A Congestion Control Method with Originator Regulation on IP network

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1. Introduction

Nowadays, congestion control in the IP network becomes more important to communicate smoothly with less performance degradation. The usage rate of network line increases as spreading IP network applications, such as IP telephony and etc.

Techniques of present congestion control in the IP network is that the router discards packets when congestion is detected and it reduces number of packets to be sent [1].

However, if start of packet discarding process delays, congestion happens. The congestion occurs when enormous amount of packets exceeding assumed amount of packets are sent to a node. Especially, it is a significant problem that huge amount of packets concentrate to a node near the place greatly influenced by the social phenomenon.

In this research, the author aims to deal with congestion in the IP network. The new technique of congestion avoidance is proposed. After assuming the thing that all communications are done on IP network, the technique applies the concept of originator regulation used in the career telephony network. When congestion is detected, this technique restricts the number of packets which go to a specific destination address, and the packets going to the specific destination are discarded at places near the

originators of the packets. Thus, the task to be processed for the router becomes possible, and the packets that are not cause of packet concentration can be transferred to the place without influences of the social phenomenon.

The author achieves to construct the model of the proposed technique and verifies with simulation on the network simulator NS2.

2. Congestion control

According to [1], If the number of packets which are transmitted to the subnet by the host is ranges of the processing performance, all packets are transmitted, except when the packets are not delivered by the transmission mistake. However, the performance falls when a huge amount of packet flows into the subnet. Such a situation is called "*congestion*".

Because the transmission in the network doesn't work at all when congestion occurs, the congestion control is needed.

Various control techniques have been proposed, for example, RED in the network layer, and TCP Tahoe in the transport layer, TCP Reno, and ECN etc.

3. Problem of traditional congestion control

Problem of the transport layer is it is not able to know the state of the network in a route on the way because the transport layer is a transmission with End to End. Therefore, it can only control the window size of the segment transmitted and the timing of the transmission, and an effective action cannot be done to congestion that happens by a route on the way.

Also, in the network layer which used the technique such as AQM traditionally, it is only able to know the information on congestion of the own node and on congestion of the adjoining node. In addition, the queue length is observed; the congestion detection is done in the network layer. But the usage rate of line in network is not observed. As for the queue, there is a possibility of not in time to begin the congestion control after the queue becomes long, because it increases exponentially when it begins to become long once. It is difficult to do an appropriate control.

4. Congestion control with originator regulation

To solve the problem of a traditional congestion control, and to eradicate

a fundamental cause of congestion, the author proposes the congestion control technique for applying the concept of the originator regulation used on the network of the career to the IP network.

In the proposal technique, it observes usage rate of line on a certain node by destination address. When congestion is detected, the packet is dropped at a certain probability to restrict the transmission of the destination address which is cause of congestion. In the node near the destination, the usage rate of network line is observed, and directed the regulation. Near the source, the packet is dropped when the notification is received. Thus, the regulation can restrict near the origin, and can solve the congestion fundamentally. In addition, the communication which is not cause of congestion is not regulated because the packet is not dropped. So it is not influenced from the congestion control.

5. Experiment by simulation

To verify the effect of the proposal technique, the proposal technique is built in, and simulated to NS2. Droptail and RED are adopted as an object of comparison. Because it was a congestion control in the same network layer, these two techniques were selected. Evaluation method is the data of each usage rate of network line etc. which is extracted from the trace file and the log file generated after it simulates. And it compares with each data.

The evaluation item is

- End time of transmission of TCP
- The number of dropped packet

The influence of communication that is not the cause of the packet concentration is evaluated from the comparison of the termination time of the communication of TCP. And the effect of the congestion control of the proposal technique is shown from the comparison of the numbers of dropped packet.

6. Conclusion

In this research, to solve congestion that the social phenomenon causes the packet concentration on one address, a new congestion control is proposed. And the author applied the concept of the originator regulation of

the career to the IP network. The network was simulated using NS2 to verify the effect, and compare proposed technique with traditional.

As a result, the congestion control that used the concept of the proposed originator regulation showed that it is possible to do the congestion control for congestion caused by the packet concentrates on one address. This technique doesn't influence the communication which transfers to other addresses. It is thought that it is more effective in a large amount of packet concentration on one place caused by the social phenomenon than the traditional technique, and not obstructs the communication to another. In addition, proposed congestion control which watches the usage rate of line is more effective than traditional technique which watches the queue.

References

[1] Andrew S. Tanenbaum. *"COMPUTER NETWORKS FOURTH EDITION"*. Nikkei BP, 2003.