Congestion Management scheme: One scheme or Many?

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Abstract
Computer communication networks have explosive growth over past few years and with the growth have come severe congestion problem. The greater variety of application sharing the network will have to satisfy variety of performance criteria. Many people have proposed different scheme. Proponent of congestion management scheme claim that their scheme is better than the all existing scheme. In this paper we proposed the solution which is combine approach.

1 INTRODUCTION
Congestion management in high speed networks is currently hotly debatable topic.

Applications decide the way of transaction. As it stands today high speed technology is used in local area network which are interconnected via slow wide area network. The argument that favors this set up is that network traffic is highly local. The traffic traveling between the sub-networks is considerably less than the traffic on the sub-network itself.

The slow speed of WANs is the result of the un availability of high speed WANs. The congestion results because the nodes on subnet are capable of high speed communication and when two nodes of different sub-networks communicate, the traffic coming into the backbone needs to processed at high speed.

There are also some economic reasons for high speed backbones. High speed links are more expensive than low-speed links. Since expensive resources are generally shared, the higher the expenses, the greater the sharing .Thus high speed link will be share by a large number of nodes on low speed subnets.

The speed of individual resources do not have to be same. The speed of some sources may be lesssthan some gigabytes but the switches ,bridges, routers, gateways, and other shared resources have to be capable of handling GBPS .

The greater variety of applications sharing the network implies that the network will have to satisfy a variety of performance criteria. The application like voice and video are delay sensitive, but loss insensitive .Still others, such as interactive graphics are delay sensitive and loss insensitive and application like electronic mail and file transfer are having similar type of properties.

Today's telecommunication and computer network have primarily been designed bin isolation. The telecommunication networks have been designed for applications with predictable bandwidth requirement and the users are charged for bandwidth. The computer networks are used and designed for sharing of bandwidth.

The higher the speed the more heterogeneous the traffic. The future network will carry data, voice, video, and other multimedia traffic .Any scheme that distinguishes from sources but treats all applications identically will not be helpful.

Proponents of congestion management schemes claim that their scheme is better than all existing schemes and theirs is all that is required. This is unfortunately is not true. This paper takes a somewhat devilish view, pointing out weaknesses in several of the ideas that have been recently proposed. The view should not be taken to mean that these ideas are not worth of pursuit. The purpose is to present both sides of issues, permitting and objective comparison of the alternatives.

2 WINDOW OR RATE CONTROL?
The flow controls utilizing window mechanisms are used in almost all existing computer networking architecture, including TCP/IP,DNA,OSI, and SNA. A rate base resource allocation is common in telecommunication network where each connection has a specific bandwidth assignment .Recently, several protocols with rate based flow control have been proposed for computer networks. In this approach the destination nodes specifies the maximum rate at which sources can send packets.

The essence of this argument is that rate –based controls require a connection oriented approach. Implementing the rate based controls in connectionless network is difficult. ,In connection oriented network, if there are bridges that are not involved in flow control decisions ,but get congested ,rate based controls are difficult to enforce. Window based control on the other hand, can be applied end to end, hop-by-hop, or using both. In the end-to-end version, the intermediate system do not have to be informed about the window size set by destination.

This discussion of window –based versus rate base controls can be summarized as below.

TR 1: Window-based Control versus Rate-based Control

	Window-based	Rate-based
Control	Window (W)	Number of packets (n), and Time interval (T)
Effective rate	$\frac{\text{Window}}{\text{Round-trip delay}}$	$\frac{n}{T}$
Required if	Memory is the bottleneck	Processor, link, or other devices are bottlenecks
Maximum queue Length	Limited to sum of windows	Bo limit
Burstiness	Results in bursty traffic	Not bursty at the source
Control span	End-to-end, hop-by-hop, or both	Hop-by-hop
Network layer	Connectionless or connection-oriented	Connection-oriented

TR 2: Router-based versus Source-based Controls

	Router-based	Source-based
Examples	Random drop Fair queueing Backpressure	Dynamic window Slow-start DECbit
Delay	Noon	Feedback delay
Feedback Overhead	Noon	Feedback messages or bits
Overhead in	Routers	Sources
Required if	No control over sources	Longer overloads
Fairness	Achievable	Not guaranteed
Overload duration	Shrort	Greater than feedback delay

3 OPEN-LOOP OR FEEDBACK?

Many of the old congestion management schemes are closed loop schemes in the sense that congested resources send a feedback signal to the source of traffic, which then adjust the traffic level .It has been found by many people that such schemes are too slow since by the time a source gets feedback and reacts to it, several thousand packets may have been lost. This has led to the development of several open loop approaches that do not require feedback. Router based controls, prior reservation and backpressure are the example of open loop schemes. The relative merits of these schemes are as discussed in next sections.

3.1 Router-based or Source based controls?

In many congestion management schemes router send a feedback signal to the sources which will initiate remedial control action increasing or decreasing the load. The examples of this type of control are slow start[18],CUTE[19],DECbit[20] and the Q-bit[14] scheme.

The router based controls do not suffer from the problems like source –based as they evenly distribute their resources without relying on sources. The examples of router based controls are random drop policy[15],fair queing [16] and backpressure.

To summarize, in the router-based versus source–based debate, router-based controls are required for fairness and work under short –duration overloads. Whereas source based controls are required for longer overloads. This summarization in tabular form is given as below.

3.2 Backpressures

Backpressure is data link- level mechanism. A data-link level mechanism has shorter feedback loop than the transport-level mechanism. It is of the form of hop-by-hop, on-off flow control. Congested router sends “transmission-of” signal to neighboring routers (or sources) and accepting further packets until their queue reduce .When the load reduces, a “transmission on” signal is sent and packet flow resumes.

For long duration overload, the backpressure is more effective in small network than the network with larger diameters. This is because in small networks, sources are close to the routers and the backpressure signal reaches the source quickly.

Backpressure should only be used for short-duration overloads after which the pressure should be removed. For long duration overloads this method should be supplemented by a transport level or network access level control scheme.

4 PRIOR -RESERVATION OR WALK-IN?

Network users prefer reservations if they want bandwidth or delay guarantees which difficult to achieve with walk in service. Reservation also makes resource management easier since the demands and capacities are known in advance. With Walk in service the resource management problem is dynamic and rather difficult. The reservation scheme is not suitable for highly dynamic situation. Reservation versus walk in concept can be compared as below in table R3

Reservation is good for long steady session walk in-service is required for short bursty traffic.

Table 3: Reservation versus Wall-in

	Reservation	Walk-in
Guarantees	Guaranteed bandwidth and/or delay	Varying bandwidth or delay
Resource Management	Easy	Difficult
Unused Resources	Wasted	Can be used by other sources
Good for	Steady traffic (Voice/Video)	Bursty traffic. (Data)
Setup	Setup required → Good for long sessions	No setup required → Good for short sessions
State	More state → Less dynamic	No state → More dynamic

5 CONCLUSION AND FUTURE WORK

The type of scheme needed depends upon the duration of overload. The longer the duration ,the higher the layer at which control should be exercised. If the congestion is permanent, the installation of additional link or high speed links are required. If congestion lasts for session duration, a session level control is more appropriate. If congestion lasts for several round trip delays the transport level controls are more effective. The combined approach requires a leaky bucket algorithm for normal operation, a source base control for packet loss, and session denial for longer term congestion.

High –speed links of the future will be shared by many more sources and applications than the links of today. As a result the higher the speed the more heterogeneous is traffic. Another related issue is that multiple competing scheme at the same level.

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