A Fair Bandwidth Allocation Scheme WFQ on Resource reSerVation Protocol

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1 Introduction

Transmissions of video and voice on the computer networks have been investigated. Long delay cause unsatisfied communications. Networks guaranteed bandwidth to decrease delay is needed for multi-media communications. Because IP(Internet Protocol) with best-effort has been used on the internet, network bandwidth can't be reserved on IP networks. RSVP(Resource reSerVation Protocol) is used for multi-media communication on IP networks. RSVP have been standardized by IETF(Internet Engineering Task Force).
The efficient bandwidth allocation scheme has been investigating. In some paper, a priority bandwidth allocation scheme with maximum and minimum required bandwidth is proposed. The other bandwidth allocation scheme is exploitation from bandwidth of other streams to accept a new stream by considering quality of other streams.

Conventional bandwidth allocation schemes guaranteed network bandwidth in crowded network. Conventional bandwidth allocation schemes isn't considered on the other network states. When a new stream is accepted into network, bandwidth allocation schemes may cause a poor QoS(Quality of Service) of Streams by exploitation from bandwidth of other streams. We have presented a fair bandwidth allocation scheme WFQMM(WFQ with the Maximum and the Minimum bandwidth) by introducing the maximum and the minimum required bandwidth into WFQ(Weighted Fair Queuing). WFQMM presents bandwidth for more streams. However, when a new stream is accepted into a network, QoS of streams in networks may grow worse remarkably. In the paper, we present bandwidth reservation scheme for conjecture time to keep away a decline of QoS strikingly.

We discuss bandwidth allocation scheme to guess the reservation time considering a satisfied ratio. A simulation shows WFQMM gives a satisfied ration and a waiting-time, also a detailed simulation shows that WFQMM much improves transmission delay.

2 Multi-media communications

Multi-media communications are that video and voice are transmitted on the computer network. Because usual datas are smaller than multi-media communications, it is no problems for a packet delay to transmit datas. A packet delay of multi-media datas is an important problem for users receiving video and voice in real time. We need QoS networks for good multi-media communications. QoS networks are guaranteed a bandwidth and a packet delay.

ATM(Asyncronous Transfer Mode) networks is one kind of QoS networks. All types of voice, video, and data information are carried in 53-byte ATM networks cells, unlike traditional best-effort packet networks. ATM networks can support a wide range of service by providing a specified QoS. IP over ATM have been investigating to transmit IP packets on ATM networks.

Because IP packets is transmitted in best-effort, multi-media communications on IP networks are difficult. IETF has been standardizing RSVP on IP networks. RSVP is described about a reservation process on IP networks. Bandwidth reservations on IP networks is realized by RSVP. RSVP messages is used for RSVP. When bandwidth is reserved, a path-message in one kind of RSVP messages is sended from the sending host to the receiving host. Then a resv-message in one kind of RSVP messages is returned from the receiving host to the sending host. In the end bandwidth is reserved from the sending host to the receiving host.

3 Fair bandwidth allocation schemes

Fair bandwidth allocation schemes have to keep away that a host or a stream command an absolute majority on the networks. Also the lost bandwidth of streams shall be guaranteed for each streams. Because necessary bandwidth of each streams differ, allocation bandwidth of each streams don't have better from same bandwidth.

WFQ is a packet bandwidth allocation scheme. After we discuss about WFQ for a stream bandwidth allocation scheme, we presented a fair bandwidth allocation scheme : WFQMM by introducing the maximum and minimum required bandwidth into WFQ.

More streams is accepted into networks by bandwidth allocation schemes. However QoS of each streams may grow worse. Therefore a satisfied ratio is defined an average bandwidth per a time-step, we present bandwidth reservation scheme for conjecture time comparing with a satisfied ratio of the modeling stream. A bandwidth reservation of streams is modeled by queuing theory. Traffics of the computer networks are often modeled by queuing theory.

4 Performance of WFQMM

We discuss the performance of the WFQMM based on simulation using queuing theory. WFQMM is implemented in the simulator. We experimented about QoS of streams. In first experiment, we show a satisfied ratio and waiting-time by simulation. It is seemed that WFQMM gives a good satisfied ratio than a conventional bandwidth allocation scheme. The efficient bandwidth reservation scheme gives a better satisfied ratio. Also we evaluate about a satisfied ratio and waiting-time for variable service numbers by simulation. We show more service numbers give a better satisfied ratio. We classified two network states such as (i)$\rho \geq 1$, (ii)$\rho < 1$ by ρ(a traffic density).

In second experiment, We show a packet delay and transmission packets by WFQMM. WFQMM much improved average delay than best-effort. WFQMM gives a smaller packet delay and more transmission packets than maximum and minimum bandwidth required.

5 Conclusion

We presented a fair bandwidth allocation scheme: WFQMM based on WFQ. When a new stream is accepted into the network, QoS of streams may grow worse remarkably. We described about bandwidth reservation scheme for conjecture time by a satisfied ratio to solve the problem.

The simulation is modeled by queuing theory. The simulation shows a good satisfied ratio and a little waiting-time than a conventional bandwidth allocation scheme. The packet simulation shows that WFQMM much improves packet transmissions.

The future works is extensions of WFQMM by way of plural routers.