

Slow Start Concept in Data Communication

Likhita KM¹, Mr. Pradeep Nayak², Finny Paul³, Keerthana G⁴, Gary Richards⁵

Students, Department of Information Science and Engineering^{1,3,4,5}

Assistant Professor, Department of Computer Science and Engineering²

Alvas Institute of Engineering and Technology, Mijar, Karnataka, India

4a20is021@gmail.com, pradeep@aiet.org.in, 4a20is018@gmail.com

keerthanasonu007@gmail.com, 4a20is019@gmail.com

Abstract: *The Transmission Control Protocol(TCP) is one of the pillars of the Internet. As a result, a lot of research has been done to enhance its performance, primarily by improving the congestion control algorithm of TCP. In this work, we demonstrate that TCP's Slow-Start algorithm is increasingly turning into a bottleneck in contemporary high-speed networks, in addition to congestion control. By incorporating StopEG into Google's BBR congestion control algorithm, it is evaluated through simulations in ns-3. Results from simulations show that it is effective in BBR, with a 68% reduction in the bottleneck queue's length when new connections are made. We suggest a different method called Stateful-TCP to address the issue, in which the path bandwidth estimated in a prior flow is used to immediately increase the transmission rate of a subsequent flow to the same destination. As a result, conventional Slow-Start is no longer necessary, and TCP is able to utilise the available path bandwidth effectively right away.*

Keywords: Data Communication.

REFERENCES

- [1]. N.Dukkipati, T.Refige, Y.Cheng, J.Chu, T.Herbert, A.Agarwal, A.Jain, and N. Sutin, "An argument for increasing TCP's initial congestion window," *ACMSIGCOMM Comput. Commun. Rev.*, vol.40, no.3, pp. 26–33, 2010.
- [2]. I. Rhee and L. Xu, "CUBIC: A new TCP-friendly high-speed TCP variant," *ACM SIGOPS Operating Syst. Rev.*, vol. 42, no. 5, pp. 64–74, 2008.
- [3]. S. Mascolo, C. Casetti, M. Gerla, M. Y. Sanadidi, and R. Wang, "TCP westwood: Bandwidth estimation for enhanced transport over wireless links," in *Proc. 7th Annu. Int. Conf. Mobile Comput. Netw. (MobiCom)*, Rome, Italy, 2001, pp. 287–297.
- [4]. C. P. Fu and S. C. Liew, "TCP veno: TCP enhancement for transmission over wireless access networks," *IEEE J. Sel. Areas Commun.*, vol.21, no.2, pp. 216–228, Feb. 2003.
- [5]. N. Cardwell, Y. Cheng, C. S. Gunn, V. Jacobson, and S. Yeganeh, "BBR: Congestion-based congestion control," *Queue*, vol. 14, no. 5, pp. 20–53, Sep. 2016.
- [6]. C. Caini and R. Firrincieli, "TCP hybla: A TCP enhancement for heterogeneous networks," *Int. J. Satell. Commun. Netw.*, vol. 22, no. 5, pp. 547–566, Sep. 2004.
- [7]. M. Alizadeh, A. Greenberg, D. A. Maltz, J. Padhye, P. Patel, B. Prabhakar, S. Sengupta, and M. Sridharan, "Data center TCP (DCTCP)," in *Proc. ACM SIGCOMM Conf. SIGCOMM*, New Delhi, India, Aug. 2010, pp. 63–74.
- [8]. K. Winstein, A. Sivaraman, and H. Balakrishnan, "Stochastic forecasts achieve high throughput and low delay over cellular networks," in *Proc. NSDI*, Lombard, IL, USA, Apr. 2013, pp. 459–471.
- [9]. M. Dong, Q. Li, D. Zarchy, P. B. Godfrey, and M. Schapira, "PCC: Rearchitecting congestion control for consistent high performance," in *Proc. NSDI*, Oakland, CA, USA, May 2015, pp. 395–408.
- [10]. V. Arun and H. Balakrishnan, "Copa: Practical delay-based congestion control for the Internet," in *Proc. NSDI*, Renton, WA, USA, 2018, pp. 329–342.
- [11]. F. Ahmed, J. Erman, Z. Ge, A. X. Liu, J. Wang, and H. Yan, "Detecting and localizing end-to-end performance degradation for cellular data services," in *Proc. IEEE INFOCOM-35th Annu. IEEE Int. Conf. Comput. Commun.*, Portland, OR, USA, Apr. 2016, pp. 459–460.

- [12]. Modified DummyNet. Accessed: Sep. 1, 2020.[Online]. Available: <https://github.com/mclab-cuhk/netmap-ipfw> [46] Y.-C. Chen, E. M. Nahum, R. J. Gibbens, and D. Towsley, “Measuring cellular networks: Characterizing 3G, 4G, and path diversity,” in Proc. Annu. Conf. Int. Technol. Alliance, Jun. 2012, pp. 1–8.
- [13]. Bonree. Accessed: Sep. 1, 2020.[Online]. Available: <https://www.bonree.com>
- [14]. G. C. Kessler. An Overview of Cryptography. Accessed: Sep. 1,2020. [Online]. Available: <http://www.garykessler.net/library/crypto.html>