Intelligent Traffic Controller for Network

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***Abstract*— In recent years the purpose of using internet increases enormously most specifically for communication field. Due to usage of internet increase traffic also increase. If the traffic increases the respond from the server gets delay. For this many algorithm has been implemented to reduce the traffic although these algorithm has their own shortcomings. This paper proposes to use fuzzy logic to reduce the traffic in the router. This logic calculates only the queue size of the router unlike other algorithm which calculates network parameter. The calculated queue size is used to calculate the allowed sending rate. Using this technology we reduce the memory used for calculating network parameter in other methods, due to less of memory used for calculating sending rate, the router becomes more efficient. This logic provides better performance thus it assures the Quality of Service. We can measure the efficiency of this proposed model using fuzzy logic controller.**

***Index Terms*— Congestion control, Fuzzy logic, Network traffic management.**

I. INTRODUCTION

Network traffic management used to avoid congestion and degradation in throughput-delay performance. When the load on network is greater than the capacity of the router bandwidth congestion occur in the network. Congestion control has to adapt the speed of transmission that match with end to end available capacity of the network router. High speed network offers bandwidth to control congestion with proper and efficient mechanism. Many protocols has been proposed to control congestion and begin made to use today's network traffic management. Two types of congestion control available explicit congestion control and implicit congestion control. In this study one of the application of fuzzy logic is used calculate optimum source sending rate. In the proposed system fuzzy logic is used to handle loosely defined input and provide the output suitable for application in proposed system. Queue size measured using fuzzy logic is given as input to the fuzzy logic controller. After processing it produces desire receiving rate of the router. Controller design provided by fuzzy logic is close to human decision making and also helps to model complicated non-liner system.

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II. PROPOSED SYSTEM

Consider a network interconnected by a number of distributed routers, this contains the core attached to the access routers that cooperate with core routers to enable end-to-end connection.

Congestion occurs when flow of traverse increase in the router and it cause the IQ Size (Instantaneous Queue Size) exceed the buffer capacity of the router it makes the bottleneck in the Internet. Any router can become bottleneck in end-to-end data path; each router must be able to manage its traffic.

Fuzzy logic is used in proposed system. This logic is widely used for industrial purpose. It provides mature control performance, accuracy and stability.

III. OPERATION PRINCIPLE

Distributed traffic controller in the router act as a data rate regulator by performing measuring and monitoring the IQ Size. Every host request the sending rate by using Req_rate field in the packet header. This field contains the value desired by host and this can be modified by any router on the route. Each router on the path compute the allowed source transmission rate according to its IQ size and compare this value to the value already in the Req_rate field. If the value computed is greater than the value already in the field , then the Req_rate field is updated with the new value by the router, otherwise it remains unchanged.

Once the packet reached the destination its Req_rate field contains the allowed sending date rate of the most congested router on the data path. If value contains in this field is lesser than the allowed sending rate of the source then the receiver send the value to the source along the ACK packet. If the value is more than the desired data rate of the source, then it sends the greater value via ACK packet. Based on the value presented in the ACK packet, the source update its Req_rate field. If the Req_rate field is not modified by any router in the data path specifies that all the routers allow the source to send the packets with its desired data rate. In order to perform the above condition need to implement the new controller in each router, for this a typical new router is modelled.

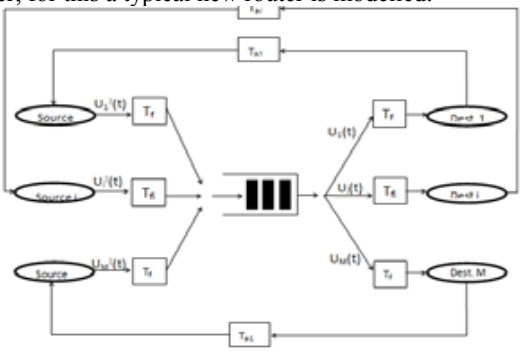

Fig.2.1.Router Model

From the fig.2.1. M number of sources sends their sending rate to their respective destination.For i=1,2,3,.....,M , Ui'(t) is the current data sending rate of the source i. Ui(t) is the sending rate of source i, computed by the routers in the end-to-end path; the time delay of a packet from source i to the router is denoted as Tfi1;the time delay of a packet of source i from router to the destination i is denoted by Tfi2.feedback delay is denoted as Tbi, it is send by the destination i to the source i. Round Trip Propagation delay (RTPD) is denoted by Tpi and is calculated by Tpi=Tfi1+Tfi2+Tbi.the source update the data rate U'(t) based on the value of Ui(t) with the consideration of other delays on the route (e.g., queuing delay) when the ACK received by the source after one RTT (Round Trip Time).

IV. THE CONTROLLER DESIGN

Fig 2.2. Shows the components of fuzzy logic traffic controller. These components are used to control the traffic in the network system. This controller is known as IntelRate controller, it is a Two Input Single Output controller. Target Buffer Occupancy (TBO) queue size q0.when the queue size level is q0>0 leads to congestion. The Queue size deviation is calculated by e(t)=q0-q(t).this queue size deviation is given as one of the input to the controller and other input is the processor speed. The output is denoted by y(t) and is calculated by y(t)=∑ui(t-Ti).During heavy traffic the controller compute the source allowed sending rate Ui(t),based on current IQ size. With is q(t) can be stabilized around q0.common parameter q(t) is measured by each router in order to complete the closed loop control.

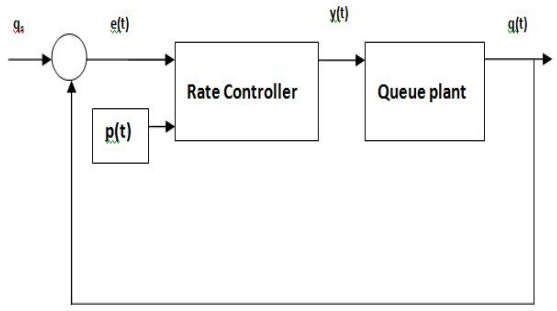

Fig. 2.2. Fuzzy Controller

The problem Definition

Need to produce the crisp output using router queue deviation (e(t)) and processing capacity of router(p(t)) as input. This output is assigned to rate of packet flow(r(t)).

V. LINGUISTIC VARIABLES

The crisp inputs e(t),g(e(t) and output u(t) are defined with linguistic variables. For this variables the below mentioned values can be assigned.

A. LV for Queue Deviation (e(t)):

a. Very Small denoted as (VS)
b. Small denoted as (SS)
c. Medium denoted as (MM)
d. Large denoted as (LL)
e. Very Large denoted as(VL)

B. LV for Processing Speed (p(t))

a. Low denoted as (LL)
b. Average denoted as (AA)
c. High denoted as (HH)

C. LV for Rate of Packet Flow(r(t))

a. Minimum denoted as (MI)
b. Optimum denoted as (OO)
c. Maximum denoted as (MX)

D. Fuzzy Set Description

Here, we define the fuzzy sets used to construct fuzzy values. Here, for making the design simple, we make following assumptions:
Maximum queue size is 3MB (3072 KB)
Processing speed of routers vary between 150MHz to 800MHz
Maximum Rate of packet flow is 1Mbps

VI. SIMULATION NETWORK DESIGN

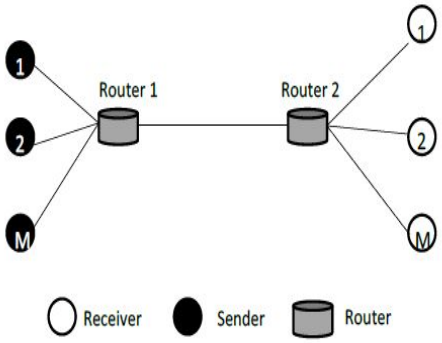

Fig.2.3. Simulator Network Design

The network consists of M senders and M destination for transmitting data in the network using two intermediary routers. Each router is configured to run the fuzzy algorithm than can handle network traffic efficiently. We use data collection tool in NS2 to run the proposed algorithm and collect the result .this result is compared with the existing traffic management technique.

CONCLUSION

The study propose a efficient traffic management in high speed network using fuzzy based technique. The scheme calculates the optimum packet transferring rate using two input such as router queue size and processing capacity of the router, so that network resources are efficiently utilized and congestion is avoided. This two input can be measured directly from the router node itself, so the scheme doesn't have any overhead of measuring network parameters like utilization, bottleneck, QoS, etc. The above technique measures the network parameters to calculate the data flow rate because of this the proposed scheme is attractive and efficient. Simulated networks are used to evaluate the performance, the result from the evaluation shows that the proposed system is effective in handling network traffic intelligently, it produces maximum throughput.

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