Asian Journal of Multidisciplinary Research (AJMR) 2016

E-ISSN: 2395-1710 P-ISSN: 2395-1729
Volume 02- Issue 12-, pp-24-31

Research Paper Open Access

CONGESTION CONTROL ON MOBILE AD-HOC NETWORKS: A STUDY AND SURVEY

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Abstract

Mobile Ad-hoc Network (MANET) is a form of unplanned dynamic network that can move freely to any locations in the network and set up itself on the fly. Since MANET is dynamic in nature route discovery is quite challenging task here and also we cannot predict node movement and traffic load of every node, because number of nodes are ideal and number of nodes are vary loaded which leads to the problem of congestion occurrence onto the network. The control of congestion is to assure the system to run at its rated capacity even on its worst condition. The congestion less based routing is entrenched to cut down the packet loss, number of nodes, changing topologies, varying no. of senders, changing the location of sink in the network. The main objective of this survey paper is to study and analyze various performance evaluations of existing congestion control techniques and traffic distribution technique. In further we design proposed work and simulate through all network parameter base for performance evaluation using this survey.

Keywords- Congestion in MANET, Congestion Control, Mobile Ad-hoc Network.

I. INTRODUCTION

Mobile Ad-hoc Network (MANET) is an infrastructure less network without any proper network structure. The main goal of MANET is to extend mobility into the field of standalone mobile domains, where a set of nodes form the network routing infrastructure in Ad-hoc fashion. The MANET applications were used majorly where rapid development and dynamic reconfiguration are more necessary such as military services, sensor network and rescue operation where participants share their information dynamically with the help of their mobile devices. Due to their high mobility of nodes in MANET it is not possible for establish stable paths for packets delivery through the network. Hence, congestion is occurring and it is the key problem for MANET. A mobile

network is said to be the state of congestion if any of the nodes is heavily loaded and it leads to congestion in the network. In other words congestion is a state where a node or link carries too much of data. So the congestion in routing leads to high overhead, packet loss and longer delays and it may sometime leads to decrease the network service quality too. Here we discussed mainly application, advantages and disadvantages of MANET. These are explained as:

APPLICATION OF MANET

1. Urgent business meetings
2. Military
3. Personal area networking and Bluetooth

ADVANTAGES OF MANET

1. Manet provide access to information and services
2. These networks can be setup at any place and at any time.

DISADVANTAGES OF MANET

1. Less physical security.
2. More attack prone.
3. Lack of authorization facilities.
4. Dynamically network topology makes it hard to find out malicious node.

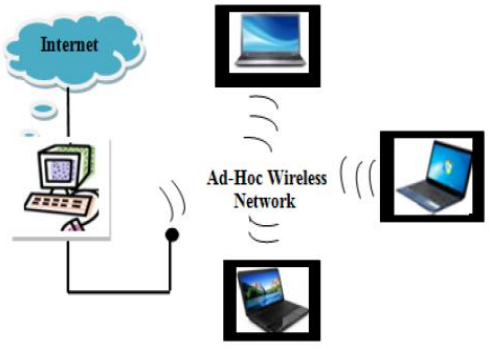

Figure 1: The General Representation of Mobile-Ad-Hoc Network

II. CONGESTION IN MANET

Congestion occurs in a communication networks due to the many packets are present in the same part of the link. Congestion may occurs when the packet load on the network (number of packets send to the network) is greater than the capacity of the network threshold (number of packets a network can handle). Congestion which may leads to packet losses, bandwidth degradation, waste time and energy on congestion recovery. When the routing protocols in MANET are not conscious about the congestion, it may leads to following issues:

1. **Long delay:** When the congestion is harsher, it is better to select an alternate new path. But the current on demand routing protocol delays the route searching process.

2. **Many packet losses:** Once the congestion is detected and packets may be also lost. Currently congestion control is maintained by decreasing the sending rate towards the sender or dropping packets at the intermediate nodes. There is another way is to decrease the traffic load. Attributable to high packet loss on congestion control little throughput is also occurred.

3. **High overhead:**
Congestion control mechanism takes a lot of efforts for process and communication in new routes. It conjointly takes a lot of and a lot of effort in maintaining the multipath routing protocol.

III. CONGESTION CONTROL IN MANET

Congestion control and security area unit are major tasks in MANET. Congestion control works decent in TCP over web. However due to dynamic topology congestion control may be a difficult taskinmobile adhoc network.Seve ral approaches are projected forcongestion c

ontrol in MANET.Congestion control techni que isthe technique by that thenetwork infor mation measure is distributed across multiple end toend connections.Acongestion control scheme ensures that the nodes place solely as several packets on the wireless channel as are often delivered to the ultimate destination.Congestion control depe nds on the strategy that however the particular control is finished. Main objective of any congestion control algorithm is to balance the traffic to extend throughput of the network. Additionally it is possible to maximize nodes transfer, packet delivery ratio, and minimizes traffic congestion; end-to-end delay and network performance are often improved.

There are three styles of congestion control are as follows:

1. **Proactive Control:** In this scheme, the congestion control mechanism is to form reservations of network resources so resource availableness is deterministically absolute to admit conversations. It needs every node to keep up a routing table (Destination address, Sequence variety and metric) for next hop to succeed in a destination node and variety of hops to succeed in destination. Users may be allowed to send information while not reservation of resources, however with an occasion that if the network is heavily loaded, user might receive low utility from network. Oneof theproactive control protoco l is DSDV (Destination Sequenced Distance Vector).

2. **Reactive Control:** This technique is applicable in reservation less networks. During this case, users got to adapt in step with changes in network state and congestion control refers to the approach within which a network will enable users to notice changes in network state. Reservation less networks is additional liable to congestion. a number of the reactive routing protocols are:

- DSR (Destination Sequence Routing Protocol)
- AODV(Ad-hoc On Demand Distance Vector)
- AOMDV (Ad-hoc On Demand Multipath Distance Vector protocol)

3. **Hybrid Routing Control:** It combines the benefits of each proactive control and reactive control protocols. e.g. ZRP (Zone Routing Protocol) and offers additional economical congestion man agement.

IV. NEED FOR CONGESTION CONTROL

Congestion is a severe problem in current reservation less networks in which no routing table is maintained at each node. There is a need of congestion control in networks so that the available bandwidth, switching speeds and capacity of network to route data, can be increased to several orders of magnitude.

V. RELATED WORK

In this section, we discuss some of the related works and algorithms proposed for solving the congestion control Problem and traffic distribution technique.**Due A. Tran et.al (2006)** designed a routing protocol called the congestion-adaptive routing (CRP) protocol to avoid congestion. The CRP protocol prevents the congestion from happening in the first place rather than handle with it reactively using the bypass concept. If a node is conscious of feasible congestion ahead, CRP distributes incoming traffic over the bypass and elementary routes dynamically based on the present network congestion situation [9].**John hobby et.al**

(2008) is employed to solve the problem and congestion control in MANET. In recent years variety of papers has been presented to this problem that is based on combining differential backlog scheduling algorithms that supported congestion control. But this work doesn't address variety of problems like how signalling is done and new algorithms interact with the wireless protocols [10].**Sunita Nandgave-Usturge et.al (2011)** designed a Routing mechanism in MANET to avert link failure due to its mobility feature, interference and congestion. Interference happened due to collision and hidden node. Hidden node interference can be decreased by using RTSCTS-handshake method of 802.11MAC.This proposed scheme exhibited that AODV has better congestion avoidance mechanisms [11].**S.C. Sharma et.al (2011)** proposed an analysis to find a finest routing protocol, which were used to transmit information from source node to destination node across entire multi hop network with any topology. The broadcasting technique is used to transmit information among all neighbour nodes and thus route is establishment. This approach makes quite challenging to control channel contention problem, redundant rebroadcast problem, packet collision and bandwidth congestion [12].**Prof.K.Srinivas et.al (2011**) MANET have been an important part of future wireless systems and it challenged the OSI layered design. In order to provide high capacity mobile access and backing new multimedia network various OSI layers network functions should be considered together while designing the network. Here the author gave a brief discussion on current stage of performance optimization objections like energy efficiency, cross-layer design and congestion control [13].**Makoto Ikeda et.al (2012)** proposed TCP congestion control for Multiple traffic in MANETs. For simulations ns-3 network simulator is used seeing Ad hoc On-Demand Distance Vector (AODV) and Optimized Link State Routing (OLSR) routing protocols. MANET performance seeing random waypoint mobility model for several number of nodes by sending multiple traffic in the network is given and it is found that coupling congestion control mechanisms between multiple flows has problems in some scenario [14].**M. Ali et al. (2012)** proposed the congestion adaptive multipath routing protocol for load balancing (CAMRLB) to boost the throughput and bypass congestion in MANETs. In CAMRLB, when the average load of an existing link increases above a defined threshold and the applicable bandwidth and the residual battery energy decrease below a defined threshold, traffic is shared over a fail-safe multiple path to reduce the traffic load on a congestion link [15].**S.Sheeja et.al (2013)** Mobile nodes are organised without any access in MANETs. Due to the mobility of nodes, the congestion occurs. So many congestion control techniques were proposed to avoid the congestion. In this research work the author proposed to develop the ECAS which subsits of congestion monitoring, effective routing technique and congestion free routing. In routing technique the author proposed particular channel in terms of queue length of packet, packet loss rate and packet dropping ratio to maintain the congestion status. The congestion free routing is established to cut down the packet loss, high overhead, long delay in the network [16].**Anju et.al (2015)** the wireless network is a collection of wireless devices which uses for temporary network. Traffic control is an effective method for controlling congestion. But it presents a number of drawbacks which are not easy to ignore. Thus the most important higher traffic load occurs. The main aim of the congestion control is to certify that system is running even in worst condition like overload

situation. By controlling the packets were injected in the network, the amount of information that reaches the data sinks gets decreased [17].

VI. IMPORTANCE OF THE RESEARCH WORK

Our research proposal is important for following purpose

1. Our proposal work under the mobile ad-hoc environment with dynamic nature that cases our
   Module control congestion and provide best data delivery.
2. In our propose work under the multipath routing strategies so that provides fast and congestion free communication with load balance base.
3. It's provides reliable as well as low overhead and increases throughput of the network. Our proposed work also minimizes the end-to-end delay because multipath routing protocol provides data delivery through more than one path bases.

VII. DISCUSSION AND FUTURE DIRECTION

According to our survey, though there are many congestion control schemes were available to control the issues occurred in MANET such as packet loss, high overhead, long delay. Still there exist these issues in MANET when the network structure and topology is complicated and number of nodes in MANET increased. Thus still there is a well established congestion control schemes were needed to address these issues even when the network is complicated.

In our future work we may explore the study on energy optimization than the network optimization. The decision metrics of the networks and packet transmission systems i.e delay, network bounding etc may be assessed. Based on those decision metrics, a cross-layer approach or cluster based approach may be designed with reason that work may help to rectification of our work and minimize the congestion from the network. For implementation Network Simulator 2 (NS2) will be used. The description about simulation environment is as follows:

Network simulator 2 (NS2) is the result of an on-going effort of research and development that is administrated by researchers at Berkeley. It is a discrete event simulator targeted at networking research. It provides substantial support for simulation of TCP, routing, and multipath protocol. The simulator is written in C++ and a script language called OTcl2. Ns uses an OTcl interpreter towards the user. This means that the user writes an OTcl script that defines the network (number of nodes, links), the traffic in the network (sources, destinations, type of traffic) and which protocols it will use. This script is then used by ns during the simulations. The result of the simulations is an output trace file that can be used to do data processing (calculate delay, throughput etc.)

VII. TABLE

AUTHOR	YEAR	TECHNIQUES	FINDINGS
Due A. Tran et.al	2006	Congestion-adaptive Routing	Designed congestion-adaptive routing (CRP) protocol to avoid congestion.
John hobby et.al	2008	Differential – backlog scheduling algorithm	wGPD protocol for combined congestion control and scheduling in MANET
Sunita Nandgave-Usturge et.al	2011	RTSCTS-handshake method	Designed a Routing mechanism in MANET to avert link failure
S.C. Sharma et.al	2011	Broadcasting techniques	Proposed an analysis to find a finest routing protocol
Prof.K.Srinivas et.al	2011	Congestion adaptive routing	Building blocks for application specific protocol stack
Makoto Ikeda et.al	2012	TCP congestion control	Proposed TCP congestion control for Multiple traffic in MANET
M. Ali et al.	2012	CAMRLB	Proposed the congestion adaptive multipath routing protocol for load balancing (CAMRLB)
S.Sheeja et.al	2013	Effective congestion avoidance scheme for MANET	Mobility based congestion control scheme
Anju et.al	2015	Modified AODV for congestion control in MANET	Traffic bottleneck is a major issue in congestion control

VIII. CONCLUSION

This Survey paper gives an overview over different congestion control algorithms. We can conclude that there is no single algorithm for congestion control in mobile ad hoc network. Nodes in MANET have limited bandwidth, buffer space, queue etc. So it is crucial to distribute the traffic among the mobile nodes. In MANET, to improve the performance, it is very essential to equity the traffic congestion. Main objective of any congestion control algorithm is to balance the traffic to increase throughput of the network. Also it is feasible to maximize nodes transfer, packet delivery ratio, and minimizes traffic congestion, end-to-end packet delay and network performance can be improved.

ACKNOWLEDGEMENT

The author is greatly obliged to thank college management for their Collaboration in developing this paper. The author wishes to thank department professors for their valuable guidance and encouragement. And also the authors sincerely thank and acknowledge all authors for their contributions and research findings directly and indirectly which used in this paper.

REFERENCES

1. Sujata V. Mallapur et.al "Load Balancing Technique for Congestion Control Multipath Routing in Mobile Ad Hoc Networks "978-1-4799-8641-5/15/$31.00 _c 2015 IEEE.
2. Abhijeet Bhorkar, Member, IEEE, et.al. "Opportunistic Routing With Congestion Diversity
3. in Wireless Ad Hoc Networks "1063-6692 © 2015 IEEE, IEEE/ACM TRANSACTIONS ON NETWORKING.

A. A. Bhorkar, T. Javidi et.al, "Achieving Congestion Diversity in Wireless Ad-hoc Networks" 978-1-4244-9921-2/11/$26.00 ©2011 IEEE

4. Hitesh Gupta et.al "Survey of Routing Base Congestion Control Techniques under MANET " 978-1-4673-5036-5/13/$31.00 © 2013 IEEE.
5. Geetika Maheshwari et al," A Survey on Congestion Control in MANET"/ (IJCSIT) International Journal of Computer Science and Information Technologies, Vol. 5 (2) , 2014, 998-1001.
6. H. Raghavendra et.al., "Congestion adaptive routing in ad hoc networks", in proceedings of the ACM International Conference on Mobile Computing and Networking (MOBICOM), October 2004, pp. 1 - 2.
7. D. A Tran et.al, "Routing with congestion awareness and adaptively in mobile ad hoc networks", in Proceedings of IEEE wireless Communications and Networking, March 2005, pp. 1988 – 199
8. C. Siva Ram Murthy and B. S. Manoj, Chapter 3 Ad Hoc Wireless Networks, in Ad Hoc Wireless Networks: Architectures and Protocols, pp. 213 245.
9. Duc A. Tran et.al,"Congestion Adaptive Routing in Mobile Ad Hoc Networks", IEEE transactions on Parallel and distributed systems, Vol. 17, No. 11, pp. 1294-1304, November 2006.
10. John hobby et.al, "Joint Scheduling and Congestion Control in Mobile Ad-Hoc Networks".
11. Sunita Nandgave-Usturge, "Study of congestion control using AODV and signal strength by avoiding link failure in MANET" 2012 International Conference on Communication, Information & Computing Technology (ICCICT), Oct. 19-20, Mumbai, India, 978-1-4577-2078-9/12/$26.00© 2011 IEEE.

12. Permanand and S.C. Sharma, Comparative Analysis of Broadcasting Techniques for Routing Protocols, IEEE 2011.
13. K. Srinivas, A. A. Chari, "ECDC: Energy Efficient Cross Layered Congestion Detection and ControlRouting Protocol" International Journal of Soft Computing and Engineering (IJSCE) ISSN: 2231-2307, Volume-2, Issue-2, May 2012 316.
14. Makoto Ikeda, "Congestion Control for Multi-flow Traffic in Wireless Mobile Ad-hoc Networks" Sixth International Conference on Complex, Intelligent, and Software Intensive Systems 2012.
15. M.Ali "Congetion Adaptive Multipath Routing For Load Balancing In Mobile Ad-Hoc Networks" 978-1-4673-1101-4/12/$31.00 ©2012 IEEE.
16. S.Sheeja et.al," Effective Congestion Avoidance Scheme for Mobile Ad Hoc Network" I. J. Computer Network and Information Security, 2013, 1, 33-40 Published Online January 2013 in MECS (http://www.mecs- press.org/) DOI: 10.5815/ijcnis.2013.01.04 Copyright © 2013 MECS I.J. Computer Network and Information Security, 2013, 1, 33-40.
17. Anju, "Modified AODV for Congestion Control in MANET "International Journal of Computer Science and Mobile Computing, IJCSMC, Vol. 4, Issue. 6, June 2015, pg.984 – 1001.