



Congestion Control in MANET Using Various Approaches: A Review

¹Gurmeen Kaur, ²Kamaljeet Kaint, ³Rakesh Kumar

¹ Research Scholar, ^{2,3} Asst. Professor

^{1,2,3} Computer Science and Engineering, Sachdeva Engineering College for Girls, Gharuan, Punjab, India

Abstract-Mobile ad-hoc network is branch of networking that deals with communication between nodes without interference of any external device. In MANET various issues have been encountered that degrades the performance of the network. problem of congestion occurs in the network for peer to peer communication. Some time a single node received large amount data than that a node can transmit further to destination. This issue get extend to data loss due to congestion occurred on a node. In MANET various algorithm had been purposed for congestion avoidance but these algorithm are too complex that consumes too much time and increase network overload.

Keywords: MANET, routing protocols, security, Congestion, Congestion, RED, IRED.

I. INTRODUCTION

1.1 MANET

A Mobile Ad-hoc Network (MANET) is the network which has moving nodes in it and in the wireless network. Nodes in the network communicate with each other on the basis of the movement and having the central point that is base station. Then there is the transmission of the information between the moving nodes in the network. Wireless ad hoc network is the faster spreading innovation from the last twenty years. The main feature of this network is that the network arrangement is simple and element nature. MANET made another set of requests to be found and it has better end to end communication. The Dynamic Source Routing (DSR) Protocol is the base routed on the important routing protocol. A node keeps the system reserves containing the source system that it is used for the information transmission. In its packet head, every given routing parcel has a complete and requested node list which is the packet will pass surely.

1.2 ISSUES IN MANET'S

The main issue in the MANET is analysis of the routing protocols and the design of the routing protocols. The main objectives of the MANET routing protocol is to have a well arranged path between the two nodes for transmitting data in the right way. Dynamic Source Routing (DSR) Protocol is shown in the MANET. DSR can be classified in two types of it: table-determined and on-interest. The table-driven routing protocols are the type of protocols comes as a better development over the wired network including internet. They use the proactive strategy; it is trying to keep the expected data of cutting edge to each node from each one host in the MANET. These protocols need each one host to remain one or more tables to hold most recent routing data, and any modification in system topology wants to be reflected by TV redesigns data all through the system with a particular end goal to keep up a predictable system view. This methodology is over once one or more courses are discovered or all possible course stages have been analyzed.

The Dynamic Source Routing (DSR) protocol is single of the all the additional for the mainstream part recognized on demand directing protocols. It is general to believe the DSR protocol with several courses as they might be manufactured amid the course disclosure by flooding. The Dynamic Source Routing (DSR) protocol designed in addition to a choice of keeping up a variety of courses, so a alternative course can be utilized upon dissatisfaction of the necessary one. Be that as it may in DSR, an excess of courses are booked up in an unimportant way, without any high opinion to their ultimate kindness. The implementation study of DSR protocols has not been focused.

1.3 Congestion in MANET

Congestion is a condition in communication organizes in which an excess of packets are shown in a part of the subnet. Congestion may happen when the load on the system is more well-known than the limit of the system. Congestion prompts packet losses and data transfer ability inducement and waste time and energy on blocking improvement. In Internet when congestion is done it is regularly pay attention on a single switch; because of the imparted midway of the MANET congestion won't overload the elastic nodes yet has an impact on the entire scope area. When the routing protocols in MANET are totally not conscious about the congestion, it brings about the additional issues.

1.3.1 Long delay: This holds up the methodology of locating the congestion. At the point when the congestion is more careful, it is better to choose an interchange way. Anyway the predominating on demand routing protocol defers the route looking for process.

1.3.2 High overhead: More handling and correspondence attempts are preferred for another route exposure. In the event that the multipath directing is used, it wants extra effort for maintaining the multi-ways paying small mind to the being there of interchange route.

1.3.3 Many packet losses: The congestion control method activities to reduce the overload in the system by also reducing the sending rate at the sender part or by dropping the packets at the center nodes or by executing both the procedure. This causes increased packet loss rate or least throughput.

1.4 Types of Congestion

1.4.1 Instantaneous Congestion: It is caused by mild bursts, created naturally by burstiness of IP traffic.

1.4.2 Baseline Congestion: It appears to be caused by systematic under engineering of network or hop capacity (or alternatively due to simple source overflow described earlier).

1.4.3 Flash Congestion: It suggests frequent but momentary periods of overload in a highly utilized network, where bursts from individual sources add up to create significant packet loss hills.

1.4.4 Spiky Delay: It a condition where no packets are transferred for a long duration of time -the transit delay of packets shoots up from few milliseconds to tens of seconds during this period.

II. REVIEW OF LITERATURE

SaritaSimaiyaet. al. [1] “IREDD Algorithm for Improvement in Performance of Mobile Ad Hoc Networks” In Mobile Ad hoc networks (MANET) traditional congestion control mechanism RED encounters with new challenges such as high packet drop ratio, degradation of throughput and frequent link failures. Congestion in a network occurs when the demand on the network resources is greater than the available resources and due to increasing mismatch in link speeds caused by intermixing of heterogeneous network technologies. Active Queue management provides a mechanism for protecting individual flows from congestion. One of the technique which uses Active Queue Management technique is RED. The basic idea behind RED queue management is to detect incipient congestion early and to convey congestion notification to the end hosts. The basic philosophy behind IREDD is to prevent congestion.

Poonam thakur.et.al. [2] “Cluster based route discovery technique for routing protocol in MANET” In this paper Mobile Ad hoc Networks (MANETs) as the name signifies is a network formed by collection of mobile ad hoc devices (nodes). It is a kind of infrastructure less wireless network which is autonomous decentralized where each node is free to move anywhere at any time. Due to the mobility of nodes routing is main issue of research, since the wired network's routing protocols cannot be used here. Routing in MANETs is mainly of two types proactive and reactive. A proactive routing protocol (DSDV, WRP, CGSR) maintains the route between all pairs of nodes in the network all the times whereas a reactive routing protocol (AODV, DSR, TORA) is an on demand routing protocol where route is found only when required which has great advantage over proactive protocols. In this paper a new cluster based route discovery algorithm for reactive routing protocol i.e. Ad hoc On Demand Distance Vector (AODV) is proposed, since for the existing algorithms control overhead is very high which consumes a lot of available bandwidth. In the future performance evaluation of the proposed technique can be done and the results thus obtained can be compared with the existing algorithms. We hope that control packet overhead will be less in case of proposed algorithm.

Sneha V. Sangolliet. al. [3] “An Efficient Congestion Control Scheme Using Cross-Layered Approach and Comparison of TCP Variants for Mobile Ad-hoc Networks (MANETs)” MANETs are wireless networks consisting of dynamic nodes that are self-configurable and infrastructure-less. The traditional layered architecture is designed for wired networks, and it runs into performance issues when deployed for Ad-hoc networks. Research focus has shifted towards cross layered architecture to break the traditional layered architecture. This paper proposes a joint optimization of Transport and Network layers by collaborating with physical layer to procure information such as signal power and battery level.

Neelam Phateet. al. [4] “Minimizing Congestion and Improved QoS of AODV using Clustering in Mobile Ad Hoc Network” With the increase in traffic in the network congestion increases, congestion unawareness in mobile ad hoc networks (MANETs) may lead to long delay, high overhead and packet loss which decreases the performance of ad hoc network. Many routing protocols are not congestion aware and this becomes the main design requirement of the routing protocol, which will tackle the problem of congestion and energy usage. This paper proposes an enhancement to the AODV routing protocol that consists of a cluster-based mechanism for supporting congestion control in MANET which provides a QoS aware path.

Hemant Kumar et. al. [5] “TCP Congestion Control with Delay Minimization in MANET” In Mobile Ad hoc Networks (MANET), mobile nodes are organized randomly without any fixed access point. Due to the limited bandwidth and dynamic topology of nodes, the network congestion occurs. Congestion control is the main problem in ad hoc networks. Congestion control is associated to controlling traffic incoming into a telecommunication network. The end-to-end Transmission Control Protocol (TCP) performance degrades rapidly with increase load in number of hops. This is one of the biggest problems of TCP over wireless networks. In this research work, we proposed to develop the Effective TCP Congestion Control AODV routing which consists of congestion monitoring on the basis of queue length and rate control.

Jhuria, M. et al. [6] “Improve Performance DSDV & DSR Protocol by Application of Mobile Agent”, The Mobile Ad-Hoc Network (MANET) is picking up notoriety particularly for the applications where the establishment of system foundation is unrealistic like military applications, fiasco administration and remote sensing. Despite the fact that the MANET gives an extraordinary method for communication item MIN: without system framework however it forces a few downsides and limits (chiefly in course finding and support) which expected to be corrected. This postulation displays a versatile specialist's based system to enhance the execution of the DSR steering convention utilizing portable

operators. The element source directing convention (DSR) is a straightforward and productive steering convention outlined particularly for utilization in multi-jump remote specially appointed systems of portable hubs. DSR license the system to be totally dealing with toward oneself and orchestrating toward oneself, without the requirement for any subsisting system base or administration.

Ahmad, S. et al. [7] “Performance Analysis of DSR & Extended DSR Protocols”, specially appointed system is gathering of remote hubs to build a system without any settled base or incorporated supervision/administration. In such a system, topology changes progressively and because of restrictions of transfer speed, transmission range and force directing turns into an essential issue. A ton of work has been carried out infield of steering in impromptu system following 1990. Element Source Routing convention (DSR) gives basic and productive directing for multi hop specially appointed system of portable hubs. This paper exhibits a recreation based execution examination and correlation between customary DSR and amplified DSR. It uses an exceptionally planned structure which expands on the Global Mobile Information System Simulator (Glomosim). A few enhancements of DSR have as of now been executed in Glomosim. A few distinctive reproduction results demonstrate that execution showed signs of improvement by conventional (officially executed) DSR.

Shen Ming-yu et al. [8] “Research and Analysis on Secure DSR Routing Protocol Based on Strand Space”, this paper describes the Authentication Test Theory of strand space firstly and the theory is expended because of the demands of mobile ad hoc network routing protocol security analysis. By analyzing the existing security DSR routing protocol leaks, a new Ariadne-S protocol model is proposed based on Ariadne routing protocol. And finally it is proved that the returning routing information from the process of routing finding are secure and credible by using strand space model.

III. APPROACHES USED

RED (Random Early Detection): RED monitors the average queue size and drops (or marks when used in conjunction with ECN) packets based on statistical probabilities.. RED congestion control mechanisms can be useful in gate- ways with a range of packet scheduling and packet dropping algorithms. For example, RED congestion control mechanisms could be implemented in gateways with drop preference, where packets are marked as either “essential” or “optional;”“optional” packets are dropped first when the queue exceeds a certain size. Similarly, for a gateway with separate queues for real-time and nonreal-time traffic, RED congestion control mechanisms could be applied to the queue for one of these traffic classes. The RED congestion control mechanisms monitor the average queue size for each output queue and. using randomization; choose connections to notify of that congestion. Transient congestion is accommodated by a temporary increase in the queue. Longer-lived congestion is reflected by an increase in the computed average queue size, and results in randomized feedback to some of the connections to decrease their windows. The probability that a connection is notified of congestion is proportional to that connection’s share of the throughput through the gateway

Distance Vector Routing Protocol (DSDV): this approach (DSDV) is developed on the basis of Bellman–Ford routing algorithm add some modifications. So In the routing protocol, each mobile node in the network keeps a routing table. Every routing table contains the list of all available destinations and the number of hops to each. Each table entry is tagged with a sequence number, it is originated by the destination node. Periodic transmissions of updates of the routing tables help maintaining the topology information of the network. There is any new significant change for the routing information, the updates are transmitted immediately. thus the routing information updates might either be periodic and event driven. DSDV protocol requires each mobile node in the network to advertise its own routing table to its current neighbors.

Cluster Gateway Switch Routing Protocol (CGSR): this is CGSR uses DSDV protocol as the underlying routing method and, therefore, it has the same overhead as DSDV. It modifies DSDV by using hierarchical cluster-head-to-gateway routing approach to route traffic from source to destination.

The gateway is nodes these are within the communication ranges of two or more cluster heads.

This packet sent by a node is first sent to its cluster head then packet sent from the cluster head to a gateway to another cluster head, many cluster head of the destination node is reached. The packet transmitted to the destination from the own cluster head,

Dynamic Source Routing (DSR): itis a reactive protocol based on the source route approach. In Dynamic Source Routing (DSR), this protocol is based on the link state algorithm in which source initiates route discovery on demand basis. And the sender determines the route from source to destination or it includes the address of intermediate nodes to the route record in the packet. The DSR was designed for multi hop networks for small Diameters. It is a beaconless protocol in which no HELLO messages are exchanged between nodes to notify them of their neighbors in the network.

Ad Hoc on-Demand Distance Vector Routing (AODV): the AODV is basically an improvement of DSDV. AODV is a reactive routing protocol instead of proactive. It is minimizes the number of broadcasts by creating routes based on demand, it’s not the case for DSDV. When any source node wants to send a packet to a destination, it broadcasts a route request (RREQ) packet. It’s The neighboring nodes in turn broadcast the packet to their neighbors and the process continues until the packet reaches the destination. In During the process of forwarding the route request, intermediate nodes record the address of the neighbor from which the first copy of the broadcast packet is received. This record is stored in their route tables, its helps for establishing a reverse path.

TORA (Temporally ordered routing): The TORA attempts to achieve a high degree of scalability using a "flat" and non-hierarchical routing algorithm. This operation the algorithm attempts to suppress, to the greatest extent possible, the generation of far-reaching control message propagation. In order to achieve this, the TORA does not use a shortest path solution, an approach which is unusual for routing algorithms of this type. TORA builds or maintains a Directed Acyclic

Graph (DAG) rooted at a destination. No two nodes may have the same height. Information may flow from nodes with higher heights to nodes with lower heights. The Information can therefore be thought of as a fluid that may only flow downhill. through maintaining a set of totally ordered heights at all times, the TORA achieves loop-free multipath routing, as information cannot 'flow uphill' and so cross back on itself. The key design concepts of TORA are localization of control messages to a very small set of nodes near the occurrence of a topological change.

The Timing is an important factor for TORA because the height metric is dependent on the logical time of the link failure.

Sr. No.	Author Name	Algorithm Name	Advantages/ Disadvantages
1	SaritaSimaiya	RED	Advantage: It prevents Congestion. Disadvantage: high packet drop ratio, degradation of throughput and frequent link failures.
2	Jhuria, M	DSDV	Advantage: The availability of paths to all destinations in network always shows that less delay is required in the path set up process. Disadvantage: DSDV requires a regular update of its routing tables, which uses up battery power and a small amount of bandwidth even when the network is idle.
3	poonamthakur	CGSR	Advantage: maintains the route between all pairs of nodes in the network. Disadvantage: overhead is very high.
4	Shen Ming-yu	DSR	Advantage: secure and credible by using strand space model. Disadvantage: High Energy Consumption
5	NeelamPhate	AODV	Advantage: Prevent from congestion & energy consumption. Disadvantage: long delay, high overhead and packet loss which decreases the performance of ad hoc network
6	poonamthakur	TORA	Advantage: It achieves a high degree of scalability. Disadvantage: It does not use a shortest path solution

IV. CONCLUSION

A Mobile Ad-hoc Network (MANET) is a set of remote versatile hubs shaping an element self-sufficient system. In our work we will use enhanced IRED with new route discovery mechanism for avoidance of above defined problems in MANET. IRED has been enhanced on the basis of weight age factor provided in the algorithm with queue length. We will implement enhanced IRED scheme for congestion avoidance in network. IRED approach has been embedded in the network for collision and congestion avoidance in the network. Route discovery management will change routes from source to destination, due to random mobility in the nodes.

REFERENCES

- [1] SaritaSimaiya "IRED Algorithm for Improvement in Performance of Mobile Ad Hoc Networks", Fourth International Conference on Communication Systems and Network Technologies, 2014, PP 23-30.
- [2] poonam thakur.et.al. "Cluster based route discovery technique for routing protocol in MANET" International Conference on Green Computing and Internet of Things, pp- 622 – 626, 2015.
- [3] Sneha V. Sangolli "An Efficient Congestion Control Scheme Using Cross-Layered Approach and Comparison of TCP Variants for Mobile Ad-hoc Networks (MANETs)", Networks & Soft Computing (ICNSC), 2014, PP 30 – 34
- [4] NeelamPhate "Minimizing Congestion and Improved QoS of AODV using Clustering in Mobile Ad Hoc Network", IEEE International Conference on Recent Advances and Innovations in Engineering, 2014, PP 45-50.
- [5] Hemant Kumar "TCP Congestion Control with Delay Minimization in MANET", IEEE Conf. on ICICES, 2014, pp 56-70.
- [6] Jhuria, M., Singh, S. "Improve Performance DSR Protocol by Application of Mobile Agent", Communication Systems and Network Technologies (CSNT), pp. 336-340, IEEE, 2014.
- [7] Ahmad, S, Awan, I., Waqqas, A. ;, Ahmad, B. "Performance Analysis of DSR & Extended DSR Protocols", Modeling & Simulation, pp. 191-196, IEEE, 2008.

- [8] Shen Ming-yu, Li Cang-yuan, "Research and Analysis on Secure DSR Routing Protocol Based on Strand Space", *Electrical and Control Engineering (ICECE)*, pp. 2917 – 2920, IEEE, 2010.
- [9] Bijender Bansal 1, Malay Ranjan Tripathy "Improved Routing Protocol for MANET", *Fifth International Conference on Advanced Computing & Communication Technologies*, 2015, pp 21-30.
- [10] Bandana Bhatia "Performance Analysis of AODV Based Congestion Control Protocols in MANET", *1st International conference on futuristic trend in computational analysis and knowledge management (ABLAZE 2015)*, 2015, pp 45-53.
- [11] Pravin Ranjan "Optimized Local Route Repair and Congestion Control in Mobile Ad hoc Network ", *Computing and Communications Technologies*, 2015, pp 328 – 333.
- [12] Istikmal 1,2 "Performance Analysis of Routing and Congestion Control Cooperation in Wireless Mobile Ad Hoc Networks" , *International Conference on Control, Electronics, Renewable Energy and Communications (ICCEREC)*, 2015, pp 789-790.
- [13] A. Nasipuri, R. Castaneda and S. Das, "Performance of multipath routing for on-demand protocols in mobile adhoc networks," *ACM/Kluwer Mobile Networks and Applications*, vol. 6, no. 4, pp. 339-349, 2001.