



## Intelligent Congestion Control Algorithm in a Network: Possible Alternatives

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**Abstract**— Performance of a network plays an important role for inter-business communication as well for e-commerce. As the number of machines hooked up on internet increases exponentially resulting in huge amount of data transfer thus requiring a network that is reliable and efficient. With ever-increasing traffic leading to several problems, congestion being one of them. Whenever problem occurs in a network the services to the users are often denied based on the priority of the user. In this paper we are going to throw light on several traditional ways for congestion control like warning bit, choke packets, load shedding and random early detection. These traditional methods for controlling congestion suffered from certain limitations like tuning of network parameters are difficult, wastage of resources etc. In this paper two theoretical intelligent possible alternatives are given first one using the combination of enhanced shortest path and macro flow by combining the streams to control the congestion. Second one uses the abilities of neural networks for finding the best route. The neural network are include at each node to take local decisions as well at central level for taking global decision.

**Keywords**— Neural networks, data mining, warning bits, choke packets, load shedding, Random early detection, Macro flow .

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### I. INTRODUCTION

#### A. Existing system

A network is said to be in the state of congestion whenever the network is unable to utilize the resources of the network properly. Traditionally following methods are used to overcome the problem of congestion.

- 1) *Warning bit*: A special bit in the header of the packet used to indicate the state of congestion. This special bit along with acknowledge is sent to the source for monitoring purpose, the source uses this information to adjust the rate of transmission.
- 2) *Choke packets*: Choke packet is transmitted by the receiving router to the source for communicating that the congestion has occurred in the link. The source responses to the choke packet by reducing the transmission rate.
- 3) *Load shedding*: One of the simplest technique for controlling the congestion. In this technique the source classifies the packets according to the priority of the packets. When congestion occurs the packets are simply discarded based on the priority of the packets.
- 4) *Random Early Detection (RED)*: In this technique drop probability is calculated by the router based on the size of the queue. The packets are marked, dropped by the router based on the probability and sends implicit or explicit message to the source. Source in response decreases the window size to adjust the transmission rate that is linearly proportional to the queue length.

#### B. Problems with existing system

Below are the demerits of the existing techniques:

- 1) Choke packets  
Demerits:
  - Parameters are difficult to tune.
  - The generation of additional choke packets by the source due to ignorance of choke packets for shorter period of time.
  - Source takes involuntary actions.
- 2) Load shedding  
Demerits:
  - Resources are wasted.

- Non-deterministic in nature.
- Sending host needs to pay attention to congestion.
- During the situation of congestion collapse only some the packets reach their destination as results the source generates more packets in form of new packets as well as regeneration of old packets.

### 3) Random early detection (RED)

Demerits:

- Small difference in parameters have large impact on performance.

### C. Alternatives

1) Artificial neural network solution: Artificial Neural network is an inspired approach of biological neuron. It consists of multiple interconnected simple computational units. The multiple inputs are provided to neural network either directly from elements or from other neurons. The input are weighted and summed. The weighted sum is provided as input to the transfer function which transfers the weighted into single output [4]. ANN Solution is possible due to their fault tolerant nature, high computational nature and ability to learn.

The Neural networks are used to determine the entire path from source to destination. The routing of packets is performed at local level as well at central level. At local level the neural network is included at each node that is provided with information such as cost of links to their neighbours, the destination and the time spent by packets in the queue. The time spent by packet in queue is calculated using little formula.

$$N = \lambda * T \quad [5] \quad (1)$$

Where N=Average number of packets in the system.

$\lambda$ = Arrival rate of packets.

T=Amount of time spent by the packets in the queue.

$$T=1/(\mu - \lambda). \quad (2)$$

Where  $\mu$ = Service rate of packets.

And  $\lambda$ =Arrival rate of Packets.

The output of the neural network is best neighbouring node.at Central level neural networks are included where the neural network is provided with inputs, the cost of links, queuing delay that was calculated earlier using local routing is used to calculate the best route from source to destination.

2) Data mining: : Data mining is the process of finding nuggets of a value or it can be said as the process of discovering patterns in vast pool of knowledge. The patterns discovered must reflect some useful information [7] [8] [6] [2].

In this approach two concept, one being the macro flow and other being the enhanced shortest path algorithm are combined to arrive for the better solution for congestion control naming (Macro enhanced shortest path algorithm). In macro flow the streams are combined on the properties of state variable like round trip time, retransmission time and even on LAN pair base [1]. The congestion control is done at two levels. At first level the congestion control is done within macro flow between the streams sharing the common knowledge of resources by making use of agglomerative hierarchy clustering algorithm [3] to form streams. This is a bottom up approach in which the connections or streams are merged by combining the clusters formed initially by finding the maximum distance between the connections. If the distance between the connections is within the threshold value they are joined to form stream and this step continues iteratively until the termination condition is met i.e. the error is within the tolerance limit. At the second level congestion control is done between the macro flows using enhanced shortest path algorithm, thus providing an extra level for controlling the state of congestion.in enhanced shortest path algorithm initially cost and congestion state of neighbouring nodes is calculated. The best link found by calculation is added to pool of best links. This step continues iteratively until all the best links are explored.

## II. CONCLUSION AND FUTURE WORK

The congestion control is the set of steps taken either to limit the spread of congestion or intensity of congestion within the tolerance limits. Various congestion control techniques are devised time and again. In this paper we tried to present some traditional congestion techniques with their limitations. Two alternate intelligent theoretical model or methods for congestion control are given, one using the neural network approach and other one using the data mining approach. In future we will try to devise a neural network congestion control algorithm as well as data mining one and compare their performance.

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