

Attacks against TCP fairness

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1 Context

In order to be accepted in existing operating systems, new transport level protocols typically need to exhibit a good level of fairness against existing protocols. Fairness usually means that flows generated by these new protocols will not monopolize network resources when competing with flows generated by older protocols. UDP is a good example of an unfair protocol since the rate at which the protocol uses network resources is unrelated to resources that are actually available. Some versions of the TCP protocols are also known for displaying some unfairness [1], [2]. An unfair protocol can appeal users since it can offer better communication performances (throughput, latency) at the cost of other users' communications. In TCP, fairness is mainly affected by two services : the loss recovery service which controls the rate at which loss segments are retransmitted and the congestion control service which aims at protecting the network against saturation.

2 Expected work

The goal of the project is to either configure or develop a version of TCP where the fairness against other existing TCP implementations is as low as possible while avoiding a network meltdown. This can be performed by either playing with configuration variables associated with the loss recovery and congestion control services or modifying the code for these services in an existing TCP/IP protocol stack. The tests and development will use the *ns3* simulator[3]. *ns3* is a discrete event simulator commonly used to test new protocols and currently supports over 15 TCP variations.

The project includes the following phases :

- Investigate existing fairness measures [4] (Jain, min-max, G, ...)
- Set up a testbed with *ns3* allowing fairness to be measured.
- Measure fairness of existing TCP variations in a default setting.
- Identify and evaluate configuration parameters playing a role in fairness in worst performing variations.
- Investigate modifications to existing services to decrease fairness.

Références

- [1] A. Esterhuizen and A. Krzesinski, TCP Congestion Control Comparison, SATNAC, 2012.
- [2] Thomas Lukaseder, Leonard Bradatsch, Benjamin Erb, Rens W. van der Heijden, Frank Kargl, A Comparison of TCP Congestion Control Algorithms in 10G Networks , IEEE 41st Conference on Local Computer Networks, 2016.

[3] <https://www.nsnam.org/>.

[4] https://en.wikipedia.org/wiki/Fairness_measure