communications, SpringerLink, 2009.

[2]. A.N. Al-Khwildi, S. Khan, K.K. Loo and H.S. Al-Raweshidy, "Adaptive Link-Weight Routing Protocol using Cross-Layer Communication for MANET", WSEAS Transactions on Communications, 2007.

[3] . Bosheng Zhou, Alan Marshall and Tsung-Han Lee, "A Cross- Layer Architecture for DiffServ in Mobile Ad-hoc Networks",

International Conference on Wireless Networks, Communications and Mobile Computing, WIRELESSCOM 2005

[4]. Seoung-Bum Lee, Gahng-Seop Ahn, Xiaowei Zhang, andAndrew T. Campbell, "INSIGNIA: An IP-Based Quality ofService Framework for Mobile ad Hoc Networks", Journal ofParallel and Distributed Computing, 2000.

[5]. Gahng-Seop Ahn, Andrew T. Campbell, Andras Veres and Li-Hsiang Sun, "SWAN: Service Differentiation in StatelessWireless Ad Hoc Networks", In the Proceedings of the 21stAnnual Joint Conference of the IEEE Computer andCommunications Societies, INFOCOM 2002.

[6]. Xue Yang and Nitin H.Vaidya, "Priority Scheduling in WirelessAd Hoc Networks", Proceedings of the 3rd ACM internationalsymposium on Mobile ad hoc networking & computing, 2002.

[7]. R. Gunasekaran and V. Rhymend Uthariaraj, "DifferentiatedBandwidth Allocation in Mobile Ad Hoc Networks (MANET) – AProfile Based Approach", Asian Journal of InformationTechnology, 2007.

[8]. Claude Chaudet —Isabelle Guerin Lassous and Janez Zerovnik,"A Distributed Algorithm for Bandwidth Allocation in Stable AdHoc Networks", International Conference on Wireless On-DemandNetwork Systems, WONS 2004.

[9]. M. Mirhakkak, N. Schult and D. Thomson, "A New Approach forProviding Quality-Of-Service In A Dynamic NetworkEnvironment", In the IEEE Proceedings of 21st Century MilitaryCommunications Conference, MILCOM 2000.

[10]. Kumar Manoj, S. C. Sharma and S.P. Singh, "Dynamic Behaviorof Bandwidth Control Management in Mobile Ad-Hoc Network",Proceedings of the World Congress on Engineering andComputer Science 2009.

[11]. K. Srinivas and A. A. Chari, "A Random Congestion Routing Protocol Based on Queue Latency and Link Reliability Estimation in MANETs", Indian Journal of Science and Technology, Vol 9(33), pp1-7, September 2016,