Comparison between Old and New Scheme of Buffer Management in Packet Queuing for Controlling Congestion in MANET

Prachi Jain[1] Vijay Prakash[2]
[1]SVITS [2]Indore

Abstract— Mobile Ad hoc Network (MANET) is a network with dynamic topology and mobile nodes. Due to the dynamic nature of network, there is no central control. Hence, nodes communicate with other nodes through intermediate nodes. The intermediate nodes are normal nodes in the same network and assume the responsibility of forwarding packets on the route from source to destination. Congestion control and securities are major tasks in MANET. Congestion control works very well in TCP over internet. But due to dynamic topology congestion control is a challenging task in mobile ad hoc network. Many approaches have been planned for congestion control in MANET. Congestion control technique is the procedure by which the network bandwidth is dispersed across multiple end to end connections. In this paper we are have done a comparison between "A Buffer Management Scheme in Packet Queue Management" and "A Advanced Buffer Management Scheme in Packet Queue Management" in MANET.

Key words: Mobile Ad Hoc Network (MANET), Congestion Control, Buffer Management Scheme, Packet Drop

I. INTRODUCTION

Mobile Ad hoc Network (MANET) is a network with dynamic topology and mobile nodes. Due to the dynamic nature of network, there is no central control. Hence, nodes communicate with other nodes through intermediate nodes. The intermediate nodes are usual nodes in the same network and assume the responsibility of forwarding packets on the route from source to destination. A Mobile Ad hoc Network (MANET) is a category of ad hoc network. Ad hoc means arranged or happening whenever necessary and not planned in advance. Ad hoc is a Local Area Network which permits new network devices to be added speedily. Mobile ad hoc network is a group of independent nodes which forms impermanent network without any immobile substructure or central manager. For establishing network wireless connections (wi-fi) are used or any additional intermediate such as satellite or cellular transmission. Each and every device in a MANET is permitted to move autonomously in any path. The movement of nodes is casual in MANET. So MANETs have a dynamic topology.

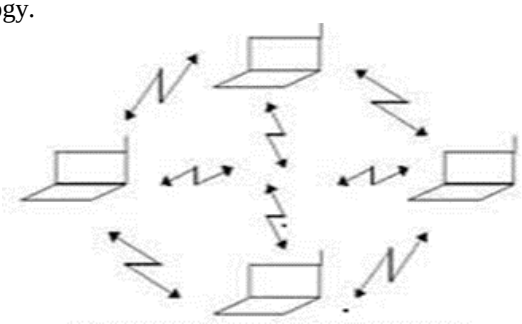

Fig. 1: Mobile Adhoc Network

MANET is a communication medium in regular human life and applications zones of MANET are growing rapidly Congestion control and securities are major tasks in MANET. Congestion control works very well in TCP over internet. But due to dynamic topology congestion control is a stimulating task in mobile ad hoc network. Many approaches have been planned for congestion control in MANET. Congestion control method is the procedure by which the network bandwidth is discrete across multiple end to end connections.

II. RELATED WORK

Kulkarni et al. [4] proposed and tested a queue management scheme called PAQMAN against old RED algorithm in IP networks. Their proposed scheme works on predictive measurement of queue size on the basis of traffic differences. The average queue length is predicted for next specified interval using recursive least square technique and it regulates the packet drop probability in that interval. Their simulation study in NS-2 shows that the proposed scheme provides better QoS evaluations as compared to RED. The same scheme is tested by

Kulkarni et al. [5] on MANET environment and simulation study is performed in NS-2 for packet loss and retransmission efficiencies to check if the proposed system can work in an energy-efficient manner. The simulation results show that PAQMAN coupled with ECN can decrease packet loss ratio and increase transmission efficiency while introducing negligible overhead.

Friderikos and Aghvami [6] planned "hop based queuing" which is an active queue management scheme for ad hoc networks. In this method, the packet drop probability is proportional to number of hops a packet traverses. They show its advantages as reduction in mean excess delay on MANET and protection of buffer space from overflow due to such TCP flows which travel through many wireless hops and become unstable, i.e., the possibility of connection timeout increases.

Lutz et al. [7] motivated on the assignment of transmission frames with same number of transmission slots per frame to a wireless node on a network shared with other nodes. They proposed a variation in such a way that number of transmission slots ("weights") can be different in different transmission frames. In this way, throughput may be increased without compromising "fairness" and packet losses due to collision may also be mitigated.

Chen and Bensaou [8] offered a study for high speed networks about their survivability in terms of fairness and packet loss problems with Drop Tail queue management system. The authors mentioned when TCP flows come across multiple congested links in high speed networks working on Drop Tail system, they face packet drop probability unfairness and round trip time unfairness. On the other hand, AQM schemes lessen the severity of above Muhammad Aamir et al.: A Buffer Management Scheme for Packet Queues in MANET 545 stated unfairness.

Abbasov and Korukoglu [9] improved the existing RED algorithm on networks and the progress is called Effective RED (ERED). It has a few variations as compared to

RED in the packet drop function which produce improved throughput and less packet loss rate as compared to RED and some other well-known AQM systems. It is presented by authors through simulation study in NS-2.

Dimitriou and Tsaoussidis [10] proposed an active queue management system called Size-oriented Queue Management (SQM) in which the criterion is packet size. Hence, it distinguishes time-sensitive traffic flow and applies different strategies of scheduling and packet drop on separate flows to raise the level of application fulfillment. Our literature review identifies that considerable work has been completed on the matter of packet queue management in both wired and wireless forms of networks. Some good efforts have also been made in this way for MANET environments. However, a highly responsive solution is required that can report the packet drop problem of queue management in buffers of MANET nodes.

III. Comparison between Old and Advanced Buffer Management Schmene in Packet Queue Management

A. Algorithm Used:

In both the schemes of buffer management, Ad hoc On-demand Distance Vector (AODV) routing protocol is used. It is a reactive protocol in which sources get routes to destinations when they demand for the same.

In old scheme of buffer management, an active queue management approach is applied to notify a neighboring sender when its assigned limit is about to reach in the buffer of QMN.

In new scheme of buffer management, an advanced active queue management approach is applied to notify nodes that the buffer is going to be full so that nodes can increase their size by some amount of percentage.

B. Number of Nodes:

In old scheme of buffer management, number of nodes taken are 5. They assume that they have a fixed node "QMN" surrounded by four neighbors "Node 1" to "Node 4". There is another node, "Node 5" which is not treated as a neighbor of QMN at initial stage. The node QMN is analyzed in there model as a queue management node.

In new scheme of buffer management, there is no fixed number of nodes. Nodes are formed according to data size. In new scheme they assume that there is a main buffer between sender and receiver and around that main buffer there are several nodes.

C. Buffer Size:

In old scheme of buffer management, each of the four neighboring nodes gets the buffer space of 25 packets in QMN. However, it is necessary to consider if a neighboring node reaches its maximum allocation in QMN but the space is left in the total buffer due to the reason that one or more other neighbors are not communicating or sending packets to QMN.
In new scheme of buffer management, there is no fixed size of buffer. Size of buffer is divided according to data size. And if needed then size of nodes is increased by some amount of percentage.

IV. Conclusion

In this paper we compare two schemes of buffer management which uses different algorithm to manage buffer so that congestion can be controlled. In old scheme of buffer management, they used active queue management scheme by which packet drop ratio has become less but still packets were dropping. To overcome this limitation, a new scheme of buffer management is introduced in which advanced active queue management scheme is introduced by which packet loss ratio has become zero.

The second limitation of old scheme of buffer management was time. The time taken by packet to travel from sender to receiver was not in seconds. It was in minutes. But in new scheme of buffer management, the time taken by a packet to travel from sender to receiver was in seconds.

By these so many factors it is concluded that new scheme of buffer management is much better than old scheme of buffer management.

References

[1] M. Aamir, M. Zaidi, and H. Mansoor, Performance analysis of Diffserv based quality of service in a multimedia wired network and VPN effect using OPNET, International Journal of Computer Science Issues, vol. 9, no. 3, pp. 368-376, 2012.
[2] L. Chrost and A. Chydzinski, On the evaluation of the active queue management mechanisms, in Proc. 1st Int. Conf. On Evolving Internet (INTERNET), 2009, pp. 113-118.
[3] K. R. S. Floyd and D. Black, The addition of explicit congestion notification (ECN) to IP, RFC 3168, Sep. 2001.
[4] P. G. Kulkarni, S. I. McClean, G. P. Parr, and M. M. Black, Proactive predictive queue management for improved QoS in IP networks, in Proc. IEEE ICN/ICONS/MCL 2006, 2006.
[5] S.T. Hasson, E. Fadil, Queuing approach to model the MANETs performance. Br. J. Sci. 6, 18–24 (2012)
[6] Y.-F. Guo, G.-S. Kuo, A packet scheduling framework for multipath routing in mobile ad hoc networks, in Vehicular Technology Conference (IEEE, 2007), pp. 233–237
[7] R. Patil, A. Damodaram, R. Das, Cross layer fair scheduling for MANET with 802.11 CDMA channels, in First Asian Himalayas International Conference, IEEE (Kathmandu, 2009), pp. 1–5
[8] T. Salonidis, L. Tassiulas, Distributed on-line schedule adaptation for balanced slot allocation in wireless ad hoc networks, in Quality of Service, Twelfth IEEE International Workshop (IEEE, 2004), pp. 20–29
[9] Y. He, R. Yuan, J. Sun, W. Gong, Semi-random backoff: towards resource reservation for channel access in wireless LANs, in 17th IEEE International Conference on Network Protocols (IEEE, Princeton, 2009), pp. 21–30
[10] H. Xiao, W.K.G. Seah, A. Lo, K.C. Chua, A flexible quality of service model for mobile ad-hoc networks, in IEEE Vehicular Technology Conference (Tokyo, 2000), pp. 445–449
[11] C. Perkins, E. Belding-Royer, and S. Das, Ad hoc ondemand distance vector (AODV) routing, RFC 3561, July2003.

