

Cyclic Performance Fluctuation of TCP BBR

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TCP BBR, CUBIC TCP, TCP fairness, Cyclic performance

1 INTRODUCTION

CUBIC TCP [1] has been widely used for this decade. In 2016, TCP BBR [2] was proposed and some papers [3] reported that fairness between them is not achieved. In this paper, we evaluate the performances of CUBIC TCP and TCP BBR when they communicate concurrently on a network with a small physical propagation delay. We then show that their throughputs fluctuate periodically.

2 TCP CONGESTION CONTROL ALGORITHM

TCP BBR controls its window size based on Kleinrock's loss model. It estimates the bottleneck bandwidth and physical propagation delay time during its communication and determines its size according to them.

3 PERFORMANCE EVALUATION

Here we evaluate the performances of ten CUBIC TCP and 10 TCP BBR connections in a situation wherein they communicate concurrently on a network with a small propagation delay time. We measured their throughputs with iperf3. The network is composed of two clients for the senders, one server for the receiver, and one network element for queueing. All of them supported 1 GbE. The maximum congestion window sizes were 32 MB.

The transitions of the ten throughputs of CUBIC TCP and TCP BBR are shown in Fig. 1 and 2, respectively. These results demonstrated the performances cyclically fluctuate with a 20 sec period.

4 DISCUSSION

The results in Section 3 showed that the throughputs of CUBIC TCP and TCP BBR significantly fluctuate and become severely low in a period. This fluctuation may cause a severe user experience in some situation for example video streaming.

5 RELATED WORK

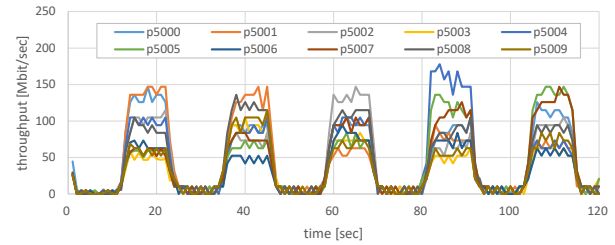


Figure 1: Throughput of 10 CUBIC (10 CUBIC and 10 BBR)

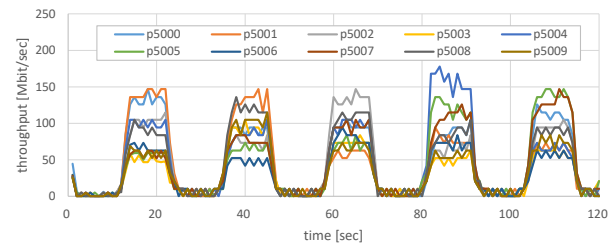


Figure 2: Throughput of 10 BBR (10 CUBIC and 10 BBR)

Hock et al. showed severe performance fairness between TCP BBR and CUBIC TCP [3]. However, they did not mention performance fluctuation.

6 CONCLUSION

In this paper, we evaluated the behaviors of the performances of CUBIC TCP and TCP BBR and showed that they periodically fluctuate. For future work, we discuss a method for relieving this fluctuation.

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