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Regulating Network Congestion Using Token Based Method with no Packet Loss at Congested Link

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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. The network congestion plays a major role in data communication. The performance of the network [13] will be improved by controlling packet loss using congestion control algorithm. 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 for controlling packet loss using tokens. It integrates TLCC [6] and XCP [7] algorithms. TLCC uses the iterative algorithm to estimate the congestion level of its output link and the output rate of the sender is controlled according to the algorithm of XCP, so there is almost no packet loss at the congested link. Thus STLCC can measure the congestion level analytically, allocate network resources [3] according to the access link, and further keep the congestion control system stable.

Keywords:

Congestion control, congestion, token, TLCC, XCP, STLCC.

I. INTRODUCTION:

Internet provides simultaneous audio, video, and data traffic. This is possible when the Internet guarantees the packet loss which depends very much on congestion control. A series of protocols have been introduced for controlling the network congestion [2]. Modern IP network services provide for the simultaneous digital transmission of voice, video, 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 therefore, the cornerstone of packet switching networks. It should prevent congestion collapse [9], provide fairness to competing flows and optimize [16] transport performance indexes such as throughput, delay and loss. In this paper the sections are organized as follows: Section 2 deals with challenges of the congestion system. Section 3 deals with the proposed work of the system, methodologies adapted to control the packet loss. Section 4 deals with the Implementation of the algorithms to the network to prevent congestion. Section 5 results describe how the entire architecture is laid out to prevent packet loss during load on network and Section 6 summarizes this work.

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II.CHALLENGES:

The sender sends the packets without intermediate station. The data packets loss happens when congestion occurs and when time is wasted. Retransmission of data packets is difficult because which takes more time and increases load on Network.

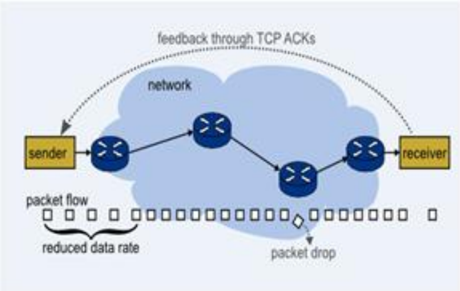

Fig: 1 Packet loss during Congestion

The major challenge is to control packet loss in the network.

III.PROPOSED WORK:

This paper proposes a solution by introducing a new protocol called STLCC (Stable Token Limited Congestion Control). It integrates the algorithms of TLCC [6] and XCP [7] altogether. In this new method the edge and the core routers will write a measure of the quality of service guaranteed by the router by writing a digital number in the Option Field of the datagram of the packet which is called a token. The token is read by the path routers and interpreted as its value will give a measure of the congestion especially at the edge routers. Based on the token number the edge router at the source reduces the congestion on the path [10]. The output 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. So, there is almost no packet loss at the congested link.

The STLCC can evaluate the congestion level analytically and allocate network resources according to the access link that further maintain the congestion control system stable. 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.

IV.IMPLEMENTATION

Network Congestion: Congestion occurs when the number of packets being transmitted through the network crosses the packet handling capacity of the networks. Congestion control aims to keep number of packets below the level at which performance falls off dramatically. 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 [8]. A packet is a small piece of data sent over a computer network [1] and having an option field of the datagram. The router either may be Edge router or Core router.

Stable Token Limit Congestion Control (STLCC):

STLCC is able to shape output and input traffic at the inter domain link with O(1) complexity. STLCC produce a congestion index, pushes the packet loss to network edge and improves the overall network performance. To solve the oscillation problems, the Stable Token-Limited Congestion Control (STLCC) is also introduced. It integrate the algorithms of TLCC and XCP [10] altogether. In STLCC, output rate of the sender is controlled using the algorithm of XCP, there is almost no packet lost at the congested link.

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At the same time, the edge router allocates all the access token resources to the incoming flow equally. When congestion happens, the incoming token rate increases at the core router, and the congestion level of the congested link will also increased as well. Thus STLCC can measure the congestion level analytically, and then allocates network resources according to the access links, and further keep the congestion control system stable.

Token:

A new and better mechanism for the congestion control with application to Packet Loss in networks with P2P traffic is proposed. In this method the edge and the core routers will write a measure of the quality of service guaranteed by the router by writing the digital number in the Option Field of the datagram of the packet. This is called as token. The token is read by the path routers and then interpreted as its value will give a measure of the congestion especially at the edge routers. Based on the token numbers, the edge router at the source, it reduces the congestion on the path.

Core Router:

A core router is a router designed to operate in the Internet Backbone (or core). To fulfill this role, a router must be able to support multiple telecommunications interfaces of the highest speed in use in the core Internet and must be able to forward the IP packets at full speed on all of them. It must also supports the routing protocols being used in the backbone. A core router is distinct from the edge routers.

Edge Router:

Edge routers sit at the edge of a backbone network and connect to the core routers. Then the token is read by the path routers and then interpret as its value will give a measure of the congestion especially at the edge routers. Based on the token number of the edge router at the source, it reduces the congestion on the path.

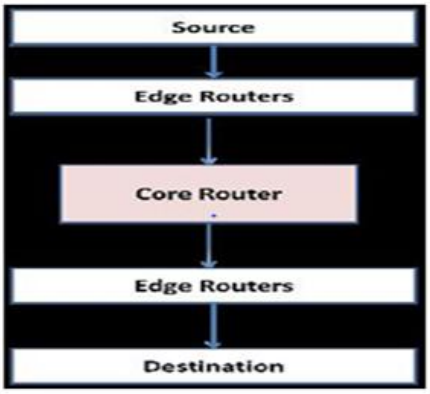

Fig: 2 System architecture of controlling packet loss at the network edge using tokens

V.RESULTS

This project results can be shown by creating classes to nodes, edge router and core router. Initially source node selects the file and transmits the file to another node through routers. The file is transmitted in the form of packets. Initially packets are forwarded to the edge router connected to the source. After receiving the first packet, edge router overwrites the source data rate with its current data rate in the option field of the datagram and gives the acknowledgement [4] to the source and forwards packet to other routers. When packets are transmitted with limited number of resources then packet is kept in waiting state that gives the result as negative acknowledgement to the source. After receiving negative acknowledgement [12] from the edge router, source adjust its current data rate .So, there is almost no packet loss at the congested link. This way of transmission will be done at each and every router and finally packets will be received by destination.

CONCLUSION:

The simple version of STLCC is proposed, which can be deployed on the current Internet. STLCC can evaluate congestion level [5] analytically and allocate network resources according to the access link that leads to stable congestion control system. The network with stable congestion control leads to the good performance and it will be possible to build a network with limited number of resources having fast transmission of data with accuracy and no delay.

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