ISSN 2394-3777 (Print)
ISSN 2394-3785 (Online)
Available online at www.ijartet.com
International Journal of Advanced Research Trends in Engineering and Technology (IJARTET)
Vol. 3, Special Issue 2, March 2016

Survey on Congestion Control in Mobile Ad Hoc Networks

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Abstract- **Congestion control is an important issue that can arise in Mobile Ad Hoc Networks (MANET). In communication networks, too many packets are present in particular region that degrades the performance. It occur when the load increases (i.e., no. of packets sent to network) in the network is higher than the network capacity (i.e., no. of packets a network can handle). When multiple users contend for access to the same resources such as bandwidth, buffers and queues then it subjected to traffic. If traffic is excessive, buffers fill up, a new incoming packet has dropped, and it leads to excessive delay. The basic techniques may used to manage congestion such as end- system flow control, network based congestion awareness and allocation, and resource allocation. In this survey we identify multipath routing and load aware technique, both are provide more reliable as well as load aware of each node. So minimize the data drop but all given approach are use routing base congestion control. Through this survey, we identify that congestion control through dynamic queue management technique, here we given about problem statement about dynamic queue base approach for congestion control and simulation parameter.**

Keywords –Wireless networks; routing protocols; TCP; MANET; Congestion avoidance; congestion prevention.

I. INTRODUCTION

Mobility and un-fixed infrastructure make wireless Mobile Ad-hoc Networks (MANETs) very attractive for many time critical applications. Between users, Mobile Ad Hoc (MANET) communication is becoming very popular in the recent years. An ad-hoc network is a special kind of collection of wireless terminals or Mobile Nodes that are able to form energetic and temporary network (i.e., Dynamic network) without any support from fixed infrastructure or centralized administration. A Mobile Ad Hoc Network (MANET) can used to extend the coverage areas of fixed wireless networks, to enable inter-sensor communications, for vehicular information exchange etc. The nodes in MANET can consist of laptops and personal digital assistants and are often limited in resources such as CPU capacity, storage capacity, battery power and bandwidth. Routing protocols should try to minimize the control traffic, such as periodic update messages. Reactive protocols are more effective, because they calculate the routes only when receiving specific requests. There are a lot of issues and challenges in designing a MANET. Mobility and the absence of any fixed infrastructure make MANETs very attractive for time-critical

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applications.

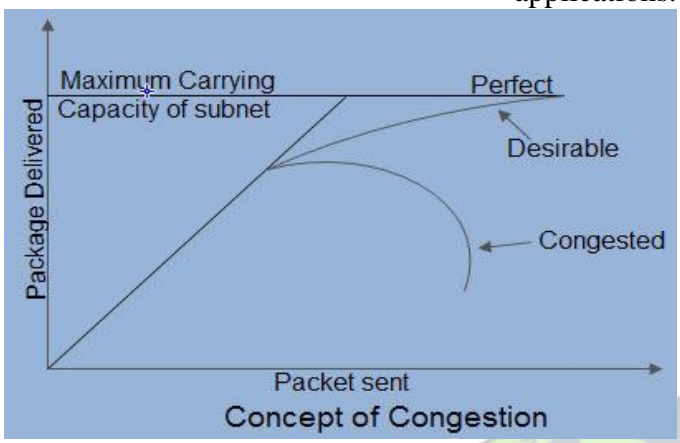

Fig. 1 Concept of congestion

At transport layer, end-systems can gather information about each used path such as congestion state, capacity and latency. This information can then used to react to congestion events in the network by moving the traffic away from congested paths. Most of the work for MANET has done in simulation, as in general, a simulator can give a quick and inexpensive understanding of protocols and algorithms [1]. So far, there are many simulation results on the performance of NET, e.g. in terms of end-to-end throughput, round trip time and packet loss.

II. LITERATURE SURVEY

Bandana Bhatia, "Performance Analysis of AODV Based Congestion Control Protocols in MANET" [1]. This paper discusses two congestion control protocols based on AODV in MANETs. Many authors have proposed protocols based on AODV, which are congestion adaptive, and deal with the congestion over the network. Improved Ad-hoc on-demand Distance Vector Routing Protocol (AODV-I) and Early Detection Congestion and Control Routing Protocol (EDAODV) are two congestion control protocols, which deals with the congestion reactively. EDAODV is a unicast routing protocols. In this protocol, the previous (predecessor) and the next (successor) node on the primary path find alternate path bi-directionally. On finding the alternate path, the previous node of the congested node uses an alternate route and bypasses the congestion to the non-congested node, which is first on the primary route as set previously during route establishment. It comprises three components are

i. Route Discovery
ii. Early congestion detection
iii. Bi-directional Path Discovery.

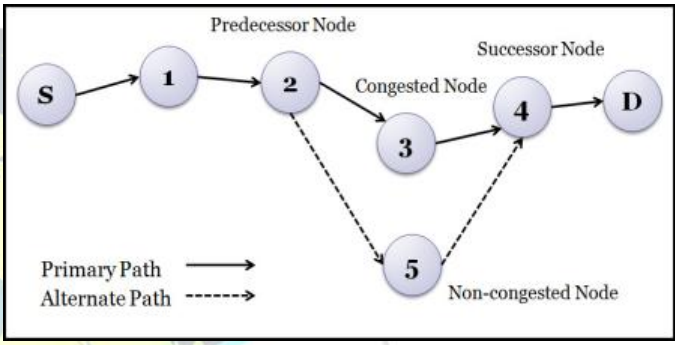

Fig. 2 Finding alternate path to reduce congestion

An Improved Ad-hoc on-demand Distance Vector Routing Protocol (AODV-I) is based on congestion aware and route repair mechanism. It deals with the congestion processing to the RREQ message thereby avoiding the selection of the busy nodes automatically during the establishment of new route. AODV lacks congestion processing in RREQ and so, is not able to avoid busy routes automatically during the route establishment. In addition, no guarantee mechanism added to RREP messages because of which whenever the RREP i not received by the source, it re-initiates route discovery process, which further adds to unnecessary overhead. These all limitations are removed in AODV-I. Congestion processing added to RREQ, thereby allowing it to avoid selecting busy routes automatically and the routing repair mechanism also added to the RREQ message, which prevents the network from initiating a new route discovery whenever the route appears to be busy. MANETs [2] In this proposed work, A node-disjoint multipath routing method based on AODV

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protocol. The main goal of the proposed method is to determine all available node-disjoint routes from source to destination with minimum routing control overhead. With the proposed approach, as soon as the first route for destination is determined, the source starts data transmission. All the other backup routes, if available, are determined concurrently with the data transmission through the first route. This minimizes the initial delay caused because data transmission started as soon as first route discovered. They also proposed three different route maintenance methods.

Li Qiang Tao et al. in his titled "ECODA: Enhance Congestion Detection and Avoidance for Multiple Class of Traffic in Sensor Networks" [3]. They proposed a novel energy efficient congestion control scheme for sensor networks, called ECODA (Enhanced congestion detection and avoidance). It comprises three mechanisms:

i. Use dual buffer thresholds and weighted buffer difference for congestion detection
ii. Flexible Queue Scheduler for packets scheduling
iii. A bottleneck-node-based source sending rate control scheme.

M. Ali et al. in his proposed work "Congestion Adaptive Multipath Routing For Load Balancing In mobile Ad-hoc Networks"[4]. In this proposed work, they present a congestion adaptive multipath routing protocol to increase the throughput and avoid congestion in MANET. When an average load of an existing link increases beyond a defined threshold and the available bandwidth and residual battery energy decreases below a defined threshold, traffic distributed over fail-safe multiple routes to reduce the traffic load on congestion.

Hemant kumar et al. "TCP Congestion Control with Delay Minimization in MANET"[5]. In this research work, we proposed to develop the Effective TCP Congestion Control AODV routing, which consists of congestion monitoring based on queue length and rate control. The overall congestion status measured in congestion monitoring. In route establishment, we propose congestion control in the particular channel, queue length of packet, traffic rate based overall congestion standard, packet loss rate and packet dropping ratio to monitor the congestion status. Based on the congestion standard, the congestion less based routing established to reduce the packet loss, high overhead, long delay in the network. Transmission control protocol (TCP) provides connection oriented, reliable and end-to-end mechanism that provides reliable packet delivery over unreliable links. In this paper, an improved mechanism for TCP congestion control routing presented based on queue length and Traffic rate. It considers the influences sending rate to TCP sender's packet only by the congestion. The drop rate for TCP calculated according to total packet received and total packet acknowledgment in network. Therefore, there is less packets are drop in proposed AODV protocol.

T. Senthilkumaran et al. "Early Detection Congestion And Control Routing In MANET".[6] This paper presents the early detection congestion and control routing protocol for wireless Ad-hoc networks called as EDAODV. EDAODV detects congestion at a node level by calculating queue status value and finding congestion status. Based on a congestion status, EDAODV utilizes the non-congested predecessor and successor nodes of a congested node and initiates route-finding process bi-directionally to find alternate non-congested path between them for transmitting data. The process finds more non-congested alternate paths and chooses a best single path for transmitting data. Thus, the proposed EDAODV is a predictive congestion and control routing protocol in MANETs. EDAODV has lost fewer packets than AODV that are not having congestion control mechanism. As future work it

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will be extended to other networks like WMN and WSN and study its performance.

T. Senthil Kumaran et al. "Dynamic congestion detection and control routing in ad hoc networks".[7] The primary objective of congestion control is to best utilize the available network resources and keep the load below the capacity. The congestion control techniques to deal with TCP have been found inadequate to handle congestion in ad hoc networks, because ad hoc networks involve special challenges like high mobility of nodes and frequent changes of topology. This paper proposes a method for dynamic congestion detection and control routing (DCDR) in ad hoc networks based on the estimations of the average queue length at the node level. Using the average queue length, a node detects the present congestion level and sends a warning message to its neighbors. The neighbors then attempt to locate a congestion-free alternative path to the destination. This dynamic congestion estimate mechanism supporting congestion control in ad hoc networks ensures reliable communication within the MANET. The proposed DCDR uses a new algorithm for detecting congestion dynamically. It uses a non-congested path discovery Mechanism to prevent network congestion, and hence packet loss and end-to-end delay are reduced and throughput improved. The DCDR protocol consists of the following components:

i. Dynamic congestion estimation technique
ii. CFS construction
iii. Congestion-free route
iv. Congestion-free path discovery

The DCDR, however, has few limitations, which are as follows:

i. If the incoming traffic is the heaviest, the DCDR could minimize the packet loss caused by network congestion, but it still suffers from packet loss.
ii. This study did not consider any wireless losses. The limitations of proposed algorithm may serve as directions for new research. By identifying and performing appropriate actions for router failure and channel error-induced packet losses, the performance of the DCDR could further be enhanced.

Sreenivas B.C et al. "L2DB-TCP: An adaptive congestion control technique for MANET based on link layer measurements". [9] The congestion control techniques provided by Transmission Control Protocol (TCP) is specially designed for wired networks. There are several approaches designed over TCP for detecting and overcoming the congestion. This paper considers design of Link-Layer congestion control for ad hoc wireless networks, where the bandwidth and delay measured at each node along the path. Based on the cumulated values, the receiver calculates the new window size and transmits this information to the sender as feedback. The sender behavior altered appropriately. The proposed technique is also compatible with standard TCP. L2DB is a congestion avoidance method, which enables us to obtain high performance by gathering capacity information such as bandwidth and delay at the link layer in each participating node. In this paper, we have introduced an additional module L2DB-End-System, which is used by both sender and receiver. This module contains code for,

i. Sending data and ACK packet
ii. Computation of RTT
iii. Modification of congestion window
iv. Receiving of both data and ACK packet.

The proposed congestion control algorithm L2DB is able to obtain higher performance by gathering capacity information such as bandwidth and delay at the link layer. This method requires the introduction of an additional module within the protocol stack of the mobile node, which is capable of adjusting the outgoing data stream based on capacity measurements.

To support this designed congestion control module

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i.e. L2DB an additional proposal has been made which provides an optional field to support the existing IEEE 802.11 protocol stack to store the information obtained from the link layer.

III. CONCLUSION

We have seen a great development in the field of wireless networks (infrastructure based) and in the field of Mobile ad hoc network (infrastructure less network). In MANET congestion is occurs when transmit the packets is greater than capacity of the network. Due to congestion, performances of the network have to be decreased. The congestion control increases the packet delivery and decrease the end-to-end delay, packet loss. Network performance can be increased by controlling the congestion in MANET. In this survey paper, numbers of congestion control techniques have discussed. There are various challenges that need to be met, so these networks are going to have widespread use in the future.

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