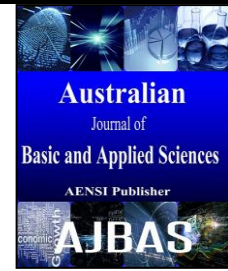




ISSN:1991-8178

Australian Journal of Basic and Applied Sciences

Journal home page: www.ajbasweb.com



Fuzzy Based Active Queue Management In Distributed Wireless Network.

B.Shajahan

Associate Professor / CSE, C.K.College of Engineering and Technology, Tamil Nadu,India

ARTICLE INFO

Article history:

Article Received 12 January 2015

Revised 1 May 2015

Accepted 8 May 2015

Keywords:

Fuzzy logic, congestion control,
Distributed wireless network, Network
simulator

ABSTRACT

In Distributed wireless network, this paper propose the traffic analysis for controlling the congestion, in which routers are associated with intelligent controllers to manage buffers and transfer packets for wired/wireless networks. By analyzing various existing traffic control protocols, which estimates auxiliary network parameters such as Packet loss ratio, Delivery rate and throughput for evaluating the performance of the network. The fuzzy logic based controller can measure the router queue size directly by using congestion control algorithm. The performance is measured in terms of the packet loss percentages, link utilization and queue size. The Quality of service is assured by the good performance of the fuzzy based controller using Target buffer Occupancy in network dynamics. In this new approach, the classical and fuzzy logic have been combined which provides better performance than various explicit traffic controllers using the network simulator.

© 2015 AENSI Publisher All rights reserved.

To Cite This Article: B.Shajahan., Fuzzy Based Active Queue Management In Distributed Wireless Network.. *Aust. J. Basic & Appl. Sci.*, 9(21): 79-85, 2015

INTRODUCTION

In a fast growing distributed wireless network, a practical resource allocation framework mutually optimizing the rate allocations in a weighted fair manner is adapted to manage the traffic. To avoid traffic in wireless network, it is necessary to have an effective network bandwidth management which does the process of identifying and classifying network parameters. It allows to visualize, organize and prioritize network traffic as per the requirements (Hangxing wua^[a] *et al.*, 1992-2000).

In most wireless internet applications such as Hypertext transfer protocol, email and transport control protocol (TCP) are widely used. In order to avoid congestion various scenarios has been proposed based on congestion window size, delay in bandwidth and wireless networks (Jingyuanwang *et al.*, 2011). The major challenge is to perform well across a wide spectrum of network conditions, i.e., buffer queue lengths is always positive values.

In wireless networks the major challenges is not properly distinguishing the congestion caused packet loss in network buffer and error caused loss with fading effects, which is addressed by variable structure congestion control protocol(VCP) (ongnao lu.shijie Zhang, 2009). In VCP a loss differentiation heuristic algorithm is used along with variety of congestion-control protocols.4.the downsides of XCP and VCP is overcome by

EFXCP which provides an excellence analysis with feedback delay for high bandwidth product networks. JetMax was able to overcome the zero packet loss, low overhead and admitted multi-link stability to efficiency and fairness by simple implementations (Yueping zhang, *et al.*).

The only drawback is for each access it requires a separate manipulation to process on priority queue. A Rate based congestion protocol works by sharing the processor and quick flow of completion but it becomes unstable in certain topologies and experience a very high buffering requirements at routers. (Jain, Loguinov, 2001) Proportional Integral Queue Independent RCP (PIQI-RCP), prove its stability under heterogeneous delay, and use ns2 simulation. The Queue management is the most important feature to the robustness and fairness of the internet. Many queue management algorithm are proposed namely self-adjustable choke to achieve both fairness and congestion control in the router. The RED algorithm combined with CHOKe algorithm's functionality are used for AQM schem, but in most of the case RED algorithm act as an implicit congestion controller which makes the managing process more complex.

Most of the explicit congestion control protocols have to estimate the bottleneck bandwidth in order to compute the allowed source sending rate. Recent survey show that problem of estimating link bandwidth (e.g., in link sharing networks or

wireless networks) may easily occur and can cause significant fairness and stability problems. They still have the basic problem of inaccurate estimation resulting in network performance degradation. In addition, their bandwidth probing speed may be too slow when the bandwidth is increased. Also, they cannot maintain the buffer queue size stable due to variation, it affects the stability of their sending rates.

The existing congestion control approaches have QoS (Quality of Service) problems in that they cannot guarantee a certain level of performance under some situations due to design drawback. The objective of this paper are: (1) To design a new rate-based explicit congestion controller based on FLC to avoid estimating link parameters such as such as Delivery rate, Packet loss ratio, and throughput for evaluating the performance of the network while remaining stable and robust to network. (2) Max-min fairness is used achieve a better bandwidth allocation and utilization. (3) To generate stable source throughput, maintain a acceptable network delay and achieve stable jitter performance by controlling the buffer queue size.

In order to achieve the above objectives, our new methodology pays attention to the existing protocols merits and techniques. Firstly we measure the source sending rate by calculating the various parameters of networks. Secondly, the controller maintains of the performances of existing system. Thirdly the Fuzzy system is used to design our proposed controller to form traffic management technique. Finally, we will employ the NS2 modeler to verify the effectiveness and superiority of our technique.

Fuzzy based controller has been considered for Intelligence system. In the existing scheme, this methodology is used to design robust systems that can contend with the common adverse synthesizing

factors such as (1) system nonlinearity, (2) parameter uncertainty, (3) measurement and modeling imprecision. In addition, fuzzy system provides a intelligence approach based on expert knowledge which is close to human decision making, and to model a complicated non-linear system. In addition, fuzzy logic control has been widely applied in industrial process control and showed extraordinary and mature control performance inaccuracy, transient response, robustness and stability. our contribution towards this paper is to develop a smooth mechanism that can generate the throughput and maintain the max-min fairness even under large network dynamics and also to ensure the effectiveness of explicit rate-based traffic management scheme.

Fuzzification is a process where crisp input values are transformed into membership values of the fuzzy sets. After the process of Fuzzification, the inference engine calculates the fuzzy output using the fuzzy rules. Defuzzification is a mathematical process used to convert the fuzzy output to a crisp value; that is, pd value in this case. There are various choices in the fuzzy inference engine and the defuzzification method. Based on these choices, several fuzzy systems can be constructed. In early stage, it was used to do rate control in ATM network, to guarantee the QoS. These control algorithms are explicit in nature, and they depend on absolute queue length (the maximum buffer size) instead of the TBO to adjust the allowed sending rate.

In early stage, it was used to do rate control in ATM network, to guarantee the QoS. These control algorithms are explicit in nature, and they depend on absolute queue length (the maximum buffer size) instead of the TBO to adjust the allowed sending rate.

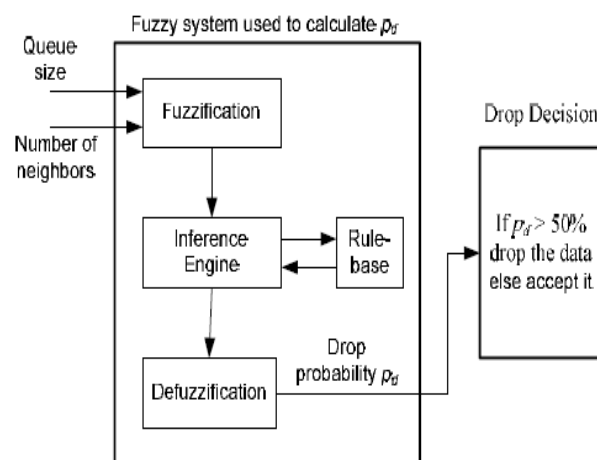


Fig. 1: Block Diagram for Fuzzy System

II. Proposed scheme:

In a distributed wireless networks, a router is

connected to two or more data lines from various networks. When a data packet comes in

any one of the lines, the router determine its exact destination by reads the address information in the packet. Then, information are updated in its routing table and policy, it directs the packet to the next network for the process of transmission. Routers perform the "traffic directing" functions on the Internet. A data packet is forwarded from one router to another through the networks that constitute the internetwork until it reaches its destination node. Congestion may occur when many flows navigate through the router and static in lower level of retrieving data. Since any router may become as bottleneck along the data transmission path, it should be able to fare the traffic. The following is the scheme of our new traffic management algorithm.

This forms a proactive scheme based on some prudent design ideas such that the performance problems and excessive resource consumption in routers due to estimating the network parameters could be overcome. The major goals of this paper is as follows. 1. To design a new rate-based explicit congestion controller based on FLC to avoid estimating link parameters such as link bandwidth, the number of flows, packet loss and network latency, while remaining stable and robust to network dynamics. 2. To provide max-min fairness to achieve an effective bandwidth allocation and utilization. 3. To generate relatively smooth source throughput, maintain a reasonable network delay and achieve stable jitter performance by controlling the queue size. 4. To demonstrate our controller has a better QoS performance through the analysis of various schemes.

We accomplish the transmission of data's with two routers. Inside the router, our intelligent controller acts as a rate based controller by measuring and monitoring the source sending rate by which we adopt the instantaneous queue size during the time of congestion. In order to tackle the traffic we follow the simple procedure where we calculating the incoming rate and outgoing rate of the corresponding router.

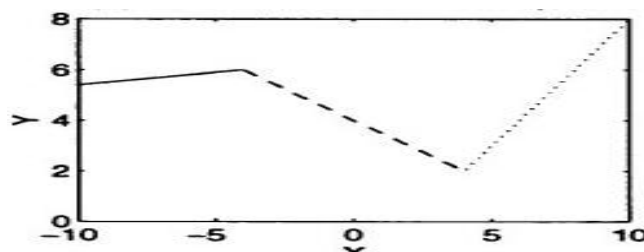
if suppose, the incoming rate value is greater

than the outgoing rate of that particular router (i.e., $i > o$), then congestion occurs. so here we apply our principle of calculating the rate of transmission. For instance, if the window size is 20 and outgoing rate is 10 then the window size will be reduced to 10 in order to smooth the higher data transmission. After the transmission of those data packets the windows size will be organized again to the normal form. The incoming rate value is stored in the Req_rate field within the router. Long-lived flows with infinitely long files are used to approximate the greedy behaviors of source when active.

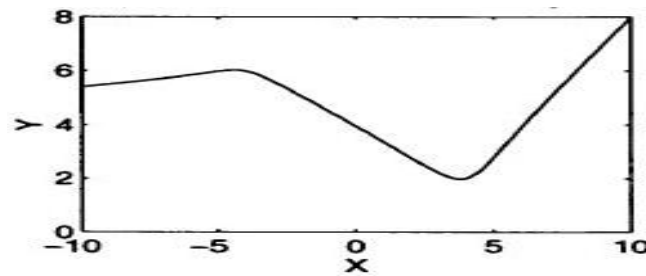
III. The Intelligent Controller Design:

In the wireless networks the interfaces of the access points are characterized by the discrepancy in channel capacity. This presents the significant bottleneck for traffic flowing from the one router to the router among the wireless network. Fuzzy logic congestion detection (FLCD) was proposed for IP networks and this algorithm synergistically combines the good characteristics of AQM and fuzzy logic based AQM algorithms (Nyirenda, C.N., D. Daward, 2007). The concept of fuzzy set I and logic of FLC were introduced in 1965 by Zadeh, and it was basically extended from two value logic to the continuous interval by adding the intermediate values between the 0 and 1. FLC is a non-linear mapping of input into output.

To analyze the good behavior and robustness of Fuzzy Rule Based Classification Systems to maintain the robustness when noise is present. We analyses compare a Fuzzy Rule Based Classification System, with respect to the crisp classification. From the results obtained it is possible to observe that Fuzzy Rule Based Classification Systems have a good tolerance, in comparison to the Crisp rules (Seas', Luengo. J, Herrera, 2011). The comparison is made between overall input and output which shows that fuzzy rules deals with approximation The parameter design issues and description of each module are discussed as follows.



A) Overall I/O curve for Crisp rules



B) Overall I/O curve for fuzzy rules

Fig. 2: Fuzzy versus crisp rules

A. Target buffer occupancy:

From the perspective of the queuing delay, the TBO value should be low values. This is especially true under the heavy traffic conditions when the queue is to be stabilized at TBO. Furthermore, too small TBOs may cause the link to become under-utilized momentarily after some flows finish their

transmissions in the networks. The residual packets in a small queue can be easily emptied before the sending rates of other flows are increased to fully utilize the accessible link bandwidth. That is the TBO should be chosen such that the network can have a reasonable queuing delay while maintaining good throughput and link utilization.

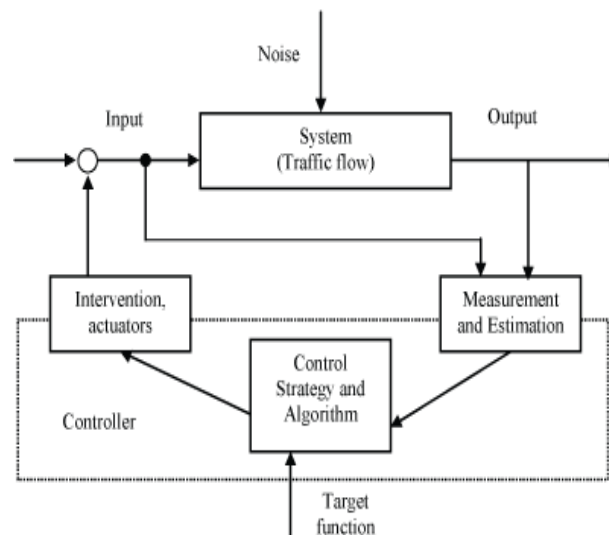


Fig. 3: The intelligent controller

In general we choose the value of $q_0=0$ as the extreme case. The controller requires to vacate the queue in whatever traffic conditions.

B. Buffer size allocation:

The determination of buffer size B is closely related to the chosen value of TBO. Although one can choose $B = q_0$, the smallest possible value, this is usually not desirable for the following two basic reasons: A controller usually has various steady state error issues, and it is unattainable that the queue size can be exactly pegged at TBO. The forceful traffic can sometimes cause a rush forward on the buffer queue size, e.g., due to a abrupt traffic swarm-in or an unexpected bandwidth reduction. The determination of buffer size B is closely related to the chosen value of TBO. Therefore, the B should be larger than the TBO.

Buffers minimize memory delays caused by variation in throughput between the pipeline and memory. There are two types of buffer design criteria. 1. Maximum rate for units that have high request rates. 2. Mean rate buffers for units that have a lower expected request rate

Buffer is sized to avoid "runout". In this case the processor stalls while the buffer is empty awaiting service. For I buffer, the buffer size (BF) should be $BF = 1 + [(Instrs\ decoded/\sim) * (IF\ latency\ in\ \sim)] / Instrs/IF$

Mean-Rate Buffer Design that use inequalities from statistics to target buffer size

- For infinite buffer, assume distribution of buffer occupancy is q and mean occupancy is Q
- Using Markov's inequality for buffer of size BF

$$\text{Prob of overflow} = p(q \geq BF) \leq Q/BF$$

- Using Chebyshev's inequality for buffer of size BF
- Prob of overflow = $p(q \geq BF) \leq s^2/(BF-Q)^2$
- for a given probability of overflow (p), conservatively select BF
 $BF = \min(Q/p, Q + s/p)$

Earlier controllers such as XCP, VCP and RCP have designed their buffer size according to the BDP, which means they require big buffers in the high BDP network.

C. Control procedure:

In this procedure, we need to include in the congestion header a new field called req_rate to carry the desired sending rate from the source and which will be continuously updated by the allowed sending rate when the packet passes each router. (1) The router extracts Req_rate from the congestion header of the packet. (2) Sample IQSize $q(t)$ and revise $e(t)$ and $g(e(t))$. (3) Compute the output $u(t)$ and compare it with Req_rate. (4) If an operation cycle d is over, update the crisp set output $u(t)$ and the output value D . Note that this procedure actually allows the router to perform the max-min fairness in that the greedy flows are always restricted to $u(t)$ by a router under heavy traffic conditions. When the packet arrives at the destination, the receiver extracts

the Req_rate from the header and records it into the ACK packet before sending it back to the source.

IV. Simulation Results And Evaluations:

In order to analyse the robustness of our traffic controller is done by considering multiple nodes and operates at an almost constant rate. The analysis process is simulated by NS2 with source sending rate as the major parameter. Two routers are considered. router 1 is used to perform the function of target buffer occupancy and buffer allocation while router 2 is accompanied with control procedures.

The analysis of our controller is done by considering following factors:

1) Queuing Delay is the waiting time of a packet and the router queue before its service.

2) Packet arrival ratio is calculated by dividing the number of packets received by the destination through the number of packets originated by the application layer of the source

3) Average packet delivery time from a source to a destination. First, for each source-destination pair, average delay for packet delivery is calculated.

4) The successful number of packets received by the destination is termed by Throughput and it is measured by bytes/sec. For varying number of nodes in network, Throughput is measured for different AQM schemes

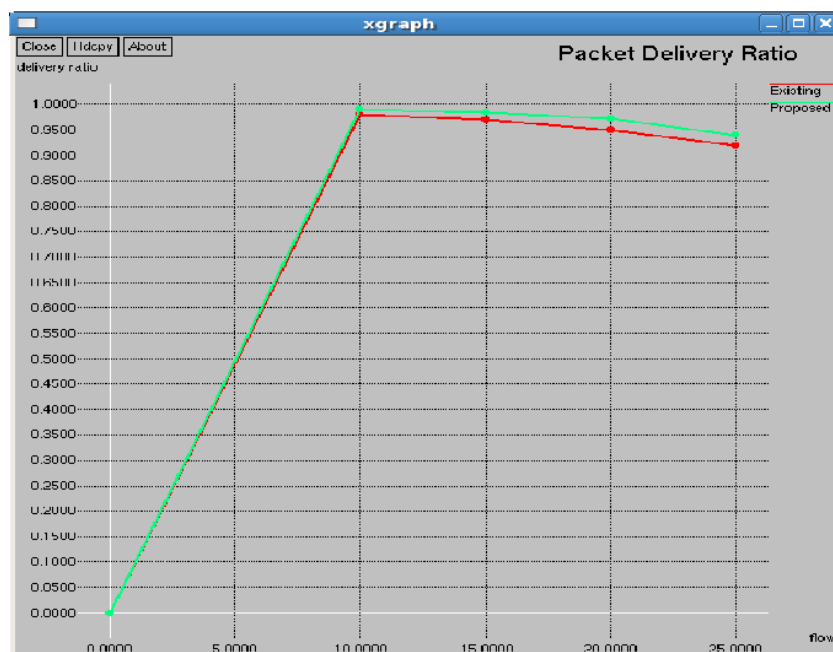


Fig. 4.2: Packet Delivery Ratio



Fig. 4.3: Packet arrival rate

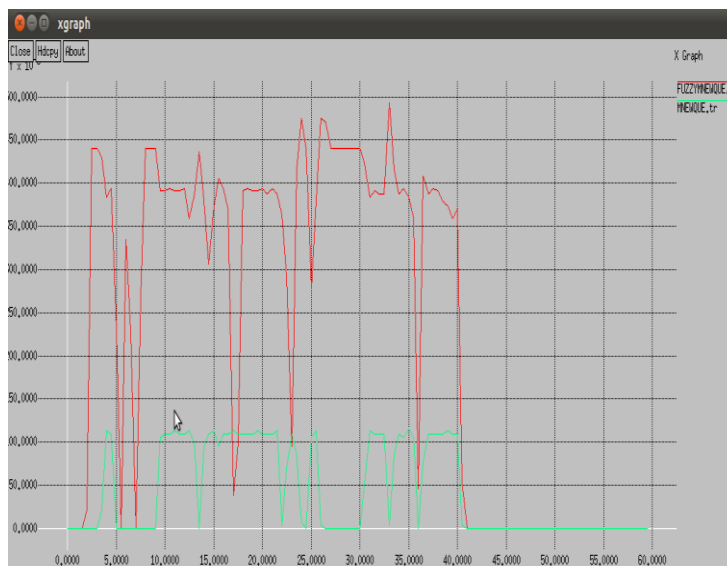


Fig. 4.4: Throughput

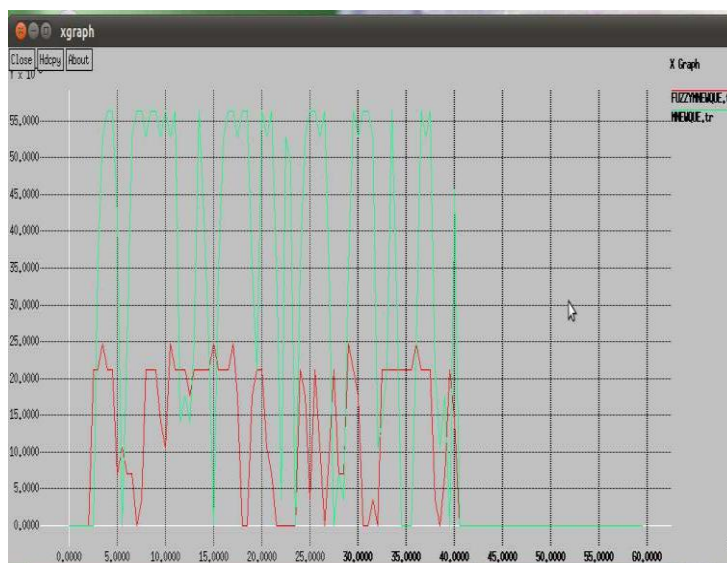


Fig. 4.5: Queuing delay

Conclusion:

A traffic management scheme has been proposed to manage the Internet congestion in order to assure the quality of service for different service applications. The controller is designed to overcome the disadvantages as well as the advantages of the existing Internet congestion control protocols. As a distributed operation in networks, the controller uses the instantaneous queue size alone to effectively throttle the source sending rate with max-min sprite. Unlike the existing explicit traffic control protocols that potentially suffer from performance problems or high router resource consumption due to the estimation of the network parameters, the controller can overcome those fundamental problems. To verify the effectiveness and superiority of the controller, extensive experiments have been conducted in NS2 modeler. In addition to the feature of the FLC being able to intelligently tackle the nonlinearity of the traffic management systems, the success of the controller is also attributed to the careful design of the fuzzy logic elements. Thus the controller has been developed to monitor the queue size of the network directly to control sending flow rate and achieve best performance in Internet traffics.

REFERENCES

- Jungang Liu and Oliver W.W. Yang, 2013. "using fuzzy logic control to provide Intelligent Traffic Management Service for High-Speed Networks", IEEE Trans. Netw. Service Manage., 10: 2.
- Hangxing wua^[a], fengyum Ren^[b], Wen Ping Pan^[c], Yadong Zhai^[d], 1992-2000."Analysis of efficient and fair explicit congestion control protocol with feedback delay: Stability and convergency", 33(16).
- Jingyuanwang, Jiangoowen, Junzhang, Yuxing Han, 2011. "TCP-FIT an improved TCP Congestion control algorithm and its Performance" pp: 2895-2902.
- Zongnao lu.shijie Zhang, 2009. "Stability Analysis of XCP congestion control system" pp: 1-6.
- Xialong li, yousef zocdeh, 2010. homayoun"Analysis, simulation and implementation of VCP A wireless profiling", pp: 1345-1358.
- Yueping zhang, Dark dleonard, Dmitrilognuinov"JetMax: Scalable max-min congestion control for high-speed hetrogenous".
- Jain, Loguinov, 2001. "PIQI: RCP Design and Analysis of Rate -Based Explicit Congestion Controller" pp: 10-20.
- Nyirenda, C.N., D. Daward, 2007. s"Fuzzy logic congestion control in IEEE 802.11 wireless local network: A performance evaluation"pp. 1-7.
- Seas', Luengo. J, Herrera, 2011."Fuzzy rule Based classification system versus crisp robust learners trained in presence of class noise's effects: A case of study"pp: 1229-1234.
- Dross, J. Shortle, Thompson, *et al.*, 2008. "Fundamentals of Queuing Theory "John Wiley & sons Inc.,
- Welzl, M., 2005. Network Congestion Control: Managing Internet Traffic. John Wiley & Sons Ltd.,
- Jain, R., 1996. "Congestion control and traffic management in ATM networks: recent advances and a survey," Computer Networks ISDN Syst., 28(13): 1723-1738.
- Jacobson, V., 1988. "Congestion avoidance and control," in Proc. SIGCOMM, pp: 314-329.
- Jacobson, V., 1990. "Modified TCP congestion avoidance algorithm.
- Ramakrishnan, K.K. and S. Floyd, 1999. "Proposals to add explicit congestion notification (ECN) to IP," RFC 2481.