Performance and Evaluation of Congestion Control and Routing Algorithm for Improving Internet Traffic Control System

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Abstract
With the development of multiple services in internet, the dominant internet congestion control scheme namely the TCP, end to end control[6] becomes insufficient. The RED algorithm to detect inefficient congestion early and to convey congestion notification to the end host, in order to allow them. To reduce their transmission rate before queue overflow and packet loss occur using active queue management[5]. Online mechanism for adaptively changing the parameters according to the observed traffic. This algorithm called adaptive RED. This paper also presents completely different architecture , which avoids congestion control[1][2] to prevent packet loss and regulate irrespective traffic in a uniform fashion. No peer flow state information is maintained in route while the fairness is guaranteed. The new architecture takes a node to node approach advocating close coordination among the core router , the edge router and the host. Employing both router and host mechanism, it has 3 main elements, the generic congestion control protocol(GCCP), the early congestion detector and the rate controller. The revised version of RED, called GCCP capable RED. Router and host shows it advantages over pure end to end control. This paper presents one specific algorithm for tolerating RED parameters to the input traffic.

Key words
Congestion control, Node to Node, Early congestion notification, Packet loss, Unresponsive traffic, Generic congestion control protocol, Random early detection.

1. Introduction

The main objective of this paper is to avoid congestion and to improve network performance and resource utilization. Random early detection and enhanced RED called adaptive RED algorithm under generic control. This architecture is called GCCA capable RED.

In the figure 1.1, the first link in the path is connected to the source. The last link in the path is connected to the destination. For all 1 , the one and one path first link in the path are connected to the same node. For the least cost path the sum of the cost of the link on the path is the minimum over all possible path between the source and destination.

Fig. 1.1

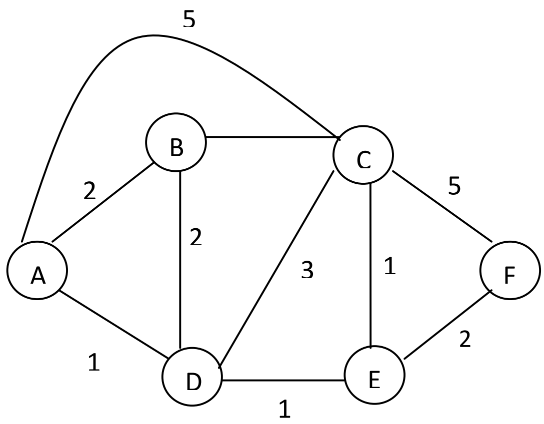


Fig 1.2

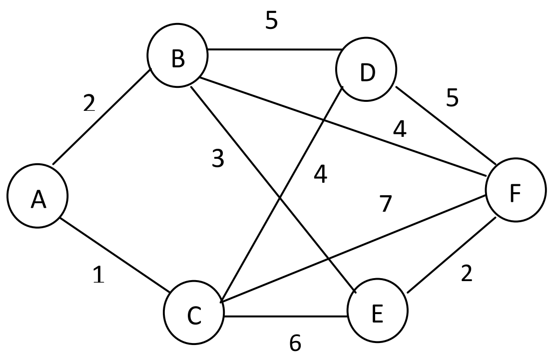
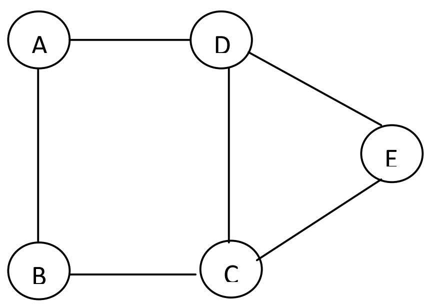


Fig. 1.3



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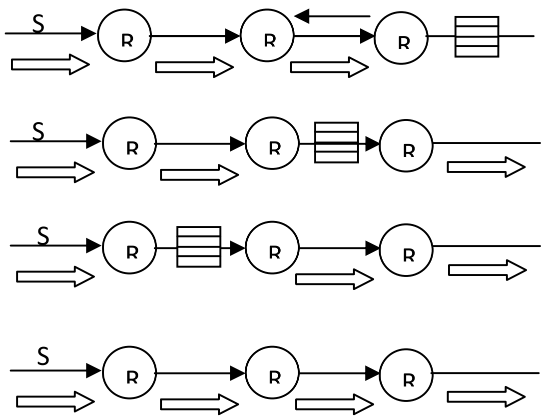
In the figure 1.2 and 1.3, the route selected are the cheapest one. In the case where there are the 2 routes both having the cheapest cost any one is chosen arbitrarily.

Fig 1.4



In figure 1.4 shows the higher throughput, and higher performance and lower the packets dropped and higher the performance

In order to enhance the performance of the RED algorithm, a new method is proposed. In this new method depending on the number of connections active the threshold values of average queue length are changed. This method is implemented under GCCA. The performance of this algorithm is compared with above methods. The main performance indicators considering here are average queue length throughput and the number of packet dropped. The higher the throughput and higher the performance and lower the packet dropped the performance. The system structure of GCCA is shown in diagram 1.1. Basic idea of GCCA into control congestion through coordination among network routers and end system rather than relying and end to end control. Control mechanism is decoupled from particular flows. Diagram 1.1 illustrates how GCCA works. A host S1 and S3 routers R1, R2, R3 of a sample network is shown.

2. Principles of internetworking

Provide a link between networks at minimum, a physical and link control connection is needed. Provision for the routing and delivery of the data between process on different network provide an accounting. Services that keeps track of the use of the various networks and routers and maintain status information. Provide the services just listed in such a way as not to require modifications to the network architecture of any of the constituent networks. Thus means that the internetworking facility must accommodate a number of differences among networks.

Intermediate systems are used to connect two or more networks, each intermediate system appears as a DTE to each of the networks to which it is attached. When DTE whishes to exchange data(a) with another data(b) , a logical connection is setup between them. This logical connection consists of the connection of sequences of logical connection across networks. The sequence such that, it forms a path from DTE(a) to DTE(b). The individual network logical connections are spliced together by IS's. Any traffic arriving to an IS as one logical connection is retransmitted on a second logical connection and vice versa.

Relaying – data units arriving from one network via the network layer protocol are relayed on another network. Traffic is over logical connection that are spliced together at the IS's.

Routing – When an end to end logical connection consists of a sequence of logical connections is to be setup in each IS in the sequence must make a routing decision that determine the next hop in the sequence. A connection less internet facility is flexible. It can deal with a variety of network source of which are themselves connectionless. In essence IP requires very little from the constituent networks.

3. Routing Principles

The first link in the path is connected to the source. The last link in the path is connected to the destination. For all I, the first link in the path are connected to the same node. For the least cost path, the sum of the cost of the link on the path is the min overall possible path between the source and the destination. Note that if all the links cost are the same, the least cost path is also the shortest path.

Routing matrix for the network

	A	B	C	D	E	F
A	-	B	C	C	E	B
B	A	-	A	D	E	E
C	A	A	-	D	E	F
D	C	B	C	-	F	F

E	B	B	C	F	-	F
F	E	E	C	D	E	-

Partial routing tables for node A,B, & E

Destination	Next node	Cost
B	B	2
C	C	1
D	C	5
E	B	5
F	B	7

Partial routing table for node A

Destination	Next Node	Cost
D	D	5
E	E	3
F	E	5

Partial routing table for node B

Destination	Next Node	Cost
F	F	2

Consider the route from A-F according to the matrix first row and six columns in node B is the first one in the cheapest route. The next node is determined by considered the route from B to F.

Centralized routing – Simple method because one location assume routing control

Distributed routing – Failure node or link has small effect in providing accurate routing information

Static routing – Simple method because node do not have to execute routing algorithm repeatedly

Adaptive routing – Provide the most current information regarding link cost

4. General Algorithm

a. The algorithm begins to build the tree by identifying its root. The root of each router tree is the router itself. The algorithm then attaches all nodes that can be reached from the root in other words all of the other neighbor nodes. Nodes and areas are temporarily in this step.

b. The algorithm compare the trees temporarily arcs and identifies the arc with the lowest cumulative cost. This arc and the node to which it connects are now a permanent part of the shortest path tree.

c. The algorithm examines the database and identifies every node that can be reached from its chosen nodes. These nodes and their arc's are added temporarily to the tree

d. The step 2 and 3 are repeated until every node in the network has become a permanent part of the tree. The only permanent arc's are those that represent the shortest route to every node.

5. Protocol functions

Fragmentation and reassembly – This concern the transfer of user messages across network subnet which support smaller packet size than the user data

Routing – To perform the routing function , the IP in each source host must to know the location of the internet gateway or local router i.e. attached to the same network or subnet. Also the IP in each gateway must know the route to be followed to each other networks or subnets

Error reporting – When routing or reassembling datagram within a host or gateway the IP may discard some datagram. This function is concerned with reporting functions

6. Congestion control approach and its methods.

It is important to avoid high packet loss rates in the internet. When a packet is decoupled before it reaches to the determination , all of the resources it has consumed in transmit or worked. In extreme cases, this situation can lead to congestion collapse loss rates are especially high during times of heavy congestion[2]. So detection of congestion before it occur avoids above problem. In this section different congestion algorithm are explained.

7. Active queue management

This idea behind active queue management [6] is to detect incipient congestion early and to convey congestion notification to the end hosts , in order to allow them to reduce their transmission rates before queue overflow and packet loss occurs. One form of active queue management being proposed by the IETF for deployment in the network is RED[4]. RED maintains an exponentially weighted moving average (EWMA) of the queue length which is user to detect congestion. RED detection increase in the average queue length and uses it to determine whether or not to duplicate or ECN mark a packet.

i) RED algorithm

```
Every q(ave) update:
        if(min < q(ave < max))
                Status = between;
        if q(ave) < min && status!=  below)
                Status = below;
                Max = max/∞;
if (q(ave < max) status! = above)
                Status = above;
                Max = max/    ;
```

ii) GCCA capable RED algorithm

```
  GCCP-capable RED
  for each packet arrival
  Calculate the instantaneous queue
   increment inc
        if inc > st
                Send a GCCP congestion message
                Set status as congestion
    return
Calculate average size queue size average
        if min <= avg < max
  Calculate probability pb with    probability p

        Send a GCCP congestion message
        Set status as congestion
        elseif  max<= avg
                Send a GCCP congestion message
                Set status as congestion
                elseif avg <= min
                if status is congestion
                        Send a GCCP
                        normal message
                        Set status as normal
                        return
```

iii) Proposed algorithm

```
   GCCP capable RED
   For each packet arrival
   Calculate the instantaneous queue
   increment inc
        if inc > st
                Send a GCCP congestion
                message
                Set status as congestion
                return
        Calculate the average queue size
        avg
        if min < = avg < max
                Calculate probability p;
                Send a GCCP congestion
                message
                Set status as congestion
        else if max < = avg
                Send a GCCP congestion
                message set status as
                congestion
        else if avg < = min
                if status is congestion
                Send a GCCP normal
                message
                Set status as normal
        return
```

8. Discussion and results

It is focused on solving 2 extremely important challenges today internet. Supporting on explosion in the number of user and supporting a myriad of new applications which require more out of the network than the best effort service that the internet currently provides. To this end a number of modifications to the basic congestion and queue management algorithm of the internet have been examined. GCCA is for the time scale from one to several hops. It is used to prevent packet loss. The end to end control is for the time scale from one to several round trips. It reduces the source rates and eliminates the danger of congestion completely.

9. Implementation and results

Max sending rate of sender
Max sending rate of sender 1 = 32 MBPS
Max sending rate of sender 2 = 32 MBPS
Max sending rate of sender 3 = 32 MBPS
Max sending rate of routers
Max sending rate of router 1 = 40 MBPS
Max sending rate of router 2 = 40 MBPS
Services 1 -> Adaptive RED
Services 2 -> GCCA-RED
Max queue size at routers
Max queue size at router1 = 30 MBPS
Max queue size at router2 = 30 MBPS
Services3->proposed-algorithm

Further enhancements

Additional ways for improving end host congestion control algorithm are also being examined. While bandwidth based increases to provide end host with an upper bound an how aggressively they can ramp up their sending rate more slowly or not at all when nearing the congestion point in order to avoid oscillation inherent in TCP winding algorithm[2] incorporating such techniques into the bandwidth based increase algorithm are being explored

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