Introduction to Computer Networks

Technical Essays

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The essay I chose is “TCP vs. TCP: a Systematic Study of Adverse Impact of Short-lived TCP Flows on Long-lived TCP Flows” (**2005** IEEE)

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Lots of researches are about UDP uses more than their share of the bandwidth when TCP flows also present. Long-lived TCP disproportionally affected by non-TCP flows in the context of fairness. Since UDP flows send data in higher rate than long-lived TCP and never back-off due to the absence of congestion control, they do lots of harm to the transmission of TCP, by the TCP fairness. However, the degradation is quite easy to detect. The authors of the paper turned their eyes to study TCP self-sabotage.

Focusing on the adverse impact of the interaction between patterns of short-lived TCP flows and long-lived TCP flows, the work significantly departs from prior studies.

First of all, it defines short-lived TCP is the TCP flow that spends most of its lifetime in slow start, while long-lived TCP spends most of its lifetime in congestion avoidance phase. Furthermore, it demonstrates and simulates the interactions between TCP flows and multiple bottleneck links and their sensitivities to correlated losses in the absence of 'non-TCP friendly' (ex. UDP) flows to give us an idea of what self-sabotage is like.

There are several scenarios discovered. Taking advantages of the characteristics of slow start, short-lived TCP can rapidly capture a greater proportion of bandwidth compared to long-lived TCP in congested avoidance. More, it must follow each other back-to-back until the long-lived flows are driven into timeout. However, if bottleneck link is heavily congested, the 'malicious' short-lived TCP cannot get sufficient bandwidth, thus the adverse of long-lived TCP is reduced.

After the reading of the paper, I realized that TCP are not that homogeneous as I used to think. At my first thought, cited from the power point of class, "if K TCP sessions share same bottleneck link of bandwidth R, each should have average rate of R/K", TCP is quite fair. Showing on the paper, if the TCPs are in different congestion phases, there will be a competition between short-lived and long-lived for bandwidth. The scenarios they generate achieve greater than 85% reduction in throughput for a number of TCP variants. But the probabilities of chance occurrences of such scenarios in normal large-scale simulations are still in study by that time. It still tells us that with careful manipulation there can be a severely degradation throughput of long-lived TCP flows.