International Journal of Advance Research in Science and Engineering
Vol. No.6, Issue No. 08, August 2017
www.ijarse.com
IJARSE
ISSN (O) 2319 - 8354
ISSN (P) 2319 - 8346

A Detailed Research on Congestion Problem in MANET

Rajshree Saxena[1], Dr.Raghav Mehra[2]

[1,2]Ph.d Computer Science, Bhagwant University,Ajmer

ABSTRACT

Mobile Ad hoc network (MANET) has been created or designed to get over the limitations of wired backbone networks and substructure-based wireless networks. MANETs are base upon the nodes mobility model which uses dynamic topology and that topology is the constitution of so many configurations, where each configuration has its own beingness. Transmutation of Data in Mobile Ad-hoc exhibit less network performance as the link break down is most patronize due to nodes movement and this is the main reason of failures of route in MANETs. There exists many routing algorithms, but then also these MANETs face the problem of "CONGESTION" which reduces the overall execution of the network. In any self organized network, nodes are sovereign i.e they may freely ride and may not cooperate properly in network. Such type of nodes are called selfish nodes or misbehaving nodes and hence their behavior is termed as selfishness or misbehavior. When such unreliable nodes are being used for communication, then they have a strong effect on the transport layer protocols such as TCP. In this survey paper, a detailed reasearch on "Congestion Control Techniques" in MANETs has been presented by us. The future direction of making congestion adaptive routing protocol has been described by us.

Keywords- Ad hoc Network, Congestion, Congestion Prevention, Congestion control, Reliability, Routing Protocol.

I. Introduction

Mobile Ad hoc network (MANET) has been created to solve the natural limitation of the wired backbone networks. A MANET is a free flock of mobile users which communicate over unstable wireless links in the situations where temporary network connectivity is needed and is useful in the areas where no already fixed infrastructure can be developed , such as disaster relief where existing sub-structure is being damaged, or in military applications where a tactical network is required. Each device or node can move freely in a MANET, as the topology of the network is not fixed as to the traditional network of communication. All the activities of network like messages delivery and searching the topology should be carried out by the nodes themselves. Therefore routing process, should have to be integrating in to the mobile nodes for transferring the information or messages from source to the destination. The Mobile ad hoc networks provides unique advantages and versatility for such environments because of some special features such as:

- An already existing and fixed substructure is not required in MANETs.
- Such networks do not function under the restrictions of a rigid or frozen topology.
- Summation of a new node , removal of existing nodes etc require only the interaction o other nodes rather than other agency's involvement .

IJARSE
ISSN (O) 2319 - 8354
ISSN (P) 2319 - 8346

II. ROUTING CONCEPT IN MANET

Routing functionality, for the transfer of data and information from a source to a destination, should have to be integrated into the mobile nodes. Therefore, "Routing" is one of the most important effect in MANETs. In MANETs the hosts are mobile and the network topology changes rapidly with the time. In an ad-hoc network it is not possible to predict this topology. Hence a routing protocol is being used to invent routes between nodes. The main aim of such an ad-hoc network routing protocol is to ascertain the path among a twosome of nodes so that messages shall be sent in a useful manner and shall reach at the exact destination within limited time. As the nodes in a MANET have limited range, so some nodes cannot directly communicate with each other, hence various routing protocols has been developed. An advantageous routing protocol for ad- hoc network should satisfy the following properties:

- To increase reliability among network, routing protocol for MANETs should be distributed.
- Routing protocols should be power efficient i.e their battery power should be high.
- A routing protocol should also provide quality of services QOS

III. PROBLEM OF CONGESTION IN MANETS

MANETs enable the transfer of information between the multiple disconnected networks. In MANETs each device works as a router and helps each other in successful delivery of the data. MANETs suffer from high transmission error rate because of the high transmission "Congestion". The problem of congestion occurs in all the types of network but to handle this problem in wired networks is not as difficult as compared to the Mobile ad-hoc network because in any wired network there congestion control techniques are executed at the transport layer where its functions are designed separately from the functions of other layers. Such type of congestion control techniques do not directly use to ad hoc networks, because of limited resources like limited wireless bandwidth, power constraints, limited buffer size etc. Congestion is a problem which develops on the shared networks, when multiple users want to run the same resources like bandwidth, buffers, and queues and demand of these resources become larger than the capacity of network. This situation is exactly called "Congestion".

The traffic which enters in the network is called as "Offered load". Initially, when the offered load increases, the network throughputs also increases linearly but after some time load approaches the network capacity "the knee point", and if load gets continuously increase then throughput does not increase. There is a very close connection among type of network traffic, network congestion and buffering. In real time network environment, each link capacity is limited and aggregate demand of the resources may exceed as compared to the available capacity. In such type of situation link becomes overloaded and when this happens it becomes congested. This problem of congestion may be persistent (permanent) or transient (temporary).

IV. TWO TYPES OF POPULAR APPROACHES WHICH CAN BE USED TO HANDLE THE CONGESTION PROBLEM ARE:

1. Congestion Prevention

Congestion Prevention is the method to handle the network from congestion which comes to play before network faces congestion. For this, nodes should monitor their status and they negotiate with the neighbor node

IJARSE
ISSN (O) 2319 - 8354
ISSN (P) 2319 - 8346

in the network so that no more traffic than the desired quantity which the node cannot handle, should be allowed to enter into the network therefore no congestion can occur. Congestion had a large affects on the performance of network. So some necessary congestion control methods are being needed to prevent the network from the congestion. The following are some of the main QoS maintenance problems in MANETs.

A. Detection of Fixed Route is not possible in MANETs

To prevent the network from the congestion, it is better to choose a reliable path. For this , route shall be analyzed so that an ideal error free fully coverage path with high transmission delivery ratio can be chosen.

B. Reservation of Bandwidth is not possible in MANETs

Bandwidth reservation requires signaling and exchange of messages between MANETs as the channel is being shared between the nodes. The reservation of bandwidth means extra overhead for signaling and releasing messages. Hence bandwidth reservation is not possible in MANETs.

C. Channel Reliability is not Guaranteed in MANETs

The channel is not reliable in MANETs Moreover, as the wireless bandwidth and capacity in MANETs are affected by interference, noise and multi-path fading.

D. Routing is Difficult in MANETs

Routing is difficult in MANET because link breakage occurs frequently. Whenever any link of a path breaks down, it need to find any other available link with a newly found path.

V. CONGESTION CONTROL

Another approach can be used to overcome the problem of congestion in which a congestion control mechanism is performed. This mechanism generally perform to improve the overall performance of the network. The main aim of congestion control is to minimize the delay and buffer overflow condition which is caused by network congestion and hence make the network able to perform better. As congestion is directly related to the problem of dropping packet, it is required that some method have been applied on the network so that the drop of packet becomes less. To control the amount of dropping rate is more difficult in MANETs as compared to the wired network due to some special characteristics of MANETs like:

A. Dynamic Topology

In MANETs, there is no central point or base station to control the whole network connection. Hence, each device can move freely in the network and so the topology of the network is not fixed. Hence it cannot be predicted whether a node which is participating during the transmission will cooperate transmission or not. If no path is found to forward the data, it starts to drop the packet after a particular time.

B. Multi Hop Routing Concept

Multi Hop means each node in MANETs can receive and send the data to the other nodes. But node forwarding capacity is limited i.e it can deliver the data packets to only the node which comes under its transmission range. A route is being detected by a routing protocol when the node does not know the path, then sender begins to transfer the data to a node which comes under its transmission range and this node is called an “Intermediate node”, each intermediate node further transmits the data to the other node and this process is repeated until data

IJARSE
ISSN (O) 2319 - 8354
ISSN (P) 2319 - 8346

reaches to the destination. Some nodes have to handle the heavy traffic because they become the intermediate node in several route.

VI. PERFORMANCE MEASURES AND THE OVERVIEW OF CONGESTION CONTROL SCHEMES

The major performance measures under consideration are:

A. Routing Load

The term Routing load refers to the traffic which occurs on the communication link due to the transmission of route establishment (RREQ, RREP, RERR) packets. These packets use some part of the available bandwidth of a communication protocol. These extra packets do not contribute to the content of the message.

B. Packet Delivery Ratio (PDR)

PDR is the ratio of the number of data packets which are successfully received by all the destinations to the total number of data packets injected into the network from all sources in a specified amount of time. The PDR can be a number between 0 and 1 and it can generally be represented in percentages.

If total no of packets transmitted = PTS Total no of packets received = PTR Then PDR (%) = (PTR/PTS)*100

C. Throughput:

Throughput is the number of packets arriving at the receiver per unit time. For example, Let T is the unit time in which measure in milliseconds. N is the number of packets which has been received in T Then throughput = N/T milliseconds.

VII. SOME CONGESTION CONTROL METHODS

1.By Controlling the Buffer Overflow Problem

Robin Choudhary & Niraj Singhal presented a good mechanism for controlling the problem of congestion. As compared to the wired networks where a fixed medium is used for the data transmission, only limited bandwidth is available in mobile ad hoc networks so there is more chance for the occurrence of error. Hence it is required that this limited resource should be used as efficient as much as possible during the transmission with minimum loss. Mobile nodes have limited transmission capacity. In this research paper, the purpose of congestion control focus is done to limit the delay and buffer overflow problem which becomes the reason of network congestion. Existing solution for calculation of delay are based on the network values like RTT, RTO, Bandwidth and number of nodes are being used for the communication between sources. These techniques are totally dependent upon the receiving and sending acknowledgement.

2. Dynamic congestion detection and avoidance

T. Senthilkumaran & V. Sankaranarayanan proposed a mechanism for detecting congestion in advance and to prevent the network from the problem of congestion. Their work is based upon the calculation of approx queue length in advance. For this, they calculate the average queue length at the level of node. To overcome the problem of congestion, a novel dynamic congestion estimation technique has been proposed that can analyze the fluctuation among the traffic. By performing the assessment of average queue length, a node becomes able to find that there is any probability of congestion and hence it sends a warning message to its neighbors. When

IJARSE
ISSN (O) 2319 - 8354
ISSN (P) 2319 - 8346

neighbors receive the warning message they try to search some alternative congestion free path. If some other path is available, then the predecessor node begins to further communicate through alternative path. So this dynamic congestion method tries to provide a reliable communication within the MANETs.

3. By reducing the link connection when node have high density of neighbor nodes

Xibin Zhao, Zhiyang You and Hai Wan presented a method for reliability analysis in MANETs. They invented that the node performance can also be influenced through the number of neighbor nodes. They proved that the wireless network has limited capacity and the throughput of the wireless network granted to each user can be reduced to zero if the number of users increase. Congestion means arrival of excessive amount of packets at a network which leads to many packet drops. A single node can communicate with many neighbor nodes. As they come under the communication range of that node then there will always be the chance of the same time many neighbor nodes can send their data packets to the same node and hence there can be excessive amount of packets arriving at these nodes become the reason of packets drop. For each node, more neighbor nodes mean more link connections between the nodes. So in this paper, to reduce the congestion problem, focus is upon identifying the relationship between the number of link connections and the node reliability.

REFERENCES

1. Li Yuanzhou, Hu Weihua "*Optimization Strategy for Mobile Ad Hoc Network Based on AODV Routing Protocol*" 978-1-4244-3709-2/10 IEEE 2016
2. T. Senthilkumaran, V. Sankaranarayanan "*Early Congestion Detection and Adaptive Routing in MANET*" Egyptian Informatics JournalVol.1,, pp-165-175,Oct, 2015.
3. Shawqi Kharbash , Wenye Wang " *Computing Two-Terminal reliability in Mobile Ad hoc Network*" in Wireless Communication And Networking Conference of IEEE,Vol.1,pp.2831-2836,March2014.
4. Gaurav Sharma, Akhilesh K. Bhardwaj" *Congestion Control in Adhoc Network*" International Journal of Advanced Research in Computer Science and Software Engineering(IJARCSSE)Volume 3,Issue 6,pp.283-286 June 2013.
5. Majid Ahmad Durgesh Kumar Mishra "*A Reliability Calculations Model for Large-Scale MANET*" International Journal of Computer Applications Volume 59– No.9, pp. 17-21, December 2012.
6. Robin Choudhary, Niraj Singhal, "*A Novel Approach for Congestion Control in MANET*" International Journal of Engineering and Innovative Technology (IJEIT) Volume 2, Issue 5, pp. 55-61, November 2012.
7. Shitalkumar A Jain "*A Study on Congestion Aware Multipath Routing Protocols in MANET*" Multidisciplinary Journal of Research in Engineering and Technology(MJRET), Volume 1, Issue 1,pp.119-128 ,April 2014.
8. Xibin Zhao, Zhiyang You, and Hai Wan "*A Novel Two-Terminal Reliability Analysis for MANET*" Research Article Hindawi Publishing Corporation Journal of Applied Mathematics Volume 2013, Article ID 216186.
9. S. Subburam, P. Sheik Abdul Khader " *Predictive congestion control mechanism for MANET*" Indian Journal of Computer Science and Engineering (IJCSE) Vol. 3,Issue No.5,pp.640-651,Nov 2012.

IJARSE
ISSN (O) 2319 - 8354
ISSN (P) 2319 - 8346

10. S.A.Jain, S.R.Kokate, Pranita Thakur, Shubhangi Takalkar " *A Study of Congestion Aware Adaptive Routing Protocols in MANET*" International Journal of Scientific and Research Publications,Volume 2, Issue 4, pp.1-5,April 2012.
11. D. Berger, Z. Ye, P. Sinha, S. Krishnamurthy, M. Faloutsos, and S. K. Tripathi. TCP-Friendly Medium Access Control for Ad-Hoc Wireless Networks: Alleviating Self-Contention. In Proceedings of the 1st IEEE International Conference on Mobile Ad-hoc and Sensor Systems, pages 214–223, Fort Lauderdale,Florida, USA, Oct. 2014.
12. K. Chen, Y. Xue and K. Nahrstedt. On Setting TCP's Congestion Window Limit in Mobile Ad Hoc Networks. In ICC '03: Proceedings of the IEEE International Conference on Communications, Anchorage, Alaska, May 2013.
13. C. de M. Cordeiro, S. R. Das, and D. P. Agrawal. COPAS: Dynamic Contention-Balancing to Enhance the Performance of TCP over Multi-hop Wireless Networks. In Proceedings of the 10th International Conference on Computer Communication and Networks (IC3N), pages 382–387, Miami, FL, USA, Oct. 2012.
14. R. de Oliveira and T. Braun. A Dynamic Adaptive Acknowledgment Strategy for TCP over Multihop Wireless Networks. In INFOCOM '05: Proceedings of the 24th Annual Joint Conference of the IEEE Computer and Communications Societies, volume 3,pages 1863–1874, Mar. 2005.
15. R. de Oliveira, T. Braun, and M. Heissenb¨uttel. An Edge-based Approach for Improving TCP in Wireless Mobile Ad Hoc Networks. In DADS '03: Proceedings of the Conference on Design, Analysis and Simulation of Distributed Systems, Orlando, USA, Mar. 2003.