Elastic-TCP: flexible congestion control algorithm to adapt for high-BDP networks

ABSTRACT

In the last decade, the demand for Internet applications has been increased, which increases the number of data centers across the world. These data centers are usually connected to each other using long-distance and high-speed networks. As known, the Transmission Control Protocol (TCP) is the predominant protocol used to provide such connectivity among these data centers. Unfortunately, the huge bandwidth-delay product (BDP) of these networks hinders TCP from achieving full bandwidth utilization. In order to increase TCP flexibility to adapt for high-BDP networks, we propose a new delay-based and RTT-independent congestion control algorithm (CCA), namely Elastic-TCP. It mainly contributes the novel window-correlated weighting function (WWF) to increase TCP bandwidth utilization over high-BDP networks. Extensive simulation and testbed experiments have been carried out to evaluate the proposed Elastic-TCP by comparing its performance to the commonly used TCPs developed by Microsoft, Linux, and Google. The results show that the proposed Elastic-TCP achieves higher average throughput than the other TCPs, while it maintains the sharing fairness and the loss ratio. Moreover, it is worth noting that the new Elastic-TCP presents lower sensitivity to the variation of buffer size and packet error rate than the other TCPs, which grants high efficiency and stability.

Keyword: Bandwidth; Data centers; Protocols; Sensitivity; Packet loss; Throughput