TCP THROUGHPUT MODELING – A NEW APPROACH

Shivamurugan.C.[1], RamaSubbu.S.[2], SivaRamakrishnan.RI[3], Dinesh.P.[4]

U.Scholars, Department of ECE, Francis Xavier Engineering College, Tirunelveli[1,2,3,4]

Abstract: TCP is the most dominant transport protocol that serves as a basis for many other protocols in wired and wireless networks. Interoperability with the TCP-dominant wireless or wired network is often critical to some ad hoc network applications using IEEE 802.11. TCP suffers from poor bandwidth utilization, and the utility of TCP in the multihop IEEE 802.11 network has been questioned. The signal interference in this environment, causes channel noise, delay and congestion in transmission which in turn affects the TCP performance. Then, to address these problems, propose two complementary mechanisms are proposed, that is, the TCP fractional window increment (FeW) scheme and the Route-failure nOtification using BUlk-losS Trigger (ROBUST) policy. The TCP FeW scheme is a preventive solution used to reduce the congestion-driven wireless link loss. The ROBUST policy is a corrective solution that enables on-demand routing protocols to suppress overreactions induced by the aggressive TCP behavior.

Keywords: TCP Reno Scheme, multi hop technique, FeW scheme, ROBUST Policy

I. INTRODUCTION

An ad-hoc network is a wireless network formed by wireless nodes without any help of infrastructure. In such a network, the nodes are mobile and can communicate dynamically in an arbitrary manner. The network is characterized by the absence of central administration devices such as base stations or access points. Furthermore, nodes should be able to enter or to leave the network easily. In these networks, the nodes act as routers. They play an important role in the discovery and maintenance of the routes from the source to the destination or from a node to another one. This is the principal challenge to such a network. If link breakages occur, the network has to stay operational by building new routes. The main technique used is the multi-hopping which increase the overall network capacity and performances. By using multi-hopping, one node can deliver data on behalf of another one to a determined destination. Thus, the problem of range radio is solved.

In [1], Wireless multi hop ad-hoc networks are network systems that can be deployed without relying on any infrastructure such as base stations hence are mobile networks such networks causes packet losses due to congestion and transmission errors . Here a packet level Model is proposed to investigate the impact of channel errors on the TCP performance over IEEE- 802.11 based multi hop Wireless networks. A markov renewal approach is used to analyze the behavior of TCP – Vegas. The paper motivates and describes the three key techniques employed by Vegas, and presents the results of a comprehensive experimental performance study—using both simulations and measurements the model takes into account the different proportions between the interference range and transmission range and adopting more accurate and realistic analysis to the fast recovery process. The results show that the impact of the channel error is reduced significantly due to the packet retransmissions on a per-hop basis and a small bandwidth delay product of ad hoc networks.

In [2] The paper studies TCP performance over multihop wireless networks that use the IEEE 802.11 protocol as the access method. The analysis and simulations show that, given a specific network topology and flow patterns, there exists a TCP window size W, at which TCP achieves best throughput via improved spatial channel reuse. However, TCP does not operate around W, and typically grows its average window size much larger; this leads to decreased throughput and increased packet loss. The TCP throughput reduction can be explained by its loss behavior. The results show that network overload is mainly signified by wireless link contention in multihop wireless networks. As long as the buffer size at each node is reasonably large (say, larger than 10 packets), buffer overflow-induced packet loss is rare and packet drops due to link-layer contention dominates. Link-layer drops offer the first sign for network

overload. It is further showed that multi hop wireless links collectively exhibit graceful drop behavior: as the offered load increases, the link contention drop probability also increases, but saturates eventually.

In [3], Analysing TCP operation over 802.11 multi hop ad hoc networks involves a cross-layer study. The effect of congestion and MAC contention on the interaction between TCP and on-demand ad hoc routing protocol in the 802.11 ad hoc network is investigated. The study reveals several problems stemming from lack of coordination and sharing in such networks. It is observed that TCP induces the over-reaction of routing protocol and hurts the quality of end-to-end connection. So, one of the critical sources of lowering TCP throughput lies in the TCP window mechanism itself. To fix this problem, a fractional window increment (FeW) scheme is proposed for TCP to prevent the over-reaction of the on-demand routing protocol by limiting TCP's aggressiveness. The proposed scheme is applicable to a wide range of transport protocols using the basic TCP mechanism, and the protocol behavior is analytically tractable.

II. PROPOSED SYSTEM

A. TCP Fractional Window Increment

The congestion-driven link loss can be clearly distinguished from channel or mobility errors, the TCP behavior can be improved accordingly. However, this approach would require some side information from other layers (for example, the node movement trace and/or the physical signal measurement. The choose proper K and α values to control the TCP operation range while preserving the basic TCP window mechanism K = 0 and α = 1 provide the upper bound for the shifted TCP operation range. Thus, we have this curve has a lower loss rate than the curve with K = 0 with respect to a fixed window value. Proposed a new TCP regulation scheme that allows the TCP congestion window to grow by a fractional rate α <=1 (packets) at every round trip time. This is equivalent to adding one packet to the window size at every $1/α$ _ round-trip time. Suppose that the current congestion window size is W, the TCP sender sends W packets at every round-trip time and receives W ACKs during one round-trip time from the TCP receiver. At every ACK reception, the TCP sender updates W by,

$$W^{new} = W^{current} + α/W^{current} \qquad (1)$$

Since parameter α represents the growth rates of the TCP window W at every round-trip time we say that α represents the probe traffic of TCP. The probe traffic should be mild enough not to cause network instability yet aggressive enough to enable meaningful network feedback.

To achieve congestion avoidance in legacy, the TCP window increases by one packet at every round-trip time independent of the network capacity. For wired networks whose bandwidth delay products are in the order of hundreds or thousands of packets, the relative scale of the probing traffic is small. However, for IEEE 802.11 multi-hop networks that typically have a low bandwidth-delay product, this probing traffic may not be mild at all. For example, if the bandwidth-delay product of a network is equal to two packets, an increase of congestion window by one packet is equivalent to adding 50 percent of the total network capacity. We also allow a fractional window (that is, 0<W _ 1).

As well as W <= 1, without losing compatibility with legacy TCP. We interpret W <1 as sending one data packet at every RTT W. To implement this, a new internal timer is introduced to avoid the possible deadlock with TCP ACK clocking at W <1. For example, if W = 0:25, the next data transmission is scheduled in four RTT by the timer. When the timer expires, the packet is sent, and W is updated. A parameter Wmin can be introduced as the lower bound of W (that is, W >W min) to avoid a potential long idle period for a very small W. The TCP parameter ssthresh (slow-start threshold) also needs a lower bound (that is, ssthresh > ssthresh min, where 0 < ssthreshmin < 1) so that the TCP slow-start is not triggered when W is very small. In a network free from routing dynamics and instability. The TCP window mechanism can achieve a very low loss rate with a small average window if a proper value of α is chosen.

B. TCP Robust Policy

The ROBUST policy is a corrective solution that enables on-demand routing protocols to suppress overreactions induced by the aggressive TCP behavior. When a node is no longer available, the current route should be invalidated, and a new route should be established regardless of its cost.

C. Program testing

There are three ways to test a program

1. For correctness
2. For implementation, efficiency and
3. For Computations complex city.

Test for correctness is supposed to verify that a program does actually what it is designed to do. This is much more difficult than it may appear at first, especially for large programs. In Verification type, demonstration of the consistency, completeness and correctness of the software is carried out as it evolves through each development stage.

In Validation, demonstration is carried out that the finished

software system correctly meets user needs and requirements.

III. RESULTS AND DISCUSSION

Figure.1. show that grid topology of broad casting signal based on TCP congestion window and providing network stability. For minimal congestion the thirty nodes are incremented and this section TCP is formed as 42 nodes with the same 100m distance between them.
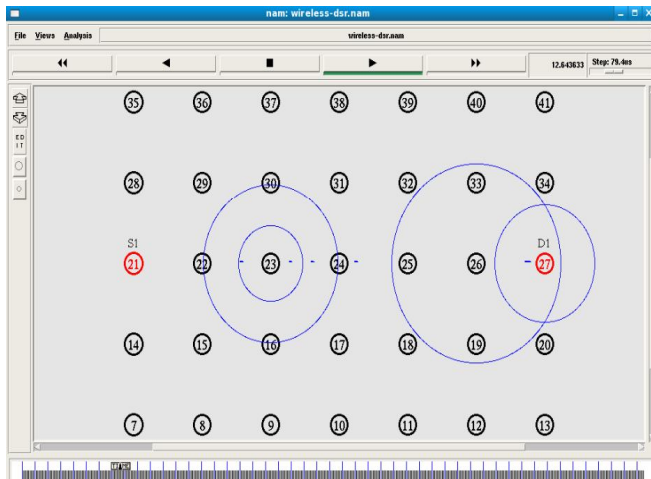

Figure.1. Grid Topology

Figure.2. shows that Dynamic route discovering through TCP congestion window and allocating resource to the windows growth factor.
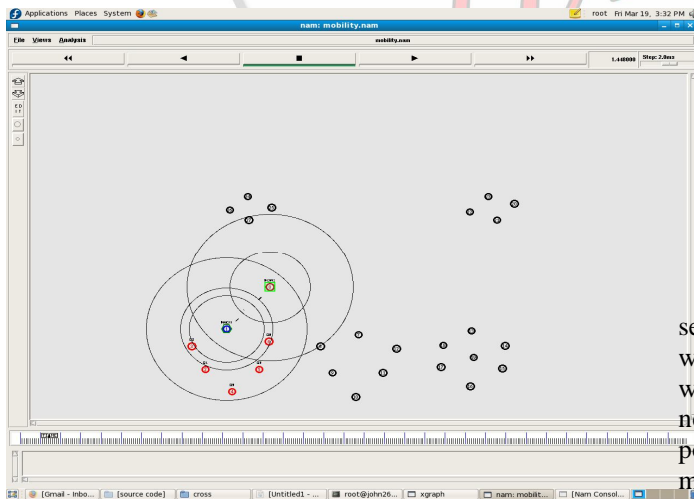

Figure.2. Mobility Topology

Figure.3. shows the performance of Bandwidth of TCP Reno with respect to SACK and Enhanced TCP Reno Scheme. Enhanced TCP Reno outsmarts previously used schemes
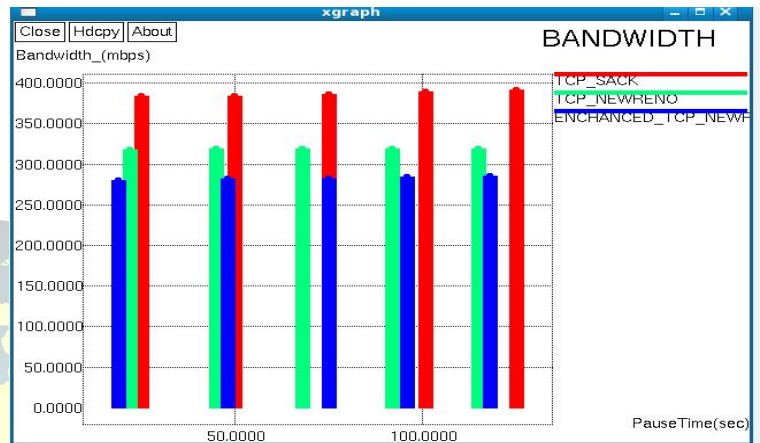

Figure.3. Bandwidth Performance

Figure.4. shows the improved performance of Enhanced TCP New Reno with respect to existing system with regards to Packet delivery ratio.
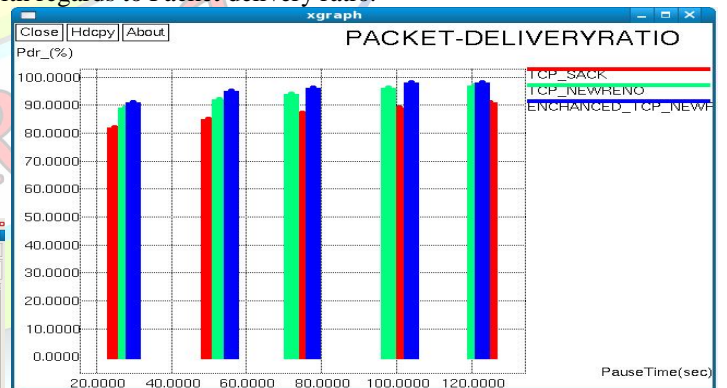

Figure.4. Packet Delivery Ratio

IV. CONCLUSION

TCP is the most dominant transport protocol that serves as a basis for many other protocols in wired and wireless networks. Interoperability with the TCP-dominant wireless or wired network is often critical to some ad hoc network applications using IEEE 802.11. TCP suffers from poor bandwidth utilization, and the utility of TCP in the multihop IEEE 802.11 network has been questioned. The signal interference in this environment, causes channel noise, delay and congestion in transmission which in turn

affects the TCP performance. Then, to address these problems, propose two complementary mechanisms are proposed, that is, the TCP fractional window increment (FeW) scheme and the Route-failure nOtification using BUlk-losS Trigger (ROBUST) policy. The TCP FeW scheme is a preventive solution used to reduce the congestion-driven wireless link loss. The ROBUST policy is a corrective solution that enables on-demand routing protocols to suppress overreactions induced by the aggressive TCP behavior.

REFERENCES

[1]. Yu.X, "Improving TCP Performance over Mobile Ad HocNetworks by Exploiting Cross-Layer Information Awareness," Proc. ACM MobiCom, 2011.

[2]. Fu.Z, P. Zerfos, H. Luo, S. Lu, L. Zhang, and M. Gerla, "The Impact of Multihop Wireless Channel on TCP Throughput and Loss," Proc. IEEE INFOCOM '10.

[3]. Nahm.K, Helmy.A, and Kuo.C.J, "TCP over Multihop 802.11 Networks: Issues and Performance Enhancement," Proc. ACM MobiHoc '10.

[4]. Liu and S. Singh.j "ATCP: TCP for Mobile Ad Hoc Networks," IEEE J. Selected Areas in Comm., vol. 19, no. 7, pp. 1300-1315, 2011.

[5]. Fu.Z, X. Meng, and S. Lu, "A Transport Protocol for Supportin g Multimedia Streaming in Mobile Ad Hoc Networks," IEEE J. Selected Areas in Comm., vol. 21, no. 10, pp. 1615-1626,2011.