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Packet Loss Control Using Tokens

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Abstract- **The Internet accommodates simultaneous audio, video and data traffic. It requires the Internet to guarantee the packet loss which at its turn depends very much on congestion controls. A series of protocols have been introduced to supplement the insufficient TCP mechanism controlling the network congestion's. CSFQ was designed as an open-loop controller to provide the fair best effort service for supervising the per-flow bandwidth consumption and has become helpless when the P2P flows started to dominate the traffic of the Internet. Token-Based Congestion Control (TBCC) is based on a closed-loop congestion control principles, which restricts token resources consumed by an end-user and provides the fair best effort service with O(1) complexity. As Self Verifying Re-feedback and CSFQ, it experiences a heavy load by policing inter-domain traffic for lack of trusts. In this paper, Stable Token-Limited Congestion Control (STLCC) is introduced as new protocols which appends inter-domain congestion control to TBCC and make the congestion control system to be stable. STLCC is able to shape input and output traffic at the inter-domain link with O(1) complexity. STLCC produce a congestion index is pushes the packet loss to the network edge and improves the network performance. At last, the simple version of STLCC is introduced. This version is deployable in the Internet without any IP protocols modifications and preserves also the packet datagram.**

Index Terms—: **Congestion, Congestion control, token, TLCC, XCP, STLCC.**

I. INTRODUCTION

Modern IP network services provide for the simultaneous digital transmission of video, voice and data. These services require congestion control protocols and algorithms which can solve the packet loss parameter can be kept under control. Congestion control is the cornerstones of packet switching networks. It should prevent congestion collapse it provide fairness to competing flows and optimize transport performance indexes such as throughput, loss and delay. The literature abounds in papers on this subject; there are papers on high-level models of the flow of packets through the network, and on specific network architectures. Despite this vast literature, congestion control in telecommunication networks struggles with two major problems that are not completely solved. The first one is the time-varying delay between the control point and the traffic sources. The second one is related to the possibility that the traffic sources do not follow the feedback signal. This latter may happen because some sources are silent as they have nothing to transmit. Originally designed for a cooperative environment. It is still mainly dependent on the TCP congestion control algorithm at terminals, supplemented with load shedding [1] at congestion links. This model is called the Terminal Dependent Congestion Control case. Core-Stateless Fair Queuing (CSFQ) [3] set up an open- loop control system at the network layer, it inserts the label of the flow arrival rate onto the packet header at edge routers and drops the packet at core routers based on the rate label if congestion happens. CSFQ is first to achieve approximate fair bandwidth allocation among flows with O (1) complexity at core routers.

According to Cache Logic report, P2P traffic was 60% of all the Internet traffic in 2004, of which Bit-Torrent [4] was responsible for about 30% of the above, although the report generated quite a lot of discussions around the real numbers. In networks with P2P traffic, CSFQ can provide fairness to competing flow, but unfortunately it is not what end-users and operators really want. Token-Based Congestion Control (TBCC) [5] restricts the total token resource consumed by an end-user. So, no matter how many connections the end-user has set up, it cannot obtain extra bandwidth resources when TBCC is used.

II. RELATED WORKS

The basic idea behind RED queue management is to detect incipient congestion early and to convey congestion notification to the end-hosts, allowing them to reduce their transmission rates before queues in the network overflow and packets are dropped.

Flow Random Early Drop (FRED) is a modified version of RED, which uses per-active-flow accounting to make different dropping decisions for connections with different bandwidth usages. FRED only keeps track of flows that have packets in the buffer, thus the cost of FRED is proportional to the buffer size and independent of the total flow numbers. FRED can achieve the benefits of per-flow queuing and round-robin scheduling. Some other interesting features of FRED include:

(1) Penalizing non-adaptive flows by imposing a maximum number of buffered packets, and surpassing their share to average perflow buffer usage;

(2) Protecting fragile flows by deterministically accepting flows from low bandwidth connections;

(3) Providing fair sharing for large numbers of flows by using “two-packet buffer” when buffer is used up;

(4) Fixing several imperfections of RED by calculate average queue length at both packet arrival and departure (which also causes more overhead).

CSFQ was designed as an open-loop controller to provide the fair best effort service. CSFQ (Core Stateless fair Queuing) is a Queuing Technique used to achieve fair bandwidth allocation using differential packet dropping. The CSFQ architecture differentiates between edge and core nodes. The edge nodes performs per flow management, core nodes do not perform per flow management and therefore can be efficiently implemented at high speeds.

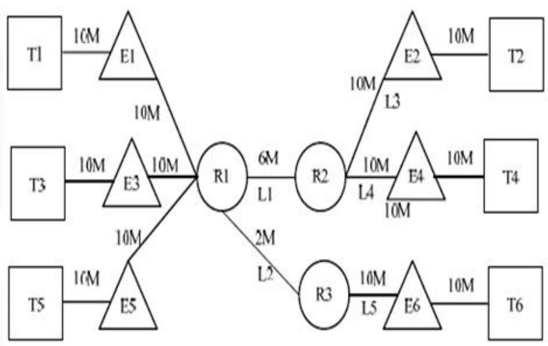

Fig.1 Fair defect of CSFQ

Token-Based Congestion Control (TBCC) is based on a closed-loop congestion control principle, which restricts token resources consumed by an end-user and provides the fair best effort service. Fairness of TBCC: for a bit-torrent application, with limited access resource, it can achieve better through put, but do not hurt the performance of networks.

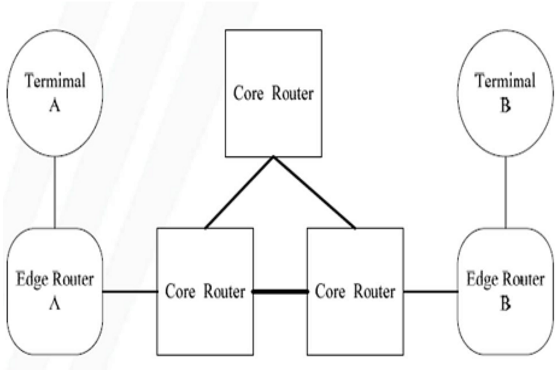

Fig. 2 Architecture of TBCC

III. PROPOSED METHODS

This logic can be implemented by assuming transmission of data between source and destination. Consider a multilayer network that consists of source, destination and routers. Whenever source sends data, the data can be transmitted over the network among routers in the form of packets [6]. A packet is a small piece of data sent over a computer network [1] and having an option field of the datagram.

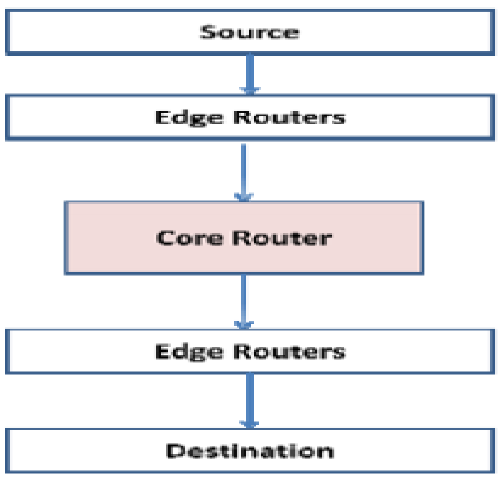

Fig.3 Architecture of Controlling Packet loss using tokens at the network edge

The router either may be Edge router or Core router. An Edge router is a device that routes data packets between one or more local area networks (LANs).A core router is a router that forwards packets to computer hosts within a network (but not between networks).The set of packets transmitted by the sender are forwarded to remaining routers with help of edge router. The edge router evaluates quality of service it can provide and writes this as value in the Option Field of the datagram of the packet and forwards the packet to core routers. This value is called as token. The path routers in the network read the token value and interpreted as its value. Based on the token number the edge router at the source minimizes the congestion on the path. The outgoing packet rate of the sender is controlled according to the algorithm of XCP. XCP allows the routers in the network to continuously adjust the sending speed of any participating hosts. These adjustments are done by changing the contents of the packets (XCP header) transferred between the sender and receiver. The feedbacks from routers are used by the sender to adjust the transfer speed to fit the routers current load. Because of this process and the congestion in the network is stable.

IV. CONCULSION

The architecture of Token-Based Congestion Control (TBCC), which provides fair bandwidth allocation to end-users in the same domain will be introduced. It evaluates two congestion control algorithms CSFQ and TBCC. In this STLCC is presented and the simulation is designed to demonstrate its validity. It presents the Unified Congestion Control Model which is the abstract model of STLCC, CSFQ and Re-feedback. Finally, conclusions will be given. To inter-connect two TBCC domains, then the interdomain router is added to the TBCC system. To support the SKA arrangements, the inter-domain router should limit its output token rate to the rate of the other domains and police the incoming token rate from peer domains.

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BIODATA

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