International Journal of Scientific Engineering and Applied Science (IJSEAS) - Volume-1, Issue-4, July 2015
ISSN: 2395-3470
www.ijseas.com

AN ENHANCED ALGORITHM FOR CONGESTION CONTROL IN NETWORK COMMUNICATIONS

Srivani. T
M.Tech

I.Kavitha Jackleen
Assistant Professor

Department of CSE
Global College of Engineering and Technology
Kadapa, Andhra Pradesh, India
srivanimtechgcet@gmail.com

Abstarct:

As the web is relied upon to better backing numerous applications, for example, multimedia with limit bandwidth, new components are expected to control the clogging in the network. Active Queue Management (AQM) algorithm assume a critical part to guarantee the solidness of the Internet. Irregular Early Detection (RED) is the first dynamic line administration calculation proposed for organization in TCP/IP systems. RED has a few parameters tuning issues that should be precisely tended to for it to give great execution under diverse system situations. We propose another calculation called Enhanced Random Early Detection (ENRED). ENRED attempts to enhance these parameters to give better blockage control over the system while remaining the upside of RED. This paper will present ENRED and a few elements about RED and its variations. We simulate the proposed algorithm (ENRED) utilizing the java, by contrasting it with the first RED. Simulation results demonstrate that the proposed algorithm accomplishes preferred line measure over RED and reductions the delay and losses.

1. INTRODUCTION

Computers have encountered an unstable development in the course of recent years, that development cause clogging breakdown. At the point when this congestion happens execution will debase. Congestion control component is done in the transport layer [1, 2].

Transmission controlprotocol (TCP) is the most well known transport layer convention for the web. Because of different reasons, for example, multipath directing, course vacillating, and retransmissions, parcels fitting in with the same stream may touch base out of request destination. Such bundle reordering abuses the outline standards of some movement control system in TCP and, in this manner, postures execution issues [1].

TCP is an association arranged dependable convention. TCP is end-to-end blockage control where all the work is finished by transport layer. It is widely utilized as a part of the web, TCP utilizes various components to accomplish superior and keep away from congestion breakdown [1, 3, 4, 5]

In [1, 6], the creator examines the solidness issue of the normal line length of Transmission Control Protocol (TCP) model when associating with Random Early Detection (RED). The model utilized for study has demonstrated period multiplying bifurcation (PDB) in the normal line size at specific estimations of parameters when unique RED is conveyed. They embrace a delicate form of RED and new inferred RED calculation into the model to study the change in solidness of normal line measure in the framework.

In [1, 7], the creators break down the dynamic conduct of a solitary RED controlled line associating with an extensive populace of romanticized TCP sources. The total activity from this populace is displayed as far as the time ward expected estimation of the parcel landing rate which responds to the bundle misfortune attaching place in the line. The line is depicted regarding the time ward expected estimations of the queue length and exponentially average queue length.

TCP clogging control has been intended to guarantee web strength alongside reasonable and effective assignment of the system transfer speed. Blockage control characterizes the techniques for verifiably translating signs from the system all together for a sender to change its rate of transmission to keep a sender from overwhelming the limit of the network [1, 8].congestion control is assembled as disseminated components that avert clogging before happen or even uproot the blockage in the event that it happened [9].

The primary goal of congestion control components is to keep the system running really near to its evaluated limit, notwithstanding when confronted with compelling over-burden. These targets could be deciphered into two principle objectives, the first is to maintain a strategic distance from the event of network congestion before happen and break down the blockage if the congestion event can't be evaded. The second is to give a reasonable support of the diverse association, alongside backing different web application areas with assorted Quality of Service (QOS) necessities [1, 10].

For the most part, there are two approaches to execute blockage control: (1) Network associate congestion controls; they are methodology taken by switches [11, 12]. These methodologies utilize the switch line size to screen the blockage condition of the system. (2) End-to-End blockage controls; they are methodologies taken by the transmission control convention (TCP) and are generally accomplished in transport layer [12].

Dynamic Queue Management (AQM) [13] switches have been as of late proposed to bolster the End-to-End blockage control in the web. AQM is a dynamic methodology than Droptail the soonest specialist patterns to AQM as an answer for defeat the disadvantages of droptail system which let parcels drop if the line is shorter than the bundle most extreme size and concerned with the issue of worldwide synchronization which keep all senders stop transmission in the meantime and retransmission in the meantime [14]. AQM has been suggested by the Internet Engineering Task Force (IETF). It is a system in light of the accompanying schedule. The switch line first chips away at best exertion benefit by stamping or dropping the bundle before the line is full furthermore takes a shot at dodging worldwide synchronization [15].

The AQM calculations can be arranged by criteria on which the choice whether to drop parcels from the line or not. It has distinctive issues in this can be distinguished. To start with normal line length-based line administration (QM), Second parcel misfortune & join use based QM, Third class-based QM, fourth control hypothesis based QM [16, 17]. Where calculations can be delegated being either responsive or proactive, a receptive AQM calculation concentrates on clogging evasion, Congestion can happen for this situation, however it will be distinguished early and mitigate. Choices on moves to be made are in view of current blockage. A proactive AQM calculation concentrates on blockage aversion which known as open circle clogging control. For this situation it is attempts to forestall clogging before it happens [15, 16, 17].

This paper is organized as follow: Section 2 describes the Transmission Control Protocol (TCP). The RED algorithm and Evaluation of its variants are described in section 3. Our proposed algorithm is described in Section 4.The performance evaluation is shown in Section 5. Finally the paper is concluded in section 6.

2. TRANSMISSION CONTROL PROTOCOL (TCP)

Transmission Control Protocol (TCP) [18, 19, 20] is a solid, association arranged, end-to end, lapse free all together convention. A TCP association is a virtual circuit between two PCs, thoughtfully all that much like a phone association however with solid information transmission between them. A sending host isolates the information stream into fragments.

Every portion is marked with an unequivocal succession number to ensure requesting and dependability. At the point when the host gets in the sections succession, it sends an aggregate recognize (ACK) consequently, telling the sender that the majority of the former fragment's had been gotten. On the off chance that an out-of-arrangement section is gotten, the recipient sends an affirmation showing the succession number of the portion that was normal. On the off chance that extraordinary information is not recognized for a time of time, the sender will timeout and retransmits the unacknowledged portions.

3. RANDOM EARLYDETECTION (RED)

RED is the fundamental of the responsive class of AQM calculations, where it is keeps up the components of this class in accomplish the reasonableness between dynamic information stream from accessible data transmission, and it is a normal line length-based calculations. RED calculation takes its choice on regardless of whether to drop parcels from the line on the watched normal line length [15, 16, and 17]. RED is custom-made for TCP association crosswise over IP switches its intended to maintain a strategic distance from blockage, worldwide synchronization, and evasion of inclination against movement and bound overall line length to point of confinement deferral. RED is a line length that checks bundles with likelihood relative to the present normal line length, for every arriving parcel the normal line size is ascertained [14, 21, 23]. The normal line size is contrasted and the base limit and greatest edge to take its choice, at every arriving parcel if normal line size is not as much as least edge bundle is in line however in the event that normal line size is bigger than most extreme edge parcel stamped. Furthermore, if the normal line size is in the middle of least and greatest edge parcel is stamped with likelihood where it is a component of measured line length [14, 24]. So RED operation relies on upon figuring the normal line size utilizing the Exponential Weight Moving Average (EWMA) [16, 21, 22, 25], and ascertaining the bundle checking likelihood. Computation of qavg is completed utilizing the equation 1.

$$q_{avg}=(1-W_q)\ q_{avg}+W_q.q \qquad (1)$$

where q is the instantaneous queue length as observed at the router, and wq is the weightapplied by the low-pass filter to the old average queue size.

The beginning packetmarking likelihood pb is figured as a straight capacity of the normal line size. It has two noteworthy techniques to figure the last bundle stamping likelihood. The primary technique, when the normal line size is steady the quantity of arriving bundles between checked parcels is a geometric arbitrary variable. The second system the quantity of arriving parcels between stamped bundles is a uniform arbitrary variable[25]. After qavghas been ascertained, it is contrasted with two edge qualities, MINth and MAXth. At that point, the beginning bundle stamping likelihood is processed as indicated in the mathematical equation 2.

$$P_b = P_{max}(q_{avg} - MINth)/(MAXth - MINth) \qquad (2)$$

Where P***max*** is the maximum value for the probability of dropping packets ***pb***, achieved when the average queue size reaches the maximum threshold (***MAXth***).

RED has its own variants which tend to control average queuing delay, while still maintaining high link utilization, reducing packet drops, reducing global synchronization and burst connection [21, 25].

4. OUR PROPOSED ALGORITHM

Our proposed algorithm called Enhanced Random Early Detection (ENRED) aims to give better congestion control over the system while protecting the benefit of RED. The calculation relies on upon improvement of the normal line measure on a way that cutoff points line size to minimize the postponement and parcel misfortune rate when contrasted with RED line, as the ENRED attempts to make the line more steady. Normal line size estimation is occurring in the low pass channel in an exponential weighted moving normal (EWMA) as demonstrated in equation 1.

It relies on upon the line weight parameter (wq) (i.e., the line weight is controlled by the size and term of barges in line measure that are permitted at the door) considering the time steady of the low pass channel. The ENRED take another parameter adjacent to the wq which is called target line (qt) (i.e., the contrast between the present line size and the normal of the greatest edge and least limit). In the event that the objective line does not surpass the discriminating point which is before support overflow,ENRED can ascertain the normal line size as per the accompanying calculation:

Target = (MAXth + MINth) / 2;

Every qavg update:

for each arrival packet before the bufferoverflow

if (qavg< q(size) < critical(th))

qt =q – target;

qavg = qt (1- wq) + q. (qt -wq);

In our proposed (ENRED),the average queue sizeis calculated by the equation 3 that is the modification ofthe equation 1. By this equation, the performance is more enhanced than before.

$$q_{avg} = qt\ (1- w_q) + q.\ (qt - w_q) \qquad (3)$$

This paper shows the comparison between three algorithms: RED algorithm, ModRED algorithm and our proposal (ENRED) algorithm because RED is the main and original algorithm in this issue, and ModRED is a new algorithm which appeared in the past few years.

5. PERFORMANCEEVALUATION

5.1 Evaluation metrics

The evaluation metrics are: ***(1)Queue size***, which shows the periods of buffer underflow and overflow. ***(2)Delay***, is the required time of two way communication, it ranges within a very few microseconds, and can be measured as per packet transfer times. ***(3)Packet losses***, which refer to the number of dropping packets per unit of time. It may also be defined as the packets that are retransmitted again from the source because the packet is either corrupted or lost. ***(4)Congestion window*** is a flow control imposed by the receiver. The former is based on the sender's assessment of perceived network congestion and the latter related to the amount of available buffer space at receiver for this connection.

5.2 Simulation setup

The simulation is often used for understanding and prediction of behavior of protocols and data streams in the network. The results are obtained using java. The topology used 50 connections and bottleneck congestion. The bottleneck link bandwidth is 3 Mbps and the transmission time of data from sender to receiver is *100 ms* the gateway set ***wq***=0.002, minimum threshold=15, maximum threshold=45 and maxp=1/50. Table (1) shows the ENRED parameters.

Table 1: ENRED parameters

Bandwidth of bottleneck link	3 Mbps
Propagation delay of bottleneck link	100 ms
Packet size	1024 byte
Buffer size	100 packets

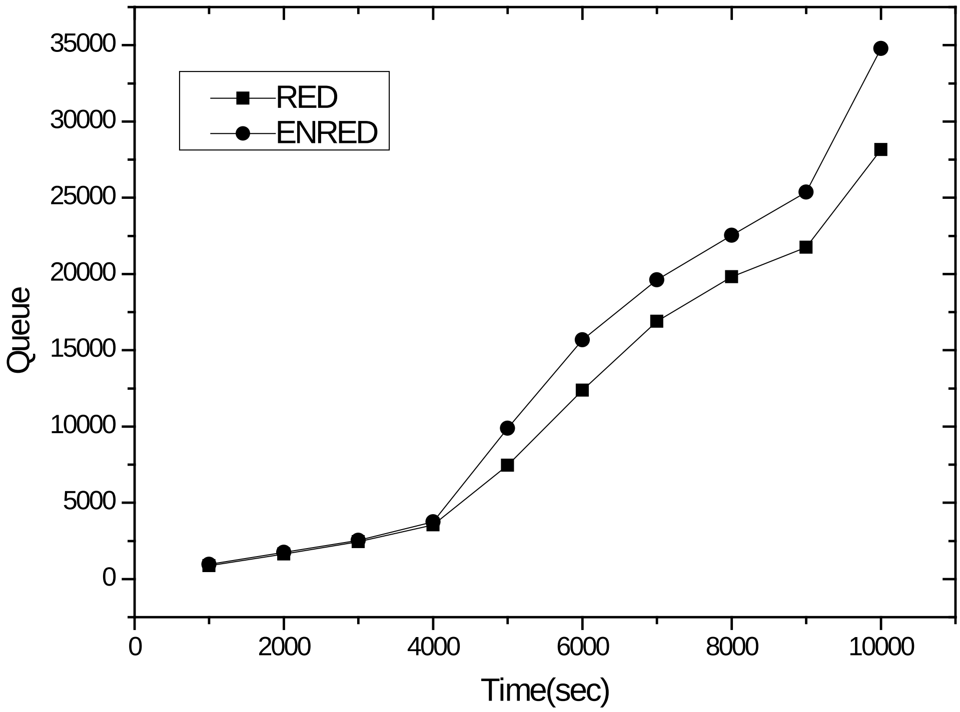

Figure 1: Packet delay in proposed Algorithm

Figure (1) shows the delay of packet in the queue for each algorithm, it is noted that ENRED achieves more predictable packet delay than others. This refers to achieving the stabilized queue size with target queue. Although the queue size of both RED and ENRED are approximately the same, but the packet delay in ENRED is less than that in RED because the congestion window is a little more in ENRED than that in RED.

6. Conclusion

This paper presented an outline about the clogging control component and focus on the RED algorithm and its variations and their properties of our proposed algorithm. The simulation results are identified with RED, ModRED, ENRED algorithms. It has proposed an improvement to existing RED algorithm called ENRED which does not oblige alteration to end framework. This plan serves to lessen the Queue size of the RED. ENRED results in little queue size which prompts less conestion rate.

References:

[1] Ayman EL-SAYED, Nawal EL-FESHAWY and Shimaa HAGAG, "A survey of Mechanisms for TCP Congestion control", The International Journal of Research and Reviews in Computer Science (IJRRCS'11),pp. 676-682, Vol.2,No.3, June 2011.

[2] M. Kalpanal and T. Purusothaman, "Performance Evaluation of Exponential TCP/IP Congestion Control Algorithm", International Journal of Computer Science and Network Security (IJCSNS), VOL.9 No.3, March 2009.

[3] Seifeddin Kadry, Issa Kamar, Ali KalaKech, Mohamed Smaili Robust, "TCP: An Improvement on TCP Protocol", Journal of Theoretical and Applied Information Technology 2005.

[4] Shimaa HAGGAG, Ayman EL-SAYED, "Enhanced TCP Westwood Congestion Avoidance Mechanism (TCP WestwoodNew)", International Journal of Computer Applications, vol. 45, No. 5, pp. 21-29, May 2012.

[5] P.Radhadevi, Ch.Srikanth, "Congestion Avoidance by TCP", International Journal of Computer Trends and Technology(IJCTT) –volume4, Issue6–June2013.

[6] Nga J.H.C., Iu H.H.C., Ling S.H., Lam H.K. "comparative study of stability in different TCP/RED models", Chaos, Solitons and Fractals, The interdisciplinary Journal of Nonlinear Science, and Nonequibrium and complex phenomena, Vol.37, Issue 4, August 2008, pp.977-987.

[7] P.Kuusela P. Lassila, J. Virtamo and P. Key, "Modeling RED with Idealized TCP Sources", 9th IFIP Conference on Performance Modeling and Evluation of ATM & IP network, 2001.

[8] S.H Low, F. Paganini, and J.C. Doyle, "Internet Congestion Control", IEEE Control Systems Magazine, FEB 2002, PP: 28-43.

[9] L.Yao-Nan, and H. Ho-Cheng, "A New TCP Congestion Control Mechanism over Wireless Ad Hoc Networks by Router-Assistant Approach", International Conference on Distrubuted Computing Systems, Jun 2007, PP: 84-84.

[10] S.Ryu, C.Rump, and C. Qiao, "advances In internet Congestion Control", IEEE Communications Surveys & Tutorials, Third Quarter, Vol.5(1), 2003, PP:28-39.

[11] C.Wanxiang, S. Peixin, and L.Zhenming, "Network-assisted congestion control", Info-tech&Info-net Iternational Conferences, Vol.2, JUN 2001, PP:28-32.

[12] K Fang-Chun, and X. Fu, "Probe-Aided MulTCP: an aggregate congestion control mechanism", ACM SIGCOMM Computer Communication Review, Vol.38 (1), JAN 2008, PP: 17-28.

[13] Andrzej Chydzinski, Agnieszka Brachman, “Performance of AQM Routers in the presence of New TCP Varints”, Advanced in Future Internet, International Conference on, PP. 88-93, 2010 Second International Conference on Advances in future Internet, 2010.

[14] Chengyu Zhu, O.W.W. Yang, J. Aweya, M. Ouellette, Montuno, A comparison of active queue management algorithms using the OPNET Modeler, Communications Magazine, IEEE, volume 40, Pages: 158 – 16, June 2002.

[15] Victor Firoiu, Marty Borden , A Study of Active Queue Management for Congestion Control, Nortel Networks, Billerica, MA, INFOCOM 2000, Nineteenth Annual Joint Conference of the IEEE Computer and Communications Societies Proceedings. IEEE, Volume 3, Pages: 1435 - 1444 vol.3, Mar 2000.

[16] Wu-chang Feng,“IMPROVING INTERNET CONGESTION CONTROL AND QUEUE MANAGEMENT ALGORITHMS”, A dissertation submitted in partial fulfillment of the requirements for the degree of Doctor of Philosophy, (Computer Science and Engineering) in The University of Michigan, 1999.

[17] G.A. Ramachandra, Reshma Banu and G.F.Ali Ahammed, Analyzing Marking Mod RED Active Queue Management Scheme on TCP applications, 2012 International Conference on Information and Network Technology (ICINT 2012) IPCSIT vol. 37 (2012) © (2012) IACSIT Press, Singapore.

[18] W.Boulevard, and A.way, “Transmission Control Protocol”, RFC 793, September 1981.

[19] V.Jacobson and M.J.Karels, “Congesion avoidance and control”, In ACM computer Communication Review; Proceeding of the Sigcomm’88 Symposium, volume 18, pages 314-329, Standford, CA,USA, Augut 1988.

[20] Hanaa A.Torkey, Gamal M. Attiya and I. Z. Morsi,”Performance Evaluation of End-to-End Congestion Control Protocols”, Menofiya Journal of Electronic Engineering Research (MJEER), Vol.18, No.2, PP. 99-118,July 2008.

[21] Jianyong Chen, Cunying Hu, and Zhen Ji , Self-Tuning Random Early Detection Algorithm to Improve Performance of Network Transmission, Hindawi Publishing Corporation Mathematical Problems in Engineering Volume, Article ID 872347, 17 pages doi:10.1155/2011/87234, 2011.

[22] G.F.Ali Ahmed, Reshma Banu, Analyzing the performance of Active Queue Management Algorithms, International journal of Computer Networks & Communications (IJCNC), Vol.2, No.2, March 2010.

[23] Chandra Himanshu, Agarwal Ajay, Velmurugan T, "Analysis of Active Queue Management Algorithms & Their Implementation for TCP/IP Networks Using OPNET Simulation Tool", International Journal of Computer Applications (IJCA), Vol. 6, Issue 11, Sept. 2010, pp. 12-15.

[24] S.Dijkstra, Modeling Active Queue Management algorithms using stochastic Petri Nets, Faculty of Electrical Engineering, Mathematical and Computer Science, University of Twente, December 14, 2004.

[25] S.Floyed, V.Jacobson, Random Early Detection gateways for congestion avoidance, IEEE/ACM Transactions on Networking August 1993.