Implementation of Effective Congestion control Mechanism for Multimedia Streaming

Gopalakrishnan.P
PG Scholor
Sethu Institute of Technology
Pulloor,Kariapatti,India

Rajarajeswari.S
Assistant Professor
Sethu Institute of Technology
Pulloor,Kariapatti,India

Dr.J.Sutha
Professor
Sethu Institute of Technology
Pulloor,Kariapatti,India

***Abstract*— Design of congestion control mechanism for multimedia streaming over the Mobile Ad-hoc Networks (MANET) is challenging. In particular, the frequent changes of the network topology and the shared nature of the wireless channel pose significant challenges. Throughput. XRCC mechanism outperforms TCP congestion control mechanism and thus is well suited for applications like multimedia streaming in MANET. XRCC minimizes packet drops caused by network congestion as compared to TCP congestion control mechanism.**

***Index Terms*— Congestion, MANET, multimedia streaming, rate-based.**

I. INTRODUCTION

THE proliferation of wireless networks is driving a revolutionary change in information society. Due to the availability of wireless interfaces on mobile devices like laptops, PDAs and cell phones etc., wireless networks are getting very popular day by day. The wireless channel now supports a higher data rate which has made real time multimedia applications like radio broadcasting, video conferencing, and real-time environment monitoring, etc. possible. Usage of these applications through mobile ad hoc networks is gaining immense popularity now a day. A mobile ad hoc network (MANET) is a wireless network, consisting of many mobile nodes connected by wireless links. Each node functions not only as an end-system, but also as a router and rely on each other to keep the network connected. In MANET, nodes are free to move randomly and organize themselves arbitrarily. This random behavior of ad hoc networks causes the topology of wireless network to be changed rapidly and unpredictably. Moreover, node's mobility puts an extra burden on TCP's congestion control mechanism. As a result, traditional congestion control mechanism, applied by the Transport Control Protocol TCP [9], is unable to catch up the network dynamics of ad hoc networks. In this paper, we have proposed a novel Explicit Rate-based Congestion Control mechanism (XRCC), for supporting applications like multimedia streaming over MANET. The following subsections give the brief idea about the problem, our proposed solution to solve the problem, and an outline of this paper respectively.

Inefficiency is another problem facing TCP in the future Internet. As the delay-bandwidth product increases, performance degrades. TCP's additive increase policy limits its ability to acquire Spare bandwidth to one packet per RTT .Since the bandwidth-delay product of a single flow over very-high bandwidth links maybe many thousands of packets, TCP might waste thousands of RTTs ramping up to full utilization following a burst of congestion. Further, the increase in link capacity does not improve the transfer delay of short flows (the majority of the flows in the Internet).Short TCP flows cannot acquire the spare bandwidth faster than “slow start” and will waste valuable RTT sramping up even when bandwidth is available.

Now we shift our attention from Internet to a mobile ad hoc network (MANET). In MANET, each node is free to move about, creating not only fluctuating wireless link bandwidth, but also link breakage, route breakage and dynamic routing. Currently TCP remains the defacto standard for congestion control in MANET (despite its many well-known deficiencies in this environment), simply because of its wide acceptance and deployment over the Internet. With the emerging need of multimedia streaming over MANET, equation-based congestion control is likely to find its way into MANET as well, for example, by reusing the same software that has been developed for the Internet.

II. RELATED WORK

Nowadays multimedia application is developed rapidly, so it changes many concepts in the internet. Multimedia become a popular medium for communication but it faces many problem in the MANET due to its unique properties. Thus there is a need of congestion control mechanism for these applications to operate in MANET. This paper proposes a novel congestion control algorithm that achieves high bandwidth utilization pro-viding fairness among competing connections and, on the other hand, is sufficiently responsive to changes of avail-able bandwidth. The main idea of the algorithm is to use adaptive setting for the additive increase/multiplicative de-crease (AIMD) congestion control scheme, where parameters may change dynamically, with respect to the current network conditions [8].

Deepak Bansal et.al, proposes an alternative algorithm. An important characteristic of these alternative algorithms is that they are slowly responsive, refraining from reacting as drastically as TCP to a single packet loss [7]. A novel approach to Internet congestion control that outperforms TCP in conventional environments, and remains efficient fair, scalable, and stable as the bandwidth delay product increases. This new eXplicit Control Protocol, XCP, generalizes the Explicit Congestion Notification proposal (ECN).In addition; XCP introduces the new concept of decoupling utilization control from fairness control. This allows a more flexible and analytically tractable protocol design and opens new avenues for service differentiation [6].

TFRC is able to maintain throughput smoothness in MANET; it obtains fewer throughputs than the competing TCP flows (i.e., being conservative). We analyze several factors contributing to TFRC's conservative behavior in MANET, many of which are inherent to the MANET network. We also show that TFRC's conservative behavior cannot be completely corrected by tuning its loss event interval estimator [4]. TCP experiences serious performance degradation in wire-less multi-hop networks with its probe-based, loss-driven congestion control scheme. They describe the Wireless eXplicit Congestion control Protocol (WXCP), a new explicit flow control protocol for wireless multi-hop networks based on XCP. They highlight the approaches taken by WXCP to address the difficulties faced by the current TCP implementation in Wireless multi-hop networks [3].

Transport protocol design for supporting multimedia streaming in mobile adhoc networks is challenging because of unique issues we describe the design and implementation of a TCP-friendly transport protocol for adhoc networks. Our key design novelty is to perform multimetric joint identification for packet and connection behaviors based on end-to-end measurements [5]. A mobile agent based congestion control AODV routing protocol is proposed to avoid congestion in ad hoc network. Some mobile agents are added in ad hoc network, which carry routing information and nodes congestion status[1]

III. PROPOSED METHOD

In this section, have tried to point out the problems of using TCP congestion control mechanism for supporting multimedia applications in mobile ad hoc networks:

- Multimedia applications usually have a higher bandwidth requirement as compare to the usual Internet applications like file transferring.
- Supporting multimedia streaming over MANET presents a number of practical challenges.
- Transmission Control Protocol (TCP), which is the most widely used transport protocol, is not suitable for applications like streaming in mobile ad hoc wireless network. This is because of the fact that TCP interprets a missing packet as an indication of network congestion which is not always true for mobile ad hoc networks. Packet loss may occur due to MANET's unique characteristics, like node mobility, channel bit errors, medium contention and route failures. Because of these special characteristics, packet loss rates on wireless links are much higher than the corresponding wired links. The TCP protocol reacts to these wireless losses in the same fashion as it would react to packet losses due to congestion, because it has been designed to react to losses in only that way.

Moreover, upon any congestion event, TCP reacts conservatively and halves its transmission rate. Such a drastic change in transmission rate could deteriorate the performance of these streaming applications. So uniformly applying congestion control for each loss will lead to unacceptable performance degradation.

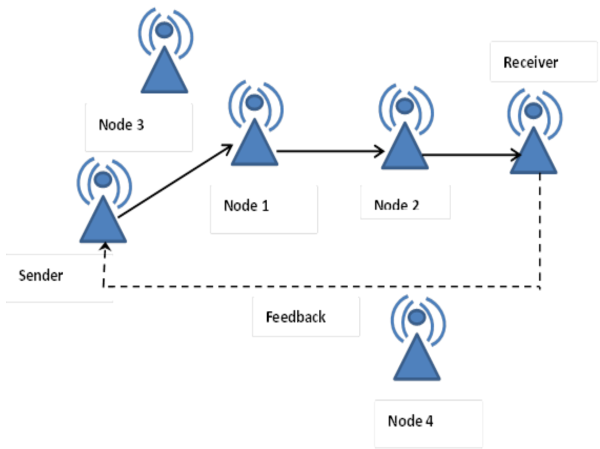


Fig 1: A Simple Network Scenario

IV. ALGORITHM

XRCC for Multimedia Streaming over MANET Our congestion control mechanism XRCC depends on the feedback from the intermediate nodes which includes both information about the network congestion and the rate information. In this section, we describe the steps used by our congestion control mechanism. The intermediate nodes provide congestion feedback to the sender via the receiver. We describe the procedure of detecting the congestion losses in the next subsection. The following subsections describe the role of the sender node, intermediate nodes, and receiver node respectively.

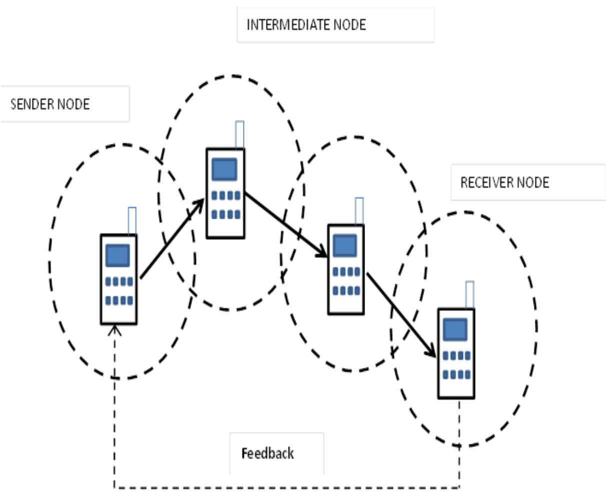


Fig 2: Illustrating of XRCC Congestion Control Mechanism

The contribution of XRCC can be listed the following

- Detecting losses due to congestion
- Adjusting the sending rate

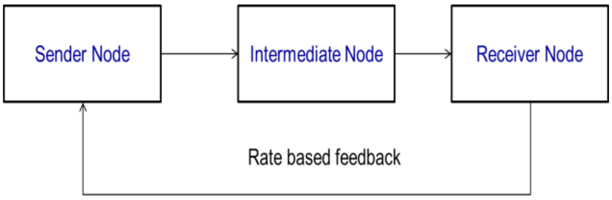


Fig 3: XRCC Congestion Control Mechanism

***Sender node**:* In sender node the data to be sending is there. It just get the feedback from the receiver node and adjust the rate of data transmission.

Intermediate node: It measures the length and calculates the rate then inserts the feedback in the packet header and sends it to the receiver.

Receiver node: In receiver node there is only one work that is to send the calculated rate feedback to the sender node.

In this paper, the sender nodes adjust their data sending by the rate feedback from the intermediate nodes, using XRCC. An intermediate node uses its queue length to calculate the explicit rate feedback and stamps it in the passing packet's header. After receiving this rate feedback, the sender adjusts its data sending rate accordingly.

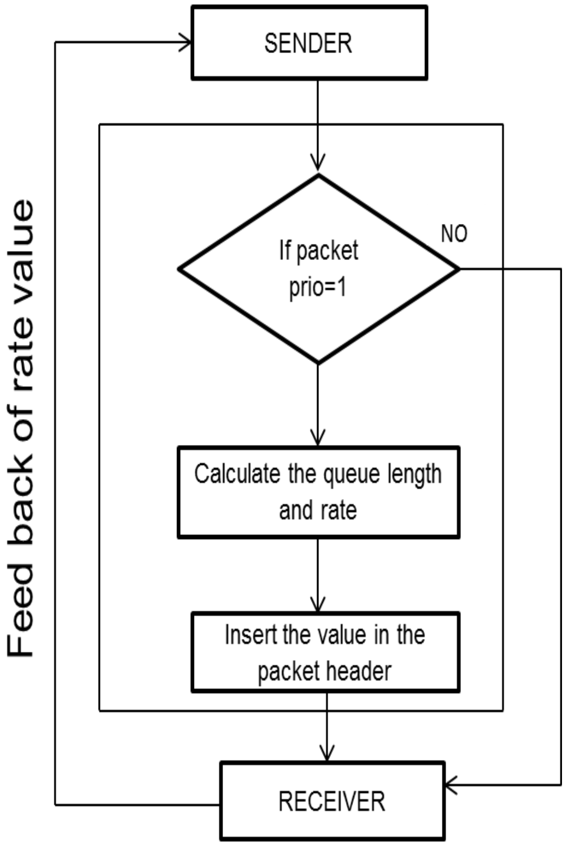
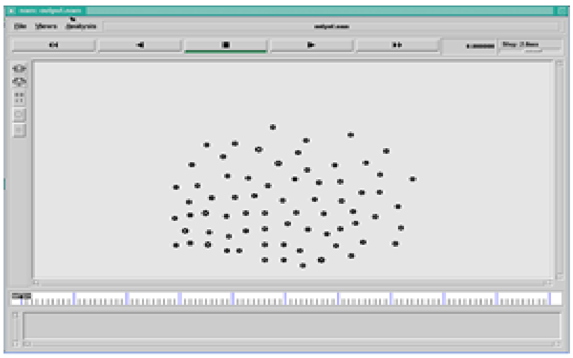


Fig 4: Flow diagram of the algorithm

V. EXPERIMENTAL RESULTS

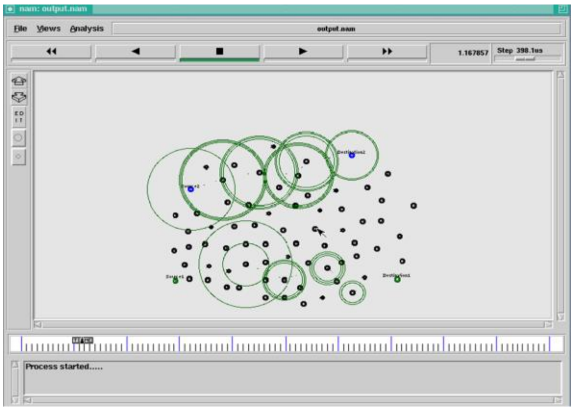
The above mentioned algorithm is implemented using ns-2 network simulator. And some of the results is shown below

Fig 5: Creation of nodes



The above figure shows a few number of nodes created in a particular environment using the simulator. The nodes are heterogeneous and homogeneous in nature.

Fig 6: Identification of source and destination nodes



First of all we have to identify which node is going to transmit the data and which node is going to receive the transmitted data. The node which transmits is known as source and the destination is the node which receives the data.

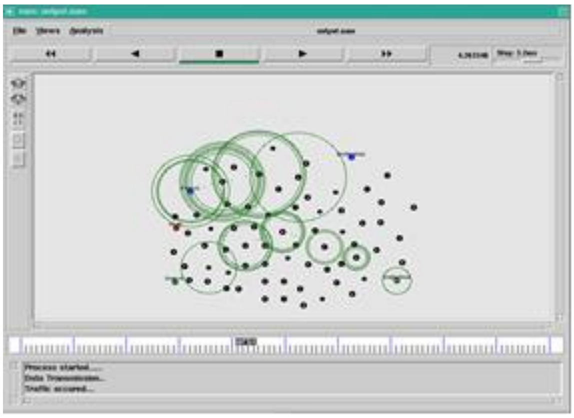


Fig 7: Data transmission

Here the data transmission is takes place. Initially we have to check which path is the shortest and in which path the traffic is less and in which path data transmission rate is minimized.

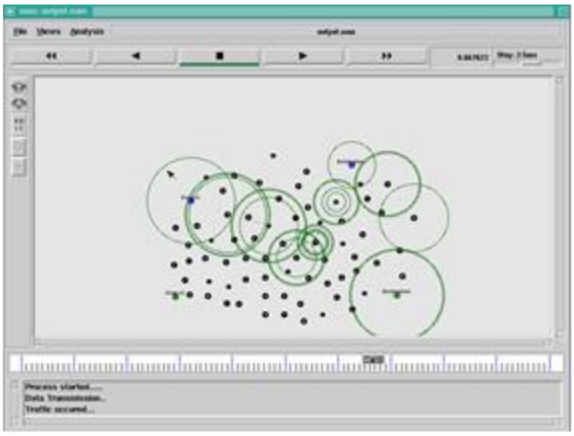


Fig A4: Traffic due to congestion

The congestion occurs due to the traffic is analyzed and the feedback is calculated in the intermediate node and with that information we have to adjust the transmission rate in the sender. Thus the congestion rate is reduced.

VI. CONCLUSION

In this paper to implementing and designed for multimedia applications in mobile ad-hoc networks is caused by MANET's dynamic and random behavior. XRCC mechanism outperforms TCP congestion control mechanism and thus is well suited for applications like multimedia streaming in MANET. XRCC minimizes packet drops caused by network congestion as compared to TCP congestion control mechanism; it still suffers from packet drops.

So our future work to improving the streaming bandwidth allocation of the Obtaining the output without packet loss and estimated bandwidth using streaming media congestion control protocol (SMCC)

REFERENCES

[1] Vishnu Kumar Sharma and Dr. Sarita Singh Bhadauria. Performance Analysis on Mobile Agent Based Congestion Control Using AODV Routing Protocol Technique with Hop by Hop Algorithm for Mobile Ad-hoc Network.International Journal of Ad hoc, Sensor & Ubiquitous Computing (IJASUC) Vol.3, No.2, April 2012.

[2] Nazia Zaman, Kazi Chandrima Rahman, Syed Faisal Hasan .Explicit Rate-based Congestion Control for Multimedia Streaming over Mobile Ad hoc Networks. International Journal of Electrical & Computer Sciences IJECS-IJENS Vol: 10 No: 04

[3] Y. Su and T. Gross. WXCP: Explic it Congestion Control for Wireless Multi-hop Networks. In Quality of service: IWQoS 2005: 13th international workshop, IWQoS 2005, Passau, Germany, And June 21-23, 2005: proceedings, volume 13, page 313. Springer Verlag, 2005.

[4] K. Chen and K. Nahrstedt. Limita tions of equation-based congestion control in mobile ad hoc networks. In Distributed Computing Systems Workshops, 2004. Proceedings. 24th International Conference on, pages 756–761, 2004.

[5] Z. Fu, X. Meng, and S. Lu. A transport protocol for supporting multimedia streaming in mobile ad hoc networks. IEEE Journal on Selected Areas in Communications, 21(10):1615–1626, 2003.

[6] D. Katabi, M. Handley, and C. Rohrs. Congestion control for high bandwidth-delay product networks. In Proceedings of the 2002 SIGCOMM conference, volume 32, pages 89–102. ACM New York, NY, USA, 2002.

[7] D. Bansal, H. Balakrishnan, S. Floyd, and S. Shenker. Dynamic behavior of slowly-responsive congestion control algorithms. In Proceedings of the 2001 SIGCOMM conference, volume 31, pages 263–274. ACM New York, NY, USA, 2001.
[8] Y.R. Yang and S.S. Lam. General AIMD congestion control. In Proc. IEEE ICNP, pages 187–198, 2000.
[9] J. Postel. RFC 793: Transmission control protocol, 1981.

Authors Profile

Gopalakrishnan P received his B.tech degree in Information Technology Engineering from Kalasalingam University Virudhunagar, Tamil Nadu in 2011. Currently he purusing his M.E (Computer and communication) in Sethu Institute of Technology, Kariapatti, His research interests include Networking, NS2, and Data Mining.

Rajarajeswari S received her B.E degree in Computer Science Engineering from Raja College of Engineering, Madurai in2000.She has received her Master of Engineering from Rajalakshmi Engineering College, Chennai in the year 2006. Currently she is purusing her Ph.D., from Anna University Chennai and Now presently working as an Associate Professor in Sethu Institute of Technology, Kariapatti, Her research interests include Networking,NS2, Data Mining and Computer Networks.

Dr. J. Sutha graduated in Computer Science and engineering with first class in the year 1991 from Madurai Kamaraj University, obtained master degree in Computer Science Engineering with first class with distinction in the year 2000 from Madurai Kamaraj University, Madurai and completed Ph.D Program in Anna University, Chennai in the year 2008. Her field of specialization is Image Processing and Artificial Intelligence. She started her teaching career as Lecturer and now she is Professor and Head of Computer Science and Engineering of Sethu Institute of Technology, Madurai. She has written 5 books and published seven papers in International Journals, five papers in International conferences and twelve papers in national conferences.