An Efficient Routing Control of Packet Loss Using Tokens at the Network Edge

Deepika. G and Ravichand. K

Abstract : This paper discusses the use of link- sharing mechanisms in packet networks and present algorithms for hierarchical link-sharing. The Internet accomidates audio, video and data traffic. A series of protocols have been introduced to insufficient TCP mechanism controlling the network congestion. This paper presents Random Early Detection(RED) for gateways for congestion avidance in packet in witched networks. Core-Stateless Fair Queuing(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 principle,which restricts token resources consumed by an end –user and provides the fair best effort service with O(1) complexity.As Self-Verifying CSFQ and Re-feedback,it experiences a heavy load by policing inter-domain traffic for lack of trust.In this paper,Stable Token-Limited Congestion Control(STLCC) is introduced as new protocols which appends inter-domain congestion control to Token-Based Congestion Control(TBCC) and make the congestion control to be stable.STLCC is able to shape output and input traffic at the inter-domain link with O(1) complexity.The RED gateway has no bias against bursty traffic and avoids the global synchronization of many connections decreasing their window at the same time.Simulations of a TCP/IP network are used to illustrate the performance of RED gateways.

Keywords—P2P,Congestion Control,CSFQ,TBCC,Congestion-Index,TCP/IP.

1. Introduction

In high speed networks with connections with large delay-bandwidth products,gateways are likely to be designed with correspondingly large maximum queues to accommodate transient congestion.In the current Internet,the TCP transport protocol detects congestion only after a packet has been dropped at the gateway.In the last few years considerable effort has been expended on the design and omplementation of packet switching networks.A principle reason for developing such networks has been to facilitate the sharing of computer resources.

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In this paper, we study wheather the benefits of a network architecture that embraces rather than avoids widespread packet loss outweigh the potential loss in efficiency. We propose an alternative approach to Internet congestion control called decongestion control. However ,it would clearly be undesirable to have large queues that were full much of the time,this would significantly increase to average delay in the network.Therefore,with increasingly high speed networks,it is increasingly important to have mechanisms that keep throughput high but average queue sizes low.In the absence of explicit feedback from the gateway,there are a number of mexhanisms that have been proposed for transport-layer protocols to maintain high throughput and low delay in the networks.Some of these proposed mechanisms are designed to work with current gateways and congestion control while other mechanisms are coupled with gateway scheduling algorithms that require per-connection state in the gateway.end-to-end delay,as well as from packet drops or other methods,Nevertheless,the view of an individual connection is limited by the timescales of the connection,the traffic pattern of the connection,the lack of knowledge of the number of congested gateways,the possibilities of routing changes,as well as by other difficulties in distinguishing propagation delay from persistent queueing delay.The most effective detection of congestion can occur in the gateway itself.

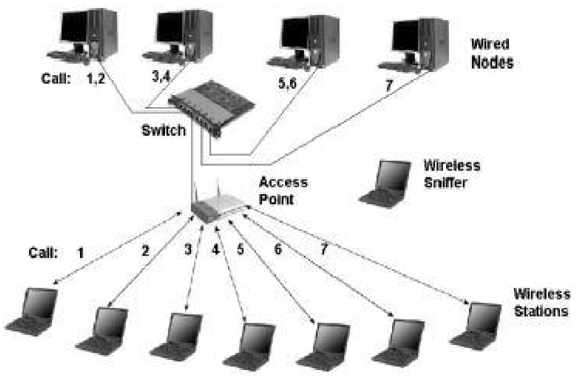


Fig1.1 System architecture

The gateway can reliably distinguish between propagation delay and persistent queueing delay.Only the gateway has a unified view of the queueing behavior over time,the persepective of individual connections is limited by the packet arrival patterns for those connections.Imn addition,a gateway is shared by many active connections with a wide range of roundtrip times, tolerances of delay ,throughtput requirements, etc. In a departure from traditional approaches, end hosts strive to transmit packets faster than the network can deliver them, leaveraging end-to-end erasure coding and in-network fairness enforcement. In this paper we present a protocol design and philosophy that supports the sharing of resources that exist in different packet switching networks. After a brief introduction to internetwork protocol issues, we describe the the function of a gateway as an interface between networks and discuss its role in the protocol. we can consider the various details of the protocol, including addressing, formatting, buffering. sequencing, flow control, error control, and so forth. A typical packet switching network is composed of a set of computer resource called HOSTS,a set of one or more packet switches, and a collecton of communication media that interconnect the packet switches. The ensemble of packet switches and communication media is called the packet switching subnet. In a packet switching subnet, data of a fixed maximum size are accepted from a source HOST, together with a formatted destination address which is used to route the data in a store and forward fashion.

2. Related Work

In this paper a new and better mechanism for congestion control with application to Packet Loss in networks with P2P traffic is proposed. In this new method the edge and the core routers will write a measure of the quality of services guaranteed by the router by writing a digital number in the Option Field of the datagram of the packet. This 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's edge point will shape the traffic generated by the source, thus reducing the congestion on the path. In Token –Limited Congestion Control(TLCC),the inter-domain router restricts the total output token rate to peer domains. When the output token rate exceeds the threshold,TLCC will decreases the Token-Level of output packets,and then the output token rate will decreases

Similarly to CSFQ and TBCC,TLCC uses also the iterative algorithm to estimate the congestion level of its output link,and requires a long period of time to reach a stable state.With band parameter configuration,TLCC may cause the traffic to fall into an oscillated process.The window size of TCP flows will always increase when acknowledge packets are received,and the congestion times many flows will lose their packets.Then,the link will be idle and the congestion level will decrease.The two steps may be repeated alternately,and then the congestion control system will never reach stability.

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 stable.Finally 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.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, provide fairness to competing flows and optimize transport performance indexes such as throughtput, delay and loss.

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.

Congestion control of the best-effort service in the Internet was originally designed for a cooperative environment. It is still mainly dependent on the TCP congestion control algorithm at terminals, supplemented with load shedding at congestion links, This model is called the Terminal dependent Congestion Control case.

3 Methodology

3.1 Random Early Detection (RED)

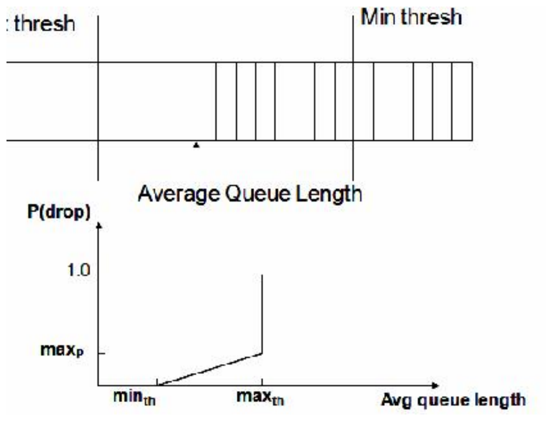
a. Detect incipient congestion

b. Assume hosts respond to lost packets

c. Aviod window synchronization

d. Randomly mark packets

e. Avoids bias against bursty traffic.



RED Algorithm

1 .Maintain running average of queue length

2 .If avg < min_{th} do nothing

3 .Low queuing,send packets through

4. If avg > max_{th},drop packet

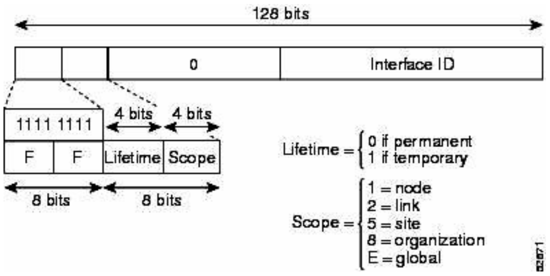
5. Protection from misbehaving sources

6. Else mark packet in a manner proportional to queue length

7 Notify sources of incipient congestion

Much of the thinking about process-to-process communication in packet switched network has been influenced by the ubiquitious telephone system.The host-host protocol for the Internet deals explicitly with the opening and closing of simplex connections between processes.

3.2 Transmisson Control Protocol (TCP)



Address format of TCP

A uniform internetwork TCP address space,understand by each GATEWAY and TCP,is essential to routing and delivery of internetwork packets.TCP addressing is intimately bound up in routings issues,since a HOST or GATEWAY must choose a suitable destination HOST or GATEWAY for an outgoing internetwork packet.

3.3 Stable Token-Limited Congestion Control (STLCC)

To solve the oscillation problem, the Stable Token-Limited Congestion Control (STLCC) is introduced. It integrates the algorithms of TLCC and Extended Copy Protection (XCP) altogether. In STLCC, the output rate of the sender is controlled according to the algorithm to XCP,so there is almost no packet lost at the congested link. At the same time, the edge router allocates all the access token resource to the incoming flows equally. When congestion happens, the incoming token rate increases at the core router, and then the congestion level of the congested link will also increase. Thus STLCC can measure the congestion level analytically, allocate network resources according to the access link, and further keep the congestion control system stable.

The architecture of Token-Based Congestion Control (TBCC),which provides fair bandwidth allocation to end-users in the same domain will be introduced. The two congestion control algorithms CSFQ and TBCC.The STLCC is presented and the simulation is designed to demonstrate its validity. The Unified Congestion Control model which is the abstract model of CSFQ,Re-feedback and STLCC,after that the simple version of STLCC is proposed which can deployed on the current Internet.

4. Conclusion

Improve TCP and stay with end-point only architecture enhance routers to help TCP and Random Early Discard(RED) with enhance routers to control traffic and Rate limiting. 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.

To limit the output token rate,three elements tkprev, tkdown and tkbackdown are inserted into the extended header tkhead.At the source edge router,the tkprev is set to the same value as the tklevel and cannot be modified by routers.Therefore the entire process is more stabilized in the previous version.One of the defects in this model is the use of static routing and the model can be improved by implementing dynamic routing.

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