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Inter-Datacenter File Transfer Examinations for HPC Using Real Datasets

Overview

- Problem Statement

Nowadays, a variety of real-time applications such as large-scale sensing and control require high-speed data transfer over inter-datacenter transport network. Several data transfer protocols, which are based on either transmission control protocol (TCP) or user datagram protocol (UDP), have been introduced for such a network. However, only a few protocols have ever succeeded in higher throughput than 10 Gbps in inter-datacenter transport network.

- Our Contributions

We develop a novel high-speed data transfer protocol for inter-datacenter transport network, namely high-performance and flexible protocol (HpFP). The HpFP1 is designed for specified networks and puts more emphasis on latency and packet loss tolerances than fairness and friendliness, while the HpFP2 is an improved version of the HpFP1 and is more suitable for real network environments. Based on HpFP2, we implement a file transfer tool, called high-performance copy (HCP), to improve data transfer performance on JHPCN.

HpFP2

- Improve the congestion control of HpFP1
- Operate in four different modes

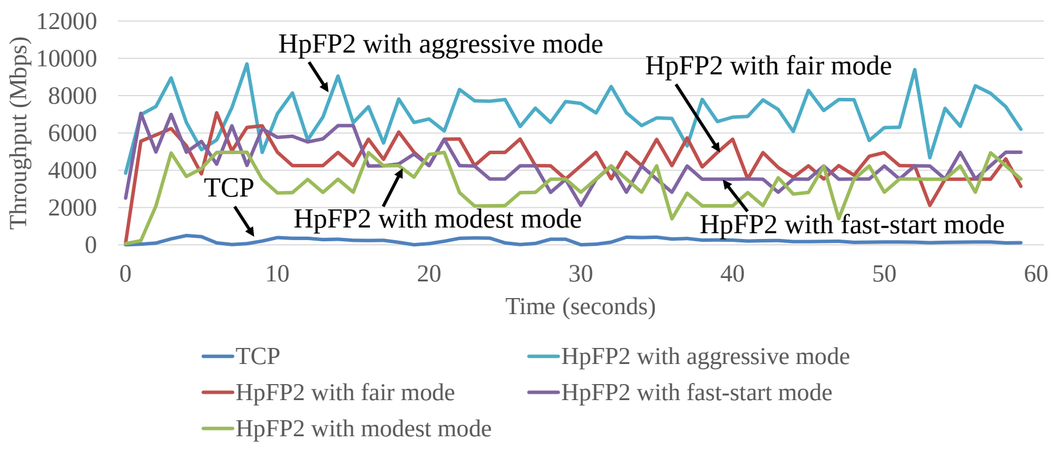
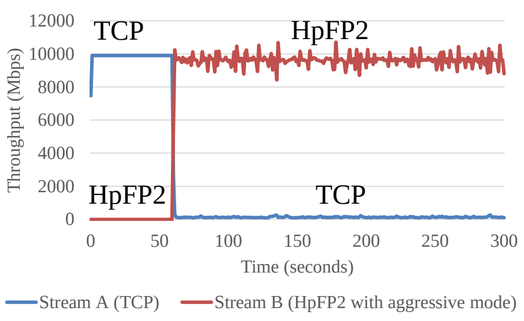
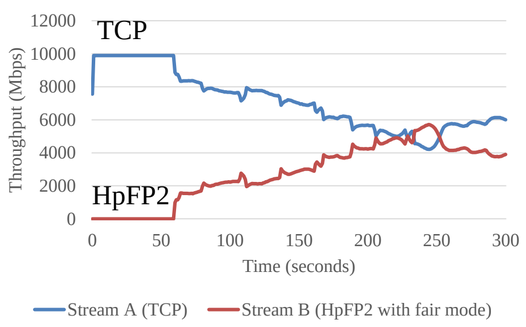


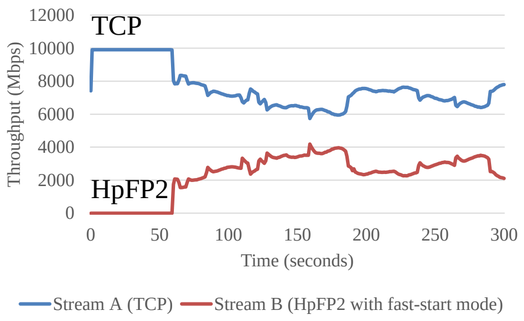
Fig. 1 Throughputs of TCP and HpFP2 in laboratory network with 100 ms RTT and 0.01% PLR



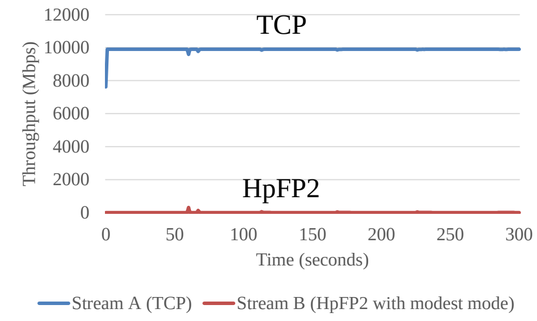
(a) Aggressive mode



(b) Fair mode



(c) Fast-start mode



(d) Modest mode

Fig. 2 Four modes of HpFP2 in laboratory network with 10 ms RTT

Throughput Improvement

- HpFP2 with fair mode achieves better performance than TCP while maintaining both fairness and friendliness.

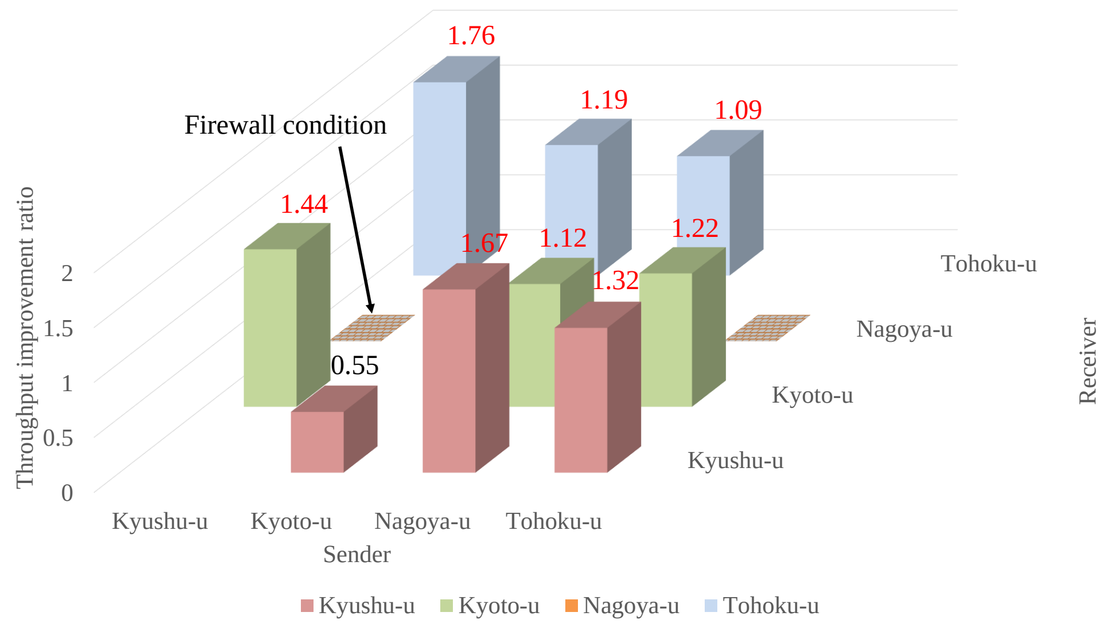
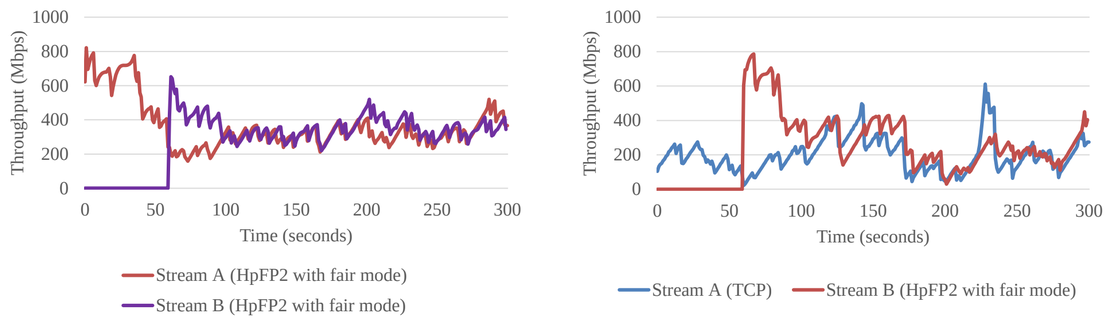


Fig. 3 Throughput improvement ratio of HpFP2 with fair mode over TCP



(a) Fairness (b) Friendliness

Fig. 4 Fairness and friendliness of HpFP2 with fair mode in JHPCN from Kyushu University to Tohoku University

HCP

- File transfer tool based on HpFP2
- Supported on both Windows and Linux platforms
- The throughput of HCP tool decreases slightly as the number of files increases, compared to the conventional secure file transfer protocol (SFTP) utility program that must open a new TCP/IP connection for each file.

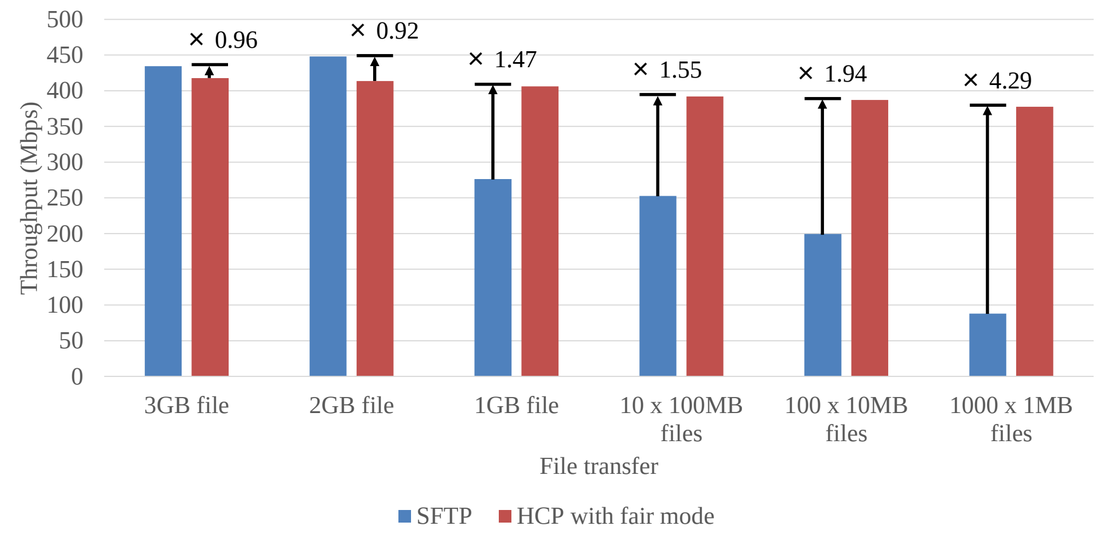


Fig. 5 Comparison of SFTP and HCP with fair mode in JHPCN from Kyoto University to Tohoku University

Collaborating Researchers
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